UNIVERSITY OF
ILLINOIS LIBRARY
AT URBANA-CHAMPAIGN
BOOKSTACKS

016.33391
Se48

100

The Library of the
NOV 22 1976
University of Illinois
at Urbana-Champaign

# SELECTED WATER RESOURCES ABSTRACTS

VOLUME 8, NUMBER 19
OCTOBER 1, 1975

W75-09351 — W75-09850
CODEN: SWRABW

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

SELECTED WATER RESOURCES ABSTRACTS is available to Federal agencies, contractors, or grantees in water resources upon request to: Manager, Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior, Washington, D. C. 20240.

SELECTED WATER RESOURCES ABSTRACTS is also available on subscription from the National Technical Information Service. Annual subscription rates are: To the SWRA Journal, $75 ($95 foreign); to the Journal & Annual Index, $100 ($125 foreign); to the Annual Index only, $50 ($65 foreign). Certain documents abstracted in this journal can be purchased from the NTIS at prices indicated in the entry. Prepayment is required.

# SELECTED
# WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior

**VOLUME 8, NUMBER 19**
OCTOBER 1, 1975

W75-09351 -- W75-09850

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

Doc
I 19.4/2:
S/S-24

# FOREWORD

**Selected Water Resources Abstracts,** a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

**Selected Water Resources Abstracts** is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

## CONTENTS

FOREWORD ..... iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

**01** NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

**02** WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

**03** WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

**04** WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

**05** WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

# SELECTED WATER RESOURCES ABSTRACTS

## 1. NATURE OF WATER

### 1A. Properties

**THE MICROWAVE EMISSION SPECTUM FROM SPARKING WATER DROPS,**
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Physics.
For primary bibliographic entry see Field 2B.
W75-09614

## 2. WATER CYCLE

### 2A. General

**RECHARGE SIMULATION MODEL,**
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
D. M. Manbeck.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 502, $3.25 in paper copy, $2.25 in microfiche. Completion Report, June 1975. 21 p, 2 fig, 4 tab, 2 ref. OWRT A-028-NEB(1). 14-31-0001-5027.

Descriptors: *Artificial recharge, Model studies, Aquifers, Groundwater, *Mathematical models, *Simulation analysis, Computer programs, *Soil moisture, *Groundwater movement.

A mathematical model simulating the movement of water from the soil surface to groundwater was developed and programmed for the IBM 360/65 computer in Fortran IV language. Components of the model include precipitation, irrigation amounts, air temperature, saturation soil moisture content and hydraulic conductivity, volumetric moisture vs. moisture potential relationship, and thickness and number of strata. The model generates the amount of water from precipitation and irrigation sources moving vertically downward from one soil layer to the next on a monthly basis with given initial conditions. The input values and mathematical relationships are used to simulate the following processes: (1) interception by vegetation; (2) surface runoff; (3) evapotranspiration; and (4) percolation. The percolation or moisture movement from the last layer just above the water table is considered recharge to the groundwater system. Flow of moisture in the soil is assumed to be one dimensional and occurs under saturated and unsaturated conditions. The concept of one-dimensional flow restricts the accuracy of the model because soil moisture movement is very complicated and more complex relationships are not amenable to easy solution.
W75-09518

**URBAN LAWN INFILTRATION RATES AND FERTILIZER RUNOFF LOSSES UNDER SIMULATED RAINFALL,**
Ball State Univ., Muncie, Ind. Dept. of Natural Resources.
For primary bibliographic entry see Field 5B.
W75-09592

**OPTIMIZING LONG-TERM STREAMFLOW FORECASTS,**
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 4A.
W75-09594

**GROUND-WATER LEVEL IN THE FLOOD PLAIN AND ADJACENT UPLANDS OF THE SANGAMON RIVER,**
Illinois Univ., Urbana. Dept. of Forestry.
For primary bibliographic entry see Field 4B.
W75-09599

**SURFACE WATER RESOURCES OF ST. JOHNS RIVER, FLORIDA,**
Reynolds, Smith and Hills, Jacksonville, Fla.
Z. Qureshi.
Water Resources Bulletin, Vol 11, No 3, p 568-574, June 1975. 2 fig, 4 ref.

Descriptors: *Surface water availability, *River basins, *Florida, *Water resources, Environment, Drainage area, Consumptive use, Hydraulic gradient, Average flow, Swamps, Hydrology, Channel flow, Springs, Low flow, Backwater, Storage capacity, Flow characteristics, Tidal effects, Navigation.
Identifiers: *St. Johns River(Fla), Reverse flow, Oklawaha River basin(Fla).

The St. Johns River basin is the largest watershed entirely within Florida, and it is one of the few northward flowing rivers in the United States. The river basin contains 29,606 sq km of which 24,424 sq km are drained by the river and its tributaries. The remainder drains into the Atlantic Ocean of the Intracoastal Waterway. Its largest sub-basin is the Oklawaha River Basin, which has a drainage area of 7433 sq km. Ground elevations range from sea level to 61 m above mean sea level in the main river basin and as high as 91 m above mean sea level in the Oklawaha River basin. The surface water resources of the St. Johns River and the existing consumptive uses were investigated. The analysis revealed that the river is an extremely large and valuable resource which has been underutilized and could play a much stronger role in serving the needs of the people in the basin. (Roberts-ISWS)
W75-09604

**GEOGRAPHIC VARIATION OF THE STATISTICAL PARAMETERS OF HYDROMETEOROLOGICAL DATA OF THE UNITED STATES,**
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 2B.
W75-09605

**REGIONAL ANALYSES OF RUNOFF CHARACTERISTICS FOR SMALL URBAN WATERSHEDS,**
Utah Water Research Lab., Logan.
J. P. Riley, E. K. Israelsen, and G. B. Shih.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 517, $4.25 in paper copy, $2.25 in microfiche. Completion Report PRWG87-1, April 1975. 69 p, 21 fig, 5 tab, 64 ref, 4 append. OWRT B-047-UTAH(1). 14-31-0001-3340.

Descriptors: Water resources, Urban hydrology, Hydrology, Hydrologic cycle, *Storm runoff, Computer models, Mathematical models, *Texas, Small watersheds, Peak discharge, *Regional analysis, Rainfall-runoff relationships, Simulation analysis, *Regression analysis, Model studies, *Runoff forecasting.
Identifiers: Austin(Tex), Houston(Tex), Dallas(Tex), Fort Worth(Tex), *Urban watersheds.

A general method was developed for estimating runoff rates and associated confidence limits of a given recurrence interval for ungaged small urban watersheds. The utility of the method developed was demonstrated through its application to a southeast region of Texas. Some 200 historical rainfall-runoff events from 40 watersheds in Houston, Austin, Dallas, and Fort Worth urban areas were analyzed. Watershed data such as drainage area, percent of urbanized area, channel length, average channel slope, land slope, and soil type are documented. Total rainfall amounts intensities, durations, and mass-time distributions were determined for each storm and used to develop a rainfall generating model. Peak runoff, total runoff volume, and runoff duration are also determined. Statistical analyses were performed to develop regression models to relate peak runoff and total runoff volume with rainfall and watershed characteristics as independent variables. An urban watershed runoff model, based on the Utah Simulation Model, was used to identify the model parameters for each watershed by reproducing the historical storms. Relationships between model parameters and measured watershed variables were established. By combining the rainfall generating model and the watershed runoff model, peak runoff rates and total runoff volumes for different conditions were generated for chart construction.
W75-09621

**MATHEMATICAL MODELS IN HYDROLOGY,**
Institute of Hydrology, Wallingford (England).
R. T. Clarke.
Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper No 19, 1973. 282 p, 6 fig, append, 79 ref.

Descriptors: Hydrology, *Computer models, *Mathematical models, Water resources development, *Model studies, *Hydrologic models, Simulation analysis, Water management(Applied), Arid lands, *Reviews, *Bibliographies.

This manual attempts to advance the use of mathematical models in hydrology from a theoretical level to practical application. The state-of-the-art is reviewed; models are useful in extracting the maximum amount of information from available data. Since data are often slight in developing countries, particularly in sparsely inhabited arid regions, such models, if used with caution, could have great application in such nations. Various models are examined, and the appendix contains computer programs. A decision-making method is described that is cheap, flexible, and competent in working with meager data bases. (Bowden-Arizona)
W75-09624

**BIBLIOGRAPHY OF U.S. GEOLOGICAL SURVEY WATER-RESOURCES REPORTS FOR UTAH,**
Geological Survey, Salt Lake City, Utah.
B. A. LaPray.
Utah Department of Natural Resources, Salt Lake City, Information Bulletin No 23, 1975. 58 p, 4 tab.

Descriptors: *Bibliographies, *Water resources, *Publications, *Utah, Hydrologic data, Surface waters, Groundwater, Water quality, Streamflow, Runoff, Hydrology, Hydrogeology, Aquifer characteristics, Groundwater movement, Wells, Floods, Chemical analysis, Information retrieval.

This bibliography contains a complete listing to December 31, 1974, of reports relating to the water resources of Utah prepared by personnel of the U.S. Geological Survey. Discussions of the related subjects of geology, hydrology, and chemical quality of the water are included in many of the reports. The reports were, for the most part, prepared by personnel assigned to the Water Resources Division, Utah District, in cooperation with State and local agencies. The bibliography is divided into four major parts: (1) publications of the Geological Survey; (2) publications by agencies of the State of Utah; (3) other publications--reports prepared by Survey personnel, but published by other agencies or by professional organizations in their journals; and (4) open-file reports of the Geological Survey. (Woodard-USGS)
W75-09718

**HYDROLOGIC ANALYSIS OF THE VALLEY-FILL AQUIFER, NORTH PLATTE RIVER VALLEY, GOSHEN COUNTY, WYOMING,**
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 2F.
W75-09722

THE IMPLEMENTATION OF A HYDROLOGIC DATA PROCESSING SYSTEM IN BRAZIL,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-09726

A LABORATORY INVESTIGATION OF SURFACE RUNOFF,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W75-09744

A LABORATORY RAINFALL SIMULATOR FOR INFILTRATION AND SOIL DETACHMENT STUDIES,
Agricultural Research Service, Lafayette, Ind.
For primary bibliographic entry see Field 2G.
W75-09746

A NON-LINEAR RAINFALL-RUNOFF MODEL, PROVIDING FOR VARIABLE LAG TIME,
Newcastle-upon-Tyne Univ. (England). Dept. of Engineering Mathematics.
D. W. Reed, P. Johnson, and J. M. Firth.
Journal of Hydrology, Vol 25, No 3/4, p 295-305, May 1975. 4 fig, 1 tab, 9 ref.

Descriptors: *Runoff, *Unit hydrographs, *Rainfall-runoff relationships, *Hydrograph analysis, Hydrology, Rainfall, Hydrographs, Analysis, Storage, Distribution, Discharge(Water), Precipitation excess, Model studies, Watersheds(Basins).
Identifiers: *Lag time.

The cascading reservoir analogue of the rainfall-runoff process was extended, by the introduction of a third parameter, to apply to catchments exhibiting variable lag times. A semi-empirical relationship between lag time and storage was incorporated and the total-runoff hydrograph was computed. The resulting nonlinears, three-parameter model produced better representation of an observed rainfall-runoff event than the linear, gamma-distribution model. (Adams-ISWS)
W75-09753

## 2B. Precipitation

METHODOLOGICAL APPROACHES IN HAWAIIAN FOG RESEARCH,
Hawaii Univ., Honolulu. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 508, $3.75 in paper copy, $2.25 in microfiche. Technical Report No 85, March 1975. 34 p, 16 fig, 2 tab, 16 ref. OWRT A-041-HI(1). 14-31-0001-4011.

Descriptors: *Fog, *Precipitation(Atmospheric), *Raindrops, Water balance, Rainfall, Wind, *Hawaii, Networks, Methodology, Computer programs, Instrumentation, Measurement, Sampling.
Identifiers: *Fog analysis computer program, *Hawaiian upslope fog, *Droplet size, *Fog sampling network, Louvered screen, Fog gage, Fog interceptor, Grunow gage.

Recent studies have demonstrated the important moisture contribution from fog precipitation in mountain areas on the island of Hawaii. Research methodologies useful in the study of Hawaiian upslope fog were investigated, included: (1) development of an improved fog gage; (2) development of indirect approximation methods for estimating average droplet sizes during precipitation episodes and separating fog and rainfall components; (3) establishment of an extensive fog sampling network on the island of Hawaii employing continuous recording equipment, for both rain, fog, and wind; (4) development of an original computer program for detailed temporal and spatial analysis of rain, fog, and wind parameters.
W75-09526

WEATHER SATELLITE PICTURE RECEIVING STATIONS, APT DIGITAL SCAN CONVERTER,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center
For primary bibliographic entry see Field 7B.
W75-09588

THE EVOLUTION OF DROP SPECTRA DUE TO CONDENSATION, COALESCENCE AND BREAKUP,
Arizona Univ., Tucson. Inst. of Atmospheric Physics.
K. C. Young.
Journal of the Atmospheric Sciences, Vol 32, No 5, p 965-973, May 1975. 10 fig, 24 ref.

Descriptors: *Coalescence, *Condensation, *Nucleation, *Drops(Fluids), Numerical analysis, Clouds, Model studies, Rain, Stochastic processes, Supersaturation.
Identifiers: Warm rain processes, Drop breakup, Collection efficiency, Drop collision.

A numerical model of warm rain processes incorporating activation of cloud condensation nuclei, drop growth by condensation and stochastic coalescence, and drop breakup was described. A collisional breakup model was compared to a spontaneous disintegration model and found not only to dominate over the spontaneous disintegration model but to produce an exponential spectrum in fair agreement with average observed drop spectra. The steady-state spectrum was found to be quite insensitive to the number of satellite drops formed by collision or their size distribution. The effect of the finite-difference solution to the collection and breakup equations was analyzed. A properly stochastic formulation for finite time steps was presented but found to differ only slightly from the simpler, 'discrete' formulation. Time steps of 5 s and 45 size categories were found adequate to describe the essential quantitative features of more intensive treatments. The model results were found to be somewhat sensitive to values used for the collection efficiency. (Jones-ISWS)
W75-09597

GEOGRAPHIC VARIATION OF THE STATISTICAL PARAMETERS OF HYDROMETEOROLOGICAL DATA OF THE UNITED STATES,
Central and Southern Florida Flood Control District, West Palm Beach.
A. N. Shahane, D. Thomas, and P. Bock.
Water Resources Bulletin, Vol 11, No 3, p 584-598, June 1975. 9 fig, 3 tab, 5 ref.

Descriptors: *Variability, *Climatology, *Hydrology, *Meteorology, *Statistics, *United States, Parametric hydrology, Analysis, Drainage area, Geographical regions, Time-series analysis, Correlation analysis, Topography, Statistical methods, Data processing.
Identifiers: *Variance analysis, Autocorrelation coefficients, Serial correlation coefficients.

A methodology was developed to assess variations of statistical parameters of the hydrologic cycle of the United States by generating seven hydrometeorological time series for 76 small and 10 large drainage basins. Two conceptually different approaches (one using directional strips of large combined watersheds and the other using analysis of variances) were employed to explore the geographic variation of the statistical parameters (autocorrelations and explained variances) in question. Results adequately indicate the correspondence between these variations and the observed topographic, climatologic, and hydrologic characteristics over the United States. The results indicated a noticeable change in autocorrelation coefficients for precipitation and evapotranspiration series on either side of the Appalachian Rocky Mountains. Analysis of variance indica a significant linear north-south effect only evapotranspiration series. Analysis of variance explained variances of hydrometeorological c ponents indicated a signficant quadratic variat in the north-south direction for runoff, precip tion, and change in storage series. In east-w directions, runoff and precipitation series show significant variation in their explained varia values. (Roberts-ISWS)
W75-09605

A WIND TUNNEL INVESTIGATION ON I MULTIPLICATION BY FREEZING OF WATE DROPS FALLING AT TERMINAL VELOCI IN AIR,
California Univ., Los Angeles. Dept. Meteorology.
For primary bibliographic entry see Field 2C.
W75-09613

THE MICROWAVE EMISSION SPECTU FROM SPARKING WATER DROPS,
New Mexico Inst. of Mining and Technolog Socorro. Dept. of Physics.
G. D. Sower.
Journal of Geophysical Research, Vol 80, No 3 355-365, January 20, 1975. 7 fig, 27 ref. ONR Co tract N00014-67-A-0267-0157, NSF Grant G 32591X.

Descriptors: *Drops(Fluids), *Electrical prope ties, *Radiation, Microwaves, Clouds, Rad waves.
Identifiers: *Collisions, *Sparks, Radiomete Liquid water content.

The microwave emission spectrum was obtaine for the discharge during collision of two opposite charged water drops of equal size in the absence an external electric field. The power spectra o tained for drops 1.00 and 1.50 mm in diamet covering the frequency range 3291-10,940 MH show pronounced maximums and minimums, u like blackbody radiation, which follows an sq law, where f is the frequency. These results impl that radiation from sparking drops is separate fro the thermal radiation from clouds. The variation radiated energy E with drop size d and charge Q found at 9210 MHz to be E proportional to Q to th 6.6 power divided by 10 to the 1.96d power. Fo colliding drops of equal size, the radiated intensit is dependent on the total charge neutralize between the drops and not on how the charge is in itially distributed, even when one drop is initiall uncharged. On the basis of the experimenta results a simple cloud model was used to calculat contributions to the antenna temperature of radiometer from (1) the electrical activity due t sparking drops and (2) the cloud liquid wate present in the antenna beam. It appears feasible t utilize a dual-wavelength radiometer as a remot sensing probe to determine simultaneously th liquid water content and the electrical activity i certain types of storms. (Jones-ISWS)
W75-09614

A STOCHASTIC MODEL OF N-DAY PRECIPITATION,
Ecole Polytechnique, Montreal (Quebec).
P. Todorovic, and D. A. Woolhiser.
Journal of Applied Meteorology, Vol 14, No 1, p 17-24, February 1975. 6 fig, 1 tab, 7 ref, append.

Descriptors: *Precipitation(Atmospheric), *Stochastic processes, Markov processes, Analytical techniques, Model studies, Probability, Numerical analysis.
Identifiers: Distribution functions, Binomial-exponential model.

General expressions were derived for the distribution functions of the total amount of precipitation and the largest daily precipitation occurring in an

n-day period. Two special cases were considered: (1) the probability of occurrence of precipitation on any day in an n-day period is a constant (binomial counting process) and (2) the probability of occurrence of precipitation on any day depends on whether the previous day was wet or dry (Markov chain counting process). The distribution function for daily precipitation was assumed to be exponential. Analytic expressions were derived for the distribution functions for total precipitation or precipitation greater than a threshold. For the numerical example chosen, the Markov chain-exponential model was slightly superior to the binomial-exponential model. This stochastic model seemed to have several advantages over present approaches. (Jones-ISWS)
W75-09747

**RECENT AFRICAN RAINFALL PATTERNS,**
Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
M. Tanaka, B. C. Weare, A. R. Navato, and R. E. Newell.
Nature, Vol 255, No 5505, p 201-203, May 15, 1975. 4 fig, 1 tab, 11 ref.

Descriptors: *Rainfall disposition, *Africa, *Distribution patterns, Precipitation(Atmospheric), Rainfall, Isohyets, Analysis, Evaluation, Average, Seasonal, Summer, Hyetographs.
Identifiers: *Sahel.

Presented were the results of a pilot study aimed at creating a more concrete basis for discussion of the variability in both space and time of rainfall in the Sahel. The Sahel region was defined as that extending across the entire African continent between 10 deg N and 20 deg N. The area west of approximately 30 deg E is a fairly regular plain; to the east are the Nile River Basin of Sudan and the mountains of Ethiopia. The atmospheric circulation system that brings rain to this region is the ascending branch of the tropical Hadley cell, often called the Intertropical Convergence Zone (ITCZ), which moves north of the equator in the Northern Hemisphere summer. This system usually reaches its most northerly position in August, the wettest month over the Sahel. The analysis was concentrated on August for years with good climatic records (1941-1973). Average August rainfall patterns were presented for 1941-1950 and 1951-1960, and the years 1964, 1968, and 1972. The Sahel region had about 10% more rainfall during 1951-1960 than in 1941-1950. The rainfall pattern for August 1964 was similar to those for 1951-1960. The lowest precipitation during 1941-1973 was in 1972 and 1973. (Humphreys-ISWS)
W75-09766

**DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP) USER'S GUIDE,**
Air Weather Service, Scott AFB, Ill.
For primary bibliographic entry see Field 7B.
W75-09770

**DROUGHT, A RECURRENT ELEMENT OF CLIMATE,**
Maryland Univ., College Park. Graduate Program in Meteorology.
H. E. Landsberg.
Paper presented on June 6, 1974, at 26th Meeting of Executive Committee of World Meteorological Organization, Geneva, Switzerland, 1974. 49 p, 26 fig, 2 tab, 40 ref.

Descriptors: *Drought, *Africa, *Forecasting, *Arid climates, *Climatology, *Meteorological data, Statistics, Statistical models, Environmental effects, Exploitation, Biomes, Deserts, Ecology, Dry seasons, Weather modification.
Identifiers: Sahel, Dust bowl, Desertification.

Drought is a recurrent element of climate and there is no need to invoke climatic change as a cause each time drought occurs. Research in past decades has made it possible to predict the risk of drought in different regions. Numerous examples are given of the applicability of statistical methods in predicting droughts and other weather anomalies. Humans heighten the consequences of drought in arid and semi-arid regions when their exploitation of the land lessens its ability to recover. The Sahel in Africa today and the Great Plains in the United States in the 1930's are examples of such an overuse. Drought is part of the climatic pattern in all parts of the world. Dry regions bear the brunt of these fluctuations since their ecosystems are more fragile than moister regions. Where in the past nomadism and migration were a way out of drought, population pressures and political aspects now aggravate the problem. Anticipation of droughts can mitigate their consequences. Current techniques, including weather modification, can alter them. (Bowden-Arizona)
W75-09799

## 2C. Snow, Ice, and Frost

**OPTIMIZING LONG-TERM STREAMFLOW FORECASTS,**
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 4A.
W75-09594

**THE FRAGMENTATION AND ELECTRIFICATION OF FREEZING DROPS,**
Toronto Univ. (Ontario). McLennan Lab.
R. J. Kolomeychuk, D. C. McKay, and J. V. Iribarne.
Journal of the Atmospheric Sciences, Vol 32, No 5, p 974-979, May 1975. 4 fig, 5 tab, 23 ref.

Descriptors: *Drops(Fluids), *Freezing, *Electrical properties, Saturation, Laboratory tests, Nitrogen, Ice, Crystals, Gases.
Identifiers: *Fragmentation, *Electrification, Splintering, Cracking.

Drops in the size range 1.2 to 1.9 mm were frozen while floating in a nitrogen stream. Frequency of splitting and cracking was found to be 80-90% when the gas was dry and 57% when it was saturated with water vapor. During freezing, about half of the drops acquired charges (of both signs) in the order of several tenths of a picoColumb and the sam proportion (in separate experiments) produced splinters, giving an average of about 10 splinters per frozen drop. (Jones-ISWS)
W75-09598

**A WIND TUNNEL INVESTIGATION ON ICE MULTIPLICATION BY FREEZING OF WATERDROPS FALLING AT TERMINAL VELOCITY IN AIR,**
California Univ., Los Angeles. Dept. of Meteorology.
H. R. Pruppacher, and R. J. Schlamp.
Journal of Geophysical Research, Vol 80, No 3, p 380-386, January 20, 1975. 1 fig, 1 tab, 53 ref.

Descriptors: *Drops(Fluids), *Freezing, *Clays, *Nucleation, Ice crystals, Supercooling, Rime, Aerosols, Laboratory tests, Meteorology, Ice.
Identifiers: *Splintering, *Fragmentation.

The freezing behavior of waterdrops nucleated by contact with clay particles was studied. The experimental setup utilized a cloud tunnel which allowed retrieval of the frozen particles from the airstream for study under a microscope. The mode of fragmentation of freezing waterdrops was investigated. It was found that, depending on the drops surface temperature, up to 42% of the drops frozen by contact nucleation with a clay aerosol transformed into ice particles with surface breaks that resulted from ejection of 1 splinter, whereas only up to 8.5% shattered into 2-3 fragments and only up to 6.3% totally ruptured into a large (3) but undetermined number of very small ice fragments. Drops frozen by clay particles submerged in a drop did not shatter and they produced much fewer frozen drops with surface breaks. It was concluded that ice multiplication by freezing and splintering of freely falling drops cannot account for the large concentration of icy crystals found in certain clouds with top temperatures warmer than -10C, although, the mechanism cannot be ignored. It may contribute to the start of the ice multiplication mechanism which, according to Hallett and Mossop, is efficiently carried on by the production of ice splinters during riming. (Jones-ISWS)
W75-09613

**ARCTIC BARRIER FORMATION,**
Exxon Production Research Co., Houston, Tex. (assignee)
For primary bibliographic entry see Field 8A.
W75-09644

**HEAT TRANSFER IN SOIL-WATER-ICE SYSTEMS,**
Dames and Moore, Washington, D.C.
A. Mohan.
Journal of the Geotechnical Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No GT2, Paper 11123, p 97-113, February 1975. 6 fig, 20 ref, 2 append.

Descriptors: *Heat transfer, *Frozen soils, *Ice, *Mathematical models, Theoretical analysis, Finite element analysis, Soil water, Soil mechanics, Temperature, Soils, Freezing, Thawing, Equations, Computer models, Water, Soil engineering, Frost action, Conduction.

The finite element method has an excellent solution capability for problems requiring transient temperature distribution under time-dependent temperature initial and boundary conditions. Some exceptional features in handling are: space variations of temperature-dependent material properties, irregular boundary geometries of problem regions, temperature and heat flux boundary conditions at any point in the problem region, and freedom in varying the size of the finite discretization within the problem region. Presented was a general computer-oriented solution technique for geotechnical problems of heat conduction, including the effect of latent heat generation and absorption. A variational principle was applied for initial boundary value problems of unsteady heat flow, and the finite elements method was used to generate approximate solutions to plane and axisymmetric problems. Variation in physical and thermal properties of materials with both temperature and space, and functional relationships between the amount of water frozen and the temperature were taken into account automatically during the process of heat conduction. Comparison of computer solutions with exact solutions of two examples showed an excellent agreement, even for a coarse element representation of an infinite medium in a finite region. The finite element method is potentially a powerful tool for prediction of temperature distribution and rate of thaw (freeze) of frozen (unfrozen) media due to an imposed source (sink) of heat and under natural environmental conditions. (Humphreys-ISWS)
W75-09742

**THE PREDICTION OF LAKE HURON LAKE-EFFECT SNOWFALL SYSTEMS,**
Nebraska Univ., Lincoln. Dept. of Geography.
K. F. Dewey.
Journal of Applied Meteorology, Vol 14, No 1, p 3-7, February 1975. 4 fig, 1 tab, 9 ref.

Descriptors: *Forecasting, *Lake Huron, *Snowfall, Snow, Energy budget, Evaporation, Ice cover, *Data collections, Lakes, Theoretical analysis, Statistical methods, Great Lakes region, Heat budget.

Identifiers: Bulk aerodynamic method, Discriminant analysis.

Data were collected during the 1971-1972 snowfall season for the Lake Huron basin. The bulk aerodynamic approach, as formulated by Priestley(1959), was utilized to estimate the daily average flux of heat and moisture over the lake. It was hypothesized that discriminant analysis could be employed to determine the threshold value (discriminant index) of the energy flux which is necessary for the occurrence of the lake-effect snowfall system. To determine the validity of this threshold value, the discriminant index was applied to a series of historical data. The results of this analysis indicated that the discriminant index could be utilized to forecast lake-effect snowfall days. (Jones-ISWS)
W75-09748

**THE COMPOSITE ROUGHNESS OF ICE COVERED STREAMS,**
Iowa Inst. of Hydraulic Research, Iowa City.
M. S. Uzuner.
Journal of Hydraulic Research, Vol 13, No 1, p 79-102, 1975. 8 fig, 2 tab, 7 ref. NSF Grant GK-35918X, Army Contract DACW25-72-C-0012.

Descriptors: *Hydraulics, *River flow, *Equations, *Ice cover, *Flow resistance, Streamflow, Resistance, Ice, Hydraulic radius, Winter, Drag, Streams, Roughness(Hydraulic), Friction.
Identifiers: Friction factors.

The various techniques proposed for calculating the composite roughness of ice-covered streams were reviewed and evaluated. Evaluation stressed the roughness formula used and the method of dividing the flow into bed and ice cover affected portions. A graph was presented to assist in application of Carey's method. The various predictors were compared and their application was discussed. The procedures proposed by Hancu and Larsen were recommended. Hancu's method was preferred because it used the Darcy-Weisbach friction factor. (Adams-ISWS)
W75-09758

**HURONIAN GLACIATION AND POLAR WANDER FROM THE GOWGANDA FORMATION, ONTARIO,**
Windsor Univ. (Ontario). Dept. of Geology.
D. T. A. Symons.
Geology, Vol 3, No 6, p 303-306, June 1975. 4 fig, 2 tab, 42 ref.

Descriptors: *Glaciation, *Geology, *On-site investigations, *Canada, Lake Huron, Evaluation, Sedimentary rocks, Diagenesis, Polar regions, Paleosols.
Identifiers: *Paleoaphebian glaciation, *Gowganda formation, Ontario, Elliot Lake, Paleomagnetic analysis, Paleoaphebian polar wander.

The origin of the till-like conglomerate of the Huronian Gowganda Formation is controversial. The argument centers on whether the conglomerate was deposited directly from the ice as a normal till in a glacial polar climate or whether the boulders were ice rafted and dropped into sediments deposited around an ice sheet in a periglacial subpolar climate. Paleomagnetic analysis provides a direct geophysical method to locate the pole position at the time of deposition and thus helps distinguish the hypotheses. The paleomagnetism of sedimentary rocks from the Huronian Gowganda Formation was studied for 16 sites near Elliot Lake, Ontario, in the Southern Geologic province. The rocks retain a stable remanence acquired during diagenesis some 2.29 billion years ago. The calculated paleolatitude of 62 degrees favors a polar glacial till mode of deposition for the thick tillite members, rather than a subpolar periglacial dropstone mode. The Gowganda pole at lat 65 degrees N, long 123 degrees W indicates that either the ice cap was much larger than now thought or the Bear and Slave provinces were separated from the Churchill, Superior, and Southern provinces in Paleoaphebian time. The pole also requires a radical change in previously published Paleoaphebian polar wander paths. (Humphreys-ISWS)
W75-09763

## 2D. Evaporation and Transpiration

**EVAPORATION FROM WATER SURFACES IN CALIFORNIA,**
California State Dept. of Water Resources, Sacramento.
J. D. Goodridge.
Bulletin 73-1, May 1974. 173 p, 3 tab, 12 ref, 2 plates.

Descriptors: *Evaporation, *Evaporation pans, *California, *Stations, Environment, Water policy, Management, Water resources, Irrigation water, Drainage, Conservation, Vegetation effects, Boundary layers, Wind velocity, Solar radiation, Planning, Arid climates, Data collections, Air-water interfaces, Free surfaces.
Identifiers: Upwind fetch.

Monthly total evaporation data were provided as reported by observers operating evaporation pans throughout California. It was the basic data appendix to Bulletin No. 73, 'Evaporation from Water Surfaces in California (1959).' It supplemented data in Bulletin 54-A, 'Evaporation from Water Surfaces in California; Basic Data (1948),' and reports in the Bulletin No. 113 series which dealt with vegetative water use and included considerable evaporation information on well-exposed Class A evaporation pans. Major drainage provinces, the hydrographic units lying within each, and the general geographic location of evaporation stations in the state were identified. Information on latitude, longitude, elevation, period of record, and pan environment for each station was given. Total evaporation data for each station was tabulated by months for each year within the period of record. A section on the nature of evaporation and factors affecting pan evaporation was included. (Roberts-ISWS)
W75-09586

**AVERAGING ERRORS IN MONTHLY EVAPORATION ESTIMATES,**
Alberta Univ., Edmonton. Dept. of Geography.
K. D. Hage.
Water Resources Research, Vol 11, No 2, p 359-361, April 1975. 2 tab, 6 ref.

Descriptors: *Evaporation, *Climatology, *Estimating, Temperature, Humidity, Environment, Wind velocity, Vapor pressure, Model studies, Hydrology, Heat flow, Latent heat, Weather, Data processing, Water temperature, Diffusion.
Identifiers: *Averaging errors, Dalton-type formula, Nonlinearity errors, Covariance, Taylor series, Clausius-Clapeyron equation, Biometeorology, Sensible heat flux.

The problem of computing evaporation from monthly mean values of temperature, relative humidity, and wind was considered with specific reference to a Dalton-type evaporation formula. Leading contributions due to nonlinearities, covariances, and their interactions were identified separately by expanding saturation vapor pressure as a Taylor series in temperature with the use of the Clausius-Clapeyron equation. A truncated form of the expansion was tested by using observations from a land station. A crude model of diurnal variations in air temperature, relative humidity, and wind speed was used to predict nonlinearity and covariance evaporation errors from monthly mean observations at 2 times per day. The model appeared to be accurate to within plus or minus 5% in warm seasons months but failed in winter when diurnal variability was negligib comparison with air mass changes in weathe ments at mid-latitude continental locat Covariance and nonlinearity errors did not pensate each other in winter and averaging e could reach 20-25%. (Roberts-ISWS)
W75-09590

**WORLD MAPS OF POTENT EVAPOTRANSPIRATION, PLANT DEVEL MENT, AND SPRING GREENING AND TUMN BROWNING OF VEGETATION, BA ON THE SOLAR THERMAL UNIT MODEL,**
Montana State Univ., Bozeman. Dept. of P and Soil Science.
J. M. Caprio.
Research Report 60, June 1974. 26 p, 6 fig, 5 NASA NAS 5-21781.

Descriptors: *Evapotranspiration, *Solar ra tion, *Maps, Temperature, Plant growth, Veg tion, Alfalfa, Harvesting, Phenology, mosphere, Spring, Autumn, Lilac, Model studi Identifiers: *Potential evapotranspiration, *S thermal unit model, Green wave passage, Bro wave passage, Langley degree days.

It was suggested that the development of m plants, rate of potential evapotranspirati vegetative greening in the spring (green wave), possibly vegetative senescence in the autu (brown wave) are associated largely with the so radiation-atmospheric temperature interaction pressed as Solar Thermal Units (STU). These w defined as the product of the mean daily tempe ture in degrees Fahrenheit minus a threshold te perature of 31F times the daily total solar radiati on a horizontal surface (global radiation) in ca ries per square centimeter. A day with a mean te perature of 61F and total solar radiation of 5 calories per square centimeter would have 30 (i. 61F-31F) times 500 which equals 15,000 ST (Langley degree days). Six maps were present based on the STU concept for about 300 locatio throughout the world. Isolines tended to paral latitudinal lines, but there was a tendency for t lines to extend northward in the western Pacif and western Atlantic areas because of t moderating effect of the warm Japanese and Gu Currents in northern latitudes. Almost all of t high-producing agricultural areas of the wor were shown to have average annual potenti evapotranspiration of greater than 15 inche (Roberts-ISWS)
W75-09771

**TRANSPIRATION RATES OF CONIFERS,**
Montana Univ., Missoula. Dept. of Botany.
M. J. Behan.
Montana University Joint Water Resource Research Center, Bozeman, Completion Report February, 1974. 50 p, 6 tab, 3 photographs, 3 au toradiographs, 34 ref. OWRT A-015-MONT(1).

Descriptors: *Transpiration, *Douglas Fir trees *Biorhythms, *Water conservation, *Conifers Stomata, Water loss, Coniferdus trees, Carbo dioxide, Diurnal, Humidity, Temperature *Montana.

Research activities on the transpiration rates o conifers are summarized. A study of the fixatior of C02 in the dark by Douglas Fir is described ir detail. Dark C02 fixation and the accumulation of the C02 as organic acids was demonstrated by measurements of ph shifts, thin layer chromatography of needle extracts, and by treatment of seedlings with 14C02. The fixation of C02 in the dark has some advantages for plants growing under water stress as it allows them to fix carbon dioxide at a time when transpiration rates are reduced due to the increased humidity and cooler temperatures which generally occur at night. (Bowden-Arizona)
W75-09784

## 2E. Streamflow and Runoff

**OPTIMIZING LONG-TERM STREAMFLOW FORECASTS,**
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 4A.
W75-09594

**COMPUTATION OF WAVE HEIGHTS DUE TO REFRACTION AND FRICTION,**
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 8B.
W75-09606

**COMPUTATION OF FLOW THROUGH MASONBORO INLET, N.C.,**
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-09608

**INITIAL BIFURCATION PROCESS IN NATURAL CHANNEL NETWORKS,**
New South Wales Univ., Kensington (Australia). School of Geography.
For primary bibliographic entry see Field 8B.
W75-09609

**MAP SHOWING DRAINAGE AREAS, MARLBOROUGH QUADRANGLE, CONNECTICUT,**
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-09704

**MAP SHOWING DRAINAGE AREAS, WEST SPRINGFIELD QUADRANGLE, MASSACHUSETTS-CONNECTICUT,**
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-09705

**MAP SHOWING DRAINAGE AREAS, LUDLOW QUADRANGLE, MASSACHUSETTS,**
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-09707

**MAP SHOWING DRAINAGE AREAS, MOUNT TOM QUADRANGLE, MASSACHUSETTS,**
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-09708

**TEMPERATURES OF STREAMS AND SELECTED RESERVOIRS IN PENNSYLVANIA,**
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W75-09713

**A LABORATORY INVESTIGATION OF SURFACE RUNOFF,**
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh.
Journal of Hydrology, Vol 25, No 3/4, p 187-200, May 1975. 7 fig, 4 tab, 19 ref.

Descriptors: *Surface runoff, *Hydrograph analysis, *Model studies, *Rainfall-runoff relationships, Prototypes, Research facilities, Hydrographs, Time series analysis, Unit hydrographs, Time lag, Hydrophase diagrams, Laboratory tests.
Identifiers: *Kinematic wave model, *Nash model, Converging surfaces.

A laboratory study of a kinematic wave model and Nash model was presented for a converging surface. The interdependent behavior of kinematic wave parameters was shown and based on this observation an experimental justification was given for retaining only one parameter in the kinematic wave model. It was observed that an objective function based on minimizing the sum of squares of hydrograph peak deviations is sufficiently adequate for fitting the entire hydrograph. An objective comparison of the two models demonstrated that the kinematic wave model is uniformly better than Nash model in performing hydrograph predictions on the laboratory watershed. (Jess-ISWS)
W75-09744

**A NON-LINEAR RAINFALL-RUNOFF MODEL, PROVIDING FOR VARIABLE LAG TIME,**
Newcastle-upon-Tyne Univ. (England). Dept. of Engineering Mathematics.
For primary bibliographic entry see Field 2A.
W75-09753

**MAN-INDUCED CHANGES OF MIDDLE MISSISSIPPI RIVER,**
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4A.
W75-09754

**THE COMPOSITE ROUGHNESS OF ICE COVERED STREAMS,**
Iowa Inst. of Hydraulic Research, Iowa City.
For primary bibliographic entry see Field 2C.
W75-09758

**STATISTICAL PROPERTIES OF WAVE FORCE,**
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-09759

## 2F. Groundwater

**GOUNDWATER MODELS,**
R. G. Thomas.
Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper No 21, 1973. 192 p, 16 fig, 4 tab, 42 ref, 6 append.

Descriptors: *Model studies, *Computer models, *Mathematical models, *Hydrogeology, *Groundwater, *Aquifer management, Hydrologic models, Digital computers, Analog models, Groundwater basins, Groundwater mining, Groundwater resources, Simulation analysis, Arid lands, *Reviews.

The various types of computer models used for groundwater studies are reviewed. Thy hydrogeologic and mathematical concepts needed to enable one to convert actual field data into a model are emphasized. The polygonal model technique, because of its flexibility in many practical groundwater conditions, is described in detail. Only brief reference is made to finite difference methods and to use of programs prepared for the analysis of electronic circuits. A review of present and potential uses of the groundwater model in water resources planning is also presented. Appended are the contents of other papers which enable one to prepare a mathematical model of a groundwater basin for the computer. The publication functions as a manual on the development of the use of the digital computer for groundwater models and on how to prepare any Fortran program for any selected groundwater basin. (Bowden-Arizona)
W75-09582

**GROUND-WATER LEVEL IN THE FLOOD PLAIN AND ADJACENT UPLANDS OF THE SANGAMON RIVER,**
Illinois Univ., Urbana. Dept. of Forestry.
For primary bibliographic entry see Field 4B.
W75-09599

**FORMATION FACTORS AND THEIR USE IN ESTIMATING WATER QUALITY IN MISSISSIPPI AQUIFERS,**
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W75-09703

**CONTOUR MAP OF THE BEDROCK SURFACE, COLLINSVILLE QUADRANGLE, CONNECTICUT,**
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-09706

**GROUNDWATER LEVELS IN NEBRASKA, 1974,**
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 4B.
W75-09710

**GREAT LAKES BASIN FRAMEWORK STUDY: APPENDIX 3--GEOLOGY AND GROUND WATER,**
Geological Survey, Albany, N.Y.
R. M. Waller, and W. B. Allen.
Great Lakes Basin Commission, Ann Arbor, Appendix 3 of Great Lakes Basin Framework Study, 1975. 152 p, 60 fig, 15 tab, 76 ref.

Descriptors: *Water resources, *Groundwater, *Great Lakes region, *Hydrogeology, Water quality, Water yield, Aquifers, Groundwater availability, Groundwater resources.
Identifiers: Great Lakes Basin.

The general geologic framework and groundwater situation throughout the Great Lakes Basin, major problems of quantity and chemical quality of groundwater, and factors to be considered in the conjunctive and beneficial use of the Basin's entire water resources are described. Emphasis is on major aquifer systems because domestic-type supplies are available almost everywhere. The Great Lakes Basin is underlain almost entirely by a thick succession of sedimentary rocks. Glacial and alluvial deposits cover the bedrock. These deposits are as much as 1,100 feet thick, with the thickest deposits generally occurring in Michigan and locally in buried bedrock velleys of New York and Wisconsin. Groundwater is present everywhere throughout the Basin, but in limited quantities in areas where the basement rock is at or near the surface. The most productive aquifers, with well yields as much as 2,500 gpm, occur in unconsolidated, well-sorted sand and gravel deposits, especially where natural recharge from streams or precipitation can occur readily. Unconsolidated aquifers are most widespread in western and central Michigan, northeastern Indiana, and the western part of Wisconsin. Carbonate (limestone and dolomite) aquifers constitute the most common bedrock aquifers in the Basin. They occur along the northern and western shore of Lake Michigan, from Illinois to Cleveland, and along the southern shore of Lake Ontario. A thick sequence of productive sandstone units is present along the western and northern part of the Lake Michigan basin. Chemical quality of groundwater is generally good, although saline, mineralized, or brackish water is present in deep bedrock throughout the Basin, and at shallow depths in a few places. (Knapp-USGS)
W75-09714

**SUMMARY OF HYDROLOGIC CONDITIONS IN COLLIER COUNTY, FLORIDA, 1973,**
Geological Survey, Tallahassee, Fla.

For primary bibliographic entry see Field 4B.
W75-09716

**GEOLOGIC AND HYDROLOGIC FEATURES OF INDIAN WELLS VALLEY, CALIFORNIA,**
Geological Survey, Reston, Va.
L. C. Dutcher, and W. R. Moyle, Jr.
Available from GPO, Washington, D.C. 20402, Price $3.75 (paper copy). Water-Supply Paper 2007, 1973. 30 p, 3 fig, 6 plate, 3 tab, 23 ref.

Descriptors: *Groundwater resources, *Groundwater availability, *Hydrologic data, *Hydrogeology, *California, Arid climates, Groundwater basins, Groundwater potential, Water quality, Chemical analysis, Water management(Applied), Planning, Water supply, Water yield, Water wells, Water resources development.
Identifiers: *Indian Wells Valley(Calif), *Mojave Desert.

Groundwater pumpage in Indian Wells Valley, virtually a closed basin in the Mojave Desert of southern California, has gradually increased since 1945 and in 1966 has exceeded the average annual water yield (perennial supply). This report summarizes the principal geologic and hydrologic parameters needed for a detailed quantitative study of the hydrology, including the future development of a groundwater basin model. The groundwater basin contains a single body of groundwater in alluvial deposits locally as much as 2,000 feet thick. The deposits consist mainly of sand and gravel but grade to silt and silty clay beneath the lower parts of the valley surface. Coefficients of transmissivity range from almost zero at the basin margins to about 300,000 gallons per day per foot in the central part of the valley. The maximum developable yield of Indian Wells Valley groundwater basin, under existing conditions, is estimated to be 10,000 acre-feet. The water of best quality occurs in the alluvial deposits of shallow to medium thickness in the western and northwestern parts of the valley and in the deep zones in the central and south-central part of the basin. The dissolved-solids content of the water there is generally less than 600 mg/litre. Water in the shallow deposits beneath the playa areas contains dissolved-solids of more than 1,000 mg/litre. (Woodard-USGS)
W75-09717

**AVAILABILITY OF GROUND WATER IN THE BRANCH RIVER BASIN, PROVIDENCE COUNTY, RHODE ISLAND,**
Geological Survey, Providence, R.I.
H. E. Johnston, and D. C. Dickerman.
Water-Resources Investigations 18-74, December 1974. 39 p, 13 fig, 1 plate, 7 tab, 30 ref.

Descriptors: *Groundwater resources, *Water yield, *Water quality, *Rhode Island, Aquifer characteristics, Well data, Water wells, Chemical analysis, Hydrologic data, Surface-groundwater relationships, Streamflow, Groundwater recharge, Hydrogeology, Groundwater movement.
Identifiers: *Branch River basin(RI), *Providence County(RI).

In the Branch River basin, Providence County, Rhode Island, stratified glacial drift consisting largely of sand and gravel constitutes the only aquifer capable of supporting continuous yields of 100 gpm or more to individual wells. The aquifer covers about a third of the 79 sq mi study area, occurring mainly in stream valleys that are less than a mile wide. Its saturated thickness is commonly 40 to 60 ft; its transmissivity is commonly 5,000 to 8,000 sq ft/day. Potential sustained yield from most parts of the aquifer is limited chiefly by the rate at which infiltration can be induced from streams. If large-scale development of groundwater is not carefully managed, periods of no streamflow may result during dry weather. Potential sustained yield varies with the scheme of well development, and is evaluated for selected areas by mathematically simulating pumping from assumed schemes of wells in models of the stream-aquifer system. Results indicate that sustained yields of 5.5, 3.4, 1.6, and 1.3 mgd can be obtained from the stratified-drift aquifer near Slatersville, Oakland, Harrisville, and Chepachet, respectively. A larger groundwater yield can be obtained, if periods of no streamflow along reaches of principal streams are acceptable. Quality of water in the stream-aquifer system is suitable for most purposes; the water is soft, slightly acidic, and generally contains less than 100 mg per litre of dissolved solids. (Woodard-USGS)
W75-09721

**HYDROLOGIC ANALYSIS OF THE VALLEY-FILL AQUIFER, NORTH PLATTE RIVER VALLEY, GOSHEN COUNTY, WYOMING,**
Geological Survey, Cheyenne, Wyo.
M. A. Crist.
Water-Resources Investigations 3-75, March 1975. 60 p, 11 fig, 4 plate, 11 tab, 25 ref.

Descriptors: *Irrigation wells, *Aquifer characteristics, *Hydrologic budget, *Model studies, *Wyoming, Digital computers, Forecasting, Water wells, Pumping, Water yield, Groundwater recharge, Surface-groundwater relationships, Water balance, Hydrologic data, Observation wells.
Identifiers: *Goshen County(Wyo).

The North Platte River valley in Goshen County, Wyo., is a highly productive agricultural area where most crops are irrigated principally with surface water. More than 200 irrigation wells in the valley fill are pumped for supplemental irrigation supplies. Groundwater in storage in the valley fill is estimated to be about 1,700,000 acre-feet. Recharge to groundwater from precipitation and imported irrigation water amounted to about 73,000 acre-feet and is nearly equal to the 76,000 acre-feet estimated as the amount of groundwater contributed to the North Platte River during the 1-year study. The hydrologic system of the valley fill is simulated with a digital model. Monthly net head change in the aquifer and the monthly net change in the groundwater discharge to the North Platte River was used to calibrate the model. The digital model developed during this investigation can be used to predict the effect of change in stress that might be applied to the system. (Woodard-USGS)
W75-09722

**GROUND-WATER DATA FOR ORANGE COUNTY AND VICINITY, TEXAS AND LOUISIANA, 1971-74,**
Geological Survey, Houston, Tex.
For primary bibliographic entry see Field 7C.
W75-09727

**WATER-RESOURCES DATA FOR SKAGWAY, ALASKA,**
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 7C.
W75-09729

**NUMERICAL ANALYSIS OF CONFINED-UNCONFINED AQUIFERS,**
Birmingham Univ. (England). Dept. of Civil Engineering.
K. R. Rushton, and L. M. Tomlinson.
Journal of Hydrology, Vol 25, No 3/4, p 259-274, May 1975. 8 fig, 4 tab, 10 ref.

Descriptors: *Numerical analysis, *Aquifers, *Interfaces, Groundwater recharge, Pumping, Equations, Hydraulic gradient, Digital computers, Analog models, Finite element analysis.
Identifiers: *Lincolnshire Limestone(England), Alternating direction method, Central difference approximation, Backward difference approximation, Iterative methods, Initial conditions, One-dimensional analysis, Two-dimensional analysis, Errors, Time steps, Mesh spacing, Convergence, Response time.

An aquifer which is partly confined and partly unconfined, presents particular difficulties when studied by numerical methods on a digital computer. By considering a one-dimensional example for which analytical solutions were available, it was found that central difference methods, such as the alternating direction method, are unsatisfactory, whereas backward difference methods give reliable results. An examination of a complex two-dimensional problem provided information about the size of time steps, convergence parameters, and the number of iterations required. (Visocky-ISWS)
W75-09751

**HYDROGEOLOGY OF THE WATERWAYS-WINEFRED LAKE AREA, ALBERTA,**
Alberta Research, Edmonton.
G. F. Ozoray.
Report 74-2, 1974. 18 p, 1 fig, 70 ref.

Descriptors: *Hydrogeology, *Canada, *Groundwater movement, Safe yield, Aquifer characteristics, Water table, Muskeg, Springs, Mineral water, Perched water, Well data, Test wells, Geochemistry, Permafrost, Discharge(Water), Transmissivity.
Identifiers: *Alberta, Quasi-spring, Climafrost.

The hydrogeology of the uppermost 1000 feet of strata in the Waterways and Winefred Lake areas was described. Maps and profiles were constructed from limited existing data and from data collected by field survey and drilling operations. The 20-year safe yields are mostly over 5 imperial gallons per minute (igpm), reaching 25-100 igpm for over half of the map area. These yields are available within 500 feet of the surface. A practical limiting factor on groundwater use is quality, because deeper groundwater is saline. In many places, saline water discharges to the surface. A semidiffuse groundwater discharge feature ('quasi-spring') describes sources of creeks at definite spring-like points in groundwater-fed muskegs. The quasi-springs are climatically and topographically controlled discharge features of climafrost zones. Widespread muskeg development exists in the area and degeneration of the groundwater flow-systems is noted. (Visocky-ISWS)
W75-09769

## 2G. Water In Soils

**INFLUENCE OF SURFACE AND NEAR-SURFACE CALICHE DISTRIBUTION ON INFILTRATION CHARACTERISTICS, LAS VEGAS, NEVADA,**
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2J.
W75-09374

**PROCEEDINGS OF THE SECOND INTERNATIONAL DRIP IRRIGATION CONGRESS.**
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W75-09423

**EDAPHIC MICRO-TUBULAR CONTINUOUS FLOW IRRIGATION IN CANADA,**
Department of Agriculture, Summerland (British Columbia).
D. S. Stevenson, and R. S. Tait.
In: Proceedings of the Second International Drip Irrigation Congress, p 86-90 (1974). 3 fig, 4 tab.

Descriptors: *Soil water movement, *Canada, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Microtubing.

A soil's ability to transfer water horizontally relative to vertical drainage is its most important characteristic in trickle irrigation. Water applied to a soil at a single point will move laterally and vertically. The shape of the resulting half sphere will depend upon the ratio of saturated conductivity to unsaturated conductivity of any particular soil. The limit to horizontal movement before drainage becomes excessive determines that area that can be irrigated with one dripper. Rooting depth of the crop imposes a limit to the area over which water will spread before an excess of it becomes drainage. Evapotranspiration (ET) over the area so defined thus determines the continuous flow from the dripper. Areas and ET are easily equated to provide dripper flows in g.p.h. The areas provide the dripper spacing for uniform irrigation. Microtubing of varying sizes and lengths as emitters provides flow control at the emitters for both level and sloping land. Seasonal changes in irrigation requirements (ET) are satisfied by alterations in line pressures as needed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09436

**LINEARIZED MOISTURE FLOW SOLUTIONS FOR POINT, LINE, AND STRIP SOURCES,**
Arizona Univ., Tucson.
A. W. Warrick, and D. O. Lomen.
In: Proceedings of the Second International Drip Irrigation Congress, p 228-233, (1974). 3 fig, 1 tab, 12 ref.

Descriptors: *Soil water movement, Mathematical studies, Irrigation system, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, Point sources, Line sources, Strip sources.

Solutions and numerical results are given for the time-dependent, linearized moisture flow equation for point, line and strip sources. The linear form is attained by assuming an unsaturated hydraulic conductivity of the form K = ko exp (alpha h) with Ko and alpha constants and with h the pressure head. In addition, the derivative of K with respect to the volumetric water content is taken as a constant. Numerical results include: (1) spatial distribution of the matric flux potential for 6 times including a comparison of 2 flow rates for a point source; (2) pressure head distribution near a single point source under cyclic conditions; (3) pressure head distribution for 2 point sources under cyclic conditions, and (4) moisture distribution patterns near line and strip sources. The major advantage of using the linearized forms is that solutions for simplified geometries may be superimposed both in time and space to simulate complex geometries and inputs of water. The major disadvantage of the non-linear nature of the soil-hydraulic functions is lost. For cyclic moisture regimes at a high frequency, it is assumed the water content fluctuation of any point will be relatively small and the linearizing assumptions are realistic. (See also W75-09423) (Skogerboe-Colorado State)
W75-09459

**TRICKLE IRRIGATION DESIGN FOR OPTIMAL SOIL WETTING,**
Utah State Univ., Logan.
J. Keller, and D. Karmeli.
In: Proceedings of the Second International Drip Irrigation Congress, p 240-245, (1974). 2 fig, 2 tab, 3 ref.

Descriptors: *Irrigation design, Soil moisture, Evapotranspiration, Flow rates, Design criteria, Economics, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

The general relationship between the percentage area wetted and crop productivity is discussed and the recommended trickler spacing for achieving the desired soil wetting is presented. The number of operating blocks (stations or sub-units) required to obtain the desired soil wetting is developed considering ET demands and system capacity constraints. The effect of the number of blocks on hydraulic features of the network and the relative economic effect is considered. (See also W75-09423)
W75-09461

**SOIL MOISTURE DISTRIBUTION AND WETTING PATTERN FROM A POINT SOURCE,**
Arizona Univ., Yuma.
R. L. Roth.
In: Proceedings of the Second International Drip Irrigation Congress, p 246-251, (1974). 4 fig.

Descriptors: Wetting, *Water levels, Flow rates, *Soil water, Irrigation, Irrigation systems, Agriculture, *Soil moisture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Wetting patterns, Point source.

Soil moisture distribution and wetting pattern tests were conducted using a point source of virgin desert sandy soil. The purpose of these studies was to characterize the extent of moisture movement and distribution within the wetted volume. The flow rates tested were approximately 3.8, 7.6, and 15.2 liters per hour (1, 2, and 4 gph) for durations of 1, 3, 6, 12, 24, and 48 hours. At the completion of each test, a pit was dug which exposed the maximum vertical diametral plane of the wetted volume. Measurements were made to define the maximum wetted area. Soil moisture measurements were made at each node point of a 15.2-centimeter (6-inch) grid imposed on the maximum wetted area. Soil cores were taken at 15.2-centimeter intervals along the line of maximum horizontal water movement. These cores were used to determine bulk density, soil texture, permeability, and moisture release characteristics. A complete soil profile description was also made of each test site. For the tests conducted the total volume of soil wetted was more a function of the amount of water applied than time of application. Maximum horizontal movement was greater than maximum vertical movement for volumes of water less than 190 liters (50 gallons). Greater maximum vertical movement occurred at volumes of water more than 190 liters. Water within the wetted volume was determined to be at tensions between 100-140 centimeters of water. (See also W75-09423) (Skogerboe-Colorado State)
W75-09462

**SOIL MOISTURE DISTRIBUTION AND DEPLETION IN AN APPLE ORCHARD IRRIGATED BY TRICKLERS,**
Hebrew Univ., Rehovoth (Israel).
I. Levin, R. Assaf, and B. Bravo.
In: Proceedings of the Second International Drip Irrigation Congress, p 252-257, (1974). 4 fig, 1 tab, 4 ref.

Descriptors: *Irrigation practices, *Soil water movement, Irrigation systems, Frequency, Orchard, Apples, Crop response, Irrigation, Agriculture, *Soil moisture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Four treatments of trickle irrigation methods were applied in an apple orchard on heavy soil. The treatments differed in water discharge rate of the tricklers (4 and 8 liter/hour), distances between the outlets on the lateral lines (1.25 m and 2 m) and irrigation frequency (1, 3 and 7-day intervals). In all treatments the amount of water applied was on the basis of 10 mm/day consumptive use. Soil moisture content fluctuations in the upper 60 cm layer before, during and after irrigation were frequently measured. The distance wetted from the trickler was linearly dependent on the duration of the single irrigation and the discharge rate of the trickler: 65 cm, 80 cm, and 120 cm after 14, 24 and 70 hours of irrigation at a 4 liter/hour discharge rate, respectively; and 120 cm after 40 hours at a 8 liter/hour discharge rate. The soil moisture content at the end of the irrigation dropped gradually from under the trickler to the farthest distance wetted, where about 90% of field capacity was reached. After the termination of the irrigation, the soil moisture content depleted gradually to the level before the beginning of the irrigation - at all distances from the tricklers and in all treatments. The results indicate that there was deep drainage below the root zone in the area under the tricklers in all treatments. (See also W75-09423) (Skogerboe-Colorado State)
W75-09463

**RECHARGE SIMULATION MODEL,**
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W75-09518

**MOVEMENT OF POLLUTANT PHOSPHORUS IN UNSATURATED SOIL,**
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W75-09527

**URBAN LAWN INFILTRATION RATES AND FERTILIZER RUNOFF LOSSES UNDER SIMULATED RAINFALL,**
Ball State Univ., Muncie, Ind. Dept. of Natural Resources.
For primary bibliographic entry see Field 5B.
W75-09592

**IMPROVING THE DESIGN OF PRACTICAL FIELD DRAINAGE,**
Ministry of Agriculture, Fisheries and Food, Cambridge (England). Field Drainage Experiment Unit.
For primary bibliographic entry see Field 4A.
W75-09595

**WAVE INDUCED PRESSURES IN PERMEABLE SEABEDS,**
Norges Tekniske Hoegskole, Trondheim. River and Harbor Lab.
For primary bibliographic entry see Field 8B.
W75-09607

**SIMULATION OF MISCIBLE DISPLACEMENT IN SOILS USING THE METHOD OF CHARACTERISTICS,**
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
A. G. Smajstrla, D. L. Reddel, and E. A. Hiler.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 2, p 281-287, March-April 1975. 9 fig, 27 ref, 1 append.

Descriptors: *Simulation analysis, *Mathematical models, *Porous media, *Infiltration, *Soils, Computer programs, Model studies, Management, Darcys law, Dispersion, Saturated flow, Unsaturated flow, Solutes, Saturated soils, Moisture content, Homogeneity, Steady flow, Unsteady flow, Percolation, Isotropy, Ion transport.
Identifiers: *Vertical infiltration.

A simulation model was developed to simulate miscible displacement of a conservative solute during one-dimensional vertical infiltration into a homogeneous, isotropic, porous media. Solutions of transient flow problems were obtainable as well as steady state problems because it was not necessary to assume constant solution fluxes to solve the dispersion equation. The accuracy of the simulation model was tested by comparison with analytical solutions, experimental data, and other simulation results from the literature. Comparisons provided excellent agreement in all cases except for Warrick's field experimental data. Considering the nonhomogeneous field conditions encountered in Warrick's experimental plot, the simulated results were considered to be good. (Sanderson-ISWS)

W75-09612

**FOR IMPROVING WATER PENETRATION INTO SOME ARIZONA SOILS-SULFURIC ACID,**
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3C.
W75-09623

**SOIL MOISTURE SENSING SYSTEM,**
C. Matlin.
US Patent No 3,882,383, 4 p, 9 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 934, No 1, p 382, May 6, 1975.

Descriptors: *Patents, *Soil moisture, Moisture content, Soil pressure, Electrical resistance, Electrodes, Equipment, *Instrumentation.

The invention relates to an electrical resistivity method for testing the moisture content of soil. The electrical resistivity of the soil is sensed by a soil moisture sensor having two electrodes in direct contact with the soil under test. This combination of sensor and associated soil become a variable resistive component of an electronic network whose output is used to energize either a meter for quantitative measurements or a miniature lite bulb for qualitative monitoring. The soil moisture sensor features a floating/breathing electrode to compensate for the adverse effects of unpredictable variations in contact pressure between the sensor electrodes and associated soil. The electrical circuitry features a means for depolarizing sensor electrodes; a means for assuring against electrical ground loops; and a solid state circuit for translating soil moisture into the light intensity of a miniature lite bulb. (Sinha-OEIS)
W75-09651

**CONTOUR MAP OF THE BEDROCK SURFACE, COLLINSVILLE QUADRANGLE, CONNECTICUT,**
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-09706

**PORE AND ERODING FLUID INFLUENCES ON SURFACE EROSION OF SOIL,**
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-09741

**EFFECTS OF DEFORESTATION ON SLOPES,**
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W75-09743

**A LABORATORY RAINFALL SIMULATOR FOR INFILTRATION AND SOIL DETACHMENT STUDIES,**
Agricultural Research Service, Lafayette, Ind.
M. J. M. Romkens, L. F. Glenn, D. W. Nelson, and C. B. Roth.
Soil Science Society of America Proceedings, Vol 39, No 1, p 158-160, January-February 1975. 3 fig, 1 tab, 2 ref.

Descriptors: *Rainfall simulators, *Simulated rainfall, *Infiltration, *Soil erosion, Soil physics, Laboratory equipment, Soil physical properties, Research facilities, Equipment, Simulation analysis, Impact(Rainfall), Raindrops.

A laboratory rainfall simulator with high intensity precision and nearly uniform rain distribution was developed for studying rain infiltration into soils and soil detachability by rainfall. The rainfall simulator consists of an assembly of closely packed hypodermic syringes with plungers driven by a common plate. Rainfall intensity is determined by controlling the plunger speed at variable motor speeds. Rain is distributed uniformly by superpositioning three independent motions-rotation, and perpendicular and linear motions in the horizontal plane. Rainfall intensities were generally within 2.5% of predicted values. The average coefficient of variation of rain distribution for various rainfall intensities over a 100 sq cm area was reduced from 31.9% with no motion to 8.5% with rotation and linear motions. (Sims-ISWS)
W75-09746

**MIX GYPSUM IN SHALLOW DEPTHS--IN SALINE SOILS,**
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 3C.
W75-09786

**HUNGRY DRYLANDS OF WESTERN RAJASTHAN NEED A NEW TECHNOLOGY,**
Central Arid Zone Research Inst. Jodhpur (India). Dry Farming Research Main Centre.
For primary bibliographic entry see Field 3F.
W75-09789

**FLOW-ASSOCIATED PRECIPITATION REACTIONS IN SALINE-SODIC SOILS AND THEIR SIGNIFICANCE,**
Central Soil Salinity Research Inst., Karnal (India).
I. P. Abrol, and I. S. Dahiya.
Geoderma, Vol 11, No 4, p 305-312, July 1974. 3 fig, 2 tab, 5 ref.

Descriptors: *Saline soils, *Land reclamation, *Gypsum, *Chemical precipitation, *Arid climates, Carbonates, Sodium, Calcium, Leaching, Soil amendments, Infiltration, Flow rates, Leachate, Saturation.

Reclamation of saline-sodic soils requires that excess exchangeable sodium on the clay complex be replaced by the more favorable divalent calcium ion and that excess soluble salts present in the soil also be leached from the root zone. The effect of flow rate and concentration of calcium the leaching solution on the extent of carbonate precipitation was studied on a highly saline-sodic soil. Precipitation of soluble carbonates in the soil increased with increasing flow velocity and concentration of calcium in the leaching solution. These results are discussed in terms of actual flow processes at the wetting front. The results suggest that by controlling the extent of carbonate precipitation, the quantity of soil amendments containing calcium necessary for reclamation of sodic soils rich in soluble carbonates can be reduced considerably. In many cases the amount of gypsum required by these soils is often overestimated because a large portion of the soluble carbonates is leached out without reaction with the added gypsum. (Mastic-Arizona)
W75-09792

**IN SALT-AFFECTED SOILS MULCHING AIDS IN CROP GROWTH,**
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 3C.
W75-09798

**INDIA CASE STUDY ON IMPROVING PRODUCTIVITY IN LOW RAINFALL AREAS.**
Food and Agricultural Organization of the United Nations, Rome (Italy). Committee on Agriculture.
For primary bibliographic entry see Field 3F.
W75-09803

## 2H. Lakes

**SILT REMOVAL FROM A LAKE BOTTOM.**
Lake Herman Development Association, Inc., Madison, S. Dak.
For primary bibliographic entry see Field 5C.
W75-09575

**WATER QUALITY EFFECT OF DIKING A SHALLOW ARID-REGION LAKE,**
Brigham Young Univ., Provo, Utah.
For primary bibliographic entry see Field 5B
W75-09577

**EFFECTS OF SALINE WATER FROM NORTH DAKOTA LAKES ON SURVIVAL OF FATHEAD MINNOW (PIMEPHALES PROMELAS) EMBRYOS AND SAC FRY,**
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W75-09669

**DYNAMICS OF TURBIDITY PLUMES IN LAKE ONTARIO,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2J.
W75-09709

**THE PREDICTION OF LAKE HURON LAKE-EFFECT SNOWFALL SYSTEMS,**
Nebraska Univ., Lincoln. Dept. of Geography.
For primary bibliographic entry see Field 2C.
W75-09748

**A SALINE INTRUSION INTO SENECA LAKE, NEW YORK,**
Hobart and William Smith Colleges, Geneva, N.Y. Earth and Space Sciences Program.
For primary bibliographic entry see Field 5B.
W75-09765

## 2I. Water In Plants

**EFFECT OF ROOT TEMPERATURE AND HUMIDITY ON THE DISTRIBUTION OF CA IN APPLE AND SUNFLOWER SEEDLINGS,**
Washington State Univ., Pullman. Dept. of Horticulture.
C. G. Woodbridge.
Z Pflanzenernaehr Bodenkd, Vol 133, No 1/2, p 64-69, 1972.

Descriptors: *Calcium, *Apples, Seedlings, Temperature, Humidity, Distribution, *Root systems.
Identifiers: *Sunflower.

Using 45Ca, the effects of root temperature and relative humidity on Ca distribution in apple and sunflower seedlings were studied during a 24 h experimental period. At 5C Ca accumulation in apple stems and leaves was much less than at 15C, 20C, 30C and 40C. The ratio of Ca accumulation in the stems and leaves was constant Maximum translocation occurred when root temperature was between 15 and 30C. In sunflower stems there was less accumulation of Ca at 5C and 40C than at other temperatures. In the basal leaves and tops more Ca accumulated at 20C and 30C than at 5C, 15C or 40C. The ratio between Ca accumulation in the basal leaves or tops and that in the stems varied with temperature. In apple seedlings less Ca was translocated than in the sunflower seedlings at all temperatures. The effects of humidity, 40% and 90%, on translocation were small.--Copyright 1974, Biological Abstracts, Inc.
W75-09351

**DROUGHT CRACK ON WESTERN WHITE PINE IN NORTHERN IDAHO,**
Forest Service (USDA), Moscow, Idaho. Intermountain Forest and Range Experiment Station.
R. D. Hungerford.
For Sci, Vol 19, No 1, p 77-80, 1973, Illus.

Descriptors: *Idaho, *White pine trees, *Droughts, *Moisture stress, Moisture deficit, Trees.
Identifiers: Tree cracks.

In Sept. of 1967 1 western white pine (Pinus monticola) in Northern Idaho had external cracks which were not apparent 3 mo. earlier. This fact together with observation of climatic data, site conditions, and wood anatomy suggest that cracking resulted from moisture stress. Inherent structural weaknesses of the wood apparently predisposed the tree stem to cracking during the drought.--Copyright 1973, Biological Abstracts, Inc.
W75-09388

**PROCEEDINGS OF THE SECOND INTERNATIONAL DRIP IRRIGATION CONGRESS.**
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W75-09423

**SEE GERMINATION RESPONSE TO SUBSURFACE IRRIGATION DEPTH,**
Agricultural Research Service, Brawley, Calif.
L. S. Willardson.
In: Proceedings of the Second International Drip Irrigation Congress, p 178-182, (1974). 4 fig, 2 ref.

Descriptors: *Subsurface irrigation, *Cotton, *Alfalfa, *Germination, Crop response, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Line sources.

A line source subsurface irrigation system was installed at 0, 2.54, 5.08, 10.16, and 20.32 cm depths in a sandy silt soil. The electrical conductivity of the soil varied between 10.4 and 16.2 mmhos per cm. Cotton and alfalfa were used to determine the effect of depth of placement of the seeds and water source on germination. (See also W75-09423) (Skogerboe-Colorado State)
W75-09451

**CHANGES IN ROOT PATTERNS OF PEACH TREES UNDER TRICKLE IRRIGATION,**
Victoria Dept. of Agriculture (Australia).
P. Willoughby, and B. Cockroft.
In: Proceedings of the Second International Drip Irrigation Congress, p 439-442, (1974). 3 tab.

Descriptors: *Peaches, *Root development, *Root distribution, *Root systems, Crop response, Irrigation effects, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

With fully mature peach trees, which before the installation of a trickle system had a uniformly distributed root system through the whole orchard area, the change to trickle produced a remarkable adaption by the tree. A whole new root system was developed in a few months, and the trees continued to produce heavy crops of fruit. (See also W75-09423) (Skogerboe-Colorado State)
W75-09498

**EFFECTS OF DRIP IRRIGATION ON SOIL-WATER-PLANT RELATIONSHIP,**
Sao Paulo Univ. (Brazil). Escola Superior de Agricultura Luiz de Queiroz.
H. A. Manfrinato.
In: Proceedings of the Second International Drip Irrigation Congress, p 446-451, (1974). 1 fig, 4 tab, 9 ref.

Descriptors: *Infiltration, *Moisture content, *Soil water movement, *Soil-water-plant relationships, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, Soil columns.

Soil columns, prepared in the laboratory, by packing sieved and air dried soil into cylinder tubes were used to study the distribution of moisture content at the moment of infiltration. Drops of water, were applied simulating rain, at eight different intensities, called treatments, with two repetitions. When the water application rate was continually reduced throughout the treatments, the moisture content also diminished and vice versa. It was also concluded that when the rain application intensity was decreasing to a very small rate, the moisture content had such a slow reduction, as if going to a limit, which was found to be the soil field capacity. (See also W75-09423) (Skogerboe-Colorado State)
W75-09500

**THE RELATION BETWEEN DRIP IRRIGATION, PHYTOPHTHORA ROOT ROT OF AVOCADO, AND FUNGICIDES,**
California Univ., Riverside.
G. A. Zentmyer, F. B. Guillement, and E. L. V. Johnson.
In: Proceedings of the Second International Drip Irrigation Congress, p 512-514, (1974).

Descriptors: *Diseases, *Disease resistance, *Fungicides, Irrigation practices, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Avocado.

Studies have been initiated to determine the effect of drip irrigation on development, spread and control of Phytophthora root rot of avocado caused by Phytophthora cinnamomi. In one test in naturally infested soil, development of Phytophthora root rot of avocado seedlings was considerably slower under drip than under sprinkler irrigation. There were also indications of less rapid spread of the fungus from infested into noninfested soil under the drip, as compared with the sprinkler regime. At the end of the first year of the experiment, 6 of 12 seedlings were still healthy in soil infested with P. cinnamomi when irrigated with a drip system, compared with 2 healthy seedlings of 12 irrigated with spitters. A number of soil fungicides have been tested in the greenhouse for possible use in drip systems, by applying frequent applications (every other day or every fourth day) to avocado seedlings growing in soil infested with Phytophthora cinnamomi. The best control of the disease has been obtained with ethazol (5-ethoxy-3-trichloremethyl-1, 2, 4-thiadiazole) chemicals for incorporation in drip systems is still in the early stages. One field plot has been established with Terrazole applied in a drip system to 10-year old avocado trees with Phytophthora root rot, and also to young trees replanted in infested soil. (See also W75-09423) (Skogerboe-Colorado State)
W75-09512

**BIOPHYSICAL CONTROL OF WATER LOSS,**
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W75-09523

**WORLD MAPS OF POTENTIAL EVAPOTRANSPIRATION, PLANT DEVELOPMENT, AND SPRING GREENING AND AUTUMN BROWNING OF VEGETATION, BASED ON THE SOLAR THERMAL UNIT MODEL,**
Montana State Univ., Bozeman. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 2D.
W75-09771

**TRANSPIRATION RATES OF CONIFERS,**
Montana Univ., Missoula. Dept. of Botany.
For primary bibliographic entry see Field 2D.
W75-09784

**TRITIATED WATER TURNOVER RATE IN RODENTS: DESERT AND MOUNTAIN,**
Nevada Univ., Reno. Desert Research Inst.
M. K. Yousef, H. D. Johnson, W. G. Bradley, and S. M. Seif.
Physiological Zoology, Vol 47, No 3, p 153-162, July, 1974. 5 fig, 3 tab, 20 ref.

Descriptors: *Rodents, *Water consumption, *Animal physiology, *Moisture stress, *Animal metabolism, Arid lands, Water utilization, Deserts, Respiration, Water requirements.
Identifiers: *Tritiated water turnover rate.

It has been technically difficult in the past to determine the daily water exchange between an animal and its surroundings. The use of tritiated water has proved useful for estimating water-turnover rate, k, where k represents the fraction of body-water pool turned over per unit of time. Assuming that animals are normally in a state of dynamic equilibrium, the measurement of k should equal daily water requirements. Eight species of rodents, three species each of kangaroo rats and ground squirrels and one species of wood rat and chipmunk, representing three families, were used in this study. These species are characteristic of a range of habitats from low desert to montane forest. The water turnover rate varied widely between the species. This difference in rate appears unrelated in most instances to phylogeny but is probably influenced by ecologic distribution, diet, behavior, and metabolic rate. (Bowden-Arizona)
W75-09801

## 2J. Erosion and Sedimentation

**INFLUENCE OF SURFACE AND NEAR-SURFACE CALICHE DISTRIBUTION ON INFILTRATION CHARACTERISTICS, LAS VEGAS, NEVADA,**
Nevada Univ., Reno. Desert Research Inst.
R. L. Cooley, G. W. Fiero, Jr., L. H. Lattman, and A. L. Mindling.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 379, $4.25 in paper copy, $2.25 in microfiche. Center for Water Resources Research, Publication No 20, December 1974, 54 p, 14 fig, 6 tab, 10 ref. OWRT B-062-NEV(1). 14-31-0001-3910.

Descriptors: *Aprons, Artificial recharge, Engineering structures, Flood control, Runoff, *Nevada, *Caliche, *Distribution, *Infiltration, Sedimentation.
Identifiers: *McCullough Range(Nev).

Objectives were (1) to determine the distribution and infiltration characteristics of caliche on McCullough Fan, a large pedimented alluvial fan bordering the McCullough Range south of Las Vegas, Nevada and (2) to investigate the development of caliche on ephermeral stream channels and interfluves on the fan. Field study indicated that caliche development and distribution are related to three erosion surfaces and to three lithologic units. Underlying the uppermost erosion surface is a fine-grained petrocalcic horizon riddled with solution-widened fractures and which contains almost no coarse clastics. The middle caliche layer mainly contains boulders, cobbles and pebbles with a variable degree of cementation. The lower surface is made up of discontinuous calcic horizons and case-hardened banks. Caliche influences infiltration mainly as gully-bed cementation horizons in the medial and distal portions of the fan. Infiltration tests were conducted establishing that interconnected fractures in the vertical fractured caliche provide a direct avenue for infiltrated water to pass through, however, most precipitation does not pass through the upper sediments.

Bouldery caliche acts as a relatively impermeable barrier to route water laterally to exit points on the walls of deep gullies. (See also W73-10721) (Fallon-Nevada)
W75-09374

**QUATERNARY SEDIMENTATION ON THE AMAZON CONTINENTAL MARGIN: A MODEL,**
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 2L.
W75-09600

**CHEMICAL TRANSPORT BY THE MEKONG RIVER,**
Paris-6 Univ. (France). Laboratoire de Geologie Dynamique.
For primary bibliographic entry see Field 5B.
W75-09603

**WAVE INDUCED PRESSURES IN PERMEABLE SEABEDS,**
Norges Tekniske Hoegskole, Trondheim. River and Harbor Lab.
For primary bibliographic entry see Field 8B.
W75-09607

**INITIAL BIFURCATION PROCESS IN NATURAL CHANNEL NETWORKS,**
New South Wales Univ., Kensington (Australia). School of Geography.
For primary bibliographic entry see Field 8B.
W75-09609

**CHANNEL RESPONSES TO ARTIFICIAL STREAM CAPTURE, DEATH VALLEY, CALIFORNIA,**
California Inst. of Tech., Pasadena. Div. of Geological and Planetary Sciences.
D. Dzurisin.
Geology, Vol 3, No 2, p 309-312, June 1975. 4 fig, 5 ref.

Descriptors: *Channel erosion, *Channel morphology, *Streams, Erosion, Erosion rates, Deposition(Sediments), Headward erosion, *California, Streamflow, Sediments, Stream stabilization, Debris avalanches, Geomorphology, Ephemeral streams, Slopes, Profiles.
Identifiers: *Stream capture, *Channel adjustments, Vertical erosion, Death Valley(Calif).

Artificial capture of Furnace Creek Wash by Gower Gulch in 1941 caused channel responses in three separate reaches of this integrated ephemeral stream system: (1) upper Furnace Creek Wash, (2) Gower Gulch channel, and (3) Gower Gulch fan. At the diversion point, vertical erosion had lowered the brink of a 25-m nickpoint by approximately 3.2 m by 1974. Upstream from the nickpoint, Furnace Creek Wash had responded with headward dissection for 2.7 km and removal of debris at a mean rate of about 4000 cu m per year. The mean slope of the Gower Gulch channel had been lowered throughout by erosion due to drastically increased discharge, producing debris at a mean rate of about 2000 cu m per year. Dissection of the upper part of the Gower fan to a maximum depth of 5.7 m and production of debris at a mean rate of about 400 cu m per year are attributed to high stream velocities and increased discharge. In the absence of further intervention, evolution of the system during the next few hundred years is likely to be characterized by the following: (1) increasing depth and extent of headward dissection in Furnace Creek Wash and its tributaries upstream from the diversion point and (2) readjustment of the Gower fan profile in response to accumulation of coarse diverted debris. (Lee-ISWS)
W75-09610

**THE EFFECT OF SULFATE AND MANGANESE DIOXIDE ON THE RELEASE OF PHOSPHORUS FROM LAKE MENDOTA SEDIMENTS,**
Wisconsin Univ., Madison. Water Chemistry Lab
For primary bibliographic entry see Field 5C.
W75-09619

**DYNAMICS OF TURBIDITY PLUMES IN LAKE ONTARIO,**
Geological Survey, Reston, Va.
E. J. Pluhowski.
Open-File report 75-249, May 1975. 59 p, 34 fig, 2 tab, 13 ref.

Descriptors: *Sediment transport, *Lake Ontario, *Aerial photography, *Turbidity currents, Tracers, Erosion, Inflow, Beach erosion, Littoral drift, Currents(Water), Remote sensing, Satellites(Artificial), Methodology, Tracking techniques, Data collections.
Identifiers: *Turbidity plume tracers.

Field activities and image analyses focused on the 275-kilometer-long south shore of Lake Ontario. LANDSAT-1 images were screened for large-scale turbidity features. Ground-truth measurements of temperature, turbidity, and several meteorologic parameters were obtained at selected sites along the south shore of the lake, at times coinciding with satellite overpasses. Large well-defined turbidity plumes were frequently observed at the mouths of the Niagara River, Welland Canal, Oswego River, and Genesee River. Although generally confirming the existence of a west-to-east littoral current along the south shore, notable exceptions to the prevailing direction were detected, especially in the Rochester embayment and in the vicinity of the Niagara River plume. Based on plume characteristics during the shipping season, the Welland Canal yields the highest concentrations of suspended matter to Lake Ontario along its south shore. Three high-risk beach-erosion zones were identified in the images, (1) Fifty Mile Pt., Ontario to Thirty Mile Pt., N.Y., (2) the Rochester embayment, and (3) Sodus Bay to Nine Mile Pt. (Woodard-USGS)
W75-09709

**GEOLOGY OF GRIGGS AND STEELE COUNTIES,**
Geological Survey, Grand Forks, N. Dak.
J. P. Bluemle.
Bulletin 64--Part 1, and North Dakota State Water Commission County Ground Water Studies 21--Part 1, 1975. 50 p, 29 fig, 2 plate, 2 tab, 27 ref.

Descriptors: *Geology, *Geologic formations, *Aquifers, *Sediment transport, *Geological surveys, *North Dakota, Geologic history, Glaciation, Lakes, Sedimentation, Geomorphology, Hydrogeology, Geologic mapping, Bedrock, Sands, Till, Mineralogy.
Identifiers: *Griggs and Steele Counties(N Dak).

The glacial deposits in Griggs and Steele Counties, N. Dak., are described in detail. This information should be of value to anyone interested in the distribution of the geologic units that have potential as aquifers. Griggs and Steele Counties, located at the eastern edge of the Williston basin, are underlain by 400 to 2,600 feet of Paleozoic and Mesozoic rocks that dip gently to the west. The Cretaceous Greenhorn, Carlile, Niobrara, and Pierre Formations lie directly beneath the glacial drift, and shale of the Pierre Formation is exposed in several places along the Sheyenne River. The Pleistocene Coleharbor Formation, which covers most of the area, consists mainly of glacial, fluvial, and lake sediment. The Coleharbor Formation averages 200 to 300 feet thick, but it is as much as 550 feet thick in some of the buried valleys. The Holocene Walsh Formation occurs in parts of the area, chiefly sloughs and river bottomland. It consists mainly of alluvial and eolian sediment. As the Late Wisconsinan glacier in eastern North Dakota thinned and receded eastward, large areas of Griggs County were washed by water flowing from the glacier. Continued withdrawal of the glacier resulted in ponding of melt water in parts of the two counties. These and other ponds tended to coalesce at lower and lower elevations, eventually forming Lake Agassiz, which flooded part of eastern Steele County. (Woodard-USGS)
W75-09725

**SEDIMENT RESUSPENSION AND DEPOSITION IN NARRAGANSETT BAY,**
Rhode Island Univ., Kingston. Graduate School of Oceanography
For primary bibliographic entry see Field 2L.
W75-09736

**PORE AND ERODING FLUID INFLUENCES ON SURFACE EROSION OF SOIL,**
California Univ., Davis. Dept. of Civil Engineering.
K. Arulanandan, P. Loganathan, and R. B. Krone.
Journal of the Geotechnical Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No GT1, Paper 11078, p 51-66, January 1975. 16 fig, 3 tab, 18 ref, 2 append. NSF Grant GK40283.

Descriptors: *Erosion, *Pore pressure, *Soil erosion, *Shear stress, *Flocculation, Sodium, Soil structure, Clays.
Identifiers: *Fluid influences, *Critical shear stress, Geotechnical engineering, Deflocculating.

Hydraulic erosion studies were carried out with a modified rotating-cylinder apparatus on saturated Yolo loam soil at different pore fluid compositions. The critical shear stress required to initiate erosion was shown to be controlled by the structure of the soil as influenced by the pore fluid composition. The critical shear stress was also shown to be dependent on the composition of the eroding fluid. The structure of the soil and the osmotic influences caused by the differences in the electrolyte concentration of the pore and eroding fluids were considered to explain the mechanism of surface erosion. (Bhowmik-ISWS)
W75-09741

**STREAM ORDERING AND CONTOUR MAPPING,**
University of Western Ontario, London. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W75-09745

**A LABORATORY RAINFALL SIMULATOR FOR INFILTRATION AND SOIL DETACHMENT STUDIES,**
Agricultural Research Service, Lafayette, Ind.
For primary bibliographic entry see Field 2G.
W75-09746

**SEDIMENT YIELDS FROM INTERMEDIATE-SIZED STREAM BASINS IN SOUTHERN ALBERTA,**
Alberta Univ., Edmonton. Dept. of Geography.
H. J. McPherson.
Journal of Hydrology, Vol 25, No 3/4, p 243-257, May 1975. 4 fig, 4 tab, 12 ref.

Descriptors: *Sediment yield, *River basins, *Hydrologic data, *Canada, Suspended solids, Dissolved solids, Regression analysis, Sediment load, Geomorphology, Rivers, Hydrology, Sedimentation, Sediment transport, Sampling, Watersheds(Basins).
Identifiers: *Alberta.

Suspended sediment yields were determined for 36 basins and dissolved sediment yields were determined for 21 intermediate-sized stream basins in southern Alberta, Canada. Calculation of long-

term mean sediment loads was based on the establishment of sediment rating-curves for gaging stations at the basins outlets and the construction of a sediment duration curve from sediment rating and flow duration curves. Mean yearly suspended sediment export ranged from 12.55 tons/sq mi to 576.9 tons/sq mi with 58% of the basins yielding less than 200 tons/sq mi. These rates were in close agreement with values reported by others for western Canada. Dissolved sediment yields ranged from 0.89 to 286.6 tons/sq mi per year with 50% of the catchments contributing less than 50 tons/sq mi per year. Relationsips between sediment yields and geomorphic and hydrologic variables were subjected to regression analysis. Highly significant relationships were established between sediment yields, unit mean discharge, mean annual discharge, local relief, elevation, and mean land slope. Mean land slope and unit mean discharge were the variables which gave the highest correlation coefficients. Predictive equations were developed which allow sediment yields to be determined for ungaged catchments. (Adams-ISWS)
W75-09750

**SEDIMENTS AND STRUCTURE OF THE JAPAN SEA,**
Lamont-Doherty Geological Observatory, Palisades, N.Y.
W. J. Ludwig, S. Murauchi, and R. E. Houtz.
Geological Society of America Bulletin, Vol 86, No 5, p 651-664, May 1975. 9 fig, 1 tab, 72 ref. ONR Contract N00014-67-A-0108-004, NSF Grant GA-27281.

Descriptors: *Sediments, *Seismic studies, Pacific coast region, Sediment distribution, Structural analysis, Marine geology, Oceans, Measurement.
Identifiers: *Seismic reflection, *Japan Sea, *Sonobuoys, Profiler, Marginal ocean basins, Abyssal plain, Yamato Basin, Sea floor, Seismic refraction.

Seismic reflection (profiler) traverses of the Japan Basin, Yamato Basin, and intervening Yamato Ridge reveal horizontally stratified sediments over weakly stratified sediments. Wide-angle reflection and refraction data from 65 sonobuoy stations made en route gave velocities in the sediments that range from 1.6 to 3.2 km/sec. The results of profiler-sonobuoy measurements combined with the results of earlier two-ship seismic refraction measurements indicated that the Japan Basin and Yamato Basin are underlain by oceanic crust which in turn is covered by sediments (and volcanics) that have built a shallower sea floor than that in the western North Pacific basin. Yamato Ridge appears to be mainly a pile of volcanics resting on an oceanic layer at normal depth. The crust of Yamato Basin may also have been modified to the extent that it has a thicker than normal layer 3 and a low-velocity mantle. Other profiler-sonobuoy data, gathered in the strait between Japan and Korea and across the Japan Sea margin of southwest Japan and northeast Japan, were presented. A number of profiler crossings of Toyama Channel indicated its formation by turbidity currents. Turbidity flows in this channel and in other channels transport sediment to the abyssal plain. (Lee-ISWS)
W75-09756

**ADENOSINE TRIPHOSPHATE MEASUREMENTS IN SOIL AND MARINE SEDIMENTS,**
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W75-09764

**WATER ESCAPE STRUCTURES IN COARSE-GRAINED SEDIMENTS,**
Louisiana State Univ., Baton Rouge. Dept. of Geology.
D. R. Lowe.
Sedimentology, Vol 22, No 2, p 157-204, May 1975. 20 fig, 107 ref.

Descriptors: *Sedimentary structures, *Consolidation, *Pore water, Sediments, Fluid friction, Bearing strength, Deformation, Stress, Particle size, Permeability, Sands, Silts, Gravels, Seepage, Earthquakes, Sedimentation rates, Deposition(Sediments).
Identifiers: *Water escape, *Liquefaction, *Fluidization, Packing, Cross bedding.

Three processes of water escape characterize the consolidation of silt-, sand-, and gravel-sized sediments: seepage, liquefaction, and fluidization. Four main types of water escape structures form during the fluidization and liquefaction of sands: (1) soft-sediment mixing bodies, (2) soft-sediment intrusions, (3) consolidation laminations, and (4) soft-sediment folds. These structures represent both the direct rearrangement of sediment grains by escaping fluids and the deformation of hydroplastic, liquefied, or fluidized sediment in response to external stresses. Fundamental controls on sediment consolidation are exerted by the bulk sediment properties of grain size, packing, permeability, and strength, and by external disturbances which act to trigger liquefaction and fluidization. The liquefaction and fluidization of natural sands usually accompany the collapse of loosely packed cross-bedded deposits. Water escape structures most commonly form in fine- to medium-grained sands deposited at high sedimentation rates and are particularly abundant in cross-laminated deposits. Their development is favored by upward decreasing permeability within sedimentary units. They are especially common in sequences made of alternating fine- and coarse-grained units such as deep-sea flysch, prodelta, and, to a lesser extent, fluvial point bar, levee, and proximal overbank deposits. (Visocky-ISWS)
W75-09768

**PROPOSED MAINTENANCE DREDGING OF THE CHANNEL FROM U.S. COAST GUARD SANTA ROSA STATION MOORINGS TO NAVIGABLE WATERSHED IN PENSACOLA BAY (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Coast Guard District (8th), New Orleans, La.
For primary bibliographic entry see Field 8A.
W75-09824

## 2K. Chemical Processes

**DETERMINATION OF LEAD IN POTABLE WATERS USING DELVES CUP ATOMIC ABSORPTION SPECTROMETER WITH SIGNAL INTEGRATION,**
New York State Dept. of Health, Albany. Div. of Labs. and Research.
For primary bibliographic entry see Field 5A.
W75-09366

**WATER ANALYSIS,**
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5A.
W75-09372

**CHEMICAL TRANSPORT BY THE MEKONG RIVER,**
Paris-6 Univ. (France). Laboratoire de Geologie Dynamique.
For primary bibliographic entry see Field 5B.
W75-09603

**SIMULATION OF MISCIBLE DISPLACEMENT IN SOILS USING THE METHOD OF CHARACTERISTICS,**
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W75-09612

**EFFECTS OF METAL-MINE DRAINAGE ON WATER QUALITY IN SELECTED AREAS OF COLORADO, 1972-73,**
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5C.
W75-09712

**GREAT LAKES BASIN FRAMEWORK STUDY: APPENDIX 3--GEOLOGY AND GROUND WATER,**
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 2F.
W75-09714

**GEOLOGIC AND HYDROLOGIC FEATURES OF INDIAN WELLS VALLEY, CALIFORNIA,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-09717

**CHANGES IN CHEMICAL QUALITY OF WATER, CEDAR BLUFF IRRIGATION DISTRICT AREA, WEST-CENTRAL KANSAS,**
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 5B.
W75-09719

**AVAILABILITY OF GROUND WATER IN THE BRANCH RIVER BASIN, PROVIDENCE COUNTY, RHODE ISLAND,**
Geological Survey, Providence, R.I.
For primary bibliographic entry see Field 2F.
W75-09721

**AUTOMATION IN A WATER QUALITY LABORATORY SCHEME,**
Geological Survey, Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 5A.
W75-09723

**GEOCHEMISTRY APPLIED TO THE DISCOVERY, EVALUATION, AND EXPLOITATION OF GEOTHERMAL ENERGY RESOURCES,**
Geological Survey, Menlo Park, Calif.
D. E. White.
In: Proceedings of the United Nations Symposium on the Development and Utilization of Geothermal Resources, September 22-October 1, 1970, Pisa, Italy: Geothermics, Special Issue 2, Vol 1, p 58-80, Instituto Internazionale per le Recerche Geotermiche, 1974. 3 fig, 4 tab, 106 ref.

Descriptors: *Geothermal studies, *Geochemistry, Water chemistry, Thermal water, Leaching, Water sources.

The application of geochemistry to geothermal energy resources requires an understanding of the sources of fluid constituents and a recognition of the major types of geothermal systems. For geochemical and most other purposes, the fundamental basis for classifying these systems is the physical state of the continuous fluid phase, whether liquid or vapor. The two contrasting types are called hot-water and vapor-dominated. The geochemical behavior of substances of high and low volatility obviously must differ greatly, depending on the physical state of the dominant fluid. Many constituents are useful in evaluating the hot-water systems, but only a few volatile constituents are significant to the vapor-dominated systems. The water that recharges most geothermal systems is, in overwhelming proportions, the local dominant meteoric water of each area. The chemical composition of thermal waters may be dominated by water-rock reactions, or constituents already dissolved in water of any type may be added to a system of convecting meteoric water. Concentrations of the major rock-forming elements in waters are controlled largely by temperature-dependent reactions. (Knapp-USGS)

W75-09724

**GROUND-WATER DATA FOR ORANGE COUNTY AND VICINITY, TEXAS AND LOUISIANA, 1971-74,**
Geological Survey, Houston, Tex.
For primary bibliographic entry see Field 7C.
W75-09727

**WATER-RESOURCES DATA FOR SKAGWAY, ALASKA,**
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 7C.
W75-09729

**AUTOMATIC U.V.-CONTROL SYSTEM FOR RELATIVE EVALUATION OF ORGANIC WATER POLLUTION,**
Vyzkumny Ustav Vodohospodarsky, Ostrava (Czechoslovakia).
For primary bibliographic entry see Field 5A.
W75-09735

**HYDROGEOLOGY OF THE WATERWAYS-WINEFRED LAKE AREA, ALBERTA,**
Alberta Research, Edmonton.
For primary bibliographic entry see Field 2F.
W75-09769

**FLOW-ASSOCIATED PRECIPITATION REACTIONS IN SALINE-SODIC SOILS AND THEIR SIGNIFICANCE,**
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 2G.
W75-09792

## 2L. Estuaries

**WAVE FORCE COEFFICIENTS FOR CIRCULAR PIERS,**
Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 8B.
W75-09593

**QUATERNARY SEDIMENTATION ON THE AMAZON CONTINENTAL MARGIN: A MODEL,**
Woods Hole Oceanographic Institution, Mass.
J. D. Milliman, C. P. Summerhayes, and H. T. Barretto.
Geological Society of America Bulletin, Vol 86, No 5, p 610-614, May 1975. 5 fig, 26 ref. NSF GX-41960.

Descriptors: *Sediment transport, *Sediment distribution, *Shores, Sedimentation, Sediments, South America, Estuaries, Coastal plains, Quaternary period, Model studies, Sea level.
Identifiers: *Nearshore sedimentation, *Amazon River sediments, *Amazon River, Nearshore environment, River mouth, Deep-sea sediment.

Sedimentation on the Amazon continental margin occurred in two distinct patterns during the Quaternary Period. During interglacials, when sea level was high (as at present), most of the sediment contributed by the Amazon River was deposited near the river mouth, then transported northwest along the innnermost shelf by longshore currents. Apparently, little Amazon sediment escaped the nearshore environment. As sea level fell in response to glacial advance, the sedimentation pattern remained roughly similar, resulting in construction of an extensive prograding shoreline. Once the sea fell more than -60 to -80 m relative to present sea level, however, most Amazon sediment was channeled directly to the deep sea. Shoreline accretion stopped, but prograded sediments were preserved as a mud wedge that presently occupies the inner shelf seaward of the Amazon River. This model also explains the accumulation of large quantities of arkosic sands throughout the western Equatorial Atlantic deep sea during Pleistocene glacial epochs. These arkosic sediments appear to have been derived mostly from the Andes Mountains via the Amazon River. (Lee-ISWS)
W75-09600

**INTERACTION BETWEEN THE DAILY HEAT BALANCE AND THE TIDAL CYCLE,**
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W75-09602

**COMPUTATION OF WAVE HEIGHTS DUE TO REFRACTION AND FRICTION,**
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 8B.
W75-09606

**COMPUTATION OF FLOW THROUGH MASONBORO INLET, N.C.,**
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
M. Amein.
Journal of the Waterways, Harbors and Coastal Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No WW1, Proceedings Paper 11124, p 93-108, February 1975. 8 fig, 3 tab, 24 ref, 2 append. Grants 2-35178,04-3-158-40.

Descriptors: *Coastal engineering, *Inlets(Waterways), *Mathematical models, *Numerical analysis, *North Carolina, Simulation analysis, Flow rates, Currents(Water), Estuaries, Tides, Model studies, Unsteady flow.
Identifiers: *Masonboro Inlet(NC).

The Masonboro Inlet system is a complex arrangement of channels connecting the coastal waterways to the Atlantic Ocean. The flow through the system was computed by means of a numerical model based on the equations of unsteady flow which represent the laws for the conservation of mass and momentum. An implicit method was used to find the solutions for the finite difference equations. The method requires that the basic equations be satisfied at all locations simultaneously. A comparison of the computed results with the field observations demonstrated the accuracy, reliability, and efficiency of the method. It was proposed that the simulation model can handle other inlets with little difficulty, because other inlets are generally much simpler than the Masonboro Inlet. (Lee-ISWS)
W75-09608

**A CASE STUDY OF ESTUARINE POLLUTION AND LOCAL AGENCY INTERACTIONS,**
University of Southern Mississippi, Hattiesburg. Bureau of Business Research.
For primary bibliographic entry see Field 5G.
W75-09620

**THE BOTTOM FAUNA OF CHINA CLAY WASTE DEPOSITS IN MEVAGISSEY BAY,**
Otago Univ., Portobello (New Zealand). Marine Biological Station.
For primary bibliographic entry see Field 5C.
W75-09673

**EFFECT OF POWER PLANT CHLORINATION ON ESTUARINE PRODUCTIVITY,**
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W75-09684

**DDT RESIDUES IN EUPHAUSIIDS IN THE UPPER ESTUARY OF THE GULF OF ST. LAWRENCE,**
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 5C.
W75-09690

**DEPOSITION OF ZINC AND CADMIUM BY MARINE BACTERIA IN ESTUARINE SEDIMENTS,**
Geological Survey, Corpus Christi, Tex.
For primary bibliographic entry see Field 5C.
W75-09692

**THE ACCUMULATION OF FLUORIDE BY MARINE AND INTERTIDAL ANIMALS,**
Newcastle-upon-Tyne Univ. (England). Dept. of Plant Biology.
For primary bibliographic entry see Field 5C.
W75-09697

**SEDIMENT RESUSPENSION AND DEPOSITION IN NARRAGANSETT BAY,**
Rhode Island Univ., Kingston. Graduate School of Oceanography.
C. A. Oviatt, and S. W. Nixon.
Estuarine and Coastal Marine Science, Vol 3, No 2, p 201-217, April 1975. 10 fig, 7 tab, 64 ref, 1 plate.

Descriptors: *Estuaries, *Sediments, *Rhode Island, *On-site investigations, Sediment distribution, Sampling, Equipment, Analysis, Data collections, Suspension, Deposition(Sediments), Nitrogen, Carbon, Biomass, Sedimentation rates, Silts, Organic matter, Organic compounds, Bottom sediments.
Identifiers: *Narragansett Bay(RI).

Monthly samples of sediments deposited in traps at three locations in Narragansett Bay, Rhode Island, showed a gradient in sediment activity that increased from an annual mean of 20 + or -8.8 g/sq m/day at the head of the estuary to 51 + or -16.7 g/sq m/day at the mouth. Deposited materials were significantly higher in total organic matter, organic carbon, and nitrogen than near surface sediments on the bottom. These parameters showed a gradient that decreased toward the mouth of the bay, with organic matter dropping from 14 + or -1 to 10 + or 1% of the dry weight deposited; carbon from 5.4 + or -0.9 to 3.4 + or -1.0%; and nitrogen from 0.6 + or -0.1 to 0.4 + or -0.1%. The annual mean carbon/nitrogen ratio was 8.2 in the lower bay and 8.7 in the upper bay. Deposited materials were dominated by particles in the silt size range from 4-60 micrometers and comprised for the most part resuspended bottom sediments rather than fresh inputs of material from the water column. (Humphreys-ISWS)
W75-09736

**WIND AND WAVE RELATIONSHIPS IN U.K. COASTAL WATERS,**
British Meteorological Office, Brackness (England).
H. C. Shellard, and L. Draper.
Estuarine and Coastal Marine Science, Vol 3, No 2, p 219-228, April 1975. 10 fig, 3 tab, 12 ref.

Descriptors: *Waves(Water), *Oceanography, *Coasts, *On-site investigations, Measurement, Analysis, Evaluation, Data collections, Winds, Velocity, Height, Frequency.
Identifiers: *United Kingdom.

Data from wave measurements for eight Light Vessels around the United Kingdom coasts were combined with suitable wind data to examine the relationships between the two. The results reveal the likely wave conditions and the range to be expected at each station under given wind conditions. The typical height of swell can also be deduced for each station. Frequency distributions

(parts per 1000) of wave heights at each Light Vessel and of mean wind speeds were presented in graphs. (Humphreys-ISWS)
W75-09737

**FRICTION FACTOR UNDER OSCILLATORY WAVES,**
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-09755

**SEDIMENTS AND STRUCTURE OF THE JAPAN SEA,**
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 2J.
W75-09756

**PROPOSED 1973 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE-SALE, OFFSHORE MISSISSIPPI, ALABAMA, AND FLORIDA, VOLUME 2, POTENTIAL ENVIRONMENTAL IMPACTS, ETC. (ENVIRONMENTAL IMPACT STATEMENT).**
Bureau of Land Management, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-09820

**CONTEMPORARY RESEARCH IN MARINE AFFAIRS,**
Delaware Univ., Newark Center for the Study of Marine Policy.
For primary bibliographic entry see Field 6B.
W75-09837

# 3. WATER SUPPLY AUGMENTATION AND CONSERVATION

## 3A. Saline Water Conversion

**DEVELOPMENT OF POROUS POLYVINYL CHLORIDE COATED TUBULETS FOR SEA-WATER DESALINATION,**
DeBell and Richardson, Inc., Enfield, Conn.
B. Baum, R. A. White, and J. Lakis.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 378, $3.75 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report OSW-RDPR-75-1006, June 1975. 42 p, 9 tab, 6 fig, 3 ref. 14-30-3250.

Descriptors: *Desalination, *Reverse osmosis, *Membranes, Cellulose, *Permeability, Sea water.
Identifiers: *Composite membranes, Tubules, Blend membranes, Polysulfore, Acrylamide, Polyvinyl alcohol, Polyacrylic acid, *Cellulose acetate, Salt rejection, *Asymmetric membranes.

Asymmetric cellulose diacetate/triacetate membranes were cast onto 0.027 inch diameter porous polyvinyl chloride tubulets. A flux of 4 gf2d at 99% R sub s, 3.5% NaCl/1200 psi was obtained. This achieves the equivalent of 4,200 gallons per cubic foot of module per day - far in excess of commercial units. Work with NS-1 coated onto tubulets primed with acrylamide gel, asymmetric polysulfone, and asymmetric cellulose acetate was less successful. The NS-1 coating can be cured at lower temperatures by the use of triethylamine catalyst.
W75-09373

**WATER QUALITY ANALYSIS SYSTEM WITH MULTICIRCUIT SINGLE SHELL HEAT EXCHANGER,**
For primary bibliographic entry see Field 5G.
W75-09642

**SOLAR STILL WITH REPLACEABLE SOLAR ABSORBING LINER AND WEIGHT CONTROLLED FEED INLET,**
L. E. Massie.
US Patent No 3,880,719, 3 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 933, No 5, p 2210, April 29, 1975.

Descriptors: *Patents, *Solar still, *Desalination apparatus, *Waste water treatment, *Water quality control, Solar distillation, Evaporation, Heat exchangers, Water purification, Equipment.

This invention provides a solar still with an evaporating tray that is covered, or constructed of, a black pliable material that can be easily replaced, or continuously cleaned, or renewed. The weight of the fluid in the tray, or the deflection of the tray due to the weight of the fluid operates valves controlling the fluid level. Counterweights, calibrated springs, or other counterloading mechanisms are provided that can be adjusted to calibrate the fluid level control system to accommodate variations in fluid density and rate of fluid refill. A heat exchange system is also provided to convert waste heat radiated from the evaporator tray and other sources, to heat the incoming fluid. The fluid monitoring system is used to detect the accumulation of excessive water in the evaporating tray and to vent this excess fluid without contaminating the interior of the still enclosure. To protect the integrity of the still enclosure, valving, water traps and other devices are used to prevent the entry of contaminants, insects and other foreign matters. (Sinha-OEIS)
W75-09643

**SYSTEM FOR THERMAL DESALTING OF WATER,**
I. Z. Makinsky, E. A. Kasimzade, and S. P. Baksht.
US Patent No 3,883,400, 3 p, 1 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 934, No 2, p 729, May 13, 1975.

Descriptors: *Patents, *Desalination, *Desalination apparatus, *Waste water treatment, Evaporators, Heat exchangers, Condensers, Equipment, Distillation, Demineralization.
Identifiers: *Thermal desalination.

The specific object of the invention is to develope a system for thermal desalting of water having simple construction and providing for a low cost of the desalted water due to the use of low-potential heat of exhaust steam of a turbine without reducing the turbine efficiency. The turbine condenser is connected through a pipeline in series with an evaporator and a water-to-water heat exchanger for forming a recirculation water cooling system. The system comprises in combination: feeding and return headers for distributing cooling water in pipelines of the system; at least one steam turbine having an exhaust; condenser means connected to the exhaust through a pipeline; an adiabatic evaporator having an inlet side and a first and second outlet side, having its inlet side connected to the condenser through a pipeline; water-to-water heat exchanger having a first, second and separate third side, the first side being connected to the first outlet side of the evaporator, the second side being connected to the condenser, the third side being connected to the feeding and return header means for distributing cooling water so that fluid flowing through the heat exchanger is brought to the temperature of the cooling water; and a distilling condenser connected through a pipeline to the second outlet side of the evaporator for receiving steam. (Sinha-OEIS)
W75-09653

**DESALINATION PROCESS,**
Department of the Navy, Washington, D.C. (assignee)
R. E. Jensen.
US Patent No 3,883,412, 4 p, 6 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 934, No 2, p 733, May 13, 1975.

Descriptors: *Patents, *Desalination processes, Desalination apparatus, *Waste water treatment, Sea water, Brackish water, Water purification, *Ion exchange, *Electrodes.
Identifiers: Deionization.

The apparatus and method for desalination of water consists of creating a space charge layer through the use of porous charged electrodes submerged in the saline solution and thereafter removing the water from the impurity ions. The energy used in this process can be partially recovered by replacing the electrodes in another saline solution and collecting the energy produced in the external circuit due to the diffusion of the ions collected by the electrodes in the saline solution. The ions concentrate near the electrodes after application of electrical potential reducing ion concentration in the center of the cell. Partial deionization can be accomplished by removal of water near the center of the cell without disturbing space charge layers. More complete desalination may be accomplished by treating the water in several successive cells. (Sinha-OEIS)
W75-09654

**REVERSE OSMOSIS APPARATUS,**
United Kingdom Atomic Energy Authority, London (England). (assignee)
R. Gayler.
US Patent No 3,883,434, 3 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 934, No 2, p 739, May 13, 1975.

Descriptors: *Patents, *Reverse osmosis, *Membranes, *Water quality control, Water pollution control, Equipment, *Desalination apparatus, *Waste water treatment.

The reverse osmosis apparatus comprises: a membrane assembly placed within a pressure shell; means for passing a feed solution through the assembly so as to obtain a product liquid by reverse osmosis; and assembly driving means for rotating the assembly within the shell. Rotating the membrane assembly of a single apparatus can provide a higher recovery ratio of product liquid than several such apparatus with non-rotatable assemblies, and furthermore, any tendency for salts to be deposited can be reduced while at the same time, velocities of feed solution within the apparatus can be reduced. The assembly driving means may comprise an electric motor and gear unit, or may comprise a fluid turbine. The feed-solution or the liquid rejected by the apparatus may be used as a working fluid to drive the turbine. The apparatus may be provided with a plurality of membrane assemblies and assembly driving means for rotating them about a single axis. (Sinha-OEIS)
W75-09661

**MULTI-EFFECT FLASH EVAPORATOR,**
J. E. Pottharst, Jr.
US Patent No 3,884,767, 4 p, 3 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 934, No 3, p 1173, May 20, 1975.

Descriptors: *Patents, *Desalination, *Waste water treatment, *Desalination apparatus, Evaporators, Distillation, Multi-stage flash distillation, Sea water.

A multi-effect flash evaporator is provided wherein preheated seawater is passed into a header extending at least partially across a vessel or compartment into which the preheated feed water is to be discharged for flashing. The header has a number of restricted discharge means such as orifices, pipe nipples, and the like, distributed along its length for discharge of the preheated seawater upwardly. A flash chamber is places along

and generally above the discharge means and has downward extending sidewalls on both sides of the header to form flow passages. The flash chamber is placed at a level below that of the mist eliminator so that steam flowing down through the passages must substantially change its flow direction in order to pass upward to the mist eliminator. (Sinha-OEIS)
W75-09663

**APPLICATION OF FILTRATION THROUGH SEMI-PERMEABLE MEMBRANES FOR TREATMENT OF WASTES,**
For primary bibliographic entry see Field 5D.
W75-09730

**OPERATING RESULTS OF ELECTRODIALYSIS AND REVERSE OSMOSIS MUNICIPAL DESALTING PLANTS,**
Reynolds, Smith and Hills, Jacksonville, Fla.
For primary bibliographic entry see Field 5D.
W75-09732

**ARIZONA AND TOMORROW'S SOLAR POWERPLANTS,**
Arizona State Fuel and Energy Office, Phoenix.
J. Martin, and D. Halacy.
(1975). 29 p, 15 fig.

Descriptors: *Powerplants, *Project planning, *Energy conversion, *Solar radiation, *Arizona, Desalination processes, Solar distillation.
Identifiers: *Solar energy.

Reasons are presented in support of the selection of Arizona as a site for a Solar Energy Research Institute and for building of prototype and functional large-scale powerplants as authorized under or implicit in Public Law 93-473. The State's climate, with an average of some 4,000 hours of sunshine yearly, an environment that would permit large equipment to remain in the open for long periods of time without damage, plenty of available land suitable for all aspects of solar energy development, and Arizona's long record of research by some of the world's outstanding authorities in the field are described as the rationale for its selection. Drawings of such devices as solar towers and solar farms are included. As background for the arguments in favor of Arizona, the report also cites work on large solar desalination plants at the University of Arizona. (McLachlan-Arizona)
W75-09804

## 3B. Water Yield Improvement

**EVAPORATION FROM WATER SURFACES IN CALIFORNIA,**
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2D.
W75-09586

**DROUGHT, A RECURRENT ELEMENT OF CLIMATE,**
Maryland Univ., College Park. Graduate Program in Meteorology.
For primary bibliographic entry see Field 2B.
W75-09799

**WATER REQUIREMENTS AND LIMITATIONS IMPOSED ON AGRICULTURAL DEVELOPMENT IN NORTHERN GHANA,**
For primary bibliographic entry see Field 3F.
W75-09800

## 3C. Use Of Water Of Impaired Quality

**CLOSING UP A FINE GRADE PAPER MACHINE SYSTEM,**
MacMillan Bloedel Ltd., New Westminster (British Columbia).
For primary bibliographic entry see Field 3E
W75-09353

**WHERE ARE WE IN FOREST FERTILIZATION,**
State Univ. New York, Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 5D.
W75-09367

**DEVELOPMENT AND SCOPE OF DRIP AND SUBSURFACE IRRIGATION,**
Udaipur Univ. (India).
M. T. Deshmukh.
In: Proceedings of the Second International Drip Irrigation Congress, p 52-57, (1974). 31 ref.

Descriptors: Agriculture, Irrigation, Subsurface irrigation, Salinity, Saline water.
Identifiers: *Trickle irrigation, *Drip irrigation.

Drip irrigation is quite suitable for arid and semi-arid regions characterized by poor saline soil, saline irrigation water, and high evapotranspiration rates. In this method, water is applied slowly and continuously to the crops on the ground surface with the help of pipes having perforations or emitters fixed at suitable intervals along the length of the pipe. Developments in the drip method of irrigation are reviewed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09431

**STRIP CULTIVATION OF THE AREA WETTED BY DRIP IRRIGATION IN THE ARAVA DESERT,**
Hebrew Univ., Rehovth (Israel).
S. D. Goldberg, and M. Uzrad.
In: Proceedings of the Second International Drip Irrigation Congress, p 142-147, (1974).

Descriptors: *Strip cropping, *Saline water, *Salinity, *Sprinkler irrigation, Melons, Irrigation practices, Irrigation, Agriculture, Corn(Field).
Identifiers: *Trickle irrigation, *Drip irrigation, *Israel(Arava Desert).

Drip irrigation cultivation is in effect strip cultivation and represents almost the most intensive form of cultivation. Throughout the growing season the cultivated strip gets a more intensive set of treatments. Under arid climatic conditions in light soils and with saline water (like in the Arava), these strips will undergo considerable chemical and physical changes with would materially differ from the intermediary uncultivated strips. The problem posed was whether the cultivated strips were better, worse, or of no difference compared to the uncultivated strips. Results show that the cultivated strips were superior to the uncultivated strips. (See also W75-09423) (Skogerboe-Colorado State)
W75-09445

**MOISTURE PROFILES AND SALINIZATION OF SOILS UNDER DRIP IRRIGATION IN THE REPUBLIC OF SOUTH AFRICA,**
South Africa Dept. of Agricultural Technical Services, Pretoria.
A. Streutker.
In: Proceedings of the Second International Drip Irrigation Congress, p 258-263, (1974). 4 tab.

Descriptors: *Saline soils, Moisture content, *Crop production, Flow rates, Cotton, Potatoes, Tomatoes, Irrigation practices, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Moisture profiles, *South Africa.

Soil moisture profiles, salinization of soils, water use, and production of cotton, potatoes and tomatoes are measured on experimental plots on four soils, from sand to clay, with three different dripper spacings, and three different drip intensities. Simultaneously, soil moisture profiles and salinization are measured on different soils under citrus-trees, peach-trees and vineyards with commercial drip irrigation systems under different climates. (See also W75-09423) (Skogerboe-Colorado State)
W75-09464

**SALINITY SENSOR CONTROL OF DRIP IRRIGATION WATER APPLICATION,**
Agricultural Research Service, Brawley, Calif.
L. S. Willardson, and J. D. Oster.
In: Proceedings of the Second International Drip Irrigation Congress, p 335-340, (1974). 3 fig, 1 tab, 1 ref.

Descriptors: Salinity, *Saline soils, Crop response, Irrigation practices, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Salinity sensors, *Milo.

In-situ salinity sensors were used to control water application by drip irrigation to maintain a constant soil salinity. Milo was grown on small field plots instrumented with salinity sensors to evaluate the effect of depth of placement and initial soil salinity on plant growth and water control. Water application was fully controlled by the sensors. Response time was short enough to encourage practical use. (See also W75-09423) (Skogerboe-Colorado State)
W75-09477

**SOIL SALINITY DISTRIBUTION IN DRIP AND SUBSURFACE IRRIGATED SUMMER SQUASH,**
Agricultural Research Service, Riverside, Calif.
K. R. Davis, and W. F. Spencer.
In: Proceedings of the Second International Drip Irrigation Congress, p 358-363, (1974). 3 fig, 2 tab, 4 ref.

Descriptors: *Salinity, *Subsurface irrigation, *Irrigation practices, *Soil water movement, Management, Agriculture, Irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation, *Squash.

Salt and water distribution patterns were determined around a porous tubing as part of a study to evaluate several drip and subsurface irrigation lines at Riverside, California. Generalized plot sampling after seasonal rainfall established initial soil salinity and water levels. A detailed scheme was employed for mid-season and end-season soil sampling. Soil salinity and water distributions before, during, and after the 1973 growing season of zucchini squash are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09481

**AFFORESTATION WITH SALINE WATER IN ABU DHABI,**
Ministry of Agriculture, Abu Dhabi (United Arab Emirates).
S. Tahnoon, and F. K. Aljibury.
In: Proceedings of the Second International Drip Irrigation Congress, p 370-371, (1974).

Descriptors: *Forestry, *Saline water, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Abu Dhabi.

The government of the country of Abu Dhabi is trying to make the desert bloom under adverse soil, wind, and water conditions. At present, three drip irrigation projects are underway. (See also W75-09423) (Skogerboe-Colorado State)
W75-09483

**SALINITY MANAGEMENT FOR HIGH FREQUENCY IRRIGATION,**
Agricultural Research Service, Riverside, Calif.
G. J. Hoffman, S. L. Rawlins, J. D. Oster, and S. D. Merrill.
In: Proceedings of the Second International Drip Irrigation Congress, p 372-375, (1974). 4 fig.

Descriptors: *Salinity, *Saline soils, *Saline water, *Leaching, Grain sorghum, Lettuce, Wheat, Crop response, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, High frequency irrigation.

A field plot experiment designed to determine the minimum leaching required to maintain crop yields under high frequency irrigation is described. Two varieties of wheat, grain sorghum, and lettuce are being grown in rotation each year in six replicated leaching fraction treatments. Precise measurements of the volume and salt concentration of the irrigation and drainage waters along the in situ soil salinity measurements and crop yield are reported. (See also W75-09423) (Skogerboe-Colorado State)
W75-09484

**IRRIGATION RETURN FLOW AS INFLUENCED BY DRIP IRRIGATION,**
New Mexico State Univ., University Park.
For primary bibliographic entry see Field 5G.
W75-09485

**AUSTRALIAN VINEYARD USES SEWAGE EFFLUENT WITH TRICKLE IRRIGATION,**
Kinnaird, Hill, deRohan and Young Ltd., Kensington and Norwood (Australia).
A. L. Read, M. F. Pietsch, and W. E. Matheson.
In: Proceedings of the Second International Drip Irrigation Congress, p 382-387, (1974).

Descriptors: Effluents, *Sewage, *Sewage disposal, *Sewage effluents, Vine crops, Irrigation, Irrigation systems, Irrigation practices, Agriculture, Clogging.
Identifiers: *Trickle irrigation, *Drip irrigation, *Grapes.

The Angle Vale Vineyard is located 32 kilometres north of Adelaide, South Australia. Supplementary irrigation is necessary for the growth of vines in the area. In 1970, Government legislation precluded the future use of water in the area, and a decision was made to use sewage effluent from Adelaide which was the only supplementary irrigation available. The 40 hectare vineyard had trickle irrigation installed and has since been enlarged to 180 hectares. The effluent has a T.D.S. varying from 1,300 to 1,800 mg/l and a varying but high algal content. The paper describes the problems of filtration and growths within the pipelines and how these problems were overcome. Monitoring of soil conditions has been necessary to study the changes in soil salinity. Maximum salinities have occurred at the perimeter of the wetted zone, approximately 50 cms from the vine rows. Total soluble salts have increased from 0.035% in the centre of the vine rows to 0.086-0.109% at the perimeter of the wetted zones. Analyses of the vine leaves and wine made from the first vintage are also reported. (See also W75-09423) (Skogerboe-Colorado State)
W75-09486

**EFFECTS OF LOCALIZED PHOSPHATE TREATMENTS AND SOLUTION PH ON THE GROWTH AND FUNCTION OF APPLE ROOTS,**
Victoria Dept. of Agriculture, Ferntree Gully (Australia). Scoresby Horticultural Research Station.
B. K. Taylor, and F. G. Goubran.
In: Proceedings of the Second International Drip Irrigation Congress, p 395-399, (1974). 4 tab.

Descriptors: *Phosphates, *Crop response, *Apples, *Root development, Nutrients, Irrigation systems, Irrigation, Agriculture, Hydrogen ion concentration, Growth rates.
Identifiers: *Trickle irrigation, *Drip irrigation.

Following the introduction of trickle irrigation to orchards, interest has risen in the possibility of feeding nutrients into such systems on a regular basis. Use of phosphatic fertilizer in this way, however, could pose a problem in that a highly localized source of P would be available to only a small portion of the root system of the tree. Movement of P away from the trickle outlet would be restricted in most orchard soils by fixation processes. The influence of localized applications of phosphate on the growth and function of apple roots at two pH levels is reported. (See also W75-09423) (Skogerboe-Colorado State)
W75-09488

**DRIP IRRIGATION EXPERIMENT ON AVOCADOS,**
California Univ., San Diego, La Jolla.
C. D. Gustafson, A. W. Marsh, R. L. Branson, and S. Davis.
In: Proceedings of the Second International Drip Irrigation Congress, p 443-445, (1974).

Descriptors: *Crop response, *Crop productivity, *Salinity, Sprinkler irrigation, Cost comparisons, Diseases, Irrigation, Agriculture.
Identifiers: *Avocados, *Trickle irrigation, *Drip irrigation.

In June, 1970 an irrigation project was initiated to compare drip irrigation with the conventional spitter-sprinkler system, commonly used in avocado orchards. Evaluation of the two methods include: (1) a comparison of growth and productivity; (2) salinity accumulation and distribution in soils under each system; (3) annual costs to operate each system; (4) determine if trees are more or less susceptible to the avocado root rot disease; and (5) observe operation of equipment. (See also W75-09423) (Skogerboe-Colorado State)
W75-09499

**DISPOSAL OF CATTLE FEEDLOT RUNOFF ON AGRICULTURAL LAND,**
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W75-09517

**FOR IMPROVING WATER PENETRATION INTO SOME ARIZONA SOILS-SULFURIC ACID,**
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
S. Miyamoto, and J. L. Stroehlein.
Progressive Agriculture in Arizona, Vol 27, No 2, p 13-16, March-April, 1975. Published by College of Agriculture, University of Arizona, Tucson. 1 fig, 4 tab, 2 ref.

Descriptors: *Soil management, *Arid lands, *Irrigation, *Sulfur compounds, *Penetration, Sulfur, Acidity, *Arizona, Permeability, Soil amendments, Flocculation, Salinity, Saline soils, Water quality, Soil chemical properties.
Identifiers: *Sulfuric acid.

Sulfuric acid, a waste product of the copper industry, is useful in improving water penetration into some Arizona soils. The effectiveness of sulfuric acid treatments depends not only upon the concentration of sodium and calcium in soils and water, but also upon the types of soils and the rates and methods of acid application. The effectiveness of acid treatment in increasing the rate of water penetration is discussed for soils and irrigation waters commonly found in southern Arizona. Because of soil variability and diverse irrigation practices, the amount of acid applied is site specific and caution must be exercised. The quality of irrigation water is another key variable. Five steps for field application of sulfuric acid are given. (Bowden-Arizona)
W75-09623

**MIX GYPSUM IN SHALLOW DEPTHS--IN SALINE SOILS,**
Central Soil Salinity Research Inst., Karnal (India).
B. K. Khosla, K. S. Dargan, and I. P. Abrol.
Indian Farming, Vol 23, No 1, p 35, April 1973. 1 fig.

Descriptors: *Gypsum, *Wheat, *Barley, *Soil surfaces, *Crop production, *Saline soils, Soil profiles, Fertilizers, Sodium.
Identifiers: *Paddy, *India.

In saline sodic soils, highest yields of paddy and wheat were obtained when gypsum was added to the upper 10 cm of the soil surface. Yields decreased when gypsum was mixed at levels 20 cm and 30 cm below the surface. The yield of paddy was 70.21 quintals per hectare when gypsum was mixed in at the 10 cm depth, and was reduced to 60.52 and 65.44 quintals per hectare when gypsum was added to the 20 and 30 cm depths respectively. In the case of wheat, 32.80 quintals per hectare were obtained when gypsum was mixed at the 10 cm level, and yields of 31.57 and 20 quintals per hectare were gathered with gypsum mixed at the 20 and 30 cm depths. It is suggested that gypsum be mixed in the surface 10 cm of soil for shallow rooted crops like paddy, wheat, and barley to obtain the highest possible yields. (Mastic-Arizona)
W75-09786

**GYPSUM CAN IMPROVE YOUR WATER ALSO,**
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 5G.
W75-09787

**SEWAGE UTILIZATION IN AGRICULTURE,**
Central Public Health Engineering Research Inst., Nagpur (India).
For primary bibliographic entry see Field 5D.
W75-09788

**FLOW-ASSOCIATED PRECIPITATION REACTIONS IN SALINE-SODIC SOILS AND THEIR SIGNIFICANCE,**
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 2G.
W75-09792

**IN SALT-AFFECTED SOILS MULCHING AIDS IN CROP GROWTH,**
Central Soil Salinity Research Inst., Karnal (India).
I. P. Abrol, and O. P. Dhankhar.
Indian Farming, Vol 23, No 1, p 26-28, April 1973. 3 fig.

Descriptors: *Mulching, *Saline soils, *Evaporation, *Leaching, *Irrigation, Gypsum, Soil surfaces, Calcium, Sodium, *Crop production, Fertilization, Soil profiles, Salts.
Identifiers: *Rice husks, *India.

Mulching can increase crop yields as much as 100 percent in salt-affected areas by preventing upward movement of salts from the lower soil layers. Because rice husks are not only a common waste product, but also difficult to dispose of, they were tested to determine their effectiveness as a mulch for preventing salt movement in a highly saline-sodic soil. Data on soil moisture and distribution of salts in the soil profile were collected to observe salt movement in different layers. Fertilizers were applied and usual irrigation and other cultural practices were followed during the crop season. A high yield of paddy was obtained from gypsum treated plots. In addition yields increased with increasing depths of rice husk mulch for both the gypsum treated and the untreated plots. The mulch prevented upward movement of salts by checking evaporation at the soil surface, and also kept the soil wet and solubilized some of the native calcium sources for use by the crops. (Mastic-Arizona)
W75-09798

## 3D. Conservation In Domestic and Municipal Use

**THE OPTIMUM DISTRIBUTION OF URBAN WATER SUPPLIES IN PUERTO RICO,**
Puerto Rico Univ., Mayaguez. School of Engineering.
For primary bibliographic entry see Field 4A.
W75-09377

**OCEAN WASTE DISPOSAL PRACTICES IN METROPOLITAN AREAS OF CALIFORNIA,**
Interstate Electronics Corp., Anaheim, Calif.
C. F. McFarlane.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-230 944. $4.75 in paper copy, $2.25 in microfiche. Report 4460C1635, February, 1974. 95 p, 12 fig, 15 tab, 26 ref.EPA Contract 68-01-0796.

Descriptors: *Waste disposal, *Surveys, *California, Data collections, Guidelines, Urban areas.
Identifiers: *Ocean disposal.

The results of a fact-finding survey of ocean waste disposal practices in the Southern California and San Francisco Metropolitan areas of California are presented. The survey is a portion of an extensive study on waste ocean disposal practices in selected areas of the United States. Information was collected by field interviews and survey techniques and was supplemented by literature and data studies. The sum of the information establishes a data base for the development of guidelines and criteria for the control of ocean waste disposal. (Prague-FIRL)
W75-09391

**STORM WATER MANAGEMENT MODEL: USER'S MANUAL, VERSION II,**
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W75-09579

**REGIONAL ANALYSES OF RUNOFF CHARACTERISTICS FOR SMALL URBAN WATERSHEDS,**
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2A.
W75-09621

**INTEGRATIVE PROCEDURES FOR COORDINATED URBAN LAND AND WATER MANAGEMENT: A SYSTEMS ANALYSIS,**
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
For primary bibliographic entry see Field 6A.
W75-09622

## 3E. Conservation In Industry

**CLOSING UP A FINE GRADE PAPER MACHINE SYSTEM,**
MacMillan Bloedel Ltd., New Westminster (British Columbia).
J. G. Bayda.
Preprint, Canadian Pulp and Paper Association, Annual Meeting (Montreal), 1975, p 53-55B, 3 fig.

Descriptors: *Pulp wastes, *Water reuse, *Water conservation, Industrial wastes, Water pollution sources, Pulp and paper industry, Suspended solids, Recycling, Water treatment, Filtration, Water pollution control, Biochemical oxygen demand, Canada, Closed conduit flow.
Identifiers: Savealls, White water, Paper machines.

Island Paper Mills, a division of MacMillan Bloedel Ltd. in Vancouver, is an integrated paper mill producing fine papers in basis weights of 23 to 150 lb/3000 sq ft. The effluent quality leaving the process was upgraded by internal reclaim and recycle of suspended solids from various streams including press tray water and wire return roll shower water. To handle the excess volume of water containing fibers and fillers, a rich/lean white water system was designed. The seal pit is divided into two sections, one containing rich white water and the other containing dirtier streams. Contents of the latter side of the pit are sent to the saveall, and reclaimed solids are returned to the pulper. The saveall-clarified water is used for low-level makeup to the seal pit and the rich white water tank, with excess going to the sewer. As a result of closing the system, suspended solids load and BOD in the process effluent are below 15 lb/ton and effluent volume is about 7000 imperial gal/ton. Machine runnability has been maintained, and paper quality problems relating to the closed system have not been encountered. (Sykes-IPC)
W75-09353

**RECYCLING A SOLID WASTE FROM A PAPER PLANT -- SEPARATION OF WOOD FIBER FROM CLAY BY DIFFERENTIAL FLOCCULATION,**
British Columbia Univ., Vancouver. Dept. of Mineral Engineering.
For primary bibliographic entry see Field 5D.
W75-09354

**PAPER MACHINE CIRCULATION SYSTEMS -- FLOWS, CONSISTENCIES, RECOVERY, AND POLLUTION (LES CIRCUITS DE LA MACHINE A PAPIER -- DEBITS, CONCENTRATIONS, RECUPERATIONS ET POLLUTIONS),**
J. Vilars.
Papier, Carton et Cellulose, Vol 23, No 5, p 72-77; No 7, p 36-39, May, July, 1974. 7 fig, 4 tab.

Descriptors: *Water circulation, *Water conservation, *Recirculated water, *Industrial water, Mathematical studies, Water pollution sources, Freshwater, Waste water treatment, Flotation, Sedimentation, Filtration, Water pollution, Water pollution control, Flow, Closed conduit flow, Pulp and paper industry.
Identifiers: *Paper machines, *White water, Consistency.

Primary paper machine water circulation systems are examined in detail, particularly with respect to formulas and calculations relating to flow, consistency, and recirculation in systems with combined treatment of all white waters, in systems with addition of fresh water, in systems with separation of table-roll (or hydrofoil) white water and suction-box white water, in systems with separate treatment of white waters with addition of clear water to the suction-box white water, and in systems with separate treatment of white waters with addition of fresh water ahead of the headbox or in the table-roll circuit. The desirability of separate treatment of white waters, maintaining minimum white water consistency, and avoiding the introduction of fresh water is pointed out. Secondary water-circulation systems are also examined, including the need for using a minimum amount of fresh water, the principles of sedimentation, flotation, and filtration clarifiers used in fiber and filler recovery, the supply of paper-machine showers, and the paper-machine stock supply system. (Speckhard-IPC)
W75-09357

**PROCESS FOR THE RECOVERY OF FORMALDEHYDE AND PHENOL CONTAINED IN WASTE WATERS,**
For primary bibliographic entry see Field 5D.
W75-09573

**PROJECTS IN THE INDUSTRIAL POLLUTION CONTROL DIVISION - DECEMBER 1974.**
Environmental Protection Agency, Washington, D.C. Industrial Pollution Control Div.
For primary bibliographic entry see Field 5D.
W75-09578

**TIDE ENERGY CONVERSION DEVICE,**
For primary bibliographic entry see Field 8A.
W75-09650

**GEOCHEMISTRY APPLIED TO THE DISCOVERY, EVALUATION, AND EXPLOITATION OF GEOTHERMAL ENERGY RESOURCES,**
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W75-09724

**INFLUENCE OF THE ENERGY CRISIS UPON THE FUTURE OF ENVIRONMENTAL POLICY,**
Committee on Interior and Insular Affairs (U.S. Senate).
For primary bibliographic entry see Field 6E.
W75-09847

## 3F. Conservation In Agriculture

**EFFECT OF ROOT TEMPERATURE AND HUMIDITY ON THE DISTRIBUTION OF CA IN APPLE AND SUNFLOWER SEEDLINGS,**
Washington State Univ., Pullman. Dept. of Horticulture.
For primary bibliographic entry see Field 2I.
W75-09351

**AN INVESTIGATION OF FACTORS AFFECTING THE INTENSITY OF WATER USE IN THE LAJAS VALLEY IRRIGATION PROJECT,**
Puerto Rico Univ., Mayaguez. Dept. of Agricultural Economics.
P. I. A. Cordero.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 381, $4.25 in paper copy, $2.25 in microfiche. Puerto Rico Water Resources Research Institute, Mayaguez, Completion Report, September 1974. 61 p, 9 fig, 24 tab, 26 ref. OWRT A-036-PR(1).

Descriptors: Farms, Irrigation, Topography, *Water utilization, *Irrigation structures, *Drainage structures, Water supply, Costs, *Puerto Rico, *Irrigation water, Rainfall intensity.
Identifiers: *Lajas Valley(P.R.), *Rainfall frequency.

Effects of a group of socio-economic factors on the intensity of irrigation water use in Lajas Valley, Puerto Rico were investigated. The factors were: size of farms, ownership of farms, available labor for the operation of irrigation systems, costs

of irrigation, employment of farmers in non-agricultural activities, administration of irrigation services, topography of the farms, and soil permeability. The following had a direct significant relationship with the intensity of irrigation water use in available labor for the operation of irrigation systems, irrigation costs, topography, and soil permeability. The other factors studied did not present a significant relationship. The data obtained are of paramount importance for government agencies that are involved in the development of the Lajas Valley Irrigation Project and similar irrigation systems in Puerto Rico.
W75-09376

**AGRICULTURAL BENEFITS AND ENVIRONMENTAL CHANGES RESULTING FROM THE USE OF DIGESTED SLUDGE ON FIELD CROPS,**
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 5D.
W75-09409

**PROCEEDINGS OF THE SECOND INTERNATIONAL DRIP IRRIGATION CONGRESS.**
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
Held July 7-14, 1974, at San Diego, California. (1974), 569 p, $10.00.

Descriptors: Crop response, Design, Design criteria, Design flow, Economics, Evaporation pans, Fertilization, Furrow irrigation, Hydraulic properties, Infiltration, *Irrigation effects, *Irrigation efficiency, *Irrigation practices, Irrigation water, Mathematical models, Orifice flow, Orchards, Return flow, Root development, Salinity, Soil water movement, Subsurface irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation, Wetting pattern.

Research related to trickle irrigation (drip irrigation) is being conducted throughout the United States and in many other countries. The 101 papers presented discuss topics such as design methods, hydraulics, crop response, salinity, water filtration, fertilization, irrigation scheduling, emitter design, emitter clogging, wetting patterns, and much more as related to this relatively new irrigation method. (See W75-09424 thru W75-09514) (Skogerboe-Colorado State)
W75-09423

**DRIP IRRIGATION-WORLDWIDE,**
California Univ., San Diego, La Jolla.
C. D. Gustafson, A. W. Marsh, R. L. Branson, and S. Davis.
In: Proceedings of the Second International Drip Irrigation Congress, p 17-22, (1974). 1 fig.

Descriptors: *History, *Irrigation practices, Irrigation systems.
Identifiers: *Trickle irrigation, *Drip irrigation.

Good water supplies are always in demand. All around the world, problems with water are: short supply, poor quality and/or expensive. In reviewing the development of drip irrigation, it is apparent that the greatest interest is in areas where there is a problem with water supplies. Poor soils or steep terrain also encourages the use of drip irrigation. Drip irrigation has been used for years. What is new, however, is its application to modern agriculture. On a commercial scale in the United States, it can be traced to 1969-70. That was not the beginning, however, since many industries have been using some type of drip irrigation for a long time. Drip irrigation had its beginning in the greenhouse culture after World War II in the United Kingdom. (See also W75-09423) (Skogerboe-Colorado State)
W75-09424

**THE PROGRESS AND PROBLEMS OF DRIP IRRIGATION IN ISRAEL,**
Hebrew Univ., Rehovoth (Israel).
E. Rawitz, and D. Hillel.
In: Proceedings of the Second International Drip Irrigation Congress, p 23-28, (1974). 18 ref.

Descriptors: Crop response, Design criteria, History, Irrigation, Irrigation system, *Irrigation practices, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Israel.

The 'state of the art' of drip irrigation in Israel is reviewed regarding both equipment and operational practices. Available equipment is generally reliable in conforms to manufacturer's specifications of hydraulic properties. Filtering and clogging of small discharge orifices remains a problem under certain conditions. A standard head has been developed for connection to the main system incorporating filter, vacuum breaker, fertilizer applicator, pressure regulator, and automatic valves. Hydraulically or electrically actuated automatic valves are used either singly or for sequential operation. Many growers have reported excellent results with drip irrigation of orchards, truck crops, and flowers. The relative advantages of drip irrigation are especially pronounced where relatively saline water must be used under extremely arid conditions. Criteria and recommendations have yet to be determined regarding irrigation frequency and application amounts in relation to emitter spacing and discharge, and percent of wetted area for different crops, soil profile characteristics, climatic conditions, and water quality. Some consequences of improper operation may be under-irrigation, excessive restriction of the root zone, and excessive leaching of water and nutrients below the rooting depth. (See also W75-09423) (Skogerboe-Colorado State)
W75-09425

**DRIP IRRIGATION AND AUTOMATION TOOLS IN EFFICIENT USE OF WATER POLICY,**
Ministry of Agriculture, Safad (Israel).
H. Paldi.
In: Proceedings of the Second International Drip Irrigation Congress, p 29-32, (1974).

Descriptors: *Automation, *Water policy, *Water conservation, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Israel.

Discussed are water savings in Israel with drip irrigation, long range irrigation plans for Israel, and irrigation system automation. (See also W75-09423) (Skogerboe-Colorado State)
W75-09426

**DRIP IRRIGATION DESIGN CRITERIA FOR TREE CROPS IN FLORIDA AND OTHER HUMID REGIONS,**
Florida Univ., Gainesville.
D. S. Harrison, and J. M. Myers.
In: Proceedings of the Second International Drip Irrigation Congress, p 33-37, (1974). 11 ref.

Descriptors: *Orchards, *Crop response, *Florida, *Humid area, Irrigation practices, Citrus fruits, Irrigation, Agriculture, Irrigation systems, Irrigation design.
Identifiers: *Drip irrigation, *Trickle irrigation.

Drip irrigation has been installed on approximately 4,000 acres of citrus and other orchard crops in Florida during the past 2 years. Some of the reasons for increased interest in this method of irrigation are: (1) conservation of water, (2) labor savings, (3) lower operating costs, and (4) lower power requirements. Some problems have developed and the future of drip irrigation in Florida will depend on how those problems are dealt with. Among significant problems are: (1) improper water filtration, (2) research data on crop response not readily available, (3) vandalism, (4) unavailability of fully tested design criteria, (5) emitter spacing, and (6) expected life. Two years research data in Florida on strawberries, and one year on tomatoes show that response to drip irrigation is comparable to other application methods and water savings as much as 60-70% may be expected. Fertilizer response, when applied through the drip system, has been outstanding. (See also W75-09423) (Skogerboe-Colorado State)
W75-09427

**DRIP IRRIGATION RESEARCH IN OREGON - A PROGRESS REPORT,**
Oregon State Univ., Corvallis.
M. N. Shearer, L. W. Martin, P. B. Lombard, and W. M. Mellenthin.
In: Proceedings of the Second International Drip Irrigation Congress, p 38-43, (1974). 4 fig, 3 tab.

Descriptors: Crop response, *Crop production, Sugarcane, *Oregon, Irrigation system, Irrigation, Agriculture, *Sprinkler irrigation, Filtration.
Identifiers: *Trickle irrigation, *Drip irrigation, Pears.

Drip irrigation research was initiated in Oregon in 1973. One year's results are reported on the following: (1) total yield, fruit size, and water requirements, of cane fruit under drip and sprinkler irrigation, (2) total yield, fruit size, and water requirements of pears grown on low intake rate montmorillonite soils under drip and rill irrigation, (3) evaporation pan coefficients for scheduling drip irrigation, and (4) filtering requirements for irrigation water containing glacial silt and debris. (See also W75-09423) (Skogerboe-Colorado State)
W75-09428

**DRIP IRRIGATION IN LANDSCAPING AND SOIL EROSION CONTROL,**
Kuluwai Irrigation Corp., Haleiwa, Hawaii.
For primary bibliographic entry see Field 4D.
W75-09429

**RESEARCHES AND APPLICATIONS ON DRIP IRRIGATION AND SIMILAR METHODS IN ITALY,**
Pisa Univ. (Italy).
P. Grossi.
In: Proceedings of the Second International Dn Irrigation Congress, p 46-51, (1974).

Descriptors: Irrigation systems, Agriculture, Irrigation practices, Research and development.
Identifiers: *Trickle irrigation, *Drip irrigation, *Italy.

Research progress with trickle irrigation is discussed along with the hydraulic, pedological, and agronomical results of this research. (See also W75-09423) (Skogerboe-Colorado State)
W75-09430

**DEVELOPMENT AND SCOPE OF DRIP AND SUBSURFACE IRRIGATION,**
Udaipur Univ. (India).
For primary bibliographic entry see Field 3C.
W75-09431

**DRIP IRRIGATION ON CITRUS,**
Zebediela Estates (South Africa).
D. H. Bester, D. C. Lotter, and G. H. Veldman.
In: Proceedings of the Second International Drip Irrigation Congress, p 58-64, (1974). 2 fig, 1 tab.

Descriptors: *Evaporation pans, Irrigation, Agriculture, Sprinkler irrigation, Wetting, Fertilization, Filtration, Orchards, *Citrus fruits.
Identifiers: *Trickle irrigation, *Drip irrigation, South Africa.

A study was conducted on citrus to establish the comparative efficiency of drip irrigation, dragline sprinkler irrigation, and a hose system discharging water directly into irrigation basins in South Africa. The following aspects of drip irrigation were investigated: (1) Soil moisture determinations and wetting patterns, (2) the possibility of using an evaporation pan to determine irrigation requirements, (3) the effect of different numbers of spacing of drippers per tree, (4) the effect of different dripper discharge rates, (5) practicability of using microtubes as drippers, (6) the possibility of applying fertilizers through a drip irrigation network, and (7) factors affecting the distribution efficiency of a drip irrigation system. (See also W75-09423) (Skogerboe-Colorado State)
W75-09432

**SOME RESULTS OF A FIELD SURVEY OF DRIP IRRIGATION SYSTEMS IN THE REPUBLIC OF SOUTH AFRICA,**
South Africa Dept. of Agricultural Technical Services, Pretoria.
W. J. Uys.
In: Proceedings of the Second International Drip Irrigation Congress, p 65-70, July 1974. 4 tab.

Descriptors: *Clogging, Flow rates, *Surveys, Irrigation, Irrigation systems, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *South Africa.

An extensive survey was conducted in the Republic of South Africa to evaluate existing drip irrigation systems under a variety of climatic, soil, crop and management conditions. The purpose of the survey is to evaluate these systems under practical farming conditions and to identify specific problems of design, operation, and management from which future extension and research programs can be formulated. (See also W75-09423) (Skogerboe-Colorado State)
W75-09433

**USE OF DRIP IRRIGATION IN GERMANY,**
Kassel Univ. (West Germany).
P. Wolff.
In: Proceedings of the Second International Drip Irrigation Congress, p 71-76, (1974).

Descriptors: *Sprinkler irrigation, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Germany.

Irrigation methods similar to drip irrigation have been used in Germany for many years, and more horticulturalists are changing from overhead irrigation to drip irrigation. The reasons for changing irrigation methods were investigated. The horticulturalists are changing methods because of increasing labor costs and an increasing demand for high quality products. (See also W75-09423) (Skogerboe-Colorado State)
W75-09434

**DRIP IRRIGATIONS INHERENT REQUISITE - WATER QUALITY,**
Scientific Irrigation Systems, El Monte, Calif.
For primary bibliographic entry see Field 5D.
W75-09435

**EDAPHIC MICRO-TUBULAR CONTINUOUS FLOW IRRIGATION IN CANADA,**
Department of Agriculture, Summerland (British Columbia).
For primary bibliographic entry see Field 2G.
W75-09436

**TRICKLE IRRIGATION,**
Ministry of Agriculture, Tel-Aviv (Israel). Irrigation and Soil Field Service.
M. Shani.
In: Proceedings of the Second International Drip Irrigation Congress, p 91-96, July 1974.

Descriptors: *Filtration, *Fertilization, Irrigation systems, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Israel.

Advantages and disadvantages are presented of trickle irrigation, types of emitters, filtration methods, and fertilization techniques based on experience in Israel. (See also W75-09423) (Skogerboe-Colorado State)
W75-09437

**VEGETABLE PRODUCTION AND WATER-USE EFFICIENCY AS INFLUENCED BY DRIP, SPRINKLER, SUBSURFACE, AND FURROW IRRIGATION METHODS,**
New Mexico State Univ., University Park.
E. G. Hanson, and T. C. Patterson.
In: Proceedings of the Second International Drip Irrigation Congress, p 97-102, (1974).

Descriptors: *Sweet corn, Onions, *Crop response, *Irrigation practices, *Vegetable crops, Irrigation systems, *Sprinkler irrigation, *Subsurface irrigation, *Furrow irrigation, Soil moisture, Salinity, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Sweet corn and onions have been grown on replicated plots with four methods of irrigation: drip, subsurface, sprinkler, and furrow. Half of the plots have been irrigated to maintain the soil moisture tension at or below 0.20 atmospheres, and the other half at or below 0.60 atmospheres. Yield, quality, and water-use efficiency pertaining to each crop are reported for three growing seasons. Changes in soil salinity are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09438

**COMPARISON OF IRRIGATION METHODS, ROOTSTOCKS, AND FERTILIZER ELEMENTS OF VALENCIA ORANGE TREES,**
Arizona Univ., Yuma.
R. L. Roth, D. R. Rodney, and B. R. Gardner.
In: Proceedings of the Second International Drip Irrigation Congress, p 103-108, (1974).

Descriptors: *Sprinkler irrigation, *Surface irrigation, *Oranges, *Fertilization, Fertilizers, Saline water, Saline soil, Irrigation practices, Irrigation systems, Irrigation, Agriculture.
Identifiers: Irrigation method comparison, *Trickle irrigation, *Drip irrigation, Micronutrients.

A 4-hectare (10-acre) block of 'Campbell' valencia orange trees planted in May 1971, was used to compare 5 irrigation methods, 2 types of rootstocks, and a phosphate and micronutrient variable. The irrigation methods were border, full-coverage sprinklers, limited-coverage sprinklers, basin, and trickle. Maximum tree growth, as measured by increase in trunk circumference, was achieved from the trickle and basin irrigation methods, even though these methods used approximately one-twentieth the water as compared to the normal border irrigation method. The full-coverage sprinkler method restricted tree growth due to salt injury of the leaves. Nitrate and salt concentrations in the root zone were mapped for each irrigation method. No observable effects of the fertilizer variables have been detected at this time. (See also W75-09423) (Skogerboe-Colorado State)
W75-09439

**DRIP IRRIGATION: SURFACE AND SUBSURFACE COMPARED WITH SPRINKLER AND FURROW,**
Agricultural Research Service, Riverside, Calif.
S. Davis, and W. J. Pugh.
In: Proceedings of the Second International Drip Irrigation Congress, p 109-114, (1974). 3 fig, 2 tab, 2 ref.

Descriptors: *Furrow irrigation, *Sprinkler irrigation, *Subsurface irrigation, Melons, Agriculture, Irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation, Squash.

Four studies are described that compared crop response to various combination of drip, subsurface, furrow and sprinkler irrigation. Study concludes that (1) when the amount of water applied is near the consumptive use requirements, subsurface irrigation has greater production and better water use efficiency, (2) less water is needed for drip and subsurface irrigation than for furrow or sprinkler irrigation, because less water is lost to direct evaporation and deep percolation, and (3) the applicators used applied water equally well to the surface or subsurface soil, except where deposits from evaporation occurred. (See also W75-09423) (Skogerboe-Colorado State)
W75-09440

**CHAMBER METHOD FOR DRIP IRRIGATION SYSTEM DESIGN AND INSTALLATION PROCEDURE,**
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 8C.
W75-09441

**THE USE OF FOGGERS IN DRIP IRRIGATION,**
Perma-Rain Irrigation, Inc., Lindsay, Calif.
R. O. Schade.
In: Proceedings of the Second International Drip Irrigation Congress, p 129-130, (1974).

Descriptors: Crop response, Irrigation systems, *Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Foggers.

The rapid increase in drip irrigation in the United States has been accompanied by a large number of new products for its application. Most of this new equipment has been emitters of various types. These emitters are used to reduce the flow and to apply the water directly to the surface of the soil. In addition to emitters a device known as a fogger is also being widely used. The fogger fogs or sprays the water into the air. The droplet size and output of each fogger ranges from 2 to 5 gallons per hour which is comparable to the discharge rate of most emitters being used today. Foggers have been installed on an estimated 8,000 acres. This accounts for approximately 15% of the acreage being irrigated by drip irrigation. Foggers are being used to irrigate citrus, decidious fruit, grapes, nuts and ornamentals. The area of principal usage is the San Joaquin Valley of California. (See also W75-09423) (Skogerboe-Colorado State)
W75-09442

**A CONSTANT MICRO SOURCE OF MOISTURE AS A COMPONENT IN A GRADIENT SYSTEM FOR A HIGH LEVEL PRODUCTION,**
Agricultural Research and Educational Center, Bradenton, Fla.
C. M. Geraldson.
In: Proceedings of the Second International Drip Irrigation Congress, p 131-136, (1974). 4 fig, 4 ref.

Descriptors: *Nutrients, Agriculture, Irrigation, Crop production, *Moisture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Micro-pore tubing.

The objective was to evaluate the use of a constant micro source of moisture which could be used as an alternative to a constant water table in establishing nutrient gradients for optimal production. Constant moisture was supplied by drip (trickle system) or by micro pore tubing. Soluble

utrients were supplied primarily by banded placement on the soil bed surface. Relative placement of fertilizer, moisture and plants as the major variables were evaluated in conjunction with different oils as well as the sources of moisture. A consistent high level production of vegetables and lowers was attained by integrating contributing omponents such as soil, moisture, fertilizer and lants to establish the desired gradient system. he resultant effect in conjunction with synthetic ulch as a protective component minimizes or liminates these components as contributing variales. (See also W75-09423) (Skogerboe-Colorado tate)
V75-09443

**ISINFECTION OF SOIL STRIPS THROUGH HE DRIP IRRIGATION SYSTEM,**
Hebrew Univ., Rehovth (Israel).
For primary bibliographic entry see Field 5G.
V75-09444

**TRIP CULTIVATION OF THE AREA WETTED Y DRIP IRRIGATION IN THE ARAVA ESERT,**
Hebrew Univ., Rehovth (Israel).
For primary bibliographic entry see Field 3C.
V75-09445

**RRIGATION FOR BENCHES,**
California Univ., Riverside.
. Furuta, S. Besemer, W. C. Jones, R. Strohman, nd T. Mock.
n: Proceedings of Second International Drip Irigation Congress, p 149-154, (1974). 4 fig.

Descriptors: *Greenhouses, Irrigation, Horticultural crops, Agriculture.
Identifiers: *Drip irrigation, *Trickle irrigation, *Bench crop production.

Experiments were conducted on the modification of existing irrigation systems and the use of drip irrigation for crops grown in benches. Where the system was properly designed, excellent plant growth and yield resulted from the use of modified nozzle irrigation systems, and from the use of drip systems, both individual emitters and tubes with small orifices. As measured by plant performance, water was more uniformly distributed in the soil where drip or the modified nozzle system was used, compared to established irrigation systems. Even with soils amended with large volumes of organic matter, uniform distribution of water occurred, even though the surface between emitters was dry. Also excellent crops were produced in a soil that would be considered too tight or heavy for use in a bench. Considerable savings in the amount of water used and a corresponding reduction of the volume of run-off resulted. (See also W75-09423) (Skogerboe-Colorado State)
W75-09446

**IRRIGATION FOR CONTAINER GROWING,**
California Univ., Riverside.
T. Furuta, R. Branson, W. C. Jones, R. Strohman, and T. Mock.
In: Proceedings of the Second International Drip Irrigation Congress, p 155-158, (1974).

Descriptors: *Nutrients, *Root development irrigation, Greenhouses, Salinity.
Identifiers: *Trickle irrigation, *Drip irrigation, *Container growing, Microtubes.

Trickle irrigation and modifications have been used for container growing, especially under greenhouse conditions, for more than a decade. Microtubing has been generally used. Difficulties with uniform wetting of the entire soil mass had been encountered. This and other problems have limited the use of trickle irrigation. With the development of emitters for containers, it became possible to study the use of drip irrigation for container growing. Experiments were conducted to study the soil mixture-fertilization-irrigation subsystem. Larger plants--tops and roots--were noted under drip irrigation. These plants had higher N content initially and lower Na and Cl content late in the experiment. Root distribution within the container was also influenced with more roots in the center of the ball. Considerably less water was used with drip irrigation than with overhead sprinkling. The method of irrigation influenced salinity, nutrient content of drainage water and the wetting pattern in the soil. (See also W75-09423) (Skogerboe-Colorado State)
W75-09447

**AUTOMATIC DRIP IRRIGATION FOR GREENHOUSE TOMATO PRODUCTION IN WEST TEXAS,**
Texas A and M Univ., Lubbock.
L. New, and R. Roberts.
In: Proceedings of the Second International Drip Irrigation Congress, p 159-164, (1974). 1 fig.

Descriptors: *Crop production, *Tomatoes, *Automatic control, *Automation, Greenhouses, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Automatic irrigation.

Soil moisture sensors are used to automatically control the operation of drip irrigation systems and maintain optimum moisture levels in West Texas tomato greenhouses. Up to ten thousand square feet of growing area is being successfully irrigated by one sensor. Time clocks cause intermittent irrigation which helps prevent overwatering, puddling and runoff. Water flow control valves limit drip emitter water application rates to 1.0 to 1.5 gallons per hour. (See also W75-09423) (Skogerboe-Colorado State)
W75-09448

**HIGH-FREQUENCY POROUS TUBE IRRIGATION FOR WATER-NUTRIENT MANAGEMENT IN HUMID REGIONS,**
Agricultural Research Service, Florence, S.C. Coastal Plains Soil and Water Conservation Research Center.
C. J. Phene.
In: Proceedings of the Second International Drip Irrigation Congress, p 166-171, (1974). 6 fig, 1 tab, 8 ref.

Descriptors: *Sweet corn, *Crop response, *Subsurface irrigation, Nitrogen, Automation, Irrigation efficiency, Nutrients, Furrow irrigation, Sprinkler irrigation, Irrigation practices, Irrigation systems.
Identifiers: *Trickle irrigation, *Drip irrigation, *Porous tube irrigation.

A plastic porous tube and an electronic soil matric potential sensor supplied sweet corn with nutrients and water automatically by controlling the water content of a limited volume of root-zone soil. Sweet corn yield and water-use efficiency obtained with high-frequency porous tube irrigation systems were compared with those obtained from high-frequency sprinkler and furrow irrigation systems under similar irrigation control and fertility. In another experiment, sweet corn yield, plant nitrogen uptake, and soil (NO3(-) movement were studied under controlled soil matric potential for various application rates of N and K. Ear yield with high-frequency porous tube irrigation was 10.5 and 12.6% greater than ear yield obtained with furrow and sprinkler irrigation, respectively. Water-use efficiency was 37 and 54% higher for sensor controlled high-frequency porous tube irrigation than for furrow and sprinkler irrigation. (See also W75-09423) (Skogerboe-Colorado State)
W75-09449

**CONTROL OF WATER BY DRIP IRRIGATION FOR ALFALFA SEED PRODUCTION,**
Agricultural Research Service, Brawley, Calif.
L. S. Willardson, R. Hageman, and A. W. Marsh.
In: Proceedings of the Second International Drip Irrigation Congress, p 172-177, (1974). 2 tab, 3 fig.

Descriptors: *Alfalfa, *Seeds, Crop response, Irrigation systems, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Drip irrigation controlled soil water tension treatments in an alfalfa seed production experiment resulted in a 4-fold yield difference between the best and poorest treatments. The experiment had 6 replications of 4 treatments and has been conducted for 2 years. Yield of forage as well as seed yields were determined. (See also W75-09423) (Skogerboe-Colorado State)
W75-09450

**SEE GERMINATION RESPONSE TO SUBSURFACE IRRIGATION DEPTH,**
Agricultural Research Service, Brawley, Calif.
For primary bibliographic entry see Field 2I.
W75-09451

**TRAVELING TRICKLE SYSTEM,**
Agricultural Research Service, Riverside, Calif. Salinity Lab.
S. L. Rawlins, G. J. Hoffman, and S. C. Merrill.
In: Proceedings of the Second International Drip Irrigation Congress, p 184-187, (1974).

Descriptors: Irrigation design, Cost comparisons, *Cost analysis, Irrigation, Irrigation systems, *Irrigation practices, Agriculture, Sprinkler irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation, *Traveling trickle systems, Row crop irrigation.

Typical drip irrigation systems deliver frequent applications of small volumes of water using a large number of small diameter orifices installed along tubes. The long lengths of tubes and large number of emitters required make drip irrigation costly for row crops. In addition, the small diameter of the orifices required to control water flow in such a system makes it susceptible to plugging and adds an additional filtration expense. A traveling trickle system is described that circumvents both of these problems by controlling water application with a few large orifices moved along the row rather than with a large number of fixed location orifices. Results are presented from cost analyses. (See also W75-09423) (Skogerboe-Colorado State)
W75-09452

**MOBILE DRIP IRRIGATION SYSTEMS,**
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
O. C. Wilke.
In: Proceedings of the Second International Drip Irrigation Congress, p 188-192, (1974). 5 fig.

Descriptors: Irrigation design, Irrigation operation and maintenance, Irrigation practices, Irrigation, Agriculture, *Irrigation systems.
Identifiers: *Trickle irrigation, *Drip irrigation.

A tractor-mounted device for moving drip irrigation laterals is described. Time periods required to load, move and unload laterals are presented. Several drip irrigation trail lines were attached to a pivot sprinkler system. The design and performance of the system are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09453

**FORMATION OF BLOCKAGES IN DRIP IRRIGATION SYSTEMS: THEIR PREVENTION AND REMOVAL,**
Israel Center of Waterworks Appliances, Tel-Aviv.
D. Pelleg, N. Lahav, and D. Goldberg.

In: Proceedings of the Second International Drip Irrigation Congress, p 203-208, (1974). 8 fig, 3 tab, 6 ref.

Descriptors: *Clogging, Irrigation systems, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Clogging is one of the most severe problems associated with trickle irrigation systems. The different kinds of clogging are described along with the reasons for clogging. Methods of preventing clogging are given, and ways of cleaning systems after clogging has occurred are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09454

**REVERSE FLUSHING TECHNIQUE FOR BI-WALL DRIP TUBING,**
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 8C.
W75-09455

**CLOGGING OF DRIP SYSTEMS FROM METABOLIC PRODUCTS OF IRON AND SULFUR BACTERIA,**
Agricultural Research and Education Center, Lake Alfred, Fla.
For primary bibliographic entry see Field 5B.
W75-09456

**CHEMICAL TREATMENT OF DRIP IRRIGATION WATER,**
Hawaiian Sugar Planters Association Experiment Station, Honolulu.
B. A. McElhoe, and H. W. Hilton.
In: Proceedings of the Second International Drip Irrigation Congress, p 215-220, (1974). 2 fig, 2 tab.

Descriptors: *Microorganisms, *Bacteria, Plugging, *Orifice flow, *Orifices, Irrigation, Agriculture, Irrigation efficiency, Irrigation systems, Irrigation water.
Identifiers: *Drip irrigation, *Trickle irrigation, *Chemical treatment.

Bacteria and other microorganisms in water are contributors to orifice plugging. Their skeletons, the slimes they produce, and their metabolic products are the glue that binds fine soil particles to the walls of the tube. Chemical treatment can arrest the agglomeration process and significantly reduce plugging. (See also W75-09423) (Skogerboe-Colorado State)
W75-09457

**MOVEMENT OF WATER AND SALTS UNDER HIGH FREQUENCY IRRIGATION,**
Agricultural Research Service, Riverside, Calif. Salinity Lab.
P. A. C. Raats.
In: Proceedings of the Second International Drip Irrigation Congress, p 222-227, (1974). 5 fig, 14 ref.

Descriptors: *Soil water movement, *Salinity, *Infiltration, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *High frequency irrigation.

Many modern irrigation systems deliver water at short intervals, in space as well as in time. Theoretical analyses show that the remaining variations are damped rapidly. Consequently, steady, one-dimensional movement and uptake is used as a basis for further analysis. Qualitative features of possible steady pressure head and water content profiles are discussed. Specific calculations for various leaching fractions and amounts of capillary rise from a water table are based on empirical, but realistic models for the dependence of the hydraulic conductivity upon the pressure head and for the spatial distribution of the rate of uptake. The resulting salinity profiles are also calculated. The results are compared with earlier, more approximate calculations. (See also W75-09423) (Skogerboe-Colorado State)
W75-09458

**LINEARIZED MOISTURE FLOW SOLUTIONS FOR POINT, LINE, AND STRIP SOURCES,**
Arizona Univ., Tucson.
For primary bibliographic entry see Field 2G.
W75-09459

**OPTIMUM LATERAL PLACEMENT FOR SUBSURFACE IRRIGATION SYSTEMS,**
Minnesota Univ., St. Paul.
J. R. Gilley, and E. R. Allred.
In: Proceedings of the Second International Drip Irrigation Congress, p 234-239, (1974). 6 ref.

Descriptors: *Subsurface irrigation, *Mathematical models, *Irrigation design, Irrigation, Irrigation efficiency, Irrigation systems, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Design of a subsurface irrigation system requires both the proper placement of the lateral line in the soil profile and proper lateral discharge. The lateral placement depends on the nature of the soil-moisture movement from the applicator and the extraction pattern of the irrigated crop. The optimum location of the laterals will therefore vary with soil type and the crop being irrigated. A mathematical model describing soil-moisture movement during subsurface irrigation has been developed. The results of the portion of the model describing infiltration from the subsurface lateral compare quite favorably with data available in the literature. A series of one dimensional sinks, to simulate soil-moisture extraction by plants, has been combined with the infiltration model to obtain a model of soil-moisture movement during subsurface irrigation. The model was used to determine optimum lateral placement as a function of soil type and crop root zone depth to obtain the desired crop extraction patterns. Results of the model indicate the optimum lateral placements also have higher irrigation efficiencies than other placement values. These variables were used to develop design curves relating lateral depth, spacing and discharge to soil type and crop extraction pattern. Results also indicate that for proper design, lateral depth is more important than lateral spacing. (See also W75-09423) (Skogerboe-Colorado State)
W75-09460

**TRICKLE IRRIGATION DESIGN FOR OPTIMAL SOIL WETTING,**
Utah State Univ., Logan.
For primary bibliographic entry see Field 2G.
W75-09461

**SOIL MOISTURE DISTRIBUTION AND WETTING PATTERN FROM A POINT SOURCE,**
Arizona Univ., Yuma.
For primary bibliographic entry see Field 2G.
W75-09462

**SOIL MOISTURE DISTRIBUTION AND DEPLETION IN AN APPLE ORCHARD IRRIGATED BY TRICKLERS,**
Hebrew Univ., Rehovoth (Israel).
For primary bibliographic entry see Field 2G.
W75-09463

**MOISTURE PROFILES AND SALINIZATION OF SOILS UNDER DRIP IRRIGATION IN THE REPUBLIC OF SOUTH AFRICA,**
South Africa Dept. of Agricultural Technical Services, Pretoria.
For primary bibliographic entry see Field 3C.
W75-09464

**AN EXPLANATION FOR THE GROWTH ADVANTAGE OF DRIP IRRIGATION,**
New Mexico State Univ., University Park.
R. S. Freeburg, D. J. Cotter, and N. S. Urquhart.
In: Proceedings of the Second International Drip Irrigation Congress, p 265-270, (1974). 2 fig, 3 tab, 6 ref.

Descriptors: *Diurnal, *Temperature, *Soil temperature, *Furrow irrigation, *Sweet corn, *Crop response, Agriculture, Irrigation, Irrigation practices.
Identifiers: *Drip irrigation, *Trickle irrigation.

Soil, leaf, and air temperatures were measured for sweet corn during a 16-day period following emergence. The corn was grown in an experiment designed to compare trickle (drip) irrigation to furrow irrigation. There was significant differences between the temperature regimes produced by the two irrigation methods. The effects were especially notable in the soil temperatures. Based on a soil temperature of 80F which research literature indicates to be optimum for corn growth, an integrated deviation from optimum was computed for each irrigation method. Deviations above the optimum at the two-inch depth were only 785 degree-hours for the trickle system as compared to 1238 degree-hours for the furrow system during the 16-day period. During this period, the growth rate of the crop under furrow irrigation was 84 percent of that under the trickle irrigation. (See also W75-09423) (Skogerboe-Colorado State)
W75-09465

**TRICKLE IRRIGATION IN MICHIGAN ORCHARDS,**
Michigan State Univ., Lansing.
C. D. Kesner, and A. L. Kenworthy.
In: Proceedings of the Second International Drip Irrigation Congress, p 272-274, (1974).

Descriptors: *Irrigation practices, Irrigation systems, *Michigan, Orchards.
Identifiers: *Trickle irrigation, *Drip irrigation, Microtubes.

The concept of trickle irrigation is being rapidly accepted by Michigan fruit growers. A major source of water is from small existing wells previously used for cooling sour (red tart) cherries at harvest time and other purposes. Lakes, ponds, rivers and creeks also serve as water sources. Pressure regulators or gate valves were originally used to control in-line pressure but the present trend is toward flow regulating valves in each row lateral. The primary emitter system in Michigan is the microtube with .025, .035, .036, or .045 inch I.D. tubes being the most popular. An illustrated presentation demonstrates the techniques used in many different installations. (See also W75-09423) (Skogerboe-Colorado State)
W75-09466

**TRICKLE IRRIGATION IN MICHIGAN ORCHARDS: CONTROLLING RATE OF FLOW WITH FLOW REGULATING VALVES AND MICROTUBES,**
Michigan State Univ. Lansing.
For primary bibliographic entry see Field 8C.
W75-09467

**DRIPPER FLOW CONSISTENCY,**
Agricultural Research Service, Riverside, Calif.
S. Davis, and W. J. Pugh.
In: Proceedings of the Second International Drip Irrigation Congress, p 281-283, (1974). 6 fig.

Descriptors: *Flow characteristics, *Flow rates, *Application equipment, Equipment, Agriculture, Irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation.

Several different emitters have been checked for flow consistency volumetrically, both in time for the same emitter and for several emitters along the applicator line. Results of two years' study show many of the applicators vary more than plus or minus 5% from the average. With the exception of a few drippers that were partially clogged or improperly manufactured, most of the drippers provided consistent water distribution both along the line and with time. (See also W75-09423) (Skogerboe-Colorado State)
W75-09468

**EVALUATION OF A TRICKLE IRRIGATION SYSTEM,**
Technion - Israel Inst. of Tech., Haifa.
D. Karmeli, and J. Keller.
In: Proceedings of the Second International Drip Irrigation Congress, p 287-292, (1974). 1 tab.

Descriptors: *Uniformity, Soil moisture, *Evaluation, *Performance, Filtration, Irrigation practices, Irrigation efficiency, Irrigation operation and maintenance, *Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, Emission uniformity, Design evaluation.

Factors determining performance of the system i.e. filtration quality, pressure and soil moisture distributions, are analyzed. Techniques for the evaluation of a system design or field performance are described and an equation to calculate the emission uniformity, EU, of a trickle system is presented. Results of field tests and design evaluations are summarized and criteria established. Relationships between EU and soil volume values as well as irrigation regimes (application rates and intervals) are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09469

**HYDRAULICS OF SINGLE-CHAMBER VS. DUAL-CHAMBER TUBING,**
Hawaiian Agronomics, Inc., Honolulu.
For primary bibliographic entry see Field 8C.
W75-09470

**DESIGNING TRICKLE IRRIGATION LATERALS FOR UNIFORMITY,**
Texas A and M Univ., College Station.
T. A. Howell, and E. A. Hiler.
In: Proceedings of the Second International Drip Irrigation Congress, p 299-304, (1974). 3 fig, 6 ref.

Descriptors: *Uniformity coefficient, *Uniform flow, *Irrigation design, Irrigation systems, Design criteria, Design flow, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Proper design of trickle irrigation laterals for desired uniformity is important to prevent under-irrigation, with resulting crop damage, or over-irrigation, with resulting water losses of drainage and runoff. Recently several papers have presented trickle irrigation design data and methods; yet a simple design equation for directly determining maximum lateral lengths for different lateral slopes, trickle emitter types, pipe sizes, and desired uniformity is not available. Design equations, based on standard principles, fluid mechanics, and graphs are presented which can be used to determine maximum trickle irrigation lateral lengths for selected uniformities. The maximum lateral length for a given uniformity is given as a power function (linear log-log) of either emitter spacing or number of emitters per lateral. Engineering design applications for this method are given in the form of specific examples. Implications and assumptions inherent in the method are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09471

**DESIGN CHARTS FOR DRIP IRRIGATION SYSTEMS,**
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 8C.
W75-09472

**HYDRAULIC AND MECHANICAL PROPERTIES OF DRIPPERS,**
Israel Center of Water Works Appliances, Tel-Aviv.
For primary bibliographic entry see Field 8C.
W75-09473

**EVALUATION OF HYDRAULICS OF FLOW THROUGH PIPES OF VARYING SLOPES, LENGTHS AND ORIFICE PLACEMENTS,**
Udaipur Univ. (India).
For primary bibliographic entry see Field 8B.
W75-09474

**PLANT WATER REQUIREMENTS AS RELATED TO TRICKLE IRRIGATION,**
E. R. Hoare, K. V. Garzoli, and J. Blackwell.
In: Proceedings of the Second International Drip Irrigation Congress, p 323-328, (1974). 3 tab, 10 ref.

Descriptors: *Water requirements, *Irrigation systems, Irrigation design, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Trickle irrigation differs from spray and flood irrigation in that water is supplied in small amounts at frequent intervals in order to satisfy, as closely as possible, the plants' immediate needs. This is in contrast to other forms of irrigation in which large quantities of water are supplied, following which a gradual drying of the soil takes place, and subsequent irrigation is carried out to replenish the reservoir of soil moisture. The difference in these two approaches to irrigation means that current methods of estimating the water requirements of crops requires further evaluation. Not only does the water requirement vary with different climatic conditions, age of the plants and the season, irrespective of the method of irrigation, but the use of trickle irrigation imposes a further variation due to its particular effect on the soil-plant-atmosphere complex. The water requirements of plants under trickle irrigation are examined and ways are suggested in which these may be calculated from evaporation data, soil properties and other characteristics specific to the particular crop. Reference is also made to the use of trickle irrigation in particular situations, and how the water requirements in such cases can best be satisfied. (See also W75-09423) (Skogerboe-Colorado State)
W75-09475

**DRIP AND FURROW IRRIGATION STUDIES ON SUGARCANE,**
Texas A and M Univ., Weslaco. Agricultural Research and Extension Center.
C. J. Gerard.
In: Proceedings of the Second International Drip Irrigation Congress, p 329-331, (1974). 3 ref.

Descriptors: *Sugarcane, *Furrow irrigation, *Crop response, *Texas, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Research was conducted to evaluate the influences of drip and furrow irrigation on growth and yield of sugarcane in 1972 and 1973 in the Lower Rio Grande Valley of Texas. Drip irrigation treatments were 0, 25, 50, 75, and 100 and 0, 50, 75, 100 and 125% pan evaporation in 1972 and 1973, respectively. Yield of sugarcane was a linear function of applied water in 1972 with yields ranging from 35 to 51 tons per acre. Drip irrigation treatments are greater than or equal to 0.5 pan evaporation maintained rapid stalk elongation in early May and June in 1972. Rapid stalk elongation in July, August and September was maintained when the water applied was greater than or equal to 0.75 pan evaporation. Soil moisture, salinity conditions and root growth as influenced by treatments, emitter sites and soil depths were evaluated. These findings and their implications are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09476

**SALINITY SENSOR CONTROL OF DRIP IRRIGATION WATER APPLICATION,**
Agricultural Research Service, Brawley, Calif.
For primary bibliographic entry see Field 3C.
W75-09477

**WATER USE WITH DRIP IRRIGATION,**
California Univ., Parlier. San Joaquin Valley Agricultural Research and Extension Center.
F. K. Aljibury, A. W. Marsh, and J. Huntamer.
In: Proceedings of the Second International Drip Irrigation Congress, p 341-345, (1974).

Descriptors: *Evaporation pans, *Water requirements, Irrigation practices, Irrigation water, Irrigation system, Irrigation design, Frequency.
Identifiers: *Trickle irrigation, *Drip irrigation, San Joaquin Valley(California).

In the absence of proper equations to calculate water requirements with drip irrigation, irrigation consultants and dealers in California have used the same water use data developed for conventional irrigation systems. Since one of the primary advantages of drip irrigation is water savings, development of water budget to fit drip irrigation became necessary. To accomplish this objective, several drip irrigation studies were initiated in the San Joaquin Valley of California. These studies were conducted on farms where citrus, avocados, plums, olives, and grapes were grown. Applied water was measured using flow meters while the frequency and amount of water application was determined with tensiometers which were set to switch the water on at 30 centibars. Water evaporation from Class A pans established in large alfalfa fields was recorded regularly. A table is presented showing suggested drip water application as a function of Class A pan evaporation and percent plant coverage. (See also W75-09423) (Skogerboe-Colorado State)
W75-09478

**WATER USE BY DRIP AND SPRINKLE IRRIGATED AVOCADOS RELATED TO PLANT COVER, EVAPORATION AND AIR TEMPERATURE,**
California Univ., Riverside.
A. W. Marsh, C. D. Gustafson, S. Davis, R. L. Branson, and R. A. Strohman.
In: Proceedings of the Second International Drip Irrigation Congress, p 346-350, (1974). 2 tab, 5 ref.

Descriptors: *Consumptive use, *Sprinkler irrigation, *Air temperature, *Evaporation, Tensiometers, Irrigation systems, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Avocado, Plant cover, *Trickle irrigation, *Drip irrigation.

Water application to the avocados has been closely controlled by relating it to tensiometer readings. A sufficiency has been maintained while limiting excesses. In 1973, the drip irrigation applications have been automatically controlled by electrified tensiometers that provide signals for a controller. The measured applications are thought to represent the actual water requirement for each irrigation system as closely as it can be determined. The correlation of measured water use to evaporation from a class A pan is shown for each irrigation method as influenced by varying air temperature, percentages of plant cover, and period of the year. (See also W75-09423) (Skogerboe-Colorado State)
W75-09479

**TRICKLE IRRIGATION MANAGEMENT FOR COTTON AND CABBAGE,**
Agricultural Research Service, Phoenix, Ariz Water Conservation Lab.
D. A. Bucks, L. J. Erie, and O. F. French.
In: Proceedings of the Second International Drip Irrigation Congress, p 351-356, (1974). 5 fig, 4 ref.

Descriptors: *Cotton, *Frequency, *Consumptive use, *Water utilization, Agriculture, Irrigation, Furrow irrigation, Comparative productivity, Crop response.
Identifiers: *Trickle irrigation, *Drip irrigation, *Cabbage.

Cotton and cabbage studies were initiated to evaluate the effects on crop production of specified quantities and frequencies of water applications using trickle irrigation. Different quantities of irrigation water were applied at frequencies of 3, 6, and 12 days. Both studies were conducted on small plots of fine-textured, clay-loam soil, using a moderately saline water. Results of these studies indicate the following: (1) the amount of soil moisture needed by the cotton and cabbage plants for high production was approximately the same as the presently-accepted consumptive use; (2) increasing frequency of trickle to 3 days did not increase yields on this soil; and (3) trickle irrigation can decrease irrigation water requirements under conditions where furrow irrigation would not attain a high overall irrigation efficiency. (See also W75-09423) (Skogerboe-Colorado State)
W75-09480

**SOIL SALINITY DISTRIBUTION IN DRIP AND SUBSURFACE IRRIGATED SUMMER SQUASH,**
Agricultural Research Service, Riverside, Calif.
For primary bibliographic entry see Field 3C.
W75-09481

**MONITORING SOIL SALINITY AND LEAF NUTRIENT LEVELS IN A YOUNG AVOCADO ORCHARD UNDER DRIP IRRIGATION,**
California Univ., Riverside.
R. L. Branson, C. D. Gustafson, A. W. Marsh, S. Davis, and R. A. Strohman.
In: Proceedings of the Second International Drip Irrigation Congress, p 364-367, (1974). 2 tab, 5 ref.

Descriptors: *Salinity, *Monitoring, *Orchards, *Leaching, *Nutrients, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Avocados.

Salinity control is an important part of the management program for avocado production because of this crop's low tolerance to salts. Soil salinity in the root zone of a newly planted avocado orchard was monitored for four years. The orchard, located in a semi-arid region of southern California, is irrigated with a moderately saline water from the Colorado River. Soil salinity rose to marginal levels during each irrigation season under both irrigation methods. Winter rainfall, however, leached accumulated salts from the soil each year. Distribution of the rainfall, as well as total amount, was an important factor with regard to adequacy of leaching. Leaf samples were analyzed annually to obtain information on the uptake of chloride, an ion toxic to avocado at relatively low levels. Leaf analysis data are also being used to evaluate the fertilization program. (See also W75-09423) (Skogerboe-Colorado State)
W75-09482

**AFFORESTATION WITH SALINE WATER IN ABU DHABI,**
Ministry of Agriculture, Abu Dhabi (United Arab Emirates).
For primary bibliographic entry see Field 3C.
W75-09483

**SALINITY MANAGEMENT FOR HIGH FREQUENCY IRRIGATION,**
Agricultural Research Service, Riverside, Calif.
For primary bibliographic entry see Field 3C.
W75-09484

**IRRIGATION RETURN FLOW AS INFLUENCED BY DRIP IRRIGATION,**
New Mexico State Univ., University Park.
For primary bibliographic entry see Field 5G.
W75-09485

**AN INVESTIGATION INTO THE POTENTIAL USES OF TRICKLE IRRIGATION FOR DESERT RECLAMATION AND FODDER PRODUCTION IN THE EMIRATE OF ABU DHABI,**
Agricultural Planning Associates Ltd., London (England).
For primary bibliographic entry see Field 4A.
W75-09487

**EFFECTS OF LOCALIZED PHOSPHATE TREATMENTS AND SOLUTION PH ON THE GROWTH AND FUNCTION OF APPLE ROOTS,**
Victoria Dept. of Agriculture, Ferntree Gully (Australia). Scoresby Horticultural Research Station.
For primary bibliographic entry see Field 3C.
W75-09488

**APPLICATION OF FERTILIZER THROUGH DRIP IRRIGATION SYSTEMS IN WEST TEXAS,**
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
K. E. Lindsey, and L. L. New.
In: Proceedings of the Second International Drip Irrigation Congress, p 400-404, (1974).

Descriptors: *Fertilization, *Pecans, Irrigation systems, Zinc, Crop response, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Zinc chelate.

Zinc chelate applications to pecan trees were made through several types of systems on several soil types. Comparisons were made with customary spray applications of Zn. Effectiveness of applications was measured by leaf analysis and trunk growth measurements. Examination of the effectiveness of several of the injection systems was done by analyzing water emitted at timed intervals after injection of Zn materials. (See also W75-09423) (Skogerboe-Colorado State)
W75-09489

**INVESTIGATIONS IN SUGARCANE FERTILIZATION BY DRIP IRRIGATION IN HAWAII,**
Hawaiian Sugar Planters Association Experiment Station, Honolulu.
M. Isobe.
In: Proceedings of the Second International Drip Irrigation Congress, p 405-410, (1974). 3 tab.

Descriptors: *Sugarcane, *Fertilization, *Hawaii, Nitrogen, Subsurface irrigation, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, Aqua ammonia.

Research was initiated in Hawaii to determine efficient ways to fertilize sugarcane under drip irrigation. Paper reports on improvement of fertilizer efficiency and the use of aqua ammonia, the cheapest source of nitrogen available on the market. (See also W75-09423) (Skogerboe-Colorado State)
W75-09490

**FERTILIZER APPLICATIONS WITH DRIP IRRIGATION,**
Agriplas Limited (South Africa).
H. L. Grobbelaar, and F. Lourens.
In: Proceedings of the Second International Drip Irrigation Congress, p 411-415, (1974). 3 tab.

Descriptors: *Fertilization, *Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

It has been found that the application of fertilizer mixtures through a drip irrigation system is not only feasible, but can be very beneficial. Fertilizer mixtures must not cause blockage, must be water soluble, must leave no residue in the fertilizer dispenser, and must be easy to handle. (See also W75-09423) (Skogerboe-Colorado State)
W75-09491

**USE OF GLYCEROPHOSPHATE FOR FERTILIZATION THROUGH TRICKLE IRRIGATION SYSTEMS,**
California Univ., Davis.
For primary bibliographic entry see Field 5B.
W75-09492

**WEED CONTROL UNDER DRIP IRRIGATION IN ORCHARD AND VINEYARD CROPS,**
A. Lange, F. Aljibury, B. Fischer, W. Humprey, and H. Otto.
In: Proceedings of the Second International Drip Irrigation Congress, p 422-424, (1974).

Descriptors: *Herbicides, Orchards, Irrigation practices, Irrigation, Agriculture, *Weed control.
Identifiers: *Trickle irrigation, *Drip irrigation, Vineyards.

Conventional herbicide applications in orchards and vineyards under drip irrigation have been somewhat unsuccessful. Annual applications of most herbicides have broken down in the moist area close to the dripper leaving a vigorous small circle of weed growth by summer. Herbicides differ in their rates of breakdown under drip irrigation when compared to furrow and sprinkler. Atrazine showed the greatest response to breakdown under continuously wet soils. Napropamide was affected least by wet soils. Trifluralin, profluralin, and norflurazon were intermediate. Numerous herbicide treatments have been evaluated under drip irrigation. The results of several of these are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09493

**INFLUENCE OF DIFFERENT AMOUNTS OF IRRIGATION--WATER, IRRIGATION--INTERVALS AND FERTILIZERS ON THE YIELD AND QUANTITY OF DRIP-IRRIGATED MUSK-AND WATERMELONS,**
Ministry of Agriculture, Beisan (Israel).
C. Dan.
In: Proceedings of the Second International Drip Irrigation Congress, p 425-430, (1974). 8 tab.

Descriptors: *Melons, *Fertilization, *Crop response, Agriculture, Irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation.

Trials were initiated to determine irrigation and fertilization practices to promote high muskmelon and watermelon yields of satisfactory quality. Yields were not affected by different amounts of irrigation water or by different irrigation schedules. (See also W75-09423) (Skogerboe-Colorado State)
W75-09494

**WATER UPTAKE BY AN APPLE TREE WITH VARIOUS PROPORTIONS OF THE ROOT SYSTEM SUPPLIED WITH WATER,**
Victoria Dept. of Agriculture, Ferntree Gully (Australia).

J. D. F. Black, and D. W. West.
In: Proceedings of the Second International Drip Irrigation Congress, p 432-433, (1974). 1 fig, 1 tab.

Descriptors: *Apple, *Root development, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, Water uptake.

Water uptake by young apple trees with 1/4, 1/2, and 3/4 of their root systems supplied with water was related to the uptake with the total system supplied with water in a split root pot trial. The respective percentages of water uptake compared with the totally watered system were 74, 88, and 94 percent. (See also W75-09423) (Skogerboe-Colorado State)
W75-09495

**EFFECTS OF NITROGEN FERTILIZER APPLICATIONS TO PART OF A ROOT SYSTEM,**
Victoria Dept. of Agriculture, Ferntree Gully (Australia).
G. J. T. Frith, and D. G. Nichols.
In: Proceedings of the Second International Drip Irrigation Congress, p 434-436, (1974). 1 tab.

Descriptors: *Nitrogen, *Fertilization, *Apples, *Root systems, Orchards, Irrigation, Agriculture, Irrigation water.
Identifiers: *Trickle irrigation, *Drip irrigation.

It is usual under trickle irrigation of mature fruit trees to have considerably less than the total root volume wetted. If satisfactory nutrition of these trees is to be achieved with fertilizer dissolved in the irrigation water, then the wetted roots must increase their efficiency of nutrient uptake in a manner similar to their increased water uptake. Trials with split root seedling apple trees grown in water culture has shown that the nitrogen uptake efficiency of roots is increased as the proportion of the root system supplied with nitrate nitrogen is decreased. The efficiency of water uptake from those parts of the root system supplied with nitrate nitrogen was also increased over the level of uptake in quarters without nutrients. (See also W75-09423) (Skogerboe-Colorado State)
W75-09496

**CHANGE IN ROOT DISTRIBUTION OF MATURE PEAR TREES IN RESPONSE TO TRICKLE IRRIGATION,**
Victoria Dept. of Agriculture, Ferntree Gully (Australia).
J. D. F. Black, and P. O. Mitchell.
In: Proceedings of the Second International Drip Irrigation Congress, p 437-438, (1974).

Descriptors: *Root distribution, *Root development, Irrigation, Agriculture, Orchards.
Identifiers: *Trickle irrigation, *Drip irrigation, Pears.

Work reported was designed to obtain an idea of the rate of adaption of the root distribution of pear trees grown under uniform sprinkler irrigation for 18 years and then converted to trickle irrigation for two years with one emitter per tree. Flow rate per emitter was 8 l per hour per tree. After two seasons the entire root system of 4 trees was exposed and examined for changes in response to the continuously moist but restricted wetted soil volume in the root zone. The intensity of new root growth was markedly higher inside the wetted soil volume. (See also W75-09423) (Skogerboe-Colorado State)
W75-09497

**CHANGES IN ROOT PATTERNS OF PEACH TREES UNDER TRICKLE IRRIGATION,**
Victoria Dept. of Agriculture (Australia).
For primary bibliographic entry see Field 2I.
W75-09498

**DRIP IRRIGATION EXPERIMENT ON AVOCADOS,**
California Univ., San Diego, La Jolla.
For primary bibliographic entry see Field 3C.
W75-09499

**EFFECTS OF DRIP IRRIGATION ON SOIL-WATER-PLANT RELATIONSHIP,**
Sao Paulo Univ. (Brazil). Escola Superior de Agricultura Luiz de Queiroz.
For primary bibliographic entry see Field 2I.
W75-09500

**TRICKLE IRRIGATION ON YOUNG PEACH TREES,**
Victoria Dept. of Agriculture, Ferntree Gully (Australia).
P. D. Mitchell, and J. D. F. Black.
In: Proceedings of the Second International Drip Irrigation Congress, p 452-455, (1974). 8 fig.

Descriptors: *Peaches, *Crop response, *Growth rates, Root distribution, Evaporation, Orchards, Irrigation systems, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Two field trails on young peach trees are described. Trial A. The effects of supplying 9, 18, 36, or 72 l of water per day to newly planted peach trees regardless of rainfall and evaporation demonstrate that these factors cannot be ignored in soils of imperfect drainage. Trees died under the highest rate, were severely damaged at the second highest rate, showed some root damage under the second lowest rate but grew better at this rate than at the lowest rate. Trial B. Growth of peach trees trickle irrigated daily or after 2.5 or 5 cm net evaporation intervals are compared. Response was less at the 5 cm interval than at the 2.5 cm or daily intervals. Root density in the wetted root zone was highest under the daily interval and least under the 5 cm interval. A significant linear relationship is established between trunk area increase and water applied per unit of trunk area per unit of evaporation. The treatment limit in this trial of 2.5 l per sq. cm. trunk area per cm evaporation is to be extended in further trials. (See also W75-09423) (Skogerboe-Colorado State)
W75-09501

**DRIP IRRIGATION IN CITRUS ORCHARDS,**
Ministry of Agriculture, Beisan (Israel).
E. Yagev, and Y. Choresh.
In: Proceedings of the Second International Drip Irrigation Congress, p 456-461, (1974). 2 fig, 7 tab.

Descriptors: *Oranges, *Crop response, Root development, Salinity, Saline soils, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

In a Valencia orange grove grafted onto sour orange root stock, drip irrigation treatments of one and two laterals per row of trees at semi-weekly and bi-weekly intervals was compared to the standard treatment of sprinkler irrigation. The water application to all treatments was based on identical daily rates. The factors checked were salt accumulation and moisture distribution pattern in the soil profile, root development, mineral content of leaves, weight of yield and number of fruit per tree, and fruit quality. There was no difference in yield and fruit quality between the treatments checked. The average salt accumulation in the soil was less with the drip irrigation treatments than with the sprinkler irrigation. The soil moisture tension below the drip lateral was low all the time and there is reason to believe that there is a loss of water below the root zone. There was no significant difference in root development between all the treatments. (See also W75-09423) (Skogerboe-Colorado State)
W75-09502

**AN INVESTIGATION ON THE USE OF DRIP IRRIGATION FOR THE ESTABLISHMENT OF MULTI-PURPOSE PARKS (GREEN BELTS AROUND THE CITIES) IN IRAN,**
Research Inst. of Forests and Rangelands, Tehran (Iran).
P. Mehdizadeh, and S. Tamaddoni-Jahromi.
In: Proceedings of the Second International Drip Irrigation Congress, p 462-467, (1974). 5 fig, 2 tab.

Descriptors: *Furrow irrigation, Crop response, *Parks, Irrigation, Irrigation systems, Irrigation practices, Forestry, Forests, Forest management.
Identifiers: *Trickle irrigation, *Drip irrigation, *Greenbelts, *Iran.

Paper deals with the application of a 'home-made' drip irrigation system in a multipurpose forest park near Tehran. The study was initiated as a pilot trial to determine: (1) if drip irrigation should be considered for irrigating forest species in the parks and green belts of Iran, (2) plant responses to drip irrigation of green belts, and (3) possible water savings. Although some suppression of height growth was found, seedlings remained healthy. The amount of irrigation water used was reduced by 85% as compared to the furrow irrigation system used previously. (See also W75-09423) (Skogerboe-Colorado State)
W75-09503

**TREE AND CROP RESPONSE TO DRIP IRRIGATION,**
Washington State Univ., Prosser.
J. E. Middleton, E. L. Proebsting, S. Roberts, and F. H. Emerson.
In: Proceedings of the Second International Drip Irrigation Congress, p 468-473, (1974). 5 fig, 3 tab, 3 ref.

Descriptors: *Orchards, *Crop response, *Fruit crops, Salinity, Irrigation system, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Prunes.

Bearing 'Early Italian' prune trees performed normally with 60 and 80 gallons per tree per day using continuous drip irrigation. With 20 and 40 gallons per tree per day the fruit was smaller, better colored and earlier with higher soluble solids. In the second year, the two lower rates greatly reduced bearing surface and yields. Leaf moisture data indicated no difference in the four quadrants of the tree when all water was applied at one point. Twelve hour daily applications were compared to continuous applications the second year. There were some soluble salts in the non-saline soil which were reduced measurably by movement away from the center of the drip area as the season progressed. Soil moisture movement was recorded. Growth response of first year apple trees to drip and sprinkler irrigation at comparative application frequencies and amounts was similar. (See also W75-09423) (Skogerboe-Colorado State)
W75-09504

**CANTALOUPE RESPONSE TO DRIP IRRIGATION,**
Agricultural Research Service, Brawley, Calif.
L. S. Willardson, G. W. Bohn, and M. J. Huber.
In: Proceedings of the Second International Drip Irrigation Congress, p 474-479, (1974). 3 tab.

Descriptors: *Root distribution, *Crop response, *Furrow irrigation, Irrigation systems, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Cantaloupe.

Changes in rooting pattern may change nutrition and plant response, and thus alter desirable characteristics of plants. Five experiments conducted included nine cantaloupe cultivars grown on silty clay loam with drip and furrow irrigation

systems. The different irrigation management practices followed have resulted in variable plant responses. (See also W75-09423) (Skogerboe-Colorado State)
W75-09505

**STAKED TOMATO DRIP IRRIGATION IN CALIFORNIA,**
California Univ., San Diego, La Jolla.
B. J. Hall.
In: Proceedings of the Second International Drip Irrigation Congress, p 480-486, (1974). 6 tab, 6 ref.

Descriptors: *Tomatoes, Furrow irrigation, Irrigation systems, Irrigation practices, Crop response, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Six staked tomato drip irrigated field trials, where properly grown, resulted in slightly higher yields and appreciable water savings, compared to furrow applications. Drip irrigation supplied water more uniformly which resulted in more even plant growth. Cultural operations can be carried out in the drip irrigated crops at any time, while close coordination of these operations is essential when using furrow or sprinkler irrigations. (See also W75-09423) (Skogerboe-Colorado State)
W75-09506

**SPRING CUCUMBER DRIP VS. FURROW IRRIGATION,**
California Univ., San Diego, La Jolla.
B. J. Hall.
In: Proceedings of the Second International Drip Irrigation Congress, p 486-490, (1974). 1 tab, 6 ref.

Descriptors: *Fertilization, *Furrow irrigation, *Crop response, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Cucumbers.

Two field trials conducted on the early spring cucumbers started and grown in plastic row covers indicate that drip irrigation can successfully produce good yields. Less water can be used in producing as high or better yields with drip irrigation. Slow release fertilizer resulted in good yields, yet the plants appeared to run short during the last two or three weeks. Placing the drip line in the bottom of a 1 1/2 to 2-inch narrow furrow appeared to reduce the mature fruit pressure on the drip lines in bush culture. (See also W75-09423) (Skogerboe-Colorado State)
W75-09507

**THE IRRIGATION OF OLIVES BY DRIP AND OTHER IRRIGATION METHODS,**
Ministry of Agriculture, Beisan (Israel).
C. Dan.
In: Proceedings of the Second International Drip Irrigation Congress, p 491-496, (1974). 4 tab.

Descriptors: *Crop response, Agriculture, Irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation, *Olives.

Drip irrigated young trees have higher and earlier yields before attaining full maturity, than trees irrigated by any other method. The number of emitters per tree was not found to be critical in the range of 4 to 8 emitters per tree. The yields of mature trees which were converted to trickle irrigation were generally somewhat higher than before. (See also W75-09423) (Skogerboe-Colorado State)
W75-09508

**PERFORMANCE OF PLANTS WITH DRIP IRRIGATION,**
California Univ., Parlier. San Joaquin Valley Agricultural Research and Extension Center.
E. K. Aljibury, M. Gerdts, A. Lange, J. Huntamer, and G. Leavitt.
In: Proceedings of the Second International Drip Irrigation Congress, p 497-502, (1974). 2 fig, 3 tab, 3 ref.

Descriptors: *Oranges, *Water utilization, *Crop response, Penetration, Furrow irrigation, Crop production, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Plums, *Drip irrigation, *Trickle irrigation.

Experiments were established to study the effect of drip irrigation on water use efficiency and production in oranges and to study the effect of drip and furrow irrigation on water penetration and performance of plums. Orange production records show higher production with drip irrigation which is attributed to improved water penetration. Plum production records show no significant difference in production or fruit quality, but irrigation efficiency was improved. (See also W75-09423) (Skogerboe-Colorado State)
W75-09509

**TRICKLE IRRIGATION MANAGEMENT FOR GRAPES,**
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
D. A. Bucks, L. J. Erie, F. S. Nakavama, and O. F. French.
In: Proceedings of the Second International Drip Irrigation Congress, p 503-507, (1974). 3 fig, 1 tab, 3 ref.

Descriptors: *Crop response, Agriculture, Irrigation, Consumptive use, Furrow irrigation, Frequency, Water utilization, Irrigation design, Irrigation practices, Water requirements.
Identifiers: *Trickle irrigation, *Drip irrigation, *Grapes.

A three-year field investigation is being conducted to determine irrigation management and design requirements for grape production. Trickle irrigation treatments include three irrigation quantities, based on ratios of a consumptive-use estimate; three irrigation frequencies--daily, 3-day and 6-day; and a variation of one or two trickle irrigation emitters per vine. Furrow irrigation treatments include the same three seasonal quantities used for the trickle irrigation applied in two or three furrows per vine; however, the irrigation frequency is varied, based on the consumptive use. First-year results were as follows: there was a 13 percent increase in yield for trickle irrigation with two emitters per vine over furrow irrigation; a 9 percent greater yield for two emitters over one emitter per vine; a 6 percent increase in berry size for trickle-irrigated fruit over furrow-irrigated; little difference in sugar content between irrigation treatments; and little difference in yield between trickle irrigation frequencies. (See also W75-09423) (Skogerboe-Colorado State)
W75-09510

**A STUDY ON DIFFERENT APPLICATION PROCEDURES OF DRIP IRRIGATION IN TOMATO CULTIVATION,**
F. T. Noyola.
In: Proceedings of the Second International Drip Irrigation Congress, p 508-511, (1974).

Descriptors: *Tomatoes, *Crop production, *Crop response, Irrigation systems, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Discussed are results of a study on tomatoes to determine reasonable application procedures of drip irrigation water. (See also W75-09423) (Skogerboe-Colorado State)
W75-09511

**THE RELATION BETWEEN DRIP IRRIGATION, PHYTOPHTHORA ROOT ROT OF AVOCADO, AND FUNGICIDES,**
California Univ., Riverside.
For primary bibliographic entry see Field 2I
W75-09512

**DRIP VS. FURROW IRRIGATION TRIALS FOR POTATO UNDER SUBTROPICAL CONDITIONS,**
Punjab Agricultural Univ., Ludhiana (India)
N. T. Singh, S. S. Grewal, and A. S. Josan.
In: Proceedings of the Second International Drip Irrigation Congress, p 515-520, (1974) 1 fig, 2 tab, 17 ref.

Descriptors: *Potatoes, Crop response, Soil temperature, *Subtropics, *Furrow irrigation, Irrigation systems, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

The drip method of irrigation was compared with conventional furrow irrigation in field grown spring and autumn potatoes. Treatments included irrigations at 0.25, 0.50, and 0.75 bar soil moisture tension at 10 cm depth and drip irrigation. As an average of six crops, for equal amounts of water used drip irrigation gave 60 q/ha or 31% higher yield than irrigation at 0.25 bar soil moisture tension. Irrigation at 0.50 and 0.75 bar tension yielded significantly lower than these treatments. Wetter soil moisture regimes lowered the maximum soil temperature at 10 cm depth by 1 to 3.5C thereby bringing it closer to the optimum required by the crop. Effect of soil moisture on soil temperature and soil strength was isolated using organic mulches. Soil temperature appeared to be a critical factor in improving yield and quality of potatoes. Drip irrigation promises a more suitable soil moisture and soil temperature regime for potato cultivation in the subtropics. (See also W75-09423) (Skogerboe-Colorado State)
W75-09513

**RESPONSE OF MATURE CITRUS TREES ON DEEP SANDY SOIL TO DRIP IRRIGATION,**
South Australia Dept. of Agriculture, Adelaide.
P. J. Cole, and M. R. Till.
In: Proceedings of the Second International Drip Irrigation Congress, p 521-526, (1974). 1 fig, 4 tab, 1 ref.

Descriptors: *Oranges, *Crop response, Agriculture, Irrigation, Management orchards, Salinity, Irrigation design, Irrigation practices, Irrigation systems.
Identifiers: *Trickle irrigation, *Drip irrigation.

A demonstration trial on mature vallencia oranges was established to provide guidelines for future drip irrigation management in Australia. The trees are on a deep sandy soil and were established and previously maintained by sprinkler irrigation. There may be up to 450 mg/l total dissolved salts in the irrigation water. Two designs of drip irrigation have been used - one with a row of drippers along the base of the trees only, and the other with a line along both the base and in midrow. There are twice the number of drippers in this latter system, each of half the flow rate of the former. A difference in the performance of trees are yielding less than sprinkler irrigated trees, with double line drip irrigation better than single line drip irrigation. (See also W75-09423) (Skogerboe-Colorado State)
W75-09514

**BIOPHYSICAL CONTROL OF WATER LOSS,**
Nebraska Univ., Lincoln. Dept. of Agronomy.
C. Y. Sullivan, J. D. Eastin, E. J. Kinbacher, W. M. Ross, and L. D. Dunkte.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 505, $3.75 in paper copy, $2.25 in microfiche. Completion Report, 1975. 39 p, 7 ref. OWRT A-026-NEB(3). 14-31-0001-5027.

escriptors: *Water loss, Water utilization, orghum, *Corn(Field), Biocontrol, *Stomata, arm management, *Drought tolerance, *Heat re-stance, Plant physiology.
entifiers: Plant breeding, *Biophysical control, orghum genotypes.

his project investigated the plant's part in con-olling water loss from cropping systems primari- in dryland agriculture but also with application irrigated conditions. Emphasis was placed on fferences in corn and sorghum in mechanisms in-olved in water loss and differences between rghum genotypes. Stomatal closure is a primary echanism for control of water loss. Stomatal sponse was evaluated by water vapor diffusive sistance and by microscopic observations of sto-atal imprints. Corn stomata closed sooner than ose of sorghum when water deficits occurred. A ethod of screening for desiccation and heat lerance was developed and used in selecting rghum genotypes. The test involves curring leaf scs, exposing them to controlled stress and valuating cellular membrane injury by measuring akage of electrolytes from the cells. Corn nerally was higher cellular tolerance to both heat d desiccation. Plants could be selected for heat d drought tolerance. Hybrids made from lected tolerant lines had a significantly positive rrelation between heat tolerance measured dur-g drought and high temperature stress periods d yield in 1974. Heat and desiccation were posi-vely correlated in tests with greenhouse grown ants.
75-09523

**ROWTH OF BARLEY IRRIGATED WITH VASTEWATER SLUDGE CONTAINING HOSPHATE PRECIPITANTS,**
ational Environmental Research Center, Cincin-ati, Ohio.
or primary bibliographic entry see Field 5D.
75-09543

**TILIZATION OF DIGESTED CHEMICAL EWAGE SLUDGES ON AGRICULTURAL ANDS IN ONTARIO,**
ntario Ministry of the Environment, Toronto.
. A. Black.
n: Municipal Sludge Management, Proceedings of he National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, ennsylvania, p 107-113, 1974. 1 fig, 2 tab, 3 ref, 1 ppend.

Descriptors: *Sludge disposal, Canada, Agricul-ure, Metals, Nitrogen, Phosphorus, Waste isposal, Land use, Sewage sludge, Waste water reatment, Sludge treatment.
Identifiers: *Land application, Sanitary landfills.

The most common method of sludge disposal cur-ently utilized in Ontario, Canada is anaerobic igesting followed by dumping into sanitary land-ills or disposal onto farmers' fields. While land pplication is frequently used, it is looked upon as disposal practice rather than as a type of fertil-zer. The agricultural value of sludge is discussed, s well as possible hazards due to the leaching of eavy metals. Ontario has had a phosphorus emoval program which will seriously affect 150 of ts treatment facilities by the end of 1975. About 85 ercent of Ontario's sewage treatment plants will ractice phosphorus removal by that time. More onsideration is being given the benefit and azards involved with the sludge contained utrients, heavy metals, long chain organics, and nicroorganisms on soils, crops, groundwater, and urface waters. Guidelines have been prepared for he utilization of processed organic waste by land pplication. These assume that organic waste has een processed by anaerobic or aerobic digestion r other suitable processing at a municipal water ollution control plant and that land application is efined as utilizing the waste for agriculture, not nerely disposing of the sludge. Requirements for the site location, land characteristics, site management, waste application rates, and waste handling and spreading equipment are detailed. (See also W75-09532) (Prague-FIRL)
W75-09544

**IMPROVING THE DESIGN OF PRACTICAL FIELD DRAINAGE,**
Ministry of Agriculture, Fisheries and Food, Cambridge (England). Field Drainage Experiment Unit.
For primary bibliographic entry see Field 4A.
W75-09595

**SIMULATION OF MISCIBLE DISPLACEMENT IN SOILS USING THE METHOD OF CHARACTERISTICS,**
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W75-09612

**WATER LAWS IN MOSLEM COUNTRIES,**
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
For primary bibliographic entry see Field 6E.
W75-09625

**DRAINAGE MATERIALS.**
Food and Agriculture Organization of the United Nations, Rome (Italy). Working Party on Water Resources and Irrigation.
For primary bibliographic entry see Field 8G.
W75-09628

**SURVEY OF EXPERIENCE WITH DRAINAGE MATERIALS AND REVIEW OF AVAILABLE SPECIFICATIONS,**
Rijksstation voor Landbouwtechniek, Merelbeke (Beligium).
For primary bibliographic entry see Field 8G.
W75-09629

**STUDY OF EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF SPECIFICATIONS AVAILABLE IN FRANCE,**
Centre National d'Etudes Techniques et de Recherches Technologiques pour l'Agriculture, les Forets et l'Equipment Rural, Antony (France).
For primary bibliographic entry see Field 8G.
W75-09630

**EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF AVAILABLE SPECIFICATIONS,**
Kuratorium fuer Kulturbauwesen, Hanover (West Germany).
For primary bibliographic entry see Field 8G.
W75-09631

**A SURVEY OF EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF AVAILABLE SPECIFICATIONS,**
Vizgazdalkodasi Tudomanyos Kutato Intezet, Budapest (Hungary).
For primary bibliographic entry see Field 8G.
W75-09632

**DRAINAGE MATERIALS - PROVISIONAL REPORT OF THE EXPERIENCE GAINED IN THE NETHERLANDS,**
Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 8G.
W75-09633

**SURVEY OF EXPERIENCES WITH DRAINAGE MATERIALS AND REVIEW OF AVAILABLE SPECIFICATIONS,**
Ministry of Agriculture, Fisheries and Food, Cambridge (England).
For primary bibliographic entry see Field 8G.
W75-09634

**INDEX 1945-1966, LAND AND WATER.**
Food and Agriculture Organization of the United Nations, Rome (Italy). Documentation Center.
For primary bibliographic entry see Field 10C.
W75-09635

**WATER FOR AGRICULTURE, ANNOTATED BIBLIOGRAPHY, AUTHOR AND SUBJECT INDEX.**
Food and Agriculture Organization of the United Nations, Rome (Italy). Documentation Center.
For primary bibliographic entry see Field 10C.
W75-09636

**IRRIGATING APPARATUS,**
H. C. Bennett.
US Patent No 3,880,189, 3 p, 4 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 933, No 5, p 2043, April 29, 1975.

Descriptors: *Patents, *Irrigation systems, *Irrigation efficiency, Irrigation operation and maintenance, *Valves, Flow control.
Identifiers: Flow control valves.

The invention relates to an irrigating system having improved flow-control valves. The irrigating system includes a large supply manifold from which a plurality of outlet pipes extend transversely at suitable intervals. A valve is located in each outlet pipe to individually control flow of water. The valve has a shaft extending through the outlet pipe with a transverse elongate handle which can be manipulated by an operator by means of a T-wrench. Consequently, the operator can walk along the manifold and individually manipulate each valve of each outlet pipe to obtain the desired flow without stooping. This not only substantially reduces the amount of time involved but also the amount of fatigue. The transverse handles are located both above and below the outlet pipes. The outlet pipes can extend from either side of the manifold with handles being above the outlet pipes and readily accessible in all instances. The valve includes a valve body of circular configuation having a resilient outer surface which enables the body to conform with and seal the transverse outlet pipe in which it is located. (Sinha-OEIS)
W75-09641

**DEVICE FOR DISTRIBUTING IRRIGATION WATER,**
M. L. King.
US Patent No 3,884,416, 4 p, 11 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 934, No 3, p 1064, May 20, 1975.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Application equipment, *Water distribution(Applied), Irrigation design, *Irrigation systems.
Identifiers: Water distribution patterns.

A device is provided for the distribution of irrigation water which comprises a body for the support of a vertical shaft, a sprinkler head affixed to the shaft and means for deriving rotational motion of the sprinkler head from the internal energy of the irrigation water passing through it. The sprinkler head is provided with a primary orifice and a secondary orifice, with the secondary orifice so aligned that the water-jet issuing from it intercepts the deflecting vane and initiates rotary motion of the vane-arm relative to the sprinkler head. The unbalanced torques resulting from the intermittant action of the secondary water jet on the vane and

from the elastic restraint of the vane-arm propel the sprinkler head into unidirectional rotary motion about its shaft. Water is conveyed through a hollow bore in the shaft through a port plate rigidly affixed to the base, and the port plate is provided with a central port and at least one radially offset port. By varying the size, shape, number and angular location of the orifices in the orifice plate, the irrigation pattern of the sprinkler may be adjusted to any arbitrary shape. (Sinha-OEIS)
W75-09662

**CHANGES IN CHEMICAL QUALITY OF WATER, CEDAR BLUFF IRRIGATION DISTRICT AREA, WEST-CENTRAL KANSAS,**
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 5B.
W75-09719

**HYDROLOGIC ANALYSIS OF THE VALLEY-FILL AQUIFER, NORTH PLATTE RIVER VALLEY, GOSHEN COUNTY, WYOMING,**
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 2F.
W75-09722

**THE SAHELIAN DROUGHT - A DISASTER FOR LIVESTOCK POPULATIONS,**
Food and Agricultural Organization of the United Nations, Rome (Italy). Animal Production and Health Div.
R. S. Temple, and M. E. R. Thomas.
World Animal Review, No 8, p 1-7, 1973. 8 fig, 3 tab.

Descriptors: *Droughts, Damages, *Livestock, *Arid climates, *Recharge, *Aquifers, Grazing.
Identifiers: *Sahelian zone.

During late 1972 and early 1973, the Sahelian zone of Africa was suffering one of its worst droughts in memory. Reports by FAO/UNDP task forces working on the Sahelian drought situation are reviewed. As a result of the bad years, beginning in 1967, the majority of watering points used by both man and animal for drinking water have failed. These natural springs and hard-dug shallow wells depend heavily on annual recharge by rain water since they often do not penetrate deeply into the aquifer. As a result of the prolonged droughts and overgrazing, grazing areas have deteriorated, and the few seeds produced often fail to germinate for lack of moisture. Although accurate statistics were difficult to obtain, fairly extensive reductions in animal populations were estimated. Calf crops are likely to be greatly reduced in 1974 and 1975. Appraisals will be made of the expected needs of the livestock populations, and ways and means of rendering assistance to the affected areas in the Sahelian zone to avoid such disaster in the future will be investigated. (Mastic-Arizona)
W75-09785

**HUNGRY DRYLANDS OF WESTERN RAJASTHAN NEED A NEW TECHNOLOGY,**
Central Arid Zone Research Inst. Jodhpur (India). Dry Farming Research Main Centre.
R. P. Singh, H. S. Daulay, M. V. R. Prasad, and H. P. Singh.
Indian Farming, Vol 23, No 12, p 5-6, March, 1974.

Descriptors: *Arid lands, *Crop production, *Precipitation(Atmospheric), *Water conservation, *Soil amendments, Salinity, Fertilizers, Water harvesting, Evaporation, Mulching, Crops, Soil moisture, Moisture stress, Technology.
Identifiers: *India(Rajasthan).

An acute ecological imbalance of the components of productivity is responsible for limiting crop production in the drylands of western Rajasthan. In addition to low and erratic annual precipitation, problems include a high solar incidence, high wind velocity resulting in a high potential evapotranspiration, and sandy soils that are low in organic matter with poor moisture-holding capacities and high infiltration rates. Soils are often high in salinity and alkalinity; soil crust formation after sowing complicates the situation. A need exists for appropriate crop planning coupled with a flexible technology of moisture conservation and fertilizer use. Some practices that would improve crop production are: water harvesting to make full use of the limited precipitation, mulches to minimize evaporation losses, better choices of crops and varieties with characteristics such as drought tolerance and a suitable maturity pattern, fertilizers to increase yields and crop efficiencies, and the use of soil amendments for more efficient utilization of the limited soil moisture. (Mastic-Arizona)
W75-09789

**THE ECOLOGICAL MANAGEMENT OF ARID AND SEMI-ARID RANGELANDS IN AFRICA AND THE NEAR EAST: AN INTERNATIONAL PROGRAMME.**
For primary bibliographic entry see Field 6G.
W75-09791

**FORAGE PREFERENCES OF TRAINED MULE DEER ON THE BEAVER CREEK WATERSHEDS,**
Arizona Game and Fish Dept., Phoenix. Research Div.
D. J. Neff.
Special Report No. 4, June, 1974. 61 p, 15 fig, 4 tab, 3 append.

Descriptors: *Habitat, *Habitat improvement, *Deer, *Watershed management, *Nutrient requirements, *Arizona, Wildlife Conservation, Wildlife habitats, Diets, Foods, Forages.
Identifiers: Mule deer, *Beaver Creek watersheds(Ariz).

Deer forage preferences were studied in relation to experimental vegetation treatments in the ponderosa pine and pinyon-juniper types on the Beaver Creek Watersheds. A total of 203 plant taxa were tested in the field in the Utah juniper, alligator juniper, and ponderosa pine vegetation types. Watersheds treatments in the sample areas included juniper cabling, pushing, felling, and aerial herbicide application; ponderosa pine clear-cutting, strip-cutting, and wildlife burn. Under present conditions, with moderate cattle grazing and a low density deer herd, the Beaver Creek watershed study area offers an abundance of high quality forage. The experimental watershed treatments which have produced the best forage crops have combined thinning or clearing of overstory with soil disturbance from skidding or slash-piling machinery. The best diversity of forage plant species on Beaver Creek was provided by an interspersion of treated and untreated vegetation. Large uniform blocks of any one type of vegetation are likely to provide less attractive deer range. Present trends in Forest Service management practices appear to be in accordance with the principle of greater vegetation interspersion and diversity. Thus, watershed treatment practices are not inherently in conflict with the forage needs of deer. (Bowden-Arizona)
W75-09793

**DROUGHT IN THE GHANA SAVANNAH: A REPORT TO THE U.S. AID MISSION TO GHANA,**
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6G.
W75-09795

**FOR RAINFED AREAS-IMPROVED VELVET BEANS FOR INCREASED FORAGE PRODUCTION,**
Indian Grassland and Fodder Research Inst., Jhansi.
M. L. Magoon, A. Singh, and K. L. Mehra.
Indian Farming, Vol 23, No 12, p 23-25, March 1974. 3 fig.

Descriptors: *Arid lands, *Plant bleeding, *Soil moisture, Soil erosion, *Beans, *Water utilization, Hay, Fertility, Soil texture, Nitrogen fixation, Organic matter, Agroclimatology, Forage mixtures, Forage legumes.
Identifiers: *Velvet beans, Fodder, *India.

Velvet beans are ideally suited for dryland areas. They not only have value as fodder and to a limited extent as a vegetable, they also have the unique quality of improving soils in sandy areas. The velvet beans are able to put up vigorous growth and cover the ground completely in a short period of time, smothering weeds and conserving soil moisture. In this manner they prevent soil erosion and improve soil fertility and texture by the addition of organic matter and by fixing the free atmospheric nitrogen. Two varieties, Florida and Lyon beans, provide excellent green fodder for cattle and sheep. The dry pods and seeds are also good sources of protein and can be fed as hay or silage. Genetic information is being collected and research is being carried out to meet the increasing demand for superior varieties of Velvet beans for the different agro-climatic conditions. About 35 species are known, both annual and perennial legumes, of which 15 are present in India. (Mastic-Arizona)
W75-09796

**HIGH MILK PRODUCTION UNDER UNFAVOURABLE NATURAL CONDITIONS,**
Hebrew Univ., Jerusalem (Israel).
R. Volcani.
World Animal Review, No 8, p 28-33, 1973. 5 fig, 3 tab, 13 ref.

Descriptors: *Arid climates, *Milk, *Environmental control, *Water shortage, Nutrients, Animal physiology.
Identifiers: *Milk production, *Israel.

The arid and semiarid climate of Israel has made increases in milk production very difficult. The fertile and semifertile zones are very limited in extent, and often these areas are faced with water shortages. Water is piped from the Jordan and other smaller rivers to the Negev in order to produce food for cattle and dairy cows. Israel's Friesian dairy herd consists of about 100,000 milking cows. Milk production is about 6,600 liters per year per cow. Average production per cow is 10-20 percent higher in large herds because a more intensive feeding and management program is practiced. Producers are being urged to increase milk and beef production as a result of increased demand by a larger population at a higher standard of living. This can be accomplished by increasing the number of milking cows, by increasing the production per cow, or by increasing both simultaneously. The Ministry of Agriculture is attempting to increase productivity per cow which seems to be most economical in the long run. This may be accomplished through intensive feeding and management of the entire herd including importation of purebred bulls, large scale industrial dairies, and elimination of climatic stress on the cows by temperature and humidity control. (Mastic-Arizona)
W75-09797

**WATER REQUIREMENTS AND LIMITATIONS IMPOSED ON AGRICULTURAL DEVELOPMENT IN NORTHERN GHANA,**
G. Benneh.
In: Factors of Agricultural Growth in West Africa, Proceedings of an International Conference held at Legon, April, 1971, University of Ghana, Legon, Institute of Statistical, Social and Economic Research, p 71-81, (1971). 6 fig, 1 tab, 22 ref.

Descriptors: *Africa, *Demonstration farms, *Soil-water-plant relationships, Groundwater

availability, *Drought, Agriculture, Grasslands, Climatic data, Education, Dry farming, Irrigation, Sorghum, Cotton, Rice, Food and cover crops, Water yield improvement.
Identifiers: *Ghana.

The northern savannah belt of Ghana, virtually empty, under-utilized and with months of rainless weather, is regarded as the future granary of the country. Two variables stand in the way of this agricultural hope for the region; the region's farmers have primitive techniques and between November and March almost no rain falls in the area. Also, the amount of rain during the March-November rainy season varies a great deal. Soil moisture calculations indicate that northern Ghana can be broken into three different regions with potential crops being rice, yams, maize in the wettest, cotton in the part with four humid months, and millet, sorghum and groundnuts in the dryest region. Irrigation may solve some agricultural difficulties. However, no useable groundwater has been found for even small irrigation schemes. Capture of surface runoff during the rainy season by dams could lead to some medium size irrigation projects. One block of several hundred thousand acres in the Upper Volta Valley has high potential for such a project. However, a massive education of the region's farmers will be necessary to make irrigated agriculture on such a scale successful. (Bowden-Arizona)
W75-09800

**INDIA CASE STUDY ON IMPROVING PRODUCTIVITY IN LOW RAINFALL AREAS.**
Food and Agricultural Organization of the United Nations, Rome (Italy). Committee on Agriculture.
COAG/74/4, Appendix I, April, 1974. 16 p, 2 tab.

Descriptors: *Soil moisture, *Asia, *Irrigation, *Soil-water-plant relationships, *Demonstration farms, *Dry farming, Agriculture, Fertilizer, Plant breeding, Area redevelopment, Arid lands, United Nations, Crop production.
Identifiers: *India.

The low rainfall areas of India comprise 79 administrative districts, representing 34.1% of the net area of land planted. While the soils in these areas are low in organic matter, water is the major limiting factor in crop yields. Small holdings and primitive farming methods also lower yields. Surface water is negligible, and groundwater limited; large scale irrigation schemes have slight application in the future. Infiltration of water into the soil can be increased by contouring, mulching and increasing organic content of soil. Impoundment of water runoff by dams, etc, requires that farming techniques be changed to reap the full benefit of the additional soil moisture. It is essential to educate farmers to the needs and virtues of new crop varieties. Without the ready local availability of seed of suitable varieties, fertilizer, agricultural equipment, the means of acquiring them more probably on credit than for cash, and finally a marketing organization for produce, the typical farmer of such regions is unlikely to derive much benefit from new techniques, and thus unlikely to use them. (Bowden-Arizona)
W75-09803

**INITIAL STAGE, OAHE UNIT, PICK-SLOAN MISSOURI BASIN PROGRAM, SOUTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-09812

# 4. WATER QUANTITY MANAGEMENT AND CONTROL

## 4A. Control Of Water On The Surface

**ECONOMICS AND FINANCE OF NEVADA PUBLIC WATER SYSTEMS,**
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 6B.
W75-09375

**THE OPTIMUM DISTRIBUTION OF URBAN WATER SUPPLIES IN PUERTO RICO,**
Puerto Rico Univ., Mayaguez. School of Engineering.
C. Hadjitheodorou, and W. Heenan.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 382, $3.75 in paper copy, $2.25 in microfiche. Puerto Rico Water Resources Research Institute, Mayaguez, Completion Report, April 1975. 42 p, 3 fig, 2 tab, 13 ref. OWRT A-039-PR(1).

Descriptors: *Water supply, Water demand, Cost analysis, *Optimization, *Water distribution(Applied), *Puerto Rico, Water treatment, Treatment facilities, *Linear programming, Optimum development plans, Cities, Urbanization.
Identifiers: Mayaguez(P.R.).

Increasing costs of supplying water to urban centers necessitate the rational analysis of such water distrbution systems, in an effort to hold the water supply costs to a minimum. Optimization of urban water distribution systems may be investigated by appling linear programming techniques to minimize the costs between water supply and demand areas. The water distribution system of the city of Mayaguez, P. R. was studied. The city is supplied by two water treatment plants of combined capacity 16 million gallons per day. Treated water is supplied by gravity to twenty-two demand areas within the city, through a distribution system consisting of approximately 100 miles of main, ranging from 2 inches to 20 inches in diameter. The costs of distributing water from the supply to the demand areas include pumping raw water to plants, water treatment, water loss, and system maintenance. The distribution system was first analyzed as a classic transportation problem in which demand areas should be supplied in such a way as to minimize the total distribution cost, under the constraints that the total amount supplied by each supply area must not exceed its capacity, and that the amount demanded by an area must be fully satisfied. In addition to the transportation analysis, a network model was developed for the Mayaguez distribution system. The network analysis maintains the same objective function, i.e. it minimizes the total distribution cost, however, different constraints are obtained by applying a material balance of water in, out, and consumed at each network node.
W75-09377

**WATER, SEWERAGE AND FLOOD CONTROL SYSTEMS PLAN AND IMPLEMENTATION PROGRAM 1973-74.**
San Diego County Comprehensive Planning Organization, Calif.
For primary bibliographic entry see Field 6D.
W75-09400

**AN INVESTIGATION INTO THE POTENTIAL USES OF TRICKLE IRRIGATION FOR DESERT RECLAMATION AND FODDER PRODUCTION IN THE EMIRATE OF ABU DHABI,**
Agricultural Planning Associates Ltd., London (England).
A. F. Willens, and G. A. Willens.
In: Proceedings of the Second International Drip Irrigation Congress, p 388-393, (1974). 4 tab, 4 ref.

Descriptors: Crop response, *Land reclamation, *Deserts, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Abu Dhabi.

An initial investigation into the possible uses of trickle irrigation to establish a range of plant species which could be potentially useful as fodder is described. The use of trickle irrigation for fodder tree production shows considerable potential and appears economically viable within the present social context of Abu Dhabi. (See also W75-09423) (Skogerboe-Colorado State)
W75-09487

**DYNAMIC PROGRAMMING OPTIMIZATION: A WATER DISTRIBUTION SYSTEM DESIGN,**
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 7C.
W75-09525

**STATE OF ARIZONA, ENVIRONMENTAL SERVICES NEEDS STUDY FOR GREENLEE COUNTY, 1970-1990.**
Arizona State Office of Economic Planning and Development, Phoenix. Planning Div.
For primary bibliographic entry see Field 5D.
W75-09584

**EVAPORATION FROM WATER SURFACES IN CALIFORNIA,**
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2D.
W75-09586

**OPTIMIZING LONG-TERM STREAMFLOW FORECASTS,**
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
J. F. Zuzel, D. C. Robertson, and W. J. Rawls.
Journal of Soil and Water Conservation, Vol 30, No 2, p 76-78, March-April 1975. 1 fig, 4 tab, 5 ref.

Descriptors: *Streamflow, *Forecasting, *Streamflow forecasting, Water balance, *Idaho, Snowmelt, Snowpacks, Hydrology, Runoff forecasting, Runoff, *Optimization, Regression analysis, Model studies, Hydrologic budget, Watershed(Basins).

An optimization technique was used to determine coefficients in a linear forecast model. Runoff volume was the dependent variable for a forecast period. The snow-water contents of n snow courses at a specific time were the independent variables. The procedure minimizes runoff volume errors for specific forecast periods and preserves the hydrologic significance of the forecast equation because all parameters are explainable from a water balance standpoint. The results indicated that the technique effectively reduces long-term streamflow volume forecast errors. Average error was 5% less than the published forecasts for two southwest Idaho drainage basins of 2150 and 7000 square kilometers. (Lee-ISWS)
W75-09594

**IMPROVING THE DESIGN OF PRACTICAL FIELD DRAINAGE,**
Ministry of Agriculture, Fisheries and Food, Cambridge (England). Field Drainage Experiment Unit.
B. D. Trafford.
Soil Science, Vol 119, No 5, p 334-338, May 1975. 4 fig, 14 ref.

Descriptors: *Drainage, *Design, *Optimization, Drainage systems, Depth, Water table, Hydraulic

conductivity, Soil types, Mole drainage, Cost-benefit ratio, Evapotranspiration, Model studies.
Identifiers: *England, Parallel drains, Line sinks, Spacing, Waterlogging.

Mathematical models exist to determine the optimum depth and spacing of field drains from measurements of hydraulic conductivity, or indirect estimates of this. The results are reasonably useful as long as the hydraulic conductivity exceeds perhaps 0.1-0.2 m/day. For heavier, less permeable soils, it is necessary either to use very cheap 'pipes' (mole drains) at the calculated spacing or normal pipes at wider spacing after increasing the hydraulic conductivity by subsoiling. (Visocky-ISWS)
W75-09595

**CORRUGATED PLASTIC DRAIN TUBING USED AS UNDERGROUND CONDUIT,**
Missouri Univ., Columbia. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W75-09611

**ENVIRONMENTAL GEOLOGY OF AN AREA IN WEST-CENTRAL ALABAMA,**
Geological Survey of Alabama, University. Environmental Div.
For primary bibliographic entry see Field 7C.
W75-09615

**ATLAS OF RIVER BASINS OF THE UNITED STATES.**
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 7C.
W75-09616

**INTEGRATIVE PROCEDURES FOR COORDINATED URBAN LAND AND WATER MANAGEMENT: A SYSTEMS ANALYSIS,**
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
For primary bibliographic entry see Field 6A.
W75-09622

**MATHEMATICAL MODELS IN HYDROLOGY,**
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2A.
W75-09624

**DRAINAGE MATERIALS.**
Food and Agriculture Organization of the United Nations, Rome (Italy). Working Party on Water Resources and Irrigation.
For primary bibliographic entry see Field 8G.
W75-09628

**SURVEY OF EXPERIENCE WITH DRAINAGE MATERIALS AND REVIEW OF AVAILABLE SPECIFICATIONS,**
Rijksstation voor Landbouwtechniek, Merelbeke (Beligium).
For primary bibliographic entry see Field 8G.
W75-09629

**STUDY OF EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF SPECIFICATIONS AVAILABLE IN FRANCE,**
Centre National d'Etudes Techniques et de Recherches Technologiques pour l'Agriculture, les Forets et l'Equipment Rural, Antony (France).
For primary bibliographic entry see Field 8G.
W75-09630

**EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF AVAILABLE SPECIFICATIONS,**
Kuratorium fuer Kulturbauwesen, Hanover (West Germany).
For primary bibliographic entry see Field 8G.
W75-09631

**A SURVEY OF EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF AVAILABLE SPECIFICATIONS,**
Vizgazdalkodasi Tudomanyos Kutato Intezet, Budapest (Hungary).
For primary bibliographic entry see Field 8G.
W75-09632

**DRAINAGE MATERIALS - PROVISIONAL REPORT OF THE EXPERIENCE GAINED IN THE NETHERLANDS,**
Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 8G.
W75-09633

**SURVEY OF EXPERIENCES WITH DRAINAGE MATERIALS AND REVIEW OF AVAILABLE SPECIFICATIONS,**
Ministry of Agriculture, Fisheries and Food, Cambridge (England).
For primary bibliographic entry see Field 8G.
W75-09634

**INDEX 1945-1966, LAND AND WATER.**
Food and Agriculture Organization of the United Nations, Rome (Italy). Documentation Center.
For primary bibliographic entry see Field 10C.
W75-09635

**MAP SHOWING DRAINAGE AREAS, MARLBOROUGH QUADRANGLE, CONNECTICUT,**
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-09704

**MAP SHOWING DRAINAGE AREAS, WEST SPRINGFIELD QUADRANGLE, MASSACHUSETTS-CONNECTICUT,**
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-09705

**MAP SHOWING DRAINAGE AREAS, LUDLOW QUADRANGLE, MASSACHUSETTS,**
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-09707

**MAP SHOWING DRAINAGE AREAS, MOUNT TOM QUADRANGLE, MASSACHUSETTS,**
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-09708

**TEMPERATURES OF STREAMS AND SELECTED RESERVOIRS IN PENNSYLVANIA,**
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W75-09713

**BIBLIOGRAPHY OF U.S. GEOLOGICAL SURVEY WATER-RESOURCES REPORTS FOR UTAH,**
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 2A.
W75-09718

**OCCURRENCE OF PESTICIDE RESIDUES IN FOUR STREAMS DRAINING LAND-USE AREAS IN PENNSYLVANIA,**
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 5B.
W75-09720

**STREAM ORDERING AND CONTOUR MAPPING,**
University of Western Ontario, London. Dept. of Geography
W. Warntz.
Journal of Hydrology, Vol 25, No 3/4, p 209-227, May 1975. 9 fig, 6 tab, 11 ref.

Descriptors: *Geomorphology, *Drainage density, *Topographic mapping, Streams, Land forming, Topography, Shape, Running waters, Gradients(Streams), Terrain analysis, Quaternary period, Contours.
Identifiers: *Stream order, Physical geography, Contour mapping.

The necessary, sufficient, possible, and likely geometrical and topological characteristics of stream drainage basins of various orders were described. A suggestion was made for experimental topographic mapping to bring it closer to the current theory of spatial hierarchical systems. Stream ordering was examined and a recommendation was offered that streams now considered as of first order be regarded as of zero order. This simplifies mathematical notation for the Horton-Strahler-Woldenberg type of analysis in quantitative geomorphology and has added intellectual interest by facilitating the understanding of the virtually infinite cyclical regress in the patterns of surface features down to individual particle size. (Jess-ISWS)
W75-09745

**MAN-INDUCED CHANGES OF MIDDLE MISSISSIPPI RIVER,**
Colorado State Univ., Fort Collins.
M. A. Stevens, D. B. Simons, and S. A. Schumm.
Journal of the Waterways, Harbors and Coastal Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No WW2, Paper 11281, p 119-133, May 1975. 9 fig, 6 tab, 8 ref, 1 append. Army Contract DACW 39-73-C-0026.

Descriptors: *Channel improvement, *Levees, *Dikes, *Inland waterways, *River regulation, Floods, Stream erosion, Stream stabilization, Sediment discharge, Navigable rivers, Control, Mississippi River, Missouri River.
Identifiers: *Middle Mississippi River, Kaskaskia River.

The objectives of the 150 years of development along the Middle Mississippi River have been to provide flood protection to people and property on the floodplain by building levees and to provide a suitable channel for navigation by contracting the river channel from St. Louis to Cairo, Illinois. The developments for flood protection and navigation have produced a new river morphology and a different river behavior. The channel position has been relatively stable for at least the last century, although the position and size of islands within the channel have changed from time to time. In the period between 1888 and 1968, the river surface was reduced by approximately one-third, the island area by one-half, and the river bed area by one-fourth. The river channel was deepened for navigation by decreasing channel width with rock and pile dikes. River bed degradation has occurred where the river channel was narrowed. A major influence on flows has been the construction of storage dams on the Missouri River since 1940. The effect of upstream developments has been the reduction in frequency of large flood flows, and the increase in minimum flow. (Singh-ISWS)
W75-09754

**MAKEUP REQUIREMENTS FOR COOLING PONDS,**
Hanford Engineering Development Lab., Richland, Wash.
For primary bibliographic entry see Field 5G.
W75-09760

**RESERVOIR OPTIMIZATION FOR WATER QUALITY CONTROL,**
Pennsylvania Univ., Philadelphia.
For primary bibliographic entry see Field 5G.
W75-09773

**INITIAL STAGE, OAHE UNIT, PICK-SLOAN MISSOURI BASIN PROGRAM, SOUTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-09812

**DETAILED PROJECT REPORT FOR LOCAL FLOOD PROTECTION, ZACATE CREEK, LAREDO, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Fort Worth, Tex.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as EIS-TX-73-1926-F, $5.75 in paper copy, $2.25 in microfiche. December 12, 1973. 139 p, 13 map, 6 fig, 4 graph.

Descriptors: *Channels, *Flood protection, *Recreation facilities, Vegetation, Stagnant water, Landscaping, Mosquitoes, Wildlife, Streams, Parks, *Texas, Diseases, Environmental effects, Floodproofing, Flood plains, Flood forecasting, Flood control, Reservoirs.
Identifiers: *Environmental Impact Statements, Laredo(Tex), Zacate Creek(Tex).

The proposed action involves construction of an improved channel and open space park along Zacate Creek to provide adequate flood protection and recreational facilities for residents of Laredo, Texas. The project will remove refuse and garbage which presently litters the creek. The removed vegetation, caused by the channel construction, will be replaced with grass and landscaping. It is anticipated that stagnant pools, mosquitoes, rats and disease will be eliminated. Wildlife will be displaced from the creek, but probably will relocate in the park and open space area. The primary adverse environmental effect will be elimination of approximately 2.5 miles of a seminatural, intermittent stream and axxociated natural cover and wildlife. Alternatives considered are: Flood proofing, evacuation of the flood plain, land use regulations, flood forecasting and warning with temporary evacuation, flood control reservoir, eight channelization plans, and recreation facilities provided by other agencies. (Gagliardi-Florida)
W75-09813

**EDIZ HOOK BEACH EROSION CONTROL, PORT ANGELES, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 8A.
W75-09815

**TABLE ROCK LAKE, WHITE RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Little Rock, Ark.
For primary bibliographic entry see Field 8C.
W75-09818

**BUSHLEY BAYOU, LOUISANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 8D.
W75-09819

**PREVENTION AND MITIGATION OF SHORE DAMAGES, KAHULUI HARBOR, MAUI, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
For primary bibliographic entry see Field 8A.
W75-09825

**FLORIDA WATER RESOURCES ACT OF 1972 (STATUTE ESTABLISHING WATER MANAGEMENT DISTRICTS FOR THE STATE OF FLORIDA).**
For primary bibliographic entry see Field 6E.
W75-09833

**ARTIFICIAL ISLANDS AND INSTALLATIONS IN INTERNATIONAL LAW,**
Rhode Island Univ., Kingston. Law of the Sea Inst.
For primary bibliographic entry see Field 6E.
W75-09834

## 4B. Groundwater Management

**AN OPTIMAL WATER QUALITY MANAGEMENT TECHNIQUE FOR CONJUNCTIVE GROUND AND SURFACE WATER USE,**
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Sciences.
For primary bibliographic entry see Field 5G.
W75-09378

**RECHARGE SIMULATION MODEL,**
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W75-09518

**A COVERED DOMESTIC LAGOON SYSTEM FOR NATURAL GROUND WATER RECHARGE NEAR METROPOLITAN AREAS,**
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-09524

**GOUNDWATER MODELS,**
For primary bibliographic entry see Field 2F.
W75-09582

**GROUND-WATER LEVEL IN THE FLOOD PLAIN AND ADJACENT UPLANDS OF THE SANGAMON RIVER,**
Illinois Univ., Urbana. Dept. of Forestry.
D. T. Bell, and F. L. Johnson.
Transactions of the Illinois State Academy of Science, Vol 67, No 4, p 376-383, December 1974. 3 fig, 1 tab, 7 ref. Army DACW 23-73-C-0020.

Descriptors: *Groundwater, *Flood plains, *Surface-groundwater relationships, *Illinois, Water table, Rivers, Streams, Precipitation(Atmospheric), Evapotranspiration, Forests, Ecosystems, Environmental effects, On-site investigations, Evaluation, Data collections.
Identifiers: *Sangamon River(Ill).

The influence of river level, precipitation, and evapotranspiration on the water table fluctuations of the streamside forest ecosystem was determined from observation well data at four locations in the upper Sangamon River bottoms and adjacent uplands. Water levels in the soil profile of the floodplain areas of the streamside forest were strongly controlled by the level of the water in the stream channel. Changes in the upland water table, however, were not closely correlated to river level changes. Precipitation was the environmental variable most strongly influencing changes in the upland groundwater system. Evapotranspiration losses in midtransect areas may exceed infiltration of groundwater from the river and drainage from higher levels during certain summer periods. The strong correlation of the river level to groundwater level indicated that the fluctuation in the level of the water table in the floodplain areas of the Sangamon River was much the same in 1974 as they were in primitive times. An hypothesis concerning the possible changes which may occur with construction of the William L. Springer Project was discussed. A thorough understanding of existing physical environmental conditions in the streamside ecosystem is essential to understanding the streamside forest ecosystem. More complete information on species tolerances is required for assessment of the effects of the changing soil saturation conditions on the streamside forest ecosystem. (Humphreys - ISWS)
W75-09599

**FORMATION FACTORS AND THEIR USE IN ESTIMATING WATER QUALITY IN MISSISSIPPI AQUIFERS,**
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W75-09703

**GROUNDWATER LEVELS IN NEBRASKA, 1974,**
Geological Survey, Lincoln, Nebr.
M. J. Ellis.
Nebraska Water Survey Paper No 40, May 1975. 86 p, 12 fig, 1 tab, 21 ref. Published by University of Nebraska Conservation and Survey Division, Lincoln.

Descriptors: *Groundwater resources, *Water wells, *Water level fluctuations, *Nebraska, Water utilization, Industries, Irrigation, Water supply, Observation wells, Hydrologic data, Data collections.

Water levels for the year 1974 and changes from predevelopment levels and previous fall levels are tabulated for approximately 700 wells in Nebraska. Several hydrographs also are included. Use of groundwater for irrigation and industrial purposes has stabilized the economy of large areas in Nebraska. Groundwater is being withdrawn in areas of the state at rates greater than rates of replenishment and significant declines in water levels have occurred. On the other hand, water levels have risen signficantly in some areas of the state where surface water is used for irrigation. (Woodard-USGS)
W75-09710

**GREAT LAKES BASIN FRAMEWORK STUDY: APPENDIX 3--GEOLOGY AND GROUND WATER,**
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 2F.
W75-09714

**SUMMARY OF HYDROLOGIC CONDITIONS IN COLLIER COUNTY, FLORIDA, 1973,**
Geological Survey, Tallahassee, Fla.
H. J. McCoy.
Open-file report FL 47030, 1974. 99 p, 13 fig, 12 ref, append.

Descriptors: *Hydrogeology, *Florida, *Groundwater, *Water balance, Withdrawal, Water yield, Water quality, Basic data collections, Hydrologic data.
Identifiers: *Naples(Fla), Collier County(Fla).

The reaction of the coastal aquifer in Naples, Florida, to the stress of increased water demand was studied during a period of deficient rainfall. When the aquifer is under severe stress--such as in the 1972-73 dry season--the quantity of water percolating downward from the upper shallow zone, through the less permeable confining zone and into the pumping zone is much less than the quantity being withdrawn and large differentials in head (as much as 10 feet) between the shallow and pumping zones occur. Rainfall during 1973 was about 80 percent of the 32-year average in the Naples area,

90 percent of average at Everglades City, and slightly above average at Immokalee. Water levels at the beginning of the 1973 water year (October 1, 1972) were generally a foot lower than at the same time in 1971. The levels recovered to about 1972 water levels in July and August of 1973. Flow characteristics in the five major canals were similar to the groundwater fluctuations. Water quality remained about the same as for 1972 except for fecal and total coliform concentrations at one site in Naples. The fecal coliform concentration set a record high and total coliform concentration was next to the highest on record. (Knapp-USGS)
W75-09716

**AVAILABILITY OF GROUND WATER IN THE BRANCH RIVER BASIN, PROVIDENCE COUNTY, RHODE ISLAND,**
Geological Survey, Providence, R.I.
For primary bibliographic entry see Field 2F.
W75-09721

**HYDROLOGIC ANALYSIS OF THE VALLEY-FILL AQUIFER, NORTH PLATTE RIVER VALLEY, GOSHEN COUNTY, WYOMING,**
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 2F.
W75-09722

**GEOCHEMISTRY APPLIED TO THE DISCOVERY, EVALUATION, AND EXPLOITATION OF GEOTHERMAL ENERGY RESOURCES,**
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W75-09724

**DATA FROM A 1,000-FOOT (305-METRE) CORE HOLE IN THE LONG VALLEY CALDERA, MONO COUNTY, CALIFORNIA,**
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-09728

**NUMERICAL ANALYSIS OF CONFINED-UNCONFINED AQUIFERS,**
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W75-09751

**A CASE STUDY OF MINE WATER QUALITY DETERIORATION, MAINSFORTH COLLIERY, COUNTY DURHAM,**
Teesside Polytechnic, Middlesbrough (England). Dept. of Civil and Structural Engineering.
For primary bibliographic entry see Field 5B.
W75-09752

**HYDROGEOLOGY OF THE WATERWAYS-WINEFRED LAKE AREA, ALBERTA,**
Alberta Research, Edmonton.
For primary bibliographic entry see Field 2F.
W75-09769

**SEWAGE DISPOSAL AND WATER SUPPLY ALTERNATIVES ON THE BASIS OF WATER QUALITY AND ECONOMIC CRITERIA,**
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5B.
W75-09774

**GYPSUM CAN IMPROVE YOUR WATER ALSO,**
Central Soil Salinity Research Inst., Karnal (India)
For primary bibliographic entry see Field 5G.
W75-09787

**FLORIDA WATER RESOURCES ACT OF 1972 (STATUTE ESTABLISHING WATER MANAGEMENT DISTRICTS FOR THE STATE OF FLORIDA).**
For primary bibliographic entry see Field 6E.
W75-09833

## 4C. Effects On Water Of Man's Non-Water Activities

**FOREST FIRE: EFFECT ON PHOSPHORUS MOVEMENT TO LAKES,**
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 5B.
W75-09364

**SECONDARY IMPACTS OF TRANSPORTATION AND WASTEWATER INVESTMENTS: REVIEW AND BIBLIOGRAPHY,**
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5C.
W75-09576

**ARIZONA'S REMOTE SUBDIVISIONS: AN INVENTORY,**
Arizona State Office of Economic Planning and Development, Phoenix. Planning Div.
For primary bibliographic entry see Field 6G.
W75-09583

**WATER FOR ENERGY SELF-SUFFICIENCY.**
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 6B.
W75-09626

**WATER FOR ENERGY SELF-SUFFICIENCY, EXECUTIVE SUMMARY.**
Water Resources Council, Washington, D.C.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $0.70. October, 1974, 18 p.

Descriptors: *Comprehensive planning, *Institutional constraints, *Energy, *Hydroelectric power, *Water distributio(Applied), Water supply, *Water supply development, *Water quality, Colorado River Basin, Mississippi River, Power system operation, Water delivery, Water cooling, North America, Power plants, Planning, Arid lands, Semiarid climates, Decisionmaking, Financing.

Recommendations include: A detailed national analysis of water availability should be accomplished as soon as projected water requirements for energy-related purposes are fully known, together with that for all competing purposes. Water for energy must be provided to the extent possible through the existing institutional framework. The adequacy of the existing regional and national institutions for management of water and land resources and for resolution of conflicts arising from competing resource uses should be analyzed and needed strengthening accomplished. Environmental hazards and constraints, land use adjustments, and social and economic impacts likely to result from providing necessary water for energy self-sufficiency should be identified and described and the information made available to the public. The states' programs of comprehensive water and related land resources analysis and planning should be given Federal encouragement and assistance to assure capability for adequate and timely decisionmaking at the State and local level and to focus needed attention on energy related water matters. Priority should be given in Federal funding to certain projects, programs, and investgations because of their significant contribution to either early provision of energy, water p energy purposes, or to overcoming present lim tions on water availability for energy purpo (See also W75-09626)
W75-09627

**EFFECTS OF DEFORESTATION ON SLOPES**
Washington Univ., Seattle. Dept. of Civil gineering.
C. B. Brown, and M. S. Sheu.
Journal of the Geotechnical Engineering Divisi Proceedings of American Society of Civil gineers, Vol 101, No GT2, Paper 11141, p 147-1 February 1975. 7 fig, 3 tab, 20 ref, 2 append.

Descriptors: *Slope stability, *Fores *Lumbering, *Soil engineering, Stability, Analy cal techniques, Mathematical studies, Theoreti analysis, Vegetation effects, Root systems, Cre Soil moisture, Water table, Vegetation, Soil phy cal properties, Soil mechanics.

The creep and stability of slopes before and af logging were analyzed. The following effects vegetation were included in the theory: (1) the ro system provides mechanical reinforcement of t soil; (2) vegetation provides a vertical surchang (3) wind in trees causes surface shears and m ments; and (4) soil moisture content and wat level are modified. It was found that immediate after log removal the reduction in the overburd decreases the creep rate. Also, this reduction a the drop in wind loading increases the slope stabi ty. The immediate effect of deforestation is, ther fore, favorable, but adverse effects becom evident when the root system decays and when drop in evapotranspiration causes a rise in th water table. (Humphreys-ISWS)
W75-09743

**URBAN RUNOFF POLLUTION CONTROL STATE-OF-THE-ART,**
National Environmental Research Center, Cincin nati, Ohio. Advanced Waste Treatment Researc Lab.
For primary bibliographic entry see Field 5D.
W75-09762

**THE SAHELIAN DROUGHT - A DISASTER FOR LIVESTOCK POPULATIONS,**
Food and Agricultural Organization of the United Nations, Rome (Italy). Animal Production and Health Div.
For primary bibliographic entry see Field 3F.
W75-09785

**EVALUATING EFFECTS OF WATER RESOURCE DEVELOPMENTS ON WILDLIFE HABITAT,**
Missouri Dept. of Conservation, Jefferson City.
For primary bibliographic entry see Field 6G.
W75-09790

**THE ECOLOGICAL MANAGEMENT OF ARID AND SEMI-ARID RANGELANDS IN AFRICA AND THE NEAR EAST: AN INTERNATIONAL PROGRAMME.**
For primary bibliographic entry see Field 6G.
W75-09791

**A SURVEY OF THE NESTING HABITATS OF THE WHITE-WINGED DOVE IN ARIZONA,**
Arizona Game and Fish Dept., Phoenix. Research Div.
For primary bibliographic entry see Field 6G.
W75-09794

**DROUGHT IN THE GHANA SAVANNAH: A REPORT TO THE U.S. AID MISSION TO GHANA,**
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6G.

W75-09795

**DROUGHT, A RECURRENT ELEMENT OF CLIMATE,**
Maryland Univ., College Park. Graduate Program in Meteorology.
For primary bibliographic entry see Field 2B.
W75-09799

**DETERIORATION OF THE ECOLOGICAL EQUILIBRIUM IN THE ARID ZONES OF NORTH AFRICA,**
For primary bibliographic entry see Field 6G.
W75-09802

## 4D. Watershed Protection

**DRIP IRRIGATION IN LANDSCAPING AND SOIL EROSION CONTROL,**
Kuluwai Irrigation Corp., Haleiwa, Hawaii.
M. D. Farrell.
In: Proceedings of the Second International Drip Irrigation Congress, p 44-45, (1974).

Descriptors: *Soil erosion, *Landscaping, Irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation.

Briefly discussed are design, filtration, problems, and controls with drip irrigation in landscaping situations. (See also W75-09423) (Skogerboe-Colorado State)
W75-09429

**REGIONAL ANALYSES OF RUNOFF CHARACTERISTICS FOR SMALL URBAN WATERSHEDS,**
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2A.
W75-09621

**SEDIMENT YIELDS FROM INTERMEDIATE-SIZED STREAM BASINS IN SOUTHERN ALBERTA,**
Alberta Univ., Edmonton. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W75-09750

**FORAGE PREFERENCES OF TRAINED MULE DEER ON THE BEAVER CREEK WATERSHEDS,**
Arizona Game and Fish Dept., Phoenix. Research Div.
For primary bibliographic entry see Field 3F.
W75-09793

**WATER REQUIREMENTS AND LIMITATIONS IMPOSED ON AGRICULTURAL DEVELOPMENT IN NORTHERN GHANA,**
For primary bibliographic entry see Field 3F.
W75-09800

**NORTH FORK NOLIN RIVER WATERSHED, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-09814

**UPPER MULBERRY RIVER WATERSHED, BARROW, GWINNETT, HALL, AND JACKSON COUNTIES, GEORGIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-09822

# 5. WATER QUALITY MANAGEMENT AND PROTECTION

## 5A. Identification Of Pollutants

**DETERMINATION OF CHLORIDE IN WATER WITH A HGS/HG2CL2 ELECTRODE,**
Canada Centre for Inland Waters, Burlington (Ontario).
I. Sekerka, J. F. Lechner, and R. Wales.
Water Research, Vol 9, No 7, p 663-665, July, 1975. 1 fig, 4 tab, 13 ref.

Descriptors: *Water analysis, *Chlorides, *Trace elements, Water pollution sources, Natural streams, Industrial water, Waste water(Pollution), *Electrodes, *Pollutant identification, Water pollution, Water chemistry, Ions, Analytical techniques, Pollutants, Electrodes.

The application of a new type of solid state chloride ion sensitive electrode, based on HgS/Hg2Cl2, has been investigated for manual and automated measurements of chloride in natural, industrial and waste waters. TThe electrode display Nerstian response for the range 0.05-3.500 ppm of chloride and can be used for concentrations down to 0.05 ppm. Achieved values of standard deviation, recovery, and comparative tests from a variety of water samples are highly satisfactory. Inherent simplicity and sensitivity together with obtained results demonstrate the usefulness of the proposed method in routine analysis. (Witt-IPC)
W75-09361

**MULTIELEMENT NEUTRON ACTIVATION ANALYSIS OF FRESH WATER USING GE(LI) GAMMA SPECTROMETRY,**
Institutt for Atomenergi, Kjeller (Norway).
B. Salbu, E. Steinnes, and A. C. Pappas.
Analytical Chemistry, Vol 47, No 7, p 1011-1016, June, 1975. 2 fig, 4 tab, 16 ref.

Descriptors: Freshwater, *Water analysis, *Trace elements, *Pollutant identification, *Neutron activation analysis, Analytical techniques, Instrumentation, Water pollution sources, Water chemistry, Water quality, Water properties, Water pollution, Computers, Data processing, Pollutants.

A simple and rapid method for the determination of trace elements in natural fresh water by purely instrumental neutron activation analysis is presented. The method which is based on Ge(Li) gamma spectrometry and computer evaluation of recorded data allows up to 40 elements to be determined without any preconcentration steps. Data illustrating the precision of the method are given. The determination limit is approximately 1 microgram/liter or less for 30 of the elements, provided normal fresh water concentrations of elements giving rise to the most prominent activities (e.g., Al, Cl, and Na) are taken into account. Spectral interferences and other possible sources of systematic errors are discussed and shown to be of moderate importance in most cases. (Witt-IPC)
W75-09362

**SIMULTANEOUS DETERMINATION OF SEVEN TRACE METALS IN POTABLE WATER USING A VIDICON ATOMIC ABSORPTION SPECTROMETER,**
New York State Dept. of Health, Albany. Div. of Labs. and Research.
K. M. Aldous, D. G. Mitchell, and K. W. Jackson.
Analytical Chemistry, Vol 47, No 7, p 1034-1037, June, 1975. 2 fig, 4 tab, 12 ref.

Descriptors: *Potable water, *Water analysis, *Pollutant identification, *Trace elements, *Spectrometers, Zinc, Cadmium, Nickel, Cobalt, Iron, Manganese, Copper, Metals, Chemical analysis, Analytical techniques, Water pollution sources, Water pollution, Waste water(Pollution), Instrumentation, Water chemistry, Water quality, Water properties, Pollutants.
Identifiers: *Atomic absorption spectrometer.

A multichannel atomic absorption spectrometer is used for the determination of Zn, Cd, Ni, Co, Fe, Mn, and Cu in potable waters. Metals are chelated with ammonium pyrrolidine dithiocarbamate at pH 4, and a 10-fold concentration is achieved by extracting into methyl isobutyl ketone. The organic phase is aspirated into an air-acetylene flame, and atomic absorption is measured simultaneously at the resonance lines of these elements by dispersing a 168 nm region of the lamp and flame spectrum across a vidicon array detector. Detection limits from 0.004 to 0.02 microgram/ml have been obtained, with dynamic ranges up to 100 and relative standard deviations of 3% at optimum concentrations. This performance, though poorer than by conventional single-channel atomic absorption spectrometry, is adequate for routine monitoring of public water supplies and most waste waters. (Witt-IPC)
W75-09363

**GAS CHROMATOGRAPHIC DETERMINATION OF SELECTED ORGANIC COMPOUNDS ADDED TO WASTE WATER,**
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
B. M. Austern, R. A. Dobbs, and J. M. Cohen.
Environmental Science and Technology, Vol 9, No 6, p 588-590, June, 1975. 5 tab, 5 ref.

Descriptors: *Water analysis, *Organic compounds, *Gas chromatography, *Pollutant identification, Analytical techniques, Pollutants, Water pollution sources, Water pollution, Separation techniques, Water chemistry, Aromatic compounds, Chromatography.
Identifiers: Styrene, p-Xylene, Ethylbezene, Nitrogenzene, Acetophenone, o-Anisidine, Anethole, Trichloroethylene, Turpentine, Nonylphenol, Dimethyl phthalate, Freon.

Analytical procedures are described for the quantitative determination of styrene, p-zylene, ethylbenzene, nitrobenzene, Acetophenone, o-anisidine, anetkole, trichloroethylene, turpentine, nonylphenol, and dimethyl phthalate, in spiked waste water. Extraction with Freon, concentration of the extract in a Kuderna-Danish apparatus, and gas chromatography are involved. Except for the gas chromatography, the analysis of 10 of the 11 compounds was identical. Trichloroethylene, because of its high volatility, was determined slightly differently. The methods are precise and sensitive to the low parts-per-billion range. (Witt-IPC)
W75-09365

**DETERMINATION OF LEAD IN POTABLE WATERS USING DELVES CUP ATOMIC ABSORPTION SPECTROMETER WITH SIGNAL INTEGRATION,**
New York State Dept. of Health, Albany. Div. of Labs. and Research.
I. S. Maines, K. M. Aldous, and D. G. Mitchell.
Environmental Science and Technology, Vol 9, No 6, p 549-551, June, 1975. 2 fig, 2 tab, 6 ref.

Descriptors: *Potable water, *Lead, *Spectroscopy, *Water analysis, Analytical techniques, *Pollutant identification, Water pollution sources, Trace elements, Water chemistry, Instrumentation, Heavy metals, Pollutants, Water pollution.
Identifiers: Delves cup prodedure, *Atomic absorption spectrometer.

A rapid method for the determination of lead in potable water is described. A 50-200 microliter

sample is dispensed with 50 microliter of gelatin solution into a stainless steel cup, dried, and inserted into an air-acetylene flame. An automated atomic absorption spectrometer measures integrated absorbance. The procedure has a detection limit of 5 microgram of lead/liter, with calibration curves linear to 200 microgram of lead/liter. Typical relative standard deviations are 2.5 and 10.2% for 100 and 20 microgram of lead/liter, respectively. When direct calibration was used, most potable water samples showed low recoveries, but use of standard additions avoided this problem. Fifty potable water samples were analyzed using the Delves cup procedure and solvent-extraction atomic absorption spectrometry. Statistical analysis (Student 't' test) showed excellent correlation between the two procedures. (Witt-IPC)
W75-09366

**BOD AS A POLLUTION INDICATOR (LA DBO COMO INDICADOR DE LA POLUCION),**
G. Van Beneden, and P. Van Beneden.
Investigacion y Tecnica del Papel, Vol 12, No 43, p 25-45, January 1975. 21 ref.

Descriptors: *Biochemical oxygen demand, *Water pollution, *Indicators, Municipal wastes, Industrial wastes, Water pollution sources, Self-purification, Photosynthesis, Mud, Rivers, Analytical techniques, Water pollution effects, Water quality, Bottom sediments, Water pollution, *Pollutant identification.

Techniques used for the evaluation of BOD in urban and industrial waste waters are reviewed. The phenomenon of self-purification of rivers is discussed, together with the roles of mud on the river bottom and of photosynthesis in the self-purification process. Methods of determining the self-purifying power of a river are also considered. (Sykes-IPC)
W75-09368

**MEASURING FLOW OF POLLUTED EFFLUENTS (POUR LA MESURE DU DEBIT DES EFFLUENTS POLLUES).**
Papier, Carton et Cellulose, Vol 24, No 3, p 31, March, 1975. 3 fig.

Descriptors: *Flowmeters, *Effluents, *Flow measurement, Venturi meters, Instrumentation, Effluents, Waste water(Pollution), Gages, Flow rates, Water measurement, *Pollutant identification, *Path of pollutants.
Identifiers: Contraflux flowmeter.

A whole series of instruments (threshold gages, venturi tubes, and the Contraflus--a specially modified venturi tube) offered by Societe Neyrpic B.M.B. particularly for measuring effluent flow under various conditions is briefly outlined. (Speckhard-IPC)
W75-09370

**WATER ANALYSIS,**
Geological Survey, Denver, Colo.
M. J. Fishman, and D. E. Erdmann.
Analytical Chemistry, Vol 47, No 5, p 334-361R, Annual review issue, April 1975. 663 ref.

Descriptors: *Water analysis, *Analytical techniques, *Bibliographies, *Pollutant identification, Alkali metals, Alkaline earth metals, Hardness(Water), Aluminum, Iron, Manganese, Chromium, Copper, Zinc, Lead, Cadmium, Cobalt, Mercury, Gold, Molybdenum, Boron, Arsenic compounds, Phosphorus, Silica, Halides, Sulfates, Sulfides, Nitrates, Nitrites, Ammonia, Organic matter, Hydrogen ion concentration, Alkalinity, Carbon dioxide, Conductivity, Turbidity, Oxygen, Detergents, Metals, Pesticides, Herbicides, Fungicides, Oxygen demand, Radioisotopes.
Identifiers: Tin, Silver, Vanadium, Bismuth, Uranium, Thorium, Selenium, Antimony, Rare earths, Organic nitrogen, Cyanide, Total carbon.

This review of the literature of analytical chemistry applied to water analysis covers the period from October, 1972 through September, 1974. It includes references to analytical methods for determining the following: alkali metals; hardness and alkaline earth metals; Al, Fe, Mn, Cr, Cu, Zn, Pb, Cd, Ni, Co, Sn, Hg, Ag, Au, Mo, V, Bi, U, Th, B, Se, As, Sb, P, silica, and rare earths; halides, sulfate, and sulfide; nitrate, nitrite, ammonia, organic N, and cyanide; pH, alkalinity, carbon dioxide, conductance, and turbidity; oxygen and other gases; detergents, pesticides, herbicides, and fungicides; oxygen demand and total carbon; organic materials; and radionuclides. (Witt-IPC)
W75-09372

**FLUID SAMPLING DEVICE,**
Houma Valve Service, Inc., La. (assignee)
For primary bibliographic entry see Field 7B.
W75-09422

**BIOLOGICAL CONTROL OF SPHAEROTILUS NATANS AND RELATED SPECIES IN WASTE WATERS,**
Nebraska Univ., Lincoln. School of Life Sciences.
For primary bibliographic entry see Field 5D.
W75-09520

**BIOLOGICAL ASSAY OF FRESH WATERS BY A NEW METHOD, DIELECTROPHORESIS,**
Oklahoma State Univ., Stillwater. Dept. of Physics.
H. A. Pohl, and K. Pollock.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 512, $3.25 in paper copy, $2.25 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, (1975). 15 p, 7 fig, 7 ref. OWRT A-056-OKLA(1). 14-31-0001-5036.

Descriptors: *Bioassay, Assay, Algae, Systematics, *Analytical techniques, *Pollutant identification, *Electrophoresis, Water treatment, Separation techniques.
Identifiers: Cellular organisms assay, Chlorella vulgaris, Nonuniform field effects, *Dielectrophoresis.

Rapid and selective methods for assaying cellular organisms in fresh water are being sought by applying the selective effects of nonuniform electric fields. A typical alga, Chlorella vulgaris is readily and quickly collected from fresh water medium by the action of nonuniform field effects (NUFE). This alga exhibits a unique spectrum of response, in which the field response of the organism varies strongly with the applied frequency (100 Hz to 4 mega Hz). Since the original NUFE methods were essentially either batch or very small volume procedures (e.g. 0.01 to 0.5 ml), major emphasis has been upon developing continuous treatment techniques more suitable to fresh water problems. This research has developed a successful method called 'stream-centered' continuous dielectrophoresis (SCD). Preliminary tests using living cells have given encouraging results. The method is under active study for it has possibilities of wide application in cell study.
W75-09531

**CHEMICAL TRANSPORT BY THE MEKONG RIVER,**
Paris-6 Univ. (France). Laboratoire de Geologie Dynamique.
For primary bibliographic entry see Field 5B.
W75-09603

**COMPARATIVE ECOLOGY OF WESTERN STREAMS,**
Montana Univ., Missoula. Dept. of Zoology.
For primary bibliographic entry see Field 5G
W75-09617

**DEVICE FOR UNDERWATER OBSERVATIO**
For primary bibliographic entry see Field 7B.
W75-09640

**DETECTOR OF TRACE SUBSTANCE WATER,**
Shibata Kagaku Kikai Kogyo Kabushiki, Tok (Japan). (assignee)
T. Fujinaga, and K. Miura
US Patent No 3,883,414, 8 p, 14 fig, 2 tab, 4 r Official Gazette of the United States Patent fice, Vol 934, No 2, p 733, May 13, 1975.

Descriptors: *Patents, Water pollution sourc *Water pollution control, Water quality contr Water analysis, Monitoring, Industrial wast *Electrolysis, *Pollutant identification, Ions.

The invention provides a new device and meth for automatically detecting and regulating and/ removing concentrations of various substances aqueous solutions, such as for example, regulati the degree of pollution of urban rivers or industri effluents, by electrolyzing the ions of these su stances dissolved therein through a flow ele trolyte cell; then depositing and condensing or di solving, automatically and with high accurac continuously or discontinuously, according to th respective electrolytic potentials of these sub stances. (Sinha-OEIS)
W75-09655

**EFFECTS OF SALINE WATER FROM NORTH DAKOTA LAKES ON SURVIVAL OF FATHEAD MINNOW (PIMEPHALES PROMELAS) EMBRYOS AND SAC FRY,**
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W75-09669

**AN INEXPENSIVE MACROINVERTEBRATE BIOASSAY TABLE FOR USE IN CONTINUOUS-FLOW TOXICITY TESTS,**
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
A. F. Maciorowski.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 4, p 420-423, April 1975. 3 fig, 4 ref.

Descriptors: *Equipment, Technology, *Design, *Bioassay, Specifications, Laboratory tests, Invertebrates, Toxicity, Pollutant identification.
Identifiers: Continuous-flow bioassay table, *Toxicity tests.

A bioassay apparatus for macroinvertebrates was designed to meet the following criteria: (1) accommodate a large number of tests; (2) be generally acceptable to a wide range of macroinvertebrate organisms; (3) require a minimum of space; (4) be relatively inexpensive. One-gallon glass jugs were used as test chambers in the controlled temperature continuous-flow bioassay table. The apparatus is capable of accomodating fifteen concentrations of a single toxicant. The system is versatile and costs at least 50% less than a comparable system utilizing aquaria. (Katz)
W75-09676

**AVOIDANCE OF FENITROTHION BY GOLDFISH (CARASSIUS AURATUS),**
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W75-09677

**MERCURY IN SEALS, TERRESTIAL CARNIVORES AND PRINCIPAL FOOD ITEMS OF THE INUIT, FROM HOLMAN, N.W.T.,**
Fisheries and Marine Service, Ste. Anne de Bellevue (Quebec). Arctic Biological Station.
T. G. Smith, and F. A. J. Armstrong.
Journal of the Fisheries Research Board of Canada, Vol 32, No 6, p 795-801, Jun 1975. 1 fig, 2 tab, 24 ref.

Descriptors: *Mercury, *Public health, Mammals, *Animal physiology, *Water pollution effects, *Diets, Environmental effects, Food chains, Toxicity, Canada, Absorption, Pollutant identification.
Identifiers: Bioaccumulation, *Tissue analysis, *Selenium, *Metyl mercury, Liver, Muscle, Marine mammals, Terrestial carnivores, Inuit, Ringed seals, Phoca hispada botnica, Sledge dogs, Canis familiaris, Arctic wolves, Canis lupus, Arctic fox, Alopex lagopus, Bearded seals, Erignathus barbatus, Arctic char, Salvelinus alpinus, Caribou, Rangifer tarandus.

Total mercury analyses were made on liver and muscle of caribou and ringed and bearded seals, and on muscle of Arctic char (the principal items in the diet of local people), of Arctic fox, sledge dogs and wolves. About half of the 123 samples were also analyzed for methyl mercury, and some for selenium. Ringed seals showed mean total mercury levels of 27 ppm in liver and 0.73 in muscle. Bearded seals showed levels of 143 in liver and 0.53 in muscle. In the livers, methyl mercury levels were 5.6% of total in ringed seals and 0.38% in bearded seals. Positive and significant correlations of mercury content with age and body weight were found. Blood mercury levels were reported to be above average in people from this community, due to the diet. (Katz)
W75-09679

**POND SNAIL EGGS AS AN INDICATORY MATERIAL FOR WATER POLLUTION BIOASSAY: PRELIMINARY EXPERIMENTS, (IN JAPANESE),**
Doshisha Univ., Kyoto (Japan). Biological Lab.
For primary bibliographic entry see Field 5C.
W75-09682

**USE OF SODIUM PENTACHLOROPHENATE AND DEHYDROABIETIC ACID AS REFERENCE TOXICANTS FOR SALMONID BIOASSAYS,**
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5C.
W75-09683

**ASPECTS OF TRACE METAL CONTAMINATION IN THE COASTAL RIVERS OF ISRAEL,**
Hebrew Univ., Jerusalem (Israel).
For primary bibliographic entry see Field 5B.
W75-09689

**UPTAKE, METABOLISM AND DISTRIBUTION OF DDT IN ORGANS OF THE BLUE CRAB, CALLINECTES SAPIDUS,**
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5C.
W75-09691

**SELENIUM DETERMINATION ON FISH TISSUE,**
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
A. R. Beal.
Journal of the Fisheries Research Board of Canada, Vol 32, No 2, p 249-252, February 1975. 2 tab, 17 ref.

Descriptors: *Heavy metals, *Analytical techniques, Equations, Laboratory tests, Methodology, *Pollutant identification, Chemical analysis.
Identifiers: *Selenium, *Tissue analysis, Wet-digestion method, Flourescence measurement, Fish tissue.

A wet-digestion procedure for selenium analysis of fish is described. It involves digestion of the fish homogenate in a nitric-perchloric-sulfuric acid mixture and subsequent complexing with 2,3-diaminonaphtalene. Interfering elements are masked with disodium (ethylene-dinitrilo)-tetraacetate prior to complexing. The slope of standards is consistent and recoveries range from 85 to 100%. (Katz)
W75-09696

**DIFFERENTIATION BETWEEN NATURAL HYDROCARBONS AND LOW LEVEL DIESEL OIL CONTAMINATION IN COOKED LOBSTER MEAT,**
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
M. Paradis, and R. G. Ackman.
Journal of the Fisheries Research Board of Canada, Vol 32, No 2, p 316-320, February 1975. 2 fig, 1 tab, 18 ref.

Descriptors: *Lobsters, *Commercial shellfish, *Organoleptic properties, *Organic compounds, *Oil pollution, *Water pollution effects, *Laboratory tests, *Analytical techniques, Chromatography, Gas chromatography, *Pollutant identification.
Identifiers: *Cooked lobster, Tissue analysis, Lipid extraction.

A combination of total lipid extraction, column chromatography and temperature-programmed gas chromatography was required to demonstrate disputed low level diesel oil contamination in cooked lobster meat. A specific diesel oil contaminant was indicated, but identifiable components were not greatly in excess of the same compounds which were also found to be a normal background in organoleptically acceptable canned lobster meat. (Katz)
W75-09698

**BIBLIOGRAPHY OF U.S. GEOLOGICAL SURVEY WATER-RESOURCES REPORTS FOR UTAH,**
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 2A.
W75-09718

**CHANGES IN CHEMICAL QUALITY OF WATER, CEDAR BLUFF IRRIGATION DISTRICT AREA, WEST-CENTRAL KANSAS,**
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 5B.
W75-09719

**OCCURRENCE OF PESTICIDE RESIDUES IN FOUR STREAMS DRAINING LAND-USE AREAS IN PENNSYLVANIA,**
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 5B.
W75-09720

**AVAILABILITY OF GROUND WATER IN THE BRANCH RIVER BASIN, PROVIDENCE COUNTY, RHODE ISLAND,**
Geological Survey, Providence, R.I.
For primary bibliographic entry see Field 2F.
W75-09721

**AUTOMATION IN A WATER QUALITY LABORATORY SCHEME,**
Geological Survey, Salt Lake City, Utah. Water Resources Div.
R. L. McAvoy.
In: Advances in Automated Analysis; Proceedings of Technicon International Congress, June 12-14, 1972, New York, NY, p 37-42, 1972. 1 fig, 4 tab.

Descriptors: *Water analysis, *Chemical analysis, *Laboratories, *Automation, Laboratory equipment, Laboratory tests.

In 1970, the Water Resources Division of the U.S. Geological Survey reorganized water quality laboratory activities in the western United States. Central Laboratory is designed to integrate manpower and machinery as a single system to produce its work. The operation of the Central Laboratory during the first year was a success. The workload during the period was about 75% above the planned level. The daily sample input to the laboratory averaged 56 per day and varied from 20 to 150. Residence time of samples in the laboratory during the later part of the test year was no more than 5 days and with priority scheduling was in the order of 1 to 2 days. Complex analyses requiring 60 to 70 tests can be processed in about 3 days, routinely. The mode of operation reduces most analyst bias from the analytical results and increases the accuracy and precision of the results. Productivity per man in the semiautomated laboratory is from 200% to 300% of nonautomated laboratories. (Knapp-USGS)
W75-09723

**GROUND-WATER DATA FOR ORANGE COUNTY AND VICINITY, TEXAS AND LOUISIANA, 1971-74,**
Geological Survey, Houston, Tex.
For primary bibliographic entry see Field 7C.
W75-09727

**WATER-RESOURCES DATA FOR SKAGWAY, ALASKA,**
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 7C.
W75-09729

**EVALUATION OF SAMPLE PREPARATION TECHNIQUES FOR ALGAL BIOASSAYS,**
Utah Water Research Lab., Logan.
D. S. Filip, and E. J. Middlebrooks.
Water Research, Vol 9, No 5/6, p 581-585, May-June 1975. 4 fig, 2 tab, 4 ref.

Descriptors: *Sampling, *Pollutant identification, *Algae, *Bioassay, *Evaluation, *Water analysis, Analytical techniques, Chemistry, Chemical oxygen demand, Eutrophication, Organic matter, Water quality, Farm wastes, Ultraviolet radiation, Phosphorus, Nutrients, Nitrates, Biological properties, Ponds, Feed lots, Runoff, Autoclaves, Membranes, Filtration.
Identifiers: *Sample preparation techniques, Biostimulatory properties, Pasturization, Glass fiber filtration.

The chemical and biostimulatory properties of mesotrophic pond water and eutrophic feedlot runoff were examined after subsamples of each were separately subjected to standard membrane filtration and autoclaving pretreatments for bottle test bioassays. Correspondingly separate subsamples were exposed to ultraviolet light to determine its effectiveness as a possible pretreatment. All three pretreatments fulfilled the requirement of destroying or removing indigenous algae, but each technique substantially altered the water chemistry changing the bioassay results. Filtration removed phosphorus; autoclaving raised the pH value, precipitated salts, and eliminated dissolved carbon dioxide; and ultraviolet light oxidized organic and inorganic nitrogen compounds. (Henley-ISWS)
W75-09734

**AUTOMATIC U.V.-CONTROL SYSTEM FOR RELATIVE EVALUATION OF ORGANIC WATER POLLUTION,**
Vyzkumny Ustav Vodohospodarsky, Ostrava (Czechoslovakia).
M. Mrkva.
Water Research, Vol 9, No 5/6, p 587-589, May-June 1975. 6 ref.

Descriptors: *Pollutant identification, *Organic compounds, *Ultraviolet radiation, *Analytical techniques, *Instrumentation, *Biochemical oxygen demand, Waste identification, Spectrophotometry, Chemistry, Evaluation, Testing, Phenols, Lignins, Humus, Organic wastes, Turbidity, Water quality, Organic matter, Municiple wastes, Industrial wastes.
Identifiers: *Ultraviolet analyzer, *Automatic analyzer, *Flow-through analyzer, Permanganate oxygen demand, Dichromate oxygen demand.

A correlation exists between ultraviolet absorbance at 254 nm and the organic content of some surface and waste water samples. With this in mind, an ultraviolet analyzer was constructed for obtaining continuous absorbance measurements. The instrument was tested in rivers containing organic pollution and in effluents from municipal and industrial sewage plants. During the second part of the investigation, an ultraviolet analyzer was tested that automatically compensates for turbidity. With these instruments, changes in the organic content of a water may be noted immediately and corrective action taken. Conversion factors relating absorbance and chemical oxygen demand for some waters were shown. (Henley-ISWS)
W75-09735

**ADENOSINE TRIPHOSPHATE MEASUREMENTS IN SOIL AND MARINE SEDIMENTS,**
Florida State Univ., Tallahassee. Dept. of Oceanography.
D. M. Karl, and P. A. LaRock.
Journal of the Fisheries Research Board of Canada, Vol 32, No 5, p 599-607, May 1975. 7 fig, 2 tab, 35 ref. NASA Grant NGR-10-004-041.

Descriptors: *Pollutant identification, *Phosphates, *Analytical techniques, Marine biology, Instrumentation, *Phosphorus compounds, Soils, Sedimentation, Estimating, Evaluation, Chemistry, Phosphorus, Analysis, Organophosphorus compounds, Sediments, Laboratory tests, Biomass, Microbiology, Separation techniques, Enzymes.
Identifiers: *Adenosine triphosphate, *Marine sediments, *Sulfuric acid-EDTA method, Bioluminescent reaction, Liquid scintillation counter, Triss method.

A sulfuric acid-EDTA method for extracting ATP from soil and marine sediments was devised. The efficacy of this method was compared to the boiling Tris extraction procedure. Efficiency of ATP recovery from solid substrates typically ranged between 81-94% for the sulfuric acid-EDTA procedure in comparison to a recovery of 3-6% for the boiling Tris buffer. The presence of various ions in the acid extract, however, inhibited light emission in the luciferin-luciferase measurement of ATP. Addition of EDTA to the extract reduced but did not eliminate the ionic interference. An internal ATP standard was thus used to determine the magnitude of the residual interference. (Henley-ISWS)
W75-09764

**PICK UP AND METABOLISM OF DDT, DIELDRIN AND PHOTODIELDRIN BY A FRESHWATER ALGA (ANKISTRODESMUS AMALLOIDES) AND A MICROCRUSTACEAN (DAPHNIA PULEX),**
Illinois Univ., Chicago. Dept. of Biological Sciences
For primary bibliographic entry see Field 5C.
W75-09805

**PESTICIDES IN FISH FROM A HAWAIIAN CANAL,**
Hawaii Univ., Honolulu. Dept. of Agricultural Biochemistry.
C. D. Shultz, W. L. Yauger, Jr, and A. Bevenue.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 2, p 206-208, February 1975. 2 tab, 7 ref.

Descriptors: *Pesticide residues, *DDT, *DDD, *DDE, *Dieldrin, *Canals, *Hawaii, Pesticides, Environmental effects, Domestic wastes, Food chains, Algae, Water pollution sources, Absorption, Path of pollutants, Pollutant identification.
Identifiers: Elops hawaiensis, Chanos chanos, Bioaccumulation, Tissue analysis.

Samples of sediment, water and biota were taken from a canal that receives drainage from streams that pass through residential Honolulu and runoff from a golf course to determine the degree of pesticide contamination. No PCB's were found in any of the samples; DDT and its metabolites were found in different concentrations in the Ten Pounder (Elops hawaiensis), a carnivore, and milkfish (Chanos chanos), a plankton feeder. The data suggest that small fish accumulate DDT more efficiently than large fish and that algae are efficient accumulators of pesticide residues, contributing residues to fish in waters containing trace amounts of pesticides. (Katz)
W75-09806

**LOSS OF FIVE PESTICIDES FROM CULTURES OF TWENTYONE PLANKTONIC ALGAE,**
Syracuse Univ. Research Corp., N.Y. Life Science Div.
G. L. Butler, T. R. Deason, and J. C. O'Kelley.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 2, p 149-152, February 1975.

Descriptors: *Bioassay, *Algae, *2,4-D, *Pesticides, *Metabolism, *Plankton, *Diazinon, Laboratory tests, Chlorinated hydrocarbon pesticides, Organophosphorus, Absorption, Adsorption, Chemical analysis, Pesticides, Gas chromatography, Pollutant identification, Water pollution effects.
Identifiers: *Atrazine, *Carbaryl, *Methoxychlor.

The loss of atrazine, carbaryl, methoxychlor, diazinon and 2,4-D from actively growing cultures of planktonic algae was used as an indication of metabolic breakdown of the pesticides by algae. Some of the cultures were able to remove significant amounts of diazinon, 2,4-D or methoxychlor but not atrazine. Results indicate which strains of algae may be utilized in experiments determining whether uptake is by absorption or adsorption. (Katz)
W75-09808

**DIFFERENTIAL UPTAKE OF ENDOSULFAN BY THE TISSUES OF MYTILUS EDULIS,**
Queen's Univ., Belfast (Northern Ireland). Dept. of Zoology.
D. Roberts.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 2, p 170-176. February, 1975. 2 fig, 14 ref.

Descriptors: *Absorption, *Adsorption, *Mussels, *Pesticides, *Bioassay, Pesticide residues, Laboratory tests, Pollutant identification, Water pollution effects.
Identifiers: *Bioaccumulation, *Mytilus edulis, *Endosulfan, *Tissue analysis.

Assimilation of Endosulfan could result from direct absorption across exposed tissue surfaces or by ingestion of the pesticide adsorbed on particulate matter in bivalves the path of entry was predicted to be via the gills to the digestive gland. The gills of Mytilus edulis did not assimilate Endosulfan to the levels recorded for the digestive gland and the rise to the maximum level was slower. The digestive gland retained the highest residue level of all tissues, suggesting that it is the major site of Endosulfan assimilation. Assimilation of pesticide into the gonad, mantle and remaining tissues was determined to be via body fluids rather than direct absorption. (Katz)
W75-09810

## 5B. Sources Of Pollution

**FOREST FIRE: EFFECT ON PHOSPHORUS MOVEMENT TO LAKES,**
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
J. G. McColl, and D. F. Grigal.
Vol 188, No 4193, p 1109-1111, June 13, 1975. 2 tab, 15 ref.

Descriptors: *Lakes, *Phosphorus compounds, *Forest watersheds, *Forest fires, *Runoff, Forest management, Pollutants, Water pollution sources, Water pollution, Forest, Burning, Watershed management, *Minnesota, Lumbering, *Path of pollutants.
Identifiers: Controlled burn.

After a wildfire in the virgin forest of a lake-watershed region in northeastern Minnesota, the phosphorus concentration in the runoff was elevated for 2 years and decreased in the third year. However, there was no increase in the phosphorus concentration of a lake and its input stream. This indicates that, under similar circumstances, controlled burning will not damage streams or lakes by elevating phosphorus levels. (Witt-IPC)
W75-09364

**MEASURING FLOW OF POLLUTED EFFLUENTS (POUR LA MESURE DU DEBIT DES EFFLUENTS POLLUES).**
For primary bibliographic entry see Field 5A.
W75-09370

**WASTEWATER SURVEY, CHANUTE AFB, ILLINOIS.**
Environmental Health Lab., Kelly AFB, Tex.
For primary bibliographic entry see Field 5D.
W75-09397

**SURVEY OF WASTEWATER DISCHARGE--ELMENDORF AFB, ALASKA,**
Environmental Health Lab., Kelly AFB, Tex.
J. F. Thomas, and C. F. Pauls.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-782 480. $4.75 in paper copy, $2.25 in microfiche. Report EHL(K)74-11, July, 1974. 11 p, 9 ref, 5 append.

Descriptors: *Surveys, Waste water, *Waste disposal, *Waste water treatment, Sampling, Analysis, Water quality standards, *Alaska, *Path of pollutants, Water pollution sources, Water pollution control.

A waste water survey was conducted at Elmendorf AFB, Alaska during the period of June 16-22, 1972. Waste water sources, discharge routes and treatment processes were evaluated. Recommendations were made for future handling of wastes from specified operations. Additional recommendations were made regarding fungicides used on the golf course and storage and disposal of waste lubricating oils, fuels and solvents. A sampling and analysis program was outlined to comply with applicable water quality standards. (Prague-FIRL)
W75-09398

**SURVEY OF WASTEWATER DISCHARGE, CAMPION AFS, ALASKA,**
Environmental Health Lab., Kelly AFB, Tex.

For primary bibliographic entry see Field 5D.
W75-09413

**DISINFECTION OF SOIL STRIPS THROUGH THE DRIP IRRIGATION SYSTEM,**
Hebrew Univ., Rehovth (Israel).
For primary bibliographic entry see Field 5G.
W75-09444

**CLOGGING OF DRIP SYSTEMS FROM METABOLIC PRODUCTS OF IRON AND SULFUR BACTERIA,**
Agricultural Research and Education Center, Lake Alfred, Fla.
H. W. Ford, and D. P. H. Tucker.
In: Proceedings of the Second International Drip Irrigation Congress, p 212-214, (1974).

Descriptors: *Clogging, *Iron bacteria, *Sulfur bacteria, Irrigation, Agriculture, Path of pollutants, *Water pollution sources.
Identifiers: *Trickle irrigation, *Drip irrigation.

Numerous drip irrigation systems have been installed in central and south Florida citrus groves. Many have ceased to function properly because of filter and emitter clogging. The most serious clogging, involving water from shallow and deep wells, has been found associated with a sulfur bacteria. The long filamentous bacteria, stuffed with sulfur from the oxidation of hydrogen sulfide within the irrigation pipes, clog all small openings within a brief period of time. The white, slimy organic-sulfur-iron mass can only be dissolved in pyridine. Another serious clogging factor, from wells containing traces of ferrous iron, has been a filamentous gelatinous iron deposit (ochre) caused by iron bacteria. The sticky sludge adheres to filters and the grooves and orifices of emitters. (See also W75-09423) (Skogerboe-Colorado State)
W75-09456

**USE OF GLYCEROPHOSPHATE FOR FERTILIZATION THROUGH TRICKLE IRRIGATION SYSTEMS,**
California Univ., Davis.
D. E. Rolston, D. L. Hoffman, and R. S. Ravschkolb.
In: Proceedings of the Second International Drip Irrigation Congress, p 416-421, (1974). 3 fig, 9 ref.

Descriptors: *Fertilization, *Fertilizers, *Phosphorus, Irrigation practices, Irrigation systems, Irrigation, Agriculture, Phosphates, Path of pollutants.
Identifiers: *Trickle irrigation, *Drip irrigation, *Glycerophosphate.

There is little doubt after 60 years of scientific investigation with several sources of inorganic phosphate that phosphorus moves very little from point of contact with the soil. The greatest successes in measuring increased movement of phosphorus in the soil profile have occurred with organic forms of phosphorus. The development of new cultural management techniques such as trickle irrigation make the use of a water-soluble, non-corrosive, high analysis source of organic phosphorus an especially desirous material. A material with this capability would be of great value where trickle systems make it extremely difficult to achieve placement by mechanically injecting phosphorus below the soil surface. The movement and sorption of glycerol phosphate was studied in unsaturated soil columns during steady-state displacement of a fertilizer pulse. Fertilizer pulses equivalent to 90 kg/ha application rates were displaced at flow rates between 5 and 15 cm/day. Results demonstrate that glycerol phosphate is capable of being displaced to much greater depths than inorganic forms of phosphorus fertilizer. It is expected that glycerol phosphate can be applied through a trickle irrigation system and be distributed within the wetted root zone. (See also W75-09423) (Skogerboe-Colorado State)
W75-09492

**EVALUATION OF RECOVERY IN A POLLUTED CREEK AFTER INSTALLATION OF NEW SEWAGE TREATMENT PROCEDURES,**
Kentucky Water Resources Inst., Lexington.
R. A. Kuehne.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 499, $3.75 in paper copy, $2.25 in microfiche. Research Report No 85, May 1975. 33 p, 1 fig, 8 tab, 12 ref. OWRT A-047-KY(1). 14-31-0001-3817, 14-31-0001-4017.

Descriptors: *Water pollution, *Streams, *Sewage lagoons, Invertebrates, Fish, *Kentucky, *Sewage treatment, Waste water treatment, Evaluation, Path of pollutants.
Identifiers: *Pollution recovery, Stream order, *Hickman Creek(Kent).

Response of Hickman Creek near Lexington, Kentucky to alleviation from serious sewage pollution was studied from January, 1973 through July, 1974. Wastes are now handled from an efficient secondary treatment facility and four sequential polishing lagoons before chlorination and discharge to West Hickman branch. Physicochemical tests gave no strong indication of residual pollution effects at the start of the study, approximately six months after the treatment facility opened. At low flow a slight oxygen sag, probably associated with algal growth in the lagoons, persists downstream from the outfall. Mean values for turbidity, nitrates and COD are somewhat higher at the outfall than at eleven stations within the basin. Orthophosphates are considerably higher in lagoon discharge than elsewhere in the system, which gains some phosphate from bedrock. While the lagoons place some oxygen demand on West Hickman in the form of unicellular algal growth, they can and do receive surges of input that cannot be accommodated in the treatment plant. They would serve as a buffer to the stream in case of operational malfunction, which could overwhelm the small stream at low flow. The lagoons provide some benefits of tertiary treatment. (Huffsey-Kentucky)
W75-09515

**WATER QUALITY STUDY OF NONPOINT SOURCE OF AGRICULTURAL RUNOFF,**
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
D. R. Andersen.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 552, $3.25 in paper copy, $2.25 in microfiche. Completion Report, July 1975. 19 p, 7 fig, 2 tab, 6 ref.

Descriptors: Path of pollutants, Simulation analysis, *Agricultural runoff, *Water quality, *Model studies, Water pollution sources, *Instrumentation, Agricultural watersheds, *Monitoring, *Nebraska.
Identifiers: *Non-point source pollution.

A 7.8 square mile agricultural drainage area was instrumented and monitored for the purpose of obtaining data from an intermediate sized watershed for evaluating available modeling techniques for simulation of the quantity and quality of non-point source agricultural runoff. The study watershed, Dee Creek, is located approximately 15 miles northeast of Lincoln, Nebraska. Instrumentation of the watershed was completed on July 1, 1974. However, due to severe drought conditions, only one runoff event occurred during the last six months of 1974. Samples were collected, during this runoff event for determining various water quality parameters such as solids, phosphorus, nitrogen and chemical oxygen demand. Additional samples were collected of the base flow on a weekly basis and the pH, temperature, dissolved oxygen and conductivity of the stream were monitored on a continuous basis during warm weather. Depth of flow at the control structure where the samples were collected was continuously recorded. However, because of limited runoff in 1974, necessary velocity measurements for calibrating the stream at this point were not completed until June 1975. As a result, limited progress was made relative to evaluation of existing modeling techniques.
W75-09519

**POLLUTION OF IRRIGATION WATERS BY PLANT PATHOGENIC ORGANISMS,**
Nebraska Univ., Lincoln. Dept. of Plant Pathology.
J. R. Steadman.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 504, $3.75 in paper copy, $2.25 in microfiche. Completion Report, June 1975. 26 p, 7 fig, 3 tab, 3 ref. OWRT B-021-NEB(1). 14-31-0001-3907.

Descriptors: *Irrigation water, Pollution, Epidemiology, Pathogenic bacteria, *Nebraska, Nematodes, Pathogenic fungi, *Fungi, *Bacteria, *Path of pollutants, Water pollution control.
Identifiers: *Phytopathogenic bacteria, *Phytopathogenic fungi, *North Platte Project(Neb), Xanthomonas phaseoli, Whetzelinia sclerotiorum.

Systematic sampling of waterways and irrigation runoff from agricultural lands in the North Platte Project of Nebraska in July and August of 1972-1974 demonstrated that phytopathogenic organisms were disseminated. The organisms monitored included the bean common blight bacterium Xanthomonas phaseoli, the bean white mold fungus Whetzelinia sclerotiorum and various nematodes. Patterns of movement of the bacterial and fungal organisms were correlated with previous or current season infection of bean plants. The short-term survival of X. phaseoli in flowing water or filution effects may explain the detection of this organism only in runoff or ditches receiving runoff from common blight-infected bean fields. Sclerotial bodies of W. sclerotiorum remained viable for at least 10-21 days in flowing water and were found throughout the irrigation waterways. Irrigation of beans with contaminated water can result in both common blight and white mold diseases. Sedimentation in a settling basin was not efficient or practical as a method of minimizing this type of organismal pollution. Use of cleaners to remove debris from headwater sources in combination with a method such as chlorination is a promising control. Dissemination of phytopathogenic organisms in irrigation reuse systems as well as agricultural land runoff should be considered in irrigation planning and system designs.
W75-09521

**MOVEMENT OF POLLUTANT PHOSPHORUS IN UNSATURATED SOIL,**
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 509, $3.75 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center, Technical Report No 46, June 1974. 41 p, 8 fig, 5 tab, 224 ref. OWRT A-021-IND(5).

Descriptors: *Phosphates, *Nutrient removal, *Waste water disposal, *Unsaturated flow, *Soil moisture tension, Soil water movement, Land disposal, Porosity, Radioisotopes, Water pollution sources, Chemical wastes, *Path of pollutants, Phosphorus.
Identifiers: Freundlich equation, Langmuir equation.

The primary objective was to determine the functional relationship between soil, soil water content and phosphorus concentration capacities in a laboratory system similar to the irrigation of waste water on land. Various concentrations of potassium phosphate solution were admitted to short soil columns on reaction chambers. The phosphate solution also contained a radioactive tracer which

was chemically the same as the major portion of the solute. After reaction with a given soil mixture, the effluent was collected at known time intervals and the amounts of phosphate removed for the time intervals were determined. The Freundlich and Langmuir isotherm equations did not account for differences in soil water pressure and being equilibrium equations neither did they account for time at equilibrium. An exponential equation similar to that of Freunlich is proposed in which soil water pressure as well as time are taken into account. As expected, clay content of the soil influenced the amount of phosphorus adsorbed from the inlet solution. Also of significance was the inlet phosphate concentration and soil water pressure. In an unsaturated state, soil water pressure tends to drain the large soil pores first and the flow lines are diverted into the small pores where more adsorptive surfaces are available.
W75-09527

**SECTORAL AND REGIONAL ECONOMIC IMPACT OF CONTROLLING NONPOINT POLLUTION IN FORESTED AREAS,**
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 553, $4.75 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center, Technical Report No 53, February 1975. 83 p, 13 fig, 11 tab, 45 ref, append. OWRT B-042-IND(4).

Descriptors: *Multiple-purpose projects, *Water pollution source, *Forest management, *Erosion control, Clear cutting, Plant management, Vegetation regrowth, Land use, Linear programming, Leontief model, Input-output analysis, Soil erosion, Discount rates, Regional analysis, *Indiana, Economic impact.
Identifiers: *Non-point source pollution, Soil losses, Lincoln Hills(Ind).

This is a case study of a forested area in Southern Indiana known as the Lincoln Hills. The direct economic and environmental impacts (soil erosion losses) of a forest resource development project were measured, and their relationship illustrated. Also the indirect economic impact was measured at various levels of resource development. Two techniques of analysis were used, linear programming and Leontief static input-output. Consideration was given to soil erosion control, the rate and manner in which timber is harvested, and the uses to which newly cut timber are put. The control of soil losses has an inverse effect both directly and indirectly on the economy of the area. The rate of harvest should be programmed over time to achieve the highest net benefit. Policy makers should encourage the utilization of the timber by industries in the area for increased income, employment and economic development of the area. (Wiersma-Purdue)
W75-09530

**WATER QUALITY EFFECT OF DIKING A SHALLOW ARID-REGION LAKE,**
Brigham Young Univ., Provo, Utah.
D. K. Fuhriman, L. B. Merritt, J. S. Bradshaw, and J. R. Barton.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Ada, Oklahoma, Report EPA-660/2-75-007, April 1975. 234 p, 7 fig, 9 tab, 28 ref 1BB045 (ROAP 21-ACC, Task 10). R-801400 (Formerly 16080 EVT). Final (6/1/70 - 6/30/74).

Descriptors: *Lakes, Dikes, *Water quality, Utah, Evaporation, Seepage, Arid lands, Sodium, Chlorides, Dissolved solids, *Computer models, Management, Water conservation, Land reclamation
Identifiers: *Lake diking, Shallow lakes, *Utah Lake(Utah)

The inflow, outflow, and in-lake water quality and quantity of Utah Lake in Central Utah were studied over a 36-month period, to determine the effect of a proposed diking project and to develop methodology for determining the effect of diking or other management practices on the quality of water in any lake system. A computer simulation model was developed which is able to analyze the effect of a given management program on the water quality of the lake, particularly as related to the 'conservative salts' present. The simulation model was also used to evaluate the evaporation from the lake by use of a salt balance technique. Results of the research indicate that the diking of Utah Lake will have a positive beneficial effect upon the water quality of the lake and will also result in considerable saving of water and reclamation of valuable land. (EPA)
W75-09577

**STATE-OF-THE-ART FOR THE INORGANIC CHEMICALS INDUSTRY: COMMERCIAL EXPLOSIVES,**
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
J. W. Patterson, and R. A. Minear.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Report EPA-600/2-74-009b, March 1975. 80 p, 10 fig, 21 tab, 32 ref. 1BB036 R/T 21 AZQ 29. R-800857.

Descriptors: *Explosives, *Chemical industry, *Inorganic compounds, Chemical wastes, Reviews, Water pollution control, Pollution abatement, Water pollution sources, *Industrial wastes.
Identifiers: Waste characteristics.

A literature and field study was made of the commercial explosives industry on the basis of products manufactured, plant size, and the nature of the wastewater, the industry may be divided into three segments. One, complex facilities, are large plants manufacturing a variety of explosives and intermediate products. The second category is small specialized formulation plants, typically limited to blending explosives formulations for use in nearby mining activities. The final category is specialty product facilities, devoted to manufacture of select ingredients such as lead azide and other explosives initiators, blasting caps, electric matches and similar appurtenance items. The explosives industry discharges large volumes of wastewater, typically high in BOD, nitrogen, and solids, frequently at extreme pH, and containing trace to high quantities of dissolved and particulate explosives products. Although pollution abatement technology has not been widely implemented within the explosives industry, there is potential for significant abatement of pollutant discharge by good housekeeping practice, application of proven treatment technology and under certain conditions total wastewater containment. (EPA)
W75-09581

**RESEARCH NEEDS FOR WATER RESOURCES CONTROL IN CALIFORNIA.**
California State Water Resources Control Board, Sacramento. Div. of Planning and Research.
For primary bibliographic entry see Field 5G.
W75-09587

**URBAN LAWN INFILTRATION RATES AND FERTILIZER RUNOFF LOSSES UNDER SIMULATED RAINFALL,**
Ball State Univ., Muncie, Ind. Dept. of Natural Resources.
K. A. Kelling, and A. E. Peterson.
Soil Science Society of American Proceedings, Vol 39, No 2, p 348-352, March-April, 1975. 1 fig, 4 tab, 25 ref.

Descriptors: *Path of pollutants, *Urban runoff, *Fertilizers, *Water pollution sources, *Infiltration, *Rainfall-runoff relationshi Nutrients, Pollutants, Vegetation effects, Sto runoff, Eutrophication, Soil-water-plant relatic ships, Soils, Infiltrometers, Surface waters, Sim lated rainfall.

Infiltration runoff measurements were made nine urban lawns by using a sprinkling infiltrom ter in conjunction with the application of complete fertilizer at three rates. The amounts inorganic N, P, and K removed with the runc water were determined. Results of the infiltrati measurements show that the presence of textur and compaction discontinuities within the so profile, formed during building and lawn constru tion, was probably the greatest factor affecting i filtration. Where these discontinuities wer distinc water intake was reduced to about 35% c that fo. a lawn with an undisturbed profile. Fc lawns with similar infiltration characteristics, first order relationship appeared to exist betwee amounts of fertilizer applied and amounts lost. A second order equation, however, best describe the relationship between percent of applied fertil izer in the runoff and 90-min cumulative infiltra tion. When the simulated storm was applied im mediately after fertilizer application, fertilize losses averaged 10.6%; however, when fertilize application was followed by recommended water ing before the intense storm, average losses were reduced to 1.7% of the amount applied. (Terstriep ISWS)
W75-09592

**INTERACTION BETWEEN THE DAILY HEAT BALANCE AND THE TIDAL CYCLE,**
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
H. F. Vugts, and J. T. F. Zimmerman.
Nature, Vol 255, No 5504, p 113-117, May 8, 1975. 5 fig, 1 tab, 4 ref.

Descriptors: *Thermal pollution, *Heat balance, *Tidal effects, *Oceans, *Tidal waters, Mathematical studies, Mathematical models, Theoretical analysis, On-site investigations, Currents(Water), Water temperature, Meteorological data, Tides, Temperature distribution, Diurnal, Evaluation, Variability, Mud flats, Frequency.
Identifiers: *Dutch Wadden Sea.

Knowledge of the heat balance and temperature cycle of a tidal-flat sea is relevant to the biology of these areas; temperature is one of the most important physical factors in its ecosystem. Moreover, in planning power stations which will discharge heated effluents in areas of tidal flats, the special character of the heat balance should be taken into account. In a sea area consisting partly of periodically drying tidal flats, the semidiurnal lunar tide, interacting with the daily variation of solar radiation, gives rise to both a beat in the amplitude of the daily water temperature cycle with a period of 14.76 d and a variation of the daily mean temperature with the same period. This is shown theoretically and by observation. Extenstive surveys of temperature fluctuations were made in the Dutch Wadden Sea. Analysis of these data showed that a qualitative agreement exists between the developed theory and field measurements. (Humphreys-ISWS)
W75-09602

**CHEMICAL TRANSPORT BY THE MEKONG RIVER,**
Paris-6 Univ. (France). Laboratoire de Geologie Dynamique.
M. Meybeck, and J. P. Carbonnel.
Nature, Vol 255, No 5504, p 134-136, May 8, 1975. 1 fig, 3 tab, 20 ref.

Descriptors: *Path of pollutants, *Pollutant identification, *Rivers, *Water quality, *Asia, Ion transport, Dissolved solids, Ions, Metals, Calcium, Magnesium, Potassium, Sodium, Silica, Sulfates, Nitrates, Chlorides, Data collections,

Sampling, Analysis, Bicarbonates, Chemical properties.
Identifiers: *Phnom Penh(Mekong River), *Cambodia.

Major rivers are important for an understanding of the overall balance of dissolved and particulate matter carried to the ocean. The Mekong River in Phnom Penh, Cambodia, has a basin area of 663,000 sq km (83% of the total drainage area) and a mean annual discharge of 14,900 cu m/s. At the Phnom Penh station, between January 1961 and December 1962, 546 daily water samples were taken in which temperature, pH, and conductivity were measured. Once a month a complete water analysis was performed. Tabulated values of water quality variation along the Mekong River and dissolved transport rate for SiO2, Ca(2+), Mg(2+), Na(+), K(+), Cl(-), SO4(2-), HCO3(-), and NO3(-1) were given. The total ionic transport for 1961-1962 was 68.5 tons/sq km/yr. This value can be taken as a fair average since the water discharge during this period was 14,970 cu m/s, which is very close to the mean annual discharge. The total dissolved mineral transport rate was 74.8 tons/sq km/yr. (Humphreys-ISWS)
W75-09603

**THE QUALITATIVE AND QUANTITATIVE DETERMINATION OF SOLUBLE AND INSOLUBLE FORMS OF PHOSPHORUS IN SEWAGE TREATMENT PLANTS,**
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 5D.
W75-09618

**ACUTE TOXICITY OF NITRITE TO RAINBOW TROUT (SALMO GAIRDNERI),**
Montana State Univ., Bozeman. Fisheries Bioassay Lab.
For primary bibliographic entry see Field 5C.
W75-09687

**ASPECTS OF TRACE METAL CONTAMINATION IN THE COASTAL RIVERS OF ISRAEL,**
Hebrew Univ., Jerusalem (Israel).
J. Kronfeld, and J. Navrot.
Water, Air and Soil Pollution, Vol 4, No 1, p 127-134, March 1975. 3 fig, 1 tab, 9 ref.

Descriptors: *Trace elements, *Heavy metals, *Water pollution sources, *Sediments, Wastes, *Metals, Soil chemical properties, Environmental effects, Sewerage, Industrial wastes, Chemical wastes, Groundwater, Permeation, Sampling, Soil analysis, Cadmium, Cobalt, Copper, Cadmium, Nickel, Lead, Mercury, Zinc, Public health.
Identifiers: *Israel, Aquatic balance, Ayyalon River, Gadura River, Qishon River Hader River(Israel).

Nine trace elements of biological concern: Cr, Co, Cu, Cd, Ni, Pb, Hg, Zn, and Ag were investigated in the sediments of coastal streams in Israel. The Ayyalon, Gadura, Qishon and Hadera rivers contain sediments exhibiting sever pollution effects due to domestic and/or industrial sewage. The danger of infiltration through soils into the groundwaters and exposure of nearshore fauna to sediments contaminated by possibly toxic trace metals is disscussed as well as high Pb and Zn levels near major highways. (Katz)
W75-09689

**DEPOSITION OF ZINC AND CADMIUM BY MARINE BACTERIA IN ESTUARINE SEDIMENTS,**
Geological Survey, Corpus Christi, Tex.
For primary bibliographic entry see Field 5C.
W75-09692

**FORMATION FACTORS AND THEIR USE IN ESTIMATING WATER QUALITY IN MISSISSIPPI AQUIFERS,**
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W75-09703

**EFFECTS OF METAL-MINE DRAINAGE ON WATER QUALITY IN SELECTED AREAS OF COLORADO, 1972-73,**
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5C.
W75-09712

**WATER-RESOURCES INVESTIGATIONS IN THE FORT UNION COAL REGION, NORTH DAKOTA, 1974-75.**
Geological Survey, Bismarck, N.Dak.
Open-file report, January 1975. 42 p, 10 fig.

Descriptors: *Water pollution sources, *Coal mine wastes, *Water quality, *North Dakota, Reviews, Project purposes, Publications, Surface waters, Groundwater, Water pollution effects, Water pollution control, Hydrologic data, Data collections, Bibliographies.
Identifiers: *Fort Union coal region(N Dak).

Owing to the current emphasis on energy development, a rather large number of geologic and hydrologic studies either are underway or are proposed by a number of agencies and private companies working in the Fort Union coal region of North Dakota. The purpose of this report is to inform other agencies, private companies, and the public in general of the on-going and recently completed work by the Water Resources Division of the U.S. Geological Survey in the Fort Union coal region. The work done by the Water Resources Division in North Dakota is listed by sequential project identification number. Some of the projects are primarily concerned with data collection. Others involve interpretation in addition to data collection. A summary of each project includes objectives, cooperators, and availability of the report. (Woodard-USGS)
W75-09715

**CHANGES IN CHEMICAL QUALITY OF WATER, CEDAR BLUFF IRRIGATION DISTRICT AREA, WEST-CENTRAL KANSAS,**
Geological Survey, Lawrence, Kans.
R. B. Leonard.
Kansas State Geological Survey, Lawrence, Chemical Quality Series No 1, April 1975. 72 p, 37 fig, 3 plate, 12 tab, 45 ref.

Descriptors: *Water quality, *Irrigation water, *Chemical analysis, *Irrigation effects, *Kansas, Hydrologic data, Data collections, Sampling, Surface waters, Groundwater, Soil analysis, Inorganic compounds, Pesticides, Water levels, Discharge(Water), Well data.
Identifiers: *Cedar Bluff area(Kans), Water quality changes.

The Cedar Bluff Irrigation District in west-central Kansas diverts water from the Smoky Hill River to irrigate about 6,000 acres. Although drainage from irrigated land replenishes groundwater in transient storage and augments low flow in the river, the drainage adversely affects the chemical quality of the related water. Specific conductance of the irrigation water increased progressively from 800 to 980 micromhos per centimeter at 25 deg C between 1964 and 1971. The percent composition of this calcium-sulfate type water remained relatively constant. The use of water for irrigation in the district and the increase of drainage to low flow have not caused serious degradation of chemical quality of the Smoky Hill River. The data include measurements of precipitation, water levels and water discharge; lithologic and gamma-ray logs of observation wells and test holes; chemical analyses of groundwater, surface water, and soil; analyses for pesticides in ground and surface water; and selected particle-size analyses of soil. (Woodard-USGS)
W75-09719

**OCCURRENCE OF PESTICIDE RESIDUES IN FOUR STREAMS DRAINING LAND-USE AREAS IN PENNSYLVANIA,**
Geological Survey, Harrisburg, Pa.
J. F. Truhlar, and L. A. Reed.
Available from NTIS, Springfield, Va 22151 as PB-242 770/AS, $3.75 in printed copy; $2.25 in microfiche. Water-Resources Investigations 6-75, June 1975. 23 p, 5 fig, 5 tab, 7 ref.

Descriptors: *Water pollution sources, *Pesticides, *Insecticides, *Pennsylvania, Surface waters, Fish, Soils, Land use, Sampling, Chemical analysis, DDT, Dieldrin, Agricultural chemicals, Orchards.

Samples of water, bed material, fish, and soil were collected in four small drainage basins in Pennsylvania in 1969-71 and analyzed to determine the concentrations of chlorinated-hydrocarbon insecticides. Water samples only were also analyzed for phenoxy-acid herbicides. Each basin studied represents a predominant land-use classification--forested, general farming, residential, and orchard farming. All water and fish samples showed pesticide concentrations less than the U.S. Public Health Service's (1969) recommended maximum permissible concentration. However, no fish were found in the orchard area stream at the time collection was attempted. DDT or one of its metabolites was the most frequently occurring insecticide and was detected in all media sampled except the forested-area soil. The highest observed combined concentration of DDT and its metabolites in storm-runoff samples was 11.4 micrograms per litre in a sample collected from the residential area stream, but the median was higher (0.12 microgram per litre) in the orchard area than in the residential area (0.02 microgram per litre). Dieldrin was the second most frequently occurring insecticide. Other insecticides detected were chlordane, heptachlor epoxide, lindane, and a trace of aldrin in one fish sample. (Woodard-USGS)
W75-09720

**SEDIMENT RESUSPENSION AND DEPOSITION IN NARRAGANSETT BAY,**
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 2L.
W75-09736

**A CASE STUDY OF MINE WATER QUALITY DETERIORATION, MAINSFORTH COLLIERY, COUNTY DURHAM,**
Teesside Polytechnic, Middlesbrough (England). Dept. of Civil and Structural Engineering.
T. Cairney, and R. C. Frost.
Journal of Hydrology, Vol 25, No 3/4, p 275-293, May 1975. 9 fig, 2 tab, 10 ref.

Descriptors: *Water quality, *Acid mine water, *Coal mines, *Dewatering, Pyrite, Iron bacteria, Shafts(Excavations), Groundwater, Oxidation, Pumping, Leaching, Water levels, Limestones, *Water pollution, Water quality control.
Identifiers: *Great Britain, *Magnesian limestone, Mineralization, Continuous pumping, Off-peak pumping.

Little work is directed to the causes of water quality deterioration when flooding of deep coal mines occurs. The present research suggested that while the usually accepted factors - the presence of iron disulphides, oxygen, and water - are essential controls, the pumping regime in operation is also of prime importance. It was argued that significantly less polluting discharges can be achieved when the mine water is held at a constant level. (Visocky-ISWS)
W75-09752

**RAPID TEMPERATURE REDUCTION OF THERMAL DISCHARGE,**
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
R. D. Townsend, and D. L. Egar.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY5, Paper 11312, p 529-541, May 1975. 9 fig, 8 ref, 2 append.

Descriptors: *Temperature, *Hydraulic jump, *Laboratory tests, *Mixing, *Thermal pollution, Model studies, Diffusion, Open channel flow, Hydraulics, Discharge(Water), Thermal powerplants, Effluents, Outlet works, Heating, Waste dilution.

A laboratory model study was conducted to investigate increasing the rate of temperature reduction by optimizing the mixing process between a heated effluent stream and a cool, tempering water flow introduced on the side of the discharge channel. The oblique hydraulic jump was used as the mixing agent. The results were compared with the standard dilution method in which the cooler stream is entrained by jet-induced turbulence. The standard techniques for predicting the location of the jump proved inadequate in the study configuration. Temperature distributions were observed throughout the flow field in order to determine mixing efficiency. Results indicated that the tempering and effluent flows were completely mixed by the hydraulic jump in a much shorter length of channel than was required by the standard jet mixing dilution process. (Adams-ISWS)
W75-09757

**A SALINE INTRUSION INTO SENECA LAKE, NEW YORK,**
Hobart and William Smith Colleges, Geneva, N.Y. Earth and Space Sciences Program.
W. F. Ahrnsbrak.
Limnology and Oceanography, Vol 20, No 2, p 275-278, March 1975. 3 fig, 3 ref.

Descriptors: *Path of pollutants, *Lakes, *New York, *Saline water intrusion, *On-site investigations, Sampling, Evaluation, Water temperature, Freshwater, Water pollution sources, Measurement, Salinity, Saline water, Movement, Conductivity, Water properties, Electrical conductance, Thermocline.
Identifiers: Seneca Lake(NY), Saline plume.

A warm, saline plume sinks, upon entering Seneca Lake, to just above the thermocline, 15 to 25 m deep. At that depth, based on vertical soundings of temperature and conductivity, the plume spreads radially, maintaining a distinct identity for 150-200 m. Temperature measurements alone suggest that the plume retains its identity to a distance of 1 km from its origin. (Humphreys-ISWS)
W75-09765

**DEOXYGENATION IN NATURAL STREAMS,**
Nebraska Natural Resources Commission, Lincoln. Data Bank.
M. K. Bansal.
Water Resources Bulletin, Vol 11, No 3, p 491-504, June 1975. 3 fig, 1 tab, 27 ref.

Descriptors: *Oxygen requirements, *Natural streams, *Oxygen, *Water quality, *Biochemical oxygen demand, Streams, Inorganic compounds, Oxygen demand, Model studies, Mathematical models, Phosphates, Nitrates, Nutrients, Water pollution, Organic matter, Dissolved oxygen, Water properties, Reaeration, Dispersion, Organic loading, Respiration, Reynolds number, Oxidation.
Identifiers: *Deoxygenation, Carbonaceous matter.

The deoxygenation process in which carbonaceous BOD is biochemically oxidized to reduced inorganic compounds is of great significance in the oxygen demand of stream waters. The BOD decay rate traditionally determined in a laboratory might not necessarily be the same as estimated for a natural stream. The variation in biochemical activity could occur due to differences in adsorption, dispersion, and biophysical processes taking place in the two environments. The first stage biochemical oxygen demand and benthal oxygen demand that occur simultaneously in a stream were considered together to calculate the gross rate of deoxygenation in polluted waters. The available data on deoxygenation measurements were analyzed to calculate the carbonaceous BOD rate constants in natural streams. The analysis indicated that the dimensionless deoxygenation parameter is a function of the ratio of the Reynolds number and Froude number of flow. The functional relationship between these two parameters essentially follows a straight line on a log-log plot. The applicability of the relationship does not depend on the volume of the organic load, size, or location of the stream. (Henley-ISWS)
W75-09767

**CATALYTIC OXIDATION OF PHENOL IN AQUEOUS SOLUTION OVER COPPER OXIDE,**
Delaware Univ., Newark. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W75-09772

**RESERVOIR OPTIMIZATION FOR WATER QUALITY CONTROL,**
Pennsylvania Univ., Philadelphia.
For primary bibliographic entry see Field 5G.
W75-09773

**SEWAGE DISPOSAL AND WATER SUPPLY ALTERNATIVES ON THE BASIS OF WATER QUALITY AND ECONOMIC CRITERIA,**
Michigan Univ., Ann Arbor.
R. Rajagopal.
Available from University Microfilms Inc., Ann Arbor, Michigan, 48106, Order No 74-25302. PhD Thesis, 1974, 178 p.

Descriptors: *Sewage disposal, *Water supply, Costs, *Groundwater, *Michigan, Statistical analysis, Construction costs, Computers, Model studies, Information retrieval, Economics, *Water quality standards, Water pollution sources.

Groundwater quality and economic factors as affected by sewage disposal and water supply alternatives for small rural townships in transition surrounding an urban center were studied. Water quality and cost data obtained from the surrounding townships in the Grand Traverse region of the State of Michigan formed the basis of this analysis. Efforts were divided into three parts: a set of chemical measurements was statistically analyzed and models for nitrate-N in groundwater were developed on the basis of land use, soil and well characteristics; with the help of a sample survey, equations for individual and community sewage disposal and water supply construction costs were formulated; and the above models, along with equations for population growth and distribution, were programmed to form a general interactive computer information system. This information system provides cost of construction of individual and community sewage disposal and water supply facilities and average nitrate-N found in groundwaters for any choice of township, land use and population growth for any future time horizon. (Prague-FIRL)
W75-09774

**A STUDY OF THE SURFACE FLUID FLOW CHARACTERISTICS OF THE NEW YORK BIGHT AND THE DEVELOPMENT OF RESEARCH DATA DISPLAY TECHNIQUES,**
Earth Satellite Corp., Washington, D.C.
R. T. Macomber, R. L. Mairs, and D. T. Stanczuk.
Final Report, October 15, 1974. 63 p, 25 fig, NOAA Contract No 3-35336.

Descriptors: *Data collections, *Data processing, Satellites(Artificial), *Coasts, *Water pollution, Ocean circulation, Sewage disposal, Littoral drift, Dispersion, Currents(Water), Tides, New York, *Remote sensing, Path of pollutants.
Identifiers: *New York Bight, Environmental quality, *Data analysis, Dredge spoil, Marine environment.

The need exists for (1) a demonstration of remote sensing data acquisition applied to studies of the coastal marine ecosystem in the New York Bight area, and (2) a demonstration of the remote sensing based information products which an be provided to area users. An effort has been made to demonstrate the applicability of remote sensor records to the study of circulation, dispersion, and related environmental characteristics, and to develop remote sensor-derived products for potential users in the New York Bight area. It is hoped that this effort will lead to a demonstration of the effectiveness of conversion of remotely revised data and ground truth data into information products which can be used for routine decision making. (NOAA)
W75-09783

**PESTICIDES IN FISH FROM A HAWAIIAN CANAL,**
Hawaii Univ., Honolulu. Dept. of Agricultural Biochemistry.
For primary bibliographic entry see Field 5A.
W75-09806

**AQUATIC INSECT COMMUNITIES OF THE TENRYU RIVER, THEIR COMPOSITION, BIOTIC INDEX AND SEASONAL CHANGE, (IN JAPANESE),**
Suzaka High School (Japan).
For primary bibliographic entry see Field 5C.
W75-09807

**DIVERSITY OF MARINE INVERTEBRATES IN A THERMAL EFFLUENT,**
Delaware Univ., Lewes. Coll. of Marine Studies.
For primary bibliographic entry see Field 5C.
W75-09809

**OFFSHORE DEVELOPMENT AND MARINE POLLUTION,**
United Nations Secretariat. Office of Legal Affairs.
M. Hardy.
Ocean Development and International Law Journal, Vol 1, No 3, p 239-273, 1973. 73 ref.

Descriptors: *International law, *Oil pollution, *Offshore platforms, *Coastal structures, *Pollution abatement, International waters, Legal aspects, Treaties, Oil industry, Water pollution, Aquatic environment, Engineering structures, Coasts, Drilling, Oceans, Water pollution control, Abatement, Pollutants, Water law, Administration, Legislation, Africa.
Identifiers: Coastal zone management, Hazardous substances(Pollution), International agreements, Territorial waters.

Offshore development, navigation, and fishing are the major economic uses of the sea. The problem of accommodating different interests of the international community in the marine environment in a legal order, with particular focus on marine pollution caused by offshore production of oil, is discussed. The range of techniques, administrative and legal, which are available for coping with the problem of allowing offshore development to proceed, while taking steps to ensure that marine pollution from this source is kept under control, is evaluated. The position under international law and the action taken by international bodies such

as the U.N. Seabed Committee, IMCO, the Stockholm Conference, and OAU are described. Further, national legislation relating to marine pollution caused by offshore mineral development in various countries is surveyed. Generally, the problems must be examined in terms of four issues: the application of adequate information, of adequate supervision, of adequate technical knowledge and equipment, and of suitable sanctions. Although international treaties are matters for future inquiry, the present exigencies require national efforts and co-operation on a regional and sub-regional level. (Fernandez-Florida)
W75-09842

## 5C. Effects Of Pollution

**DISTRIBUTION AND DYNAMICS OF AQUATIC INSECTS IN THE ELK CREEK EXPERIMENTAL WATERSHED, LUBRECHT FOREST, MONTANA,**
Montana Univ., Missoula. Dept. of Zoology.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 510, $3.25 in paper copy, $2.25 in microfiche. Research Report No 61, Montana University Joint Water Resources Research Center, Bozeman, March 1975. 21 p, 1 fig, 3 tab, 15 ref. OWRT A-050-MONT(1).

Descriptors: *Aquatic insects, Fauna, Environmental effects, Environment, *Ecological distribution, *Montana, Watersheds(Basins), *Regression analysis, *Correlation analysis, Benthos, Streams.
Identifiers: *Stream ecology, *Ecological research, Elk Creek experimental watershed(Mont).

Regression and correlation analysis of insect abundance and environmental factors and of species-species relationships indicates low predictive power for physical factors and much stronger biological correlations. With improved physical measurements, least squares regression analysis should be useful in the estimation of benthos densities in streams. Response surfaces computed from funcational regressions on abundances of co-occurring species indicated quantitative differences in habitat selection by stream insects. (Holje-Montana State)
W75-09528

**SILT REMOVAL FROM A LAKE BOTTOM.**
Lake Herman Development Association, Inc., Madison, S. Dak.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Report EPA-660/3-74-017, February 1975. 37 p, 6 fig, 2 tab, 4 ref. 1BA031. 16010 ELF.

Descriptors: *Eutrophication, Water pollution effects, Sediments, Lakes, *Sediment control, *South Dakota, *Dredging, Lake beds, Silts.
Identifiers: *Lake Herman(SoDak), *Silt removal, *Lake bottoms.

Dredging was used as a method to remove 62,600 cubic yards of silt from Lake Herman during the summers of 1970, 1971, and 1972. The silt was transported via a pipeline to a silt deposit area adjacent to the northeast corner of the lake. The water removed by the dredging process drained by gravity along a gradual slope, dropping its silt and losing nutrients to the lush vegetation, and eventually returned to the lake. In the bay area where dredging occurred water depth was increased from 5.5 feet to approximately 11 feet. There was no significant change in the levels of biological organisms or nutrients, except for phosphorus, which increased just after the dredging began. Whether dredging actually caused the increase is still debatable. Vegetation in the deposit area became extremely lush. Water returning to the lake from the deposit area was lower in nutrients than the water in the lake. (EPA)
W75-09575

**SECONDARY IMPACTS OF TRANSPORTATION AND WASTEWATER INVESTMENTS: REVIEW AND BIBLIOGRAPHY,**
Environmental Impact Center, Inc., Newton, Mass.
S. E. Bascom, K. G. Cooper, M. P. Howell, A. C. Makrides, and F. T. Rabe.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Report EPA-600/5-75-002, January, 1975, 276 p. 1HA095 21 ART 11. EQC 317.

Descriptors: *Bibliographies, Publications, Analytical techniques, Community development, Land use, Water resources, Planning, Data collections, Environment, *Investment, Local governments, Waste water treatment, Highways, *Reviews, *Transportation, Regional development, Data storage and retrieval, Environmental effects.
Identifiers: *Environmental impacts.

A review is presented of over fifty major studies and three hundred relevant reports related to secondary environmental impacts on various forms of public investments, e.g. land based transportation and wastewater collection systems. The Bibliography is organized into four sections: Section I is subdivided into: (a) a review of secondary impacts classified according to type of investment (highways, mass transit, and wastewater collection systems); (b) where possible, according to type of secondary effects (economic, social and land use); and (c) a brief summary of modeling techniques which may be utilized to analyse and project likely secondary environmental impacts. Section II condenses the findings of about fifty major studies related to land transportation and wastewater treatment systems. Section IV classifies these literature studies by: (a) impact; (b) investment; (c) geographic area examined; (d) type of study; and (e) type of analytic techniques used in assessing secondary effects. (Scherer-EPA)
W75-09576

**HYPOLIMNETIC OXYGENATION USING LIQUID OXYGEN,**
Union Carbide Corp., San Francisco, Calif. Aquatic Environmental Sciences.
For primary bibliographic entry see Field 5G.
W75-09589

**THE EFFECT OF SULFATE AND MANGANESE DIOXIDE ON THE RELEASE OF PHOSPHORUS FROM LAKE MENDOTA SEDIMENTS,**
Wisconsin Univ., Madison. Water Chemistry Lab.
D. M. Olson.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 515, $4.25 in paper copy, $2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, June 1975. 47 p, 17 fig, 1 tab, 13 ref, 4 append. OWRR A-035-WIS(1), 14-31-0001-3050, 14-31-0001-3250.

Descriptors: *Phosphorus, *Lake sediments, *Eurtophication, *Sulfates, *Manganese oxides, Wisconsin, Lakes, Iron, Water quality standards, Water pollution effects.
Identifiers: Lake Mendota(Wisc).

The recommendation of the National Technical Advisory Committee to the Secretary of the Interior to limit the addition of sulfate or manganese oxide to lakes containing iron in the hypolimnion was evaluated by laboratory experiments in which Lake Mendota sediments were placed in carboys and incubated in the presence of various amounts of sulfate and manganese dioxide. Differences were noted in the quantity of orthophosphate released under anaerobic conditions between carboys that received 1 and 5 mg/l Mn02 and 0 and 10 mg/l MnO2. However, the significance of the observed difference is uncertain in view of the scattered iron data, the level of sulfate maintained, and the oxidizing capacity of the added MnO2. A direct relationship was observed between the quantity of added MnO2 and Mn(II) concentration. The addition of sulfate did not show a direct relationship to the quantity of orthophosphate released under anaerobic conditions. The results of these experiments are concluded to be insufficient to either support or reject the recommendation of the National Technical Advisory Committee.
W75-09619

**THE EFFECT OF BASIC CUPROUS CARBONATE ON THE STATE OF THE LIVER IN JUVENILE AMUR AUTUMN CHUM (ONCORHYNCHUS KETA INFRASP. AUTUMNALIS),**
Tikhookeanskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva i Okeanografii, Vladivostok (USSR).
A. A. Zhirnova, A. M. Kolgayev, and N. N. Shirokova.
Journal of Ichthyology, Vol 14, No 3, p 453-456, 1974; 2 fig, 15 ref.

Descriptors: *Salmonids, *Chum salmon, *Growth stages, *Juvenile growth stages, *Copper compounds, Cytological studies, Inorganic compounds, Fish physiology, Laboratory tests.
Identifiers: *Oncorhynchus keta, Fingerlings, *Cuprous carbonate, Tissue analysis.

Basic cuprous carbonate had no adverse effects on the development of juvenile Amur Autumn Chum, Oncorhynchus keta. The weights of fingerlings were equivalent for both test and control groups although there was more intensive resorption of the yolk sac in the experimental group. The antiseptic had no significant pathological effects on the liver, nor were differences discovered in copper content in the liver cells. (Katz)
W75-09668

**EFFECTS OF SALINE WATER FROM NORTH DAKOTA LAKES ON SURVIVAL OF FATHEAD MINNOW (PIMEPHALES PROMELAS) EMBRYOS AND SAC FRY,**
North Dakota State Univ., Fargo. Dept. of Zoology.
B. L. Burnham, and J. J. Peterka.
Journal of the Fisheries Research Board of Canada, Vol 32, No 6, p 809-812, June 1975. 2 tab, 9 ref.

Descriptors: *Minnows, *Saline water, *Growth stages, Salt tolerance, Fish physiology, Toxicity, Embryonic growth stage, Fry, Sodium chloride, Sodium sulfate, Lethal limit, Laboratory tests, Bioassay, On-site investigations, *North Dakota, Lakes, Water pollution effects, Pollutant identification.
Identifiers: *Fathead minnows, *Pimephales promelas, Sac fry, Tissue analysis, Bioaccumulation.

Eggs and sac fry of the fathead minnow (Pimephales promelas) were subjected in the laboratory to various dilutions of water obtained from four saline lakes in North Dakota; three were sodium sulfate-, one a sodium-chloride-type lake. In water from the latter, the percent of fertilized eggs surviving as sac fry for 5 days remained the same as the percent hatched: about 90% at treatment levels of 500-12,000 micromhos, and 68% in undiluted lake water of 18,000 micromhos. In sodium sulfate-type water, however, about 92% of the fertilized eggs hatched at treatment levels of 500 up to only 6,000 micromhos, with about 82% living as sac fry for 5 days in water from two of the lakes and only about 54% living for 5 days in dilutions

made from the most saline lake (lake water of 25,000 micromhos). No sac fry survived for 5 days after hatching in sodium-sulfate-type water of 12,000 micromhos. From laboratory bioassays and field observations, it is estimated that sodium sulfate-type water exceeding 8,000 micromhos during reproductive periods may decrease survival of sac fry. (Katz)
W75-09669

**THE EFFECT OF DIFFERENT OXYGEN CONDITIONS DURING INCUBATION ON THE SURVIVAL AND SOME OF THE DEVELOPMENTAL CHARACTERISTICS OF THE 'VERKHOVA' (LEUCASPIUS DELINEATUS) IN THE EMBRYONIC PERIOD,**
Akademiya Nauk SSR, Moscow. Inst. of Evolutionary Morphology and Animal Ecology.
M. V. Gulidov.
Journal of Ichthyology, Vol 14, No 3, p 393-397, 1974. 4 tab, 2 ref.

Descriptors: Freshwater fish, Growth stages, *Growth rates, *Fish eggs, *Embryonic growth stage, *Oxygen requirements, *Toxicity, *Dissolved oxygen, *Fish physiology, Laboratory tests, Life cycles, Lethal limit, Respiration.
Identifiers: *Leucaspius delineatus, *Cyprinids, Oxygen concentrations, Developmental stages, Blastoderm.

Four series of experiments were carried out on the incubation of the eggs of Leucaspius delineatus from the stages of commencement of over-growth of the yolk sac by the blastoderm-closure of the yolk plug to the hatching of embryos at different oxygen concentrations. The data obtained are examined in the light of the ecological developmental characteristics of L. delineatus under natural conditions. (Katz)
W75-09670

**SELENIUM TOXICITY ON THE EARLY LIFE STAGES OF ZEBRAFISH (BRACHYDANIO RERIO),**
Ottawa Univ (Ontario). Dept. of Biology.
A. J. Niimi, and Q. N. Laham.
Journal of the Fisheries Research Board of Canada, Vol 32, No 6, p 803-806, June 1975; 2 tab, 18 ref.

Descriptors: Fish, *Growth stages, *Embryonic growth stage, *Larvae, *Inorganic compounds, Groundwater, Surface water, Environmental effects, Fish eggs, Animal physiology, Aquaria, Lethal limit, *Toxicity, Mortality, Laboratory tests, Water pollution effects.
Identifiers: *Selenium, *Zebrafish, Brachdanio rerio, Fish embryology.

Embryos at four stages of development and newly hatched larvae of zebrafish (Brachydanio rerio) were exposed to selenium concentrations between 0.5 and 10 micrograms per milliliter to establish toxic levels. Embryo mortality was negligible at all selenium concentrations. Following hatching, mortality among the larvae sharply increased at concentrations of 3 micrograms per milliliter or greater irrespective of the embryonic stage when exposed. For most treatments, over 90% of the larvae died within 10 days of hatching. The mortality rate for larvae exposed to selenium after hatching was slightly less. (Katz)
W75-09671

**EFFECTS OF KOKANEE SALMON (ONCORHYNCHUS NERKA) DECOMPOSITION ON THE ECOLOGY OF A SUBALPINE STREAM,**
California Univ., Davis. Div. of Environmental Studies.
S. E. Richey, M. A. Perkins, and C. R. Goldman.
Journal of the Fisheries Research Board of Canada, Vol 32, No 6, p 817-820, June 1975. 2 fig, 14 ref.

Descriptors: *Salmonids, *Cycling nutrients, *Decomposing organic matter, *Primary productivity, *Food chains, *Food webs, *Biomass, *Spawning, *Phosphorus, Streamflow, Ecosystems, Life cycles, Sampling, Plankton, Downstream, Upstream, Water pollution effects.
Identifiers: *Kokanee salmon, Oncorhynchus nerka, *Salmon carcasses, Autotrophs, Heterotrophs.

The role of kokanee salmon (Oncorhynchus nerka) carcass decomposition in the nutrient cycles and energy flow of a subalpine stream was investigated during a season (1970-1971) of high spawner abundance and a season (1972-1973) of low spawner abundance with a December storm flushing the stream of carcasses. Primary production, periphyton biomass, heterotrophic activity, and nutrient concentrations were greater downstream than upstream during the peak carcass decomposition of 1971, whereas they were the same at other times of that year and in 1972-73. Calculations showed that upstream-downstream differences in phosphate could be accounted for by the salmon carcasses. (Katz)
W75-09672

**THE BOTTOM FAUNA OF CHINA CLAY WASTE DEPOSITS IN MEVAGISSEY BAY,**
Otago Univ., Portobello (New Zealand). Marine Biological Station.
P. K. Probert.
Journal of the Marine Biological Association of the United Kingdom, Vol 55, p 19-44, 1975. 10 fig, 4 tab, 67 ref.

Descriptors: *Sediments, *Mine wastes, *Industrial wastes, *Benthic fauna, Water pollution effects, Environmental effects, Benthos, Silts, Clays, Sampling, Distribution, Mollusks, Worms, Biological communities, Water pollution control.
Identifiers: *China Clay waste, Polychaetes, Echinoderms, *New Zealand, Mevagissey Bay(NZ).

A survey of the infaunal macrobenthos of fine-grained china clay waste deposits in Mevagissey Bay, Cornwall, was carried out before the cessation of these discharges. The results are compared with earlier studies in the bay and the grosss structure and extent of the bottom fauna associations are described, from which it is hoped that major post-pollution changes may be followed. The observed faunal impoverishment in the nearshore regions of the bay is attributed to sediment instability resulting from high rates of deposition combined with certain physical properties of the sediment preventing the establishment of those species, especially tubicolous polychaetes, which tend to bind the sediment and make it more suitable for colonization by other benthic organisms. (Katz)
W75-09673

**EFFECT OF DDT ON DISCRIMINATING ABILITY OF RAINBOW TROUT (SALMO GAIRDNERI),**
Alberta Univ., Edmonton. Dept. of Zoology.
P. C. McNicholl, and W. C. MacKay.
Journal of the Fisheries Research Board of Canada, Vol 32, No 6, p 785-788, June 1975.

Descriptors: *Organoleptic properties, *DDT, *Light intensity, *Chlorinated hydrocarbon pesticides, *Salmonids, *Rainbow trout, Lethal limit, Fish physiology, Water pollution effects.
Identifiers: *LD50, *Visual discrimination, Linear equations.

Rainbow trout, Salmo gairdneri, trained to discriminate between a bright (723 lx) and a dim (22 lx) light were tested to determine the minimum difference in light intensity they could distinguish before and 71 h after being fed DDT orally at 0,30,50 and 80% of the LD50 dose. Discriminating ability decreased linearly with increased dose, while performance and retention remained unaffected. (Katz)
W75-09674

**A COMPARATIVE STUDY OF THE TOLERANCE OF TWO FRESHWATER PLANARIANS, DUGESIA TIGRINA AND POLYCELIS FELINA, TO LOW OXYGEN LEVELS, (ETUDE COMPARATIVE DE LA TOLERANCE AUX BASSES TENSIONS D'OXYGENE CHEZ DEUX PLANAIRES D'EAU DOUCE, DUGESIA TIGRINA ET POLYCELIS FELINA),**
Lyon 1 Univ., Villeurbanne (France). Departement de Biologie et Zoologie.
R. Russier-Delolme.
Annales de Limnologie, Vol 10, No 3, p 311-322 1974. 1 fig, 3 tab, 15 ref. English abstract

Descriptors: *Aquatic animals, *Dissolved oxygen, *Resistance, *Oxygen demand, Water properties, Turbidity, Adaption, Speciation, Environmental effects, Water pollution effects.
Identifiers: *Planarians, *Dugesia tigrina, *Polycelis felina, Comparative studies.

A closed-bottle method was used for determining the lethal level of oxygen for two fresh-water Triclads, Dugesia tigrina, and Polycelis felina, in stagnant as well as in stirred water. The lethal level was about 0.30 mg if dissolved oxygen per liter. However it varies significantly according to the species and to whether the water is stirred or not. At low oxygen concentrations, both species reduce considerably their metabolism, i.e. they adapt to the low oxygen levels. D. tigrina does so to a greater extent than P. felina. D. tigrina also survives 6 times longer than P. felina in such unfavorable conditions. (Katz)
W75-09675

**AVOIDANCE OF FENITROTHION BY GOLDFISH (CARASSIUS AURATUS),**
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
E. Scherer.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 4, p 492-496, April 1975. 1 fig, 1 tab, 6 ref.

Descriptors: *Fish behavior, *Pesticides, *Bioassay, Laboratory tests, Toxicants, Environmental effects, Water pollution effects, Toxicity, *Lethal limit, Pollutant identification.
Identifiers: *Sublethal effects, Carassius auratus, *Fenitrothion, *Avoidance(Fish), *Goldfish.

Goldfish (Carassius auratus) avoided water containing the pesticide fenitrothion. The response was graded over the tested concentration range of five orders of magnitude. The threshold was around 10 micro-grams per liter to 3.5 X 10-8M, which was well below the incipient lethal level. (Katz)
W75-09677

**THE EFFECTS OF OILS ON GROWTH OF FRESHWATER PHYTOPLANKTON,**
Polytechnic of Central London (England). Dept. of Life Sciences.
V. N. Dennington, J. J. George, and C. H. E. Wyborn.
Environmental Pollution, Vol 8, No 3, p 233-237, April 1975. 2 fig, 2 tab, 13 ref.

Descriptors: *Phytoplankton, *Euglena, *Scenedesmus, *Primary productivity, *Growth rates, *Oil pollution, Populations, Sampling, Photosynthesis, Food chains, Water pollution effects, Cultures, Metabolism.
Identifiers: Freshwater phytoplankton, *Euglena gracilis, *Scenedesmus quadricauda, Diesel oils, Lubricating oils.

Experiments investigating the effects of oils on pure cultures of freshwater algae show that Euglena gracilis grew in cultures containing up to 10% diesel and lubricating oils. The growth of Scenedesmus quadricauda was reduced by lubricating oil and halted by the presence of diesel oil. It was suggested that oils may affect photosynthetic metabolism in sensitive species. (Katz)
W75-09678

**MERCURY IN SEALS, TERRESTIAL CARNIVORES AND PRINCIPAL FOOD ITEMS OF THE INUIT, FROM HOLMAN, N.W.T.,**
Fisheries and Marine Service, Ste. Anne de Bellevue (Quebec). Arctic Biological Station.
For primary bibliographic entry see Field 5A.
W75-09679

**EFFECTS OF PCB ON INTERSPECIFIC COMPETITION IN NATURAL AND GNOTOBIOTIC PHYTOPLANKTON COMMUNITIES IN CONTINUOUS AND BATCH CULTURES,**
State Univ. of New York, Stony Brook. Marine Biology Program.
N. S. Fischer, E. J. Carpenter, C. C. Remsen, and C. F. Wurster.
Microbial Ecology, Vol 1, No 1, p 39-50, 1974. 4 fig, 2 tab, 43 ref.

Descriptors: *Polychlorinated biphenyls, *Diatoms, Competition, *Algae, *Phytoplankton, Methodology, *Analytical techniques, Pesticides, Chlorinated hydrocarbon pesticides, Laboratory tests, Environmental effects, Primary productivity, Water pollution effects.
Identifiers: *Thalassiosira pseudonana, *Gnotobiotic communities.

The toxicity of PCBs to the diatom Thalassiosira pesudonana grown in pure and mixed cultures was greatest when in competition with other species. Continuous cultures were superior to batch cultures for studying competitive interaction, and PCB caused greater alteration of species composition in continuous cultures than in batch cultures. Normal phytoplankton communities, maintained in continuous culture, responded to PCB stress the same as did gnotobiotic communities, with T. pseudonana showing similar responses in both communities. A PCB concentration of 0.1 microgram g/l did not affect algal growth in pure cultures but caused substantial disruption of continuous culture communities. The possible impact of PCB pollution on natural phytoplankton communities is discussed. (Katz)
W75-09680

**EFFECT OF TEMPERATURE ON ACCUMULATION OF METHYLMERCURIC CHLORIDE AND P,P' DDT BY RAINBOW TROUT (SALMO GAIRDNERI),**
National Marine Fisheries Service, Ann Arbor, Mich. Great Lakes Fishery Lab.
R. E. Reinert, L. J. Stone, and W. A. Willford.
Journal of the Fisheries Research Board of Canada, Vol 31, No 10, p 1649-1652, October, 1974. 1 fig, 1 tab, 10 ref.

Descriptors: Temperature, *Heated water, *Rainbow trout, *Pesticide residues, *DDT, *Mercury, Laboratory tests, Bioassay, Analytical techniques, Methodology, Gas chromatography, DDE, Metabolism, Environmental effects, Water pollution effects, Thermal pollution, Water temperature.
Identifiers: Bioaccumulation, *Methylmercuric chloride.

Amounts of mercury and DDT residues accumulated from water by yearling rainbow trout in the laboratory increased as water temperature increased. Fish exposed to methylmercuric chloride at concentrations of 234-263 parts per trillion for 12 weeks at 5,10 and 15C accumulated 1.19, 1.71 and 1.96 ppm; fish exposed to DDT at concentrations of 133-176 parts per trillion accumulated 3.76, 5.93 and 6.82 ppm. Concentrations of mercury accumulated by the fish were significantly different at each of the three temperatures, and the concentrations of DDT were significantly different at 5, 10 and 15C. (Katz)
W75-09681

**POND SNAIL EGGS AS AN INDICATORY MATERIAL FOR WATER POLLUTION BIOASSAY: PRELIMINARY EXPERIMENTS, (IN JAPANESE),**
Doshisha Univ., Kyoto (Japan). Biological Lab.
N. Kobayashi.
The Japanese Journal of Limnology, Vol 35, No 4, p 155-161, October 1974. 2 fig, 4 tab, 11 ref. English abstract.

Descriptors: *Monitoring, *Bioassay, *Bioindicators, Water quality control, *Snails, *Inhibition water pollution effects, Pollutant identification, Water quality, Laboratory tests, Growth rates mercury, Cadmium, Copper, Zinc, Chromium, Lead, Metals, Polychlorinated biphenyls, *Pollutant identification.
Identifiers: *Radix auricularius japonicus, Japan(Osaka).

Bioassays were made to measure the water pollution around Osaka city using pond snail (Radix auricularius japonicus) eggs as an indicator organism. No cleavage of eggs occurred in the heavily polluted sewage disposal plant discharge. Heavy metals stop, retard or deform development, as do some other chemicals. The advantages of using pond snail eggs as a bioassay organism are simplicity, speed, high sensitivity, uniformity and accuracy. (Katz)
W75-09682

**USE OF SODIUM PENTACHLOROPHENATE AND DEHYDROABIETIC ACID AS REFERENCE TOXICANTS FOR SALMONID BIOASSAYS,**
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
J. C. Davis, and R. A. W. Hoos.
Journal of the Fisheries Research Board of Canada, Vol 32, No 3, p 411-416, March 1975. 2 tab, 12 ref.

Descriptors: Toxicity, *Salmonids, *Bioassay, Standards, Laboratory tests, Rainbow trout, Trout, Salmon, *Toxicants, Lethal limit, Water temperature, Hardness(Water), Hydrogen ion concentration, Testing, Laboratory tests, Sockeye salmon, Pollutant identification.
Identifiers: *Sodium pentachlorophenate, Reference toxicants, *Dehydroabietic acid, Coho salmon, *Toxicity tests, Oncorhynchus ssp.

Results of an interlaboratory bioassay standardization exercise involving seven independent fish bioassay laboratories in British Columbia are presented. Toxicity of standard solutions of sodium pentachlorophenate and dehydroabietic acid was determined in freshwater static bioassays with yearling rainbow trout (Salmo gairdneri), coho salmon (Oncorhynchus kisutch) and sockeye (Oncorhynchus nerka) salmon. Reported LC50's for the three species ranged from 37 to 130 ppb for sodium pentachlorophenate and 1.03-2.14 ppm for dehydroabietic acid. In general, test results for individual species and toxicants were fairly consistent and major disparities could be explained in some instances by variations in physical and chemical characteristics of the bioassay such as water temperature, hardness or pH. Fish size and condition factor appeared to have little effect on apparent toxicity over the ranges tested. The usefulness of reference toxicants for standardizing bioassays is emphasized and suggestions are made for improved test procedures and increasing accuracy of results. Guidelines for toxicity tests should include the use of reference toxicants as a means of standardizing bioassay results. (Katz)
W75-09683

**EFFECT OF POWER PLANT CHLORINATION ON ESTUARINE PRODUCTIVITY,**
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
J. L. Fox, and M. S. Moyer.
Chesapeake Science, Vol 16, No 1, p 66-68, March 1975. 2 fig, 22 ref.

Descriptors: *Chlorination, *Water purification, *Cooling water, *Powerplants, Water treatment, Control, Primary productivity, Chlorine, *Water pollution effects, *Florida.
Identifiers: *Biological fouling, Crystal River powerplant(Fla).

Power plants chlorinate their cooling waters to prevent biological fouling of condenser tube walls. The effects of chlorine on in situ net primary productivity in the discharge waters of a power plant at Crystal River, Florida were examined. Primary productivity values decreased an average of 57% due to plant passage and chlorination. in the absence of chlorine, the average decrease was 13%. (Katz)
W75-09684

**EFFECTS OF LOGGING ON WATER TEMPERATURE AND DISSOLVED OXYGEN IN SPAWNING BEDS,**
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
N. H. Ringler, and J. D. Hall.
Transactions of the American Fisheries Society, Vol 104, No 1, p 111-121, 1975. 8 fig, 5 tab, 28 ref.

Descriptors: *Fish reproduction, *Water temperature, *Dissolved oxygen, *Spawning, *Lumbering, Streams, *Salmonids, Environmental effects, Salmon, Trout, Ecosystems, Sediments, Commercial fishing, Water quality, Temperature, Life cycles, Fry, Mortality, *Clearcutting, Water pollution effects.
Identifiers: *Coho salmon, Cutthroat trout, Intragravel water, Survival.

The temperature and dissolved oxygen content of intragravel water were measured in three Oregon coastal streams between June 1968 and June 1969. In 1966, the watershed of one stream had been completely clear-cut, and that of a second stream partially clearcut in staggered settings. A third watershed was left unlogged. Clearcut logging resulted in increased temperature of intragravel water in salmon and trout spawning beds and decreased concentrations of dissolved oxygen. The changes were related largely to reduced forest cover over the stream surface and to deposition of fine sediments in the gravel. No serious reduction in survival to emergence of coho salmon occurred along with the observed changes in temperature or dissolved oxygen. A decrease in the resident population of cutthroat trout after logging may have been related to these changes. (Katz)
W75-09685

**DDT AND THE RUGOPHILIC RESPONSE OF SETTLING BARNACLES BALANUS IMPROVISUS,**
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
N. Meith-Avcin.
Journal of the Fisheries Research Board of Canada, Vol 31, No 12, p 1960-1963, December 1974, 4 fig, 1 tab, 5 ref.

Descriptors: *Crustaceans, *Organic pesticides, *DDT, Laboratory studies, Fish physiology, Water pollution effects.
Identifiers: Balanus improvisus, *Rugophilic response, *Barnacles, *Cyprids, Tactile discrimination, Glass settling plates.

Treatment of glass-settling plates with DDT generally resulted in lowered settlement densities of the cyprids of Balanus improvisus and lowered indices of preference for roughened surfaces, indicating that DDT interferes with the cyprids' rugophilic response pattern, particularly tactile discrimination, to settlement surfaces. (Katz)
W75-09686

**ACUTE TOXICITY OF NITRITE TO RAINBOW TROUT (SALMO GAIRDNERI),**
Montana State Univ., Bozeman. Fisheries Bioassay Lab.
R. C. Russo, C. E. Smith, and R. V. Thurston.
Journal of the Fisheries Research Board of Canada, Vol 31, No 10, p 1653-1655, October 1974. 1 fig, 1 tab, 10 ref.

Descriptors: *Trout, *Salmonids, *Bioassay, *Lethal limit, *Nitrites, *Toxicity, Water pollution sources, Sewage, Nitrification, Laboratory, studies, Fish physiology, Water pollution effects.
Identifiers: Bioaccumulation, *Methemoglobinemia, Tissue analysis.

Flow-through bioassays on the acute toxicity of nitrite to rainbow trout (Salmo gairdneri) of four different sizes (2-235g) showed median lethal concentration (LC50) values for 4 days ranging from 0.19 to 0.39 mg/liter NO2-N. For 12-g rainbow trout the asymptotic LC50 was 0.14-0.15 mg/liter NO2 after 8 days. Resulting methemoglobinemia due to the exposure of salmonids to nitrite was discussed. (Katz)
W75-09687

**THE EFFECTS OF LAPSED TIME SINCE FEEDING UPON THE TOXICITY OF ZINC TO FISH,**
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. Cairns, Jr., W. H. van der Schalie, and G. F. Westlake.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 3, p 269-274, March 1975. 1 fig, 2 tab, 5 ref.

Descriptors: *Bioassay, Methodology, *Laboratory tests, *Toxicity, *Zinc, *Time, *Toxicants, Mortality, Pollutants, Analytical techniques, Fish, Standards, Water pollution effects.
Identifiers: *Carassius auratus, Fishfeeding.

Fish bioassays advise a period of no feeding before exposing the fish to potential toxicants. The validity of this procedure was tested by determining the effects of different lapsed times between feeding and placement in a toxicant. Fish were placed in water containing a lethal concentration of zinc at specific times after feeding from 0-72 hours. Time until death was recorded for each fish. Statistical analysis revealed a slight increase in survival time as the interval between feeding and exposure to zinc increased. This did not appear to be of sufficient magnitude to support the standard acute bioassay requirement that fish not be fed for 24-48 hours prior to their exposure to a toxicant. (Katz)
W75-09688

**DDT RESIDUES IN EUPHAUSIIDS IN THE UPPER ESTUARY OF THE GULF OF ST. LAWRENCE,**
Bedford Inst., Dartmouth (Nova Scotia).
D. C. Darrow, S. Guildford, and D. D. Sameoto.
Journal of the Fisheries Research Board of Canada, Vol 32, No 2, p 310-314, February 1975.

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, *Zooplankton, Aquatic populations, *Food chains, *Primary productivity, Analytical techniques, Equations, Lipids, *Pesticide residues.
Identifiers: *Euphausiids, Thysanoessa raschii, Thysanoessa inermis, Meganyctiphanes norvegica, *Gulf of St. Lawrence.

No significant variation was found in organochlorine residue levels between different stations in an area from the Saguenay River to the end of the Gaspe' Peninsula in the Gulf of St. Lawrence for the euphausiids Thysanoessa raschii, T. inermis and Meganyctiphanes norvegica. Significant differences were found between the concentration of organochlorine residues for M. norvegica and the Thysanoessa species, but there was no difference between the two Thysanoessa species. Significantly lower values for percent lipid were found in T. inermis and T. raschii between June 1973 and May 1974 samples, but the total amount of organochlorine residues did not change. This suggests that these species do not lose p,p'-DDT when they metabolize lipids for energy or the production of gonad material. (Katz)
W75-09690

**UPTAKE, METABOLISM AND DISTRIBUTION OF DDT IN ORGANS OF THE BLUE CRAB, CALLINECTES SAPIDUS,**
Virginia Inst. of Marine Science, Gloucester Point.
P. F. Sheridan.
Chesapeake Science, Vol 16, No 1, p 20-26, March 1975. 3 tab, 41 ref.

Descriptors: *DDT, DDE, DDD, *Pesticide residues, *Bioassay, *Crabs, Commercial shellfish, *Chlorinated hydrocarbon pesticides, *Metabolism, *Virginia, *Absorption, Distribution, Water pollution effects.
Identifiers: Tissue analysis, Hepatopancreas, Gonads, *Bioaccumulation, Callinectes sapidus, *York River(Virginia).

Metabolites of DDT were detected in five out of six major organs of adult blue crabs collected from the York River, Virginia during the summer of 1972. Total residue concentrations were highest in the hepatopancreas (55-217 ppb) and below the limit of detection in the heart and associated serum. Concentrations in pooled gonad samples (ovaries and testes) were variable (9-67 ppb) and correlated with the development stage of the ovaries. Residue levels were low in the gills (6-31 ppb), backfin muscles and edible claw (1-13 ppb). DDT itself was not detected in any of the organs. Adult blue crabs were exposed for 12 hours to 0.01, 0.1 and 1.0 ppm DDT in water and monitored with respect to metabolism and distribution of residues. Metabolic transformation of DDT to DDD and DDE occurred immediately, regulated by the hepatopancreas. (Katz)
W75-09691

**DEPOSITION OF ZINC AND CADMIUM BY MARINE BACTERIA IN ESTUARINE SEDIMENTS,**
Geological Survey, Corpus Christi, Tex.
C. W. Holmes, and C. J. McLerran.
Limnology and Oceanography, Vol 19, No 3, p 998-1001, 1974. 2 fig, 8 ref.

Descriptors: *Texas, Bacteria, *Aquatic bacteria, *Estuaries, *Heavy metals, Translocation, *Zinc, *Cadmium, *Sediments, *Radioactive isotopes, Growth cycles, Populations, Cultures, Metabolism, Growth rates, Environmental effects, Laboratory tests, Water pollution effects.
Identifiers: Bioaccumulation, Corpus Christi Harbor(Tex).

Mixed cultures of marine bacteria isolated from the sediments of Corpus Christi Harbor, Texas, were examined for their ability to assimilate or precipitate radioactive zinc and cadmium from solution. Test data indicate that during summer, when bacterial activity is at a maximum, the bacteria and their metabolic byproducts play a significant role in the removal of zinc and cadmium from seawater and their subsequent deposition [illegible] marine sediments. (Katz)
W75-09692

**EFFECT OF ZINC ON GROWTH OF THE MI[illegible] NOW PHOXINUS PHOXINUS,**
Umea Univ (Sweden) Dept. of Biology
B. E. Bengtsson
Oikos, Vol 25, No 1, p 370-373, 1974. 2 fig, 2 t[illegible] 15 ref

Descriptors: Freshwater fish, *Bioassay, *Growth rates, *Growth stages, *Fish physiolog[illegible] *Nitrates, Environmental effects, Biochemistr[illegible] Laboratory studies, Water pollution effect[illegible] Metabolism, Pesticides, *Zinc.
Identifiers: *Phoxinus phoxinus, *Minnows, *Zi[illegible] nitrate, Bioaccumulation, Tubifex, Comparati[illegible] studies, Sublethal dosages.

Reduced growth occurred in yearlings and adul[illegible] of the minnow Phoxinus phoxinus following exp[illegible] sure to zinc nitrate in fresh water over a 150-da[illegible] period. Yearlings were more sensitive than adul[illegible] and showed reduced growth at 0.13 ppm zin[illegible] (corresponding to 1/25 of the 96-hr. LC50[illegible] Supressed growth was associated with reduce[illegible] Tubifex consumption. Both yearlings and adult[illegible] showed a pronounced initial response. (Katz)
W75-09693

**CHANGES IN BLOOD CHEMISTRY OF JU[illegible] VENILE STEELHEAD TROUT, SALMO GAIRD[illegible] NERI, FOLLOWING SUBLETHAL EXPOSURE[illegible] TO NITROGEN SUPERSATURATION,**
National Marine Fisheries Service, Seattle, Wash.
T. W. Newcomb.
Journal of the Fisheries Research Board of Canada, Vol 31, No 12, p 1953-1957, December 1974. 1 fig, 28 ref.

Descriptors: *Salmonids, *Trout, *Nitrogen, *Argon, *Tissue analysis, *Fish physiology, *Chemical analysis, Environmental effects, Laboratory tests, Dissolved oxygen, Stress, Water pollution effects.
Identifiers: *Blood chemistry, *Swimming performance, Sublethal saturation, Gas embolism.

Groups of juvenile steelhead trout (Salmo gairdneri) were exposed for 35 days to various (103, 105, 110 and 116%) sublethal nitrogen plus argon saturations. Pooled serum samples were analyzed for Ca, Na, PO4, K, Cl, albumin, total protein, cholesterol, alkaline phosphatase, glucose, urea, uric acid, total biblirubin, lactate dehydrogenase, and serum glutamic oxalacetic transaminase. An increase in serum potassium and phosphate, and a decline in serum albumin, calcium, cholesterol, total protein and alkaline phosphatase were noted in steelhead exposed to 116% nitrogen (N2+Ar) saturation (total atmospheric gas saturation 110%). No major changes in blood chemistry were observed at nitrogen saturations of 110% or less. (Katz)
W75-09694

**THE EFFECT OF CONCENTRATION OF SUSPENSION AND INERT MATERIAL ON THE ASSIMILATION OF ALGAE BY THREE BIVALVES,**
Newcastle-upon-Tyne Univ. (England). Dove Marine Lab.
R. L. Foster-Smith.
Journal of the Marine Biological Association of the United Kingdom, Vol 55, p 411-418, 1975. 4 fig, 4 tab, 7 ref.

Descriptors: *Suspended solids, *Crustaceans, *Selectivity, *Filtration, Suspension, Mussel, Laboratory tests, Algae, Feeding rates, Analytical techniques, Water pollution effects.
Identifiers: Mytilus edulis, Cerastoderma edule, Venerupis pullastra, Pallial organs, Assimilation efficiency, Gills.

The effect of concentration of food in suspension on assimilation efficiences was investigated using Mytilus edulis, Cerastoderma edule, and Venerupis pullastra. Assimilation efficiency was inversely related to the total amounts of Phaeodactylum ingested over periods of up to 3 h rather than related directly to concentration of suspension or rates of ingestion. The pallial organs did not select Phaeodactylum in preference to inorganic particles (alumina), but once ingested the alumina had little effect on the proportion of Phaeodactylum ingested. (Katz)
W75-09695

**THE ACCUMULATION OF FLUORIDE BY MARINE AND INTERTIDAL ANIMALS,**
Newcastle-upon-Tyne Univ. (England). Dept. of Plant Biology.
D. A. Wright, and A. W. Davison.
Environmental Pollution, Vol 8, No 1, p 1-13, January 1975. 1 fig, 9 tab, 22 ref.

Descriptors: *Toxicity, *Aluminum, *Industrial wastes, Invertebrates, *Bioassay, *Marine animals, Intertidal areas, Mollusks, Mussels, Baseline studies, Public health, Estuaries, Fluorides.
Identifiers: *Bioaccumulation, *Mytilus edulis.

Preliminary toxicity tests with fluoride were carried out on a number of marine invertebrates. Evan at unnaturally high ambient fluoride levels, no adverse effects were seen, except possibly in the case of the filter-feeding mollusc Mytilus edulis. In both invertebrates and vertebrates, fluoride was accumulated in skeletal structures. There was little or no accumulation in soft, edible tissues, with the exception of fish skin. (Katz)
W75-09697

**EFFECTS OF THIOUREA TREATMENT ON SEXUALLY MATURING AND GONADECTOMIZED MALE SOCKEYE SALMON (ONCORHYNCHUS NERKA),**
Fisheries and Marine Service, Vancouver (British Columbia). Vancouver Lab.
J. R. McBride, and A. P. Overbeeke.
Journal of the Fisheries Research Board of Canada, Vol 32, No 1, p 11-19, January 1975. 4 fig, 1 tab, 26 ref.

Descriptors: *Sockeye salmon, *Growth stages, *Gonads, *Bioassay, *Fish physiology, Biochemistry, Sexual maturity, Salmonids, Laboratory tests, Water pollution effects.
Identifiers: *Thyroid, *Pituitary gland, Cell types, *Tissue analysis, Gonadectomized fish, *Thiourea, Thyrotrops, Negative feedback, PAS-positive cells, Mycoid cells.

Adult male sockeye salmon (Oncorhynchus nerka) in the final stage of sexual maturation were treated with thiourea for periods of 7-14 weeks which produced strong histological thyroid stimulation but no visible effect on spermatogenesis or development of secondary sexual characteristics. Thiourea inhibited the increase in thickness of the skin and induced changes in the pars distalis of the pituitary gland, involving several cell types, including retardation of gonadotrop development. In gonadectomized fish, thiourea affected neither the skin nor the interrenal tissue. It caused a marked increase in the height of the thyroid epithelium correlated with hypertrophy, degranulation, and some vacuolization of PAS-positive cells in the dorso-caudal area of the proximal pars distalis of the pituitary gland. (Katz)
W75-09699

**BEHAVIOR OF JUVENILE COHO SALMON (ONCORHYNCHUS KISUTCH) EXPOSED TO SUMITHION (FENITROTHION), AN ORGANOPHOSPHATE INSECTICIDE,**
British Columbia Dept. of Recreation and Conservation, Victoria. Fish and Wildlife Branch.
C. J. Bull, and J. E. McInerney.
Journal of the Fisheries Research Board of Canada, Vol 31, No 12, p 1867-1872, December 1974. 2 fig, 22 ref.

Descriptors: *Salmon, *Organophosphorus pesticides, *Insecticides, *Fish behavior, *Bioassay, *Fish physiology, *Salmonids, *Water pollution effects, Laboratory tests, Environmental effects.
Identifiers: Oncorhynchus kisutch, *Coho salmon, *Sumithion, Locomotion, Comfort behavior.

Coho salmon, Oncorhynchus kisutch, were exposed to sublethal concentrations of the organophosphate pesticide Sumithion. After 2-hr exposure at 0.48 and 0.75 ppm, behavior involving locomotion ceased, except coughing which increased. In the 0-0.23 ppm range social behavior and feeding decreased. Feeding was depressed at concentrations as low as 0.1 ppm. (Katz)
W75-09700

**EFFECT OF CONSTANT TEMPERATURE ON GROWTH RATES OF PUMPKINSEED SUNFISH (LEPOMIS GIBBOSUS),**
Queen's Univ., Kingston (Ontario). Dept. of Zoology.
E. Pessah, and P. M. Powles.
Journal of the Fisheries Research Board of Canada, Vol 31, No 10, p 1678-1682, October 1974. 4 fig, 1 tab, 13 ref.

Descriptors: *Sunfishes, *Growth rates, *Water temperature, Bioassay, Thermal pollution, Aquiculture, Laboratory studies, Environmental effects, Growth stages, Fish physiology, Metabolism, Thermal pollution, Water pollution effects.
Identifiers: *Pumpkinseed sunfish, Lepomis gibbosus, *Growth acclimation, Growth model.

Relative growth rates of fall-captured Lepomis gibbosus exposed to six constant temperature regimes (5-30C) were clearly separable for the first six weeks. Thereafter, growth declined, becoming uniform between 15 and 30C, and linear and negative at 10 and 5C, respectively. A growth model between 15 and 30C, emerged as follows: 0-4 wk, rapid; 5-10 wk, intermediate; 11-16 wk, low uniform. The initial high followed by the low uniform stanza suggests 'growth acclimation' took place. (Katz)
W75-09701

**ORGANOCHLORINE RESIDUE LEVELS IN ARCTIC RINGED SEALS: VARIATION WITH AGE AND SEX,**
Bedford Inst., Dartmouth (Nova Scotia).
R. F. Addison, and T. G. Smith.
Oikos, Vol 25, No 3, p 335-377, 1974. 2 tab, 8 ref.

Descriptors: *Pesticide residues, *DDT, *Lipids, *DDE, *Polychlorinated biphenyls, Chlorinated hydrocarbon pesticides, Pesticides, Aging(Biological), Path of pollutants, Mammals, Age, Water pollutant effects.
Identifiers: *Arctic ringed seals, Tissue analysis, Bioaccumulation, Sex.

Residues of DDT, DDE and PCB's were found in blubber samples of Canadian Arctic ringed seals Pusa hispida at concentrations in the low ppm range. In males, residue concentration increased with age, slopes of the curves relating DDE and DDT to age differed significantly ($P<0.01$) from zero, but the relationship between PCB and age was weaker ($P<0.05$). In females, these relationships were absent. (Katz)
W75-09702

**EFFECTS OF METAL-MINE DRAINAGE ON WATER QUALITY IN SELECTED AREAS OF COLORADO, 1972-73,**
Geological Survey, Denver, Colo.
R. E. Moran, and D. A. Wentz.
Colorado Water Resources Circular No 25, 1974. 250 p, 31 fig, 22 tab, 55 ref, append. Published by Colorado Water Conservation Board, Denver.

Descriptors: *Path of pollutants, *Water pollution sources, *Mine drainage, *Mine wastes, *Colorado, Acid mine water, Mine water, Mining, Spoil banks, Waste dumps, Water pollution effects, Water quality, Water chemistry.

In 18 mining areas in Colorado, significant amounts of acidity and metals are added to surface waters by drainage from mines and associated tailings. In the vicinity of Kerber Creek, acid drainage from an abandoned adit flows through a tailings pile and then into the stream; metal contributions from the tailings are greater than those from the adit. Stream pH's increase below the drainage due to dilution and neutralization of the acid by bicarbonate. Dissolved metal concentrations decrease due to dilution, chemical precipitation, and probably adsorption onto ferric hydroxide particles. Total metal concentrations in streams of the Kerber Creek area decrease downstream due to dilution and to settling of the precipitates. Manganese and zinc remain predominantly in the dissolved phase: when they do precipitate they settle out rapidly. Cadmium, copper, iron, lead, and nickel gradually shift from the dissolved to the suspended fraction, indicating a different removal process. Both total and dissolved metal loads in streams of the Kerber Creek area are greater during high flow than during low flow, owing to flushing of water from mines and tailings piles, erosion of tailings, and scouring of chemical precipitates from the stream bottom. (Knapp-USGS)
W75-09712

**EVALUATION OF ENVIRONMENTAL IMPACT OF LANDFILLS,**
Wisconsin Univ., Madison.
P. Caffrey, M. David, and R. K. Ham.
Journal of the Environmental Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No EE1, Paper 11119, p 55-69, February 1975. 1 fig, 4 tab, 1 append. NSF Grant GI-29731.

Descriptors: *Landfills, *On-site investigations, *Waste dumps, *Wisconsin, Land management, Waste disposal, Evaluation, Environmental effects, Water quality, Aesthetics, Environmental engineering, Inspection, Water pollution effects.
Identifiers: *Environmental impact, Noise, Vectors, Air quality.

In order to evaluate various refuse recycling and disposal alternatives, it was necessary to evaluate the environmental impact of present disposal methods (landfill). The method used involves evaluating ratings for 20 field factors to determine the effect on six basic environmental parameters. This procedure was used to evaluate 69 sites in Wisconsin. The results showed that land use and esthetics were affected most by landfills, followed by air and water quality with lesser effects on noise and vectors. Further analysis compared average ratings for various types of land disposal sites and showed that city and county sites had less environmental impact than town or village sites and that sanitary sites performed better than open dumps. (Lardner-ISWS)
W75-09761

**PICK UP AND METABOLISM OF DDT, DIELDRIN AND PHOTODIELDRIN BY A FRESHWATER ALGA (ANKISTRODESMUS AMALLOIDES) AND A MICROCRUSTACEAN (DAPHNTA PULEX),**
Illinois Univ., Chicago. Dept. of Biological Sciences.
S. Neudorf, and M. A. Q. Khan.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 4, p 443-450, April 1975. 2 fig, 3 tab, 27 ref.

Descriptors: *DDT, *DDD, *Pesticides, *Absorption, Adsorption, *Metabolism, *Algae, *Daphnia, *Dieldrin, *Bioassay, DDE, Aquatic

animals, Crustaceans, Water fleas, Carbon radioisotopes, Chlorinated hydrocarbon pesticides, Insecticides, Laboratory tests, Food chains, Water pollution effects.
Identifiers: *Photodieldrin, Bioaccumulation, *Ankistrodesmus amalloides, Daphnia pulex.

The uptake and metabolism of DDT, dieldrin and photodieldrin in a fresh water food chain was investigated with the use of 14C-labeled pesticides. The fresh water alga, Ankistrodesmus amalloides, concentrated 2.5 times more DDT than dieldrin and ten times more DDT than photodieldrin. This was attributed to the solubilities of the pesticides. The time for maximum absorption was 120 minutes for DDT, 30-60 minutes for dieldrin and 30 minutes for photodieldrin. The alga metabolized DDT to both DDE (3.5%) and DDD (0.8%). The fresh water flea, Daphnia pulex, shows a 13.6% conversion of DDT to DDE. (Katz)
W75-09805

**AQUATIC INSECT COMMUNITIES OF THE TENRYU RIVER, THEIR COMPOSITION, BIOTIC INDEX AND SEASONAL CHANGE, (IN JAPANESE),**
Suzaka High School (Japan).
T. Komatsu.
The Japanese Journal of Limnology, Vol 35, No 4, p 173-184, October 1974. 12 fig, 2 tab, 16 ref. (English abstract).

Descriptors: *Biological communities, *Aquatic insects, *Insect behavior, *Biorhythms, *Water pollution, Speciation, Waste water, Water quality, Industrial wastes, Seasonal, Microenvironment, Data collections, Stations.
Identifiers: *Biotic index, Tenryu River(Japan), *Japan.

During the year 1968-1969 the seasonal change of aquatic insect communities and the biotic index were studied in the Tenryu River, Central Japan, including an area which had been polluted by pulp plant wastes. Number of species was found to range from 2 to 29. Maximum numbers were attained in May, and minimum in July in relatively clean water. The net-spinning caddis-worm Hydropsche ulmeri predominated the area. (Katz)
W75-09807

**LOSS OF FIVE PESTICIDES FROM CULTURES OF TWENTYONE PLANKTONIC ALGAE,**
Syracuse Univ. Research Corp., N.Y. Life Science Div.
For primary bibliographic entry see Field 5A.
W75-09808

**DIVERSITY OF MARINE INVERTEBRATES IN A THERMAL EFFLUENT,**
Delaware Univ., Lewes. Coll. of Marine Studies.
D. T. Logan, and D. Maurer.
Journal Water Pollution Control Federation, Vol 47, No 3, p 515-523, March 1975. 2 fig, 5 tab, 31 ref.

Descriptors: *Heated water, *Invertebrates, *Biological communities, *Benthos, *Temperature, *Environmental effects, Analytical techniques, *Thermal pollution, Water pollution effects, Effluents, Water quality control, Bioindicators, Pollutants, Marine animals.
Identifiers: *Diversity index, Thermal effluents.

In order to test the hypothesis that species diversity may be used to determine the effect of a pollutant on a community, the effect of a thermal effluent on an estuarine benthic community was recorded. Data showed that an unusually high diversity may exist in a thermal effluent at the mouth of the discharge canal. Differences in species composition, an increase in relative numbers of a pollution indicator organism, and reduction in species number and the total number of organisms in the effluent were noted. This change in community structure was not necessarily reflected by a decrease in diversity. It is premature to rely exclusively on a diversity index when one is evaluating the effect of a pollutant on a community. (Katz)
W75-09809

**DIFFERENTIAL UPTAKE OF ENDOSULFAN BY THE TISSUES OF MYTILUS EDULIS,**
Queen's Univ., Belfast (Northern Ireland). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W75-09810

## 5D. Waste Treatment Processes

**TREATMENT AND SAFE DISPOSAL OF CATIONIC COATING COLORS,**
Merck and Co., Pittsburgh, Pa.
R. H. Windhager.
Preprint, Canadian Pulp and Paper Association, Annual Meeting (Montreal), 1975, p A161-165, 3 fig, 5 ref, 3 tab.

Descriptors: *Pulp wastes, *Cations, *Waste water treatment, *Neutralization, Industrial wastes, Wastes, Waste treatment, Clays, Toxicity, Fish, Water pollution sources, Pollutants, Colorimetry, Analytical techniques, Water pollution treatment, Colorimetry, Polymers, *Waste disposal.
Identifiers: Hydroxyethyl starch, Polyacrylamide, Lignosulfonates, Black liquor, Coating colors, Broke, Repulping, Reprographic papers, Coated papers, Dielectric papers, Electrophotographic papers.

Strongly cationic coating colors are widely used in the manufacture of conductive substrates for Electrofax, dielectric, and other reprographic papers. The long-chain quaternary ammonium polymers give the best conductive response over a wide relative humidity range, and are the products of choice for these applications. Methods of neutralizing cationic coating color wastes with clays, hydroxyethylated starch, polyacrylamide, lignosulfonate derivatives, and kraft black liquor are discussed. Unless these wastes are properly inactivated before discharge into a body of water, they can have a toxic effect on fish life. Two colorimetric tests for detecting non-neutralized cationic polymers in aqueous media are presented. In addition, the optimum repulping conditions for safe reuse of broke coated with cationic polymers are given. (Witt-IPC)
W75-09352

**CLOSING UP A FINE GRADE PAPER MACHINE SYSTEM,**
MacMillan Bloedel Ltd., New Westminster (British Columbia).
For primary bibliographic entry see Field 3E.
W75-09353

**RECYCLING A SOLID WASTE FROM A PAPER PLANT -- SEPARATION OF WOOD FIBER FROM CLAY BY DIFFERENTIAL FLOCCULATION,**
British Columbia Univ., Vancouver. Dept. of Mineral Engineering.
S. R. Rao, and A. A. Winer.
Preprint, Canadian Pulp and Paper Association, Annual Meeting (Montreal), 1975, p B25-30, 7 fig, 6 ref, 3 tab.

Descriptors: *Pulp wastes, *Fibers(Plant), *Clays, *Separation techniques, Flocculation, Cationic adsorption, Water pollution sources, Industrial wastes, Waste treatment, Solid wastes, Sludge, *Recycling, Pollution abatement, Sludge treatment, Water reuse.
Identifiers: Polyacrylamide.

A sludge sample obtained from a fine paper mill was separated into its wood fiber and clay components by flocculation. The best separation was made by means of a differential flocculation technique at pH 8, using a cationic flocculant (a polyacrylamide of low molecular weight). The best products obtained were 81% wood fiber and 19% adhering clay in the flocculated portion, and 78% clay and 22% wood fiber in the unflocculated portion. (Sykes-IPC)
W75-09354

**BIOLOGICAL TREATMENT OF SPENT BISULFITE LIQUOR (TRAITEMENT BIOLOGIQUE DE LA LIQUEUR RESIDUELLE AU BISULFITE),**
S. N. Los, J.-J. Garceau, and G. Pineault.
ATIP (Association Technique de l'Industrie Papetiere) Revue, Vol 29, No 2, p 55-60, 1975. 7 fig, 10 ref, 3 tab.

Descriptors: *Biological treatment, *Pulp wastes, *Sulfite liquors, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Activated sludge, Biochemical oxygen demand, Oxygen requirements, Microorganisms, Carbohydrates, Laboratory tests, Water pollution treatment, Water pollution control, Lignins.
Identifiers: Lignosulfonates, High-yield pulping, Sodium bisulfite.

A laboratory study was made of biological treatment of spent liquor from high-yield sodium bisulfite pulping of wood using a conventional activated sludge system with four continuously operating 10-liter cells arranged in parallel. Data were obtained on levels of BOD removal, production of activated sludge, oxygen consumption, reaction rate, and feed-rate:microorganism, BOD:carbohydrate, and BOD:lignosulfonate ratios. Parameters studied included incoming liquor and sludge concentrations and residence time. BOD reduction ranged from 70-77% for the 4 cells. Oxygen consumption was 0.11 mg oxygen per mg of 5-day BOD removed. The results should be of use in designing an industrial-scale system. (Speckhard-IPC)
W75-09355

**WASTE WATER CLARIFICATION BY FLOTATION (FLOTACIOS SZENNYVIZTISZTITAS),**
K. Engelhoffer.
Papiripar, Vol 18, No 5, p 254-262, 1974. 12 fig.

Descriptors: *Pulp wastes, *Flotation, Water pollution treatment, Water pollution, Water purification, Water pollution sources, Industrial wastes, Wastes, *Waste water treatment, Technology, Economics, Recycling, Pulp and paper industry.
Identifiers: *White water, *Fiber recovery.

White water clarification and fiber recovery by flotation is gaining in importance over traditional sedimentation methods. Technological and economic advantages of flotation are indicated. High-pressure flotation has been used successfully at 4 paper mills both for treating of recycleable water and as final effluent purification. (Brown-IPC)
W75-09356

**PAPER MACHINE CIRCULATION SYSTEMS -- FLOWS, CONSISTENCIES, RECOVERY, AND POLLUTION (LES CIRCUITS DE LA MACHINE A PAPIER -- DEBITS, CONCENTRATIONS, RECUPERATIONS ET POLLUTIONS),**
For primary bibliographic entry see Field 3E.
W75-09357

**USE OF CENTRIFUGES FOR PURIFICATION OF EFFLUENTS (PRIMENENIE TSENTRIFUG DLYA OCHISTKI STOCHNYKH VOD),**
Vyskumny Ustav Papieru a Celulozy, Prague (Czechoslovakia).
J. Trca, and J. Kirchnerova.

Bumaznnaya Promyshlennost, No 2, p 30-31, February, 1975.

Descriptors: *Centrifugation, *Suspended solids, *Dewatering, *Sludge treatment, *Water purification, Foreign research, Foreign countries, Europe, Water pollution treatment, Water pollution control, *Waste water treatment, Efficiencies, Costs, Wood wastes, Water pollution sources, Bark, Pilot plants, Treatment facilities, Sludge, Equipment.
Identifiers: Czechoslovakia.

Pilot plant experiments conducted in Czechoslovakia are described in which centrifuges were used for the removal of suspended solids from effluents and for dewatering muds from biological purification. The best type of centrifuge for this purpose is a continuous apparatus with a screw type discharge of the sediment. It has been reported in the literature that the main drawback of centrifuges is a worsening of the efficiency of purification equipment where the centrifuge filtrate is recycled. This was not observed in the experiments conducted. Also the reported higher costs of centrifugation as compared with filtration were not confirmed. The costs were actually lower. With the use of coagulating agents a dryness of up to 42% can be obtained for sedimentation muds. At present continuous centrifuges with screw discharge are being tested at biological purification plants for dewatering of excess activated sludge and muds formed during purification of effluents from wood barking. The procedure used in the second case is described. It is pointed out that a wider application of this type of purification depends on the development and production of more efficient new centrifuges. (Stapinski-IPC)
W75-09358

**OPTIMUM CONDITIONS FOR CHEMICAL PURIFICATION OF EFFLUENTS (OPTIMAL'NYE USLOVIYA KHIMICHESKOI OCHISTKI STOCHNYKH VOD),**
M. B. Berov, V. M. Shapchenko, and V. V. Lobko.
Bumazhnaya Promyshlennost, No 2, p 17-19, February, 1975. 5 fig.

Descriptors: *Pulp wastes, *Waste water treatment, Industrial wastes, Wastes, Water pollution treatment, Color, Lignin, Hydrogen ion cencentration, Neutralization, Chemical reactions, Water pollution sources, Water pollution, Biological treatment, Lime.
Identifiers: *Aluminum sulfate, Kraft mills, Sodium hydroxide, *Chemical treatment.

Chemical purification of kraft mill effluents, which have been purified biologically, is done by treatment with aluminum sulfate. The best results from the viewpoint of decoloration, lignin separation, and minimum residual aluminum are obtained at a pH of 5.5-5.8. Following decoloration and sedimentation, the purified effluent is neutralized with NaOH or lime to raise the pH to 6.5-7.5, a level required for the effluent discharge. A study of the purification system at a kraft mill showed that the pH of the effluent-aluminum sulfate mixture does not remain stable but increases steadily, although very slowly. The value of the final pH depends linearly on the initial pH; at an initial pH of 5.8 the final pH is 6.2-7.1. This steady increase of the pH is explained by the reaction of H ions with the dissociated (sodium form) hydroxyl groups of lignin. Because of the slowness of the process, the pH reached during the residence time of the effluent in the decoloration-sedimentation zone is not the equilibrium pH. However, it is high enough to eliminate the need for neutralization, provided the initial pH is sufficiently high i.e., not lower than 5.8. This will make it possible to eliminate the neutralization stage, thus reducing the mineralization of the purified effluent. (Stapinski-IPC)
W75-09359

**POSSIBILITIES FOR REDUCING 5-DAY BOD-CONSUMING MATERIALS IN STEAM CONDENSATES FROM SPENT SULFITE LIQUOR EVAPORATION (MOEGLICHKEITEN DER REDUKTION DER BSB(5)-VERBRAUCHENDEN STOFFE IN BRUNDENKONDENSATEN AUS SULFITABLAUGENEINDAMPFUNGEN),**
R. Hornke, and W. Kunstner.
Wochenblatt fur Papierfabrikation, Vol 103, No 6, p 195-199, March 31, 1975. 5 fig, 7 tab.

Descriptors: *Biochemical oxygen demand, *Sulfite liquors, *Evaporation, Water pollution sources, Water pollution control, Industrial wastes, Wastes, Pulp wastes, Biological treatment, Neutralization, Foreign countries, Europe, Water pollution treatment, Waste water treatment, Water quality control, Water pollution.
Identifiers: *Steam condensates, Sulfite mills, *Austria.

Significant amounts of oxygen-consuming substances are present in the acid steam condensate from sulfite mills. This tends to lower the quality of water streams which are usually rendered polysaprobic (very strongly polluted) by pulp mill discharges. By neutralization and biological treatment of the steam condensate before disposal, it was possible to improve stream quality considerably, from 180 5-day BOD (tons/day) to 5.5 at the Chemiefaser Lenzing mill in Austria. (Ward-IPC)
W75-09360

**WHERE ARE WE IN FOREST FERTILIZATION.**
State Univ. New York, Syracuse. Coll. of Environmental Science and Forestry.
A. L. Leaf.
Proceedings of the Canadian Forest Fertilization Workshop (Sault Ste. Marie), January 8-10, 1974, p 1-5. 22 ref

Descriptors: *Municipal wastes, *Industrial wastes, *Fertilizers, *Forest management, *Waste disposal, Wastes, Water pollution sources, Water pollution control, Reviews, Environmental effects, Fertilization, Waste treatment.

A brief review of the current status of forest fertilization is presented. Two significant aspects of the discussion include the use of sewage and industrial effluents as potential fertilizing materials, and the environmental impact of forest fertilization. (Sykes-IPC)
W75-09367

**S(OCIETE) I(NDUSTRIELLE DE) C(EELLULOSE D') A(LIZAY, FRANCE): NEW STEP IN REDUCING POLLUCTION (S.I.C.A.: NOUVELLE ETAPE DANS LA DEPOLLUTION).**
Papier, Carton et Cellulose, Vol 24, No 1/2, p 56-59, January-February, 1975. 7 fig

Descriptors: *Waste water treatment, *Pulp wastes, *Water purification, Industrial wastes, Wastes, Water pollution sources, Water pollution treatment, Waste treatment, Odor, Costs, Pollution abatement, Water pollution control, Foreign countries, Europe, Treatment facilities.
Identifiers: Turbo-circulator clarifier, Noise, Kraft mills, Sulfite mills.

The new Turbo-circulator racle type of effluent clarifier installed at a French bisulfite and kraft pulp mill (with cross chemical recovery) is described. Future effluent treatment plans, noise and odor control efforts, and the cost of the mill's antipollution program are also indicated. (Speckhard-IPC)
W75-09369

**CLEANING OF CIRCULATION WATER AND EFFLUENT FROM PAPER AND BOARD MILLS BY CHEMICOPHYSICAL METHODS (DIE MOEGLICHKEIT DER REINIGUNG VON KREISLAUF- UND RESTABWASSER BEI PAPIER- UND KARTONFABRIKEN UNTER BERUECKSICHTIGUNG CHEMISCH-PHYSIKALISCHER VERFAHREN),**
Sulzer Bros. Ltd., Winterthur (Switzerland).
B. Morgeli.
Available from IPC, Appleton, Wis 54911, for $8.00 in paper copy. English translation of Das Papier, Vol 29, No 3, p 100-104, March 1975. 4 fig, 7 ref, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Recirculated water, *Water treatment, Industrial wastes, Industrial water, Water pollution sources, Water pollution treatment, Flocculation, Filtration, Absorption, Water pollution control, Legislation, Pulp and paper industry, Recycling.

The regulations governing effluent wastes have become more stringent, requiring corresponding changes in the paper and board industry. Chemical-physical effluent treatment processes are discussed. On the basis of theoretical considerations, test results, and mill experience, three are usable in recycling water, viz., flocculation, filtration, and adsorption. Suitably combined with a biological process, these offer solutions to the water pollution problem. (Ward-IPC)
W75-09371

**PACKED-BED REACTORS FOR SECONDARY EFFLUENT BOD AND AMMONIA REMOVAL,**
Iowa State Univ., Ames. Dept. of Civil Engineering.
J. C. Young, E. R. Baumann, and D. J. Wall.
Journal Water Pollution Control Federation, Vol 47, No 1, p 46-56, January, 1975. 13 fig, 1 tab, 11 ref.

Descriptors: *Waste water treatment, Pilot plants, Suspended solids, Nitrification, Sewage treatment, Reviews, Biochemical oxygen demand, Ammonia.
Identifiers: *Packed-bed reactors, *BOD removal, *Ammonia removal.

The use of packed-bed reactors (PBRs) in waste water treatment is reviewed. Results of pilot plant studies are described from investigations conducted: to determine BOD and suspended solids removal characteristics of the PBR-filter system when it is used to polish secondary effluent from biological treatment plants; to determine whether nitrification may be accomplished in PBR units at temperatures below 10 C; to compare the performance and operating characteristics of various PBR media; and, to determine such characteristics of dual-media filters following aerobic PBR treatment of secondary effluents. The PBR and dual-media filter systems provided a high degree of polishing for low-quality secondary effluents. Effluent BOD was reduced to below 5 mg/liter. Nitrification was successful throughout cold weather for an entire winter operation. Effluent ammonia nitrogen concentrations averaged less than one mg/liter. Three PBR media--sand, crushed coal, and loosely-packed plastic--gave almost the same BOD and suspended solids removals. Selection of media thus should be related more to design and operational simplicity and cost than to media size and shape. Operation of packed-bed reactors is relatively simple in comparison with operation of activated sludge systems. (Prague-FIRL)
W75-09379

**FERRIC CHLORINE OR LIME FOR CHEMICAL TREATMENT,**
Technion Israel Inst. of Tech., Haifa. Environmental Engineering Labs.
N. Narkis, M. Rebhun, and R. Offer.
Water and Sewage Works, Vol 122, No 1, p 43-45, January, 1975. 2 fig, 3 tab, 8 ref.

Descriptors: *Lime, *Ferric chloride, Alum, *Sewage treatment, Flocculants, Costs, Sludge treatment, Waste disposal, Organic compounds, *Waste water treatment.

Identifiers: *Chemical treatment.

Direct chemical treatment of raw sewage, as primary treatment, followed by biological or physicochemical treatment has been studied. Chemical flocculation with ferric chloride is compared with lime flocculation according to the parameters: removal characteristics of mineral constituents, including alkalinity, phosphates and Mg++, and efficiencies of removal of sewage organic materials. Selection of the right flocculant is important in waste water treatment. Conventionally, ferric salts, alum, or lime are used. Ferric and aluminum salts act as flocculants through their positively charged polynuclear hydroxo complexes; lime treatment with a high pH causes the formation of positively charged Mg(OH)2, and CaCO3 precipitate. Hydrolyzing flocculants, such as ferric chloride, were compared with lime depending on: contaminants removal efficiencies by flocculation; water quality of the final effluent; economic feasibility; and, ultimate disposal of sludge. The choice of a flocculant is affected by costs and sludge handling. Lime requirements are higher than ferric salts or alum. Primary sludge from alum or iron can be treated anaerobically while lime sludge must be disposed by thickening, followed by filtration, drying and incineration or by acid dissolving. (Prague-FIRL)
W75-09380

**FLOW EQUALIZATION.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
EPA Technology Transfer Seminar Publication, May, 1974. 21 p, 7 fig, 2 tab, 11 ref.

Descriptors: *Waste water treatment, *Municipal wastes, Equalization reservoirs, Flow control, Organic loading, Sewage treatment, Treatment facilities, *Reviews.
Identifiers: *Flow equalization.

The main objectives of flow equalization basins for municipal waste water treatment plants are to dampen the diurnal flow variation and the concentration and mass flow of waste water constituents. The result is a more uniform loading of organics, nutrients, and other suspended and dissolved constituents to subsequent processes, thus, flow equalization improves the performance of an existing treatment facility and/or reduces the required size of downstream facilities. Equalization of municipal waste water flows can be divided into three categories: equalization of dry weather flows; equalization of wet weather flows from separate sanitary sewers; and, equalization of combined storm and sanitary waste water. Dry weather flow equalization is discussed. The benefits of dry weather flow equalization including the impact on primary settling and on biological treatment are given. The determination of equalization requirements in terms of the determination of required volume, impact of equalization diurnal concentration variation, basin construction, air and mixing requirements, and pump and pump control systems is discussed. The costs of flow equalization vary considerably from one application to another, depending on the basin size, construction, mixing and aeration requirements, availability of land, location of facility, and pumping requirements. Several case histories of flow equalization are presented. (Orr-FIRL)
W75-09381

**NITRIFICATION AND DENITRIFICATION FACILITIES, WASTEWATER TREATMENT.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
EPA Technology Transfer Seminar Publication, August, 1973, Revised February, 1974. 24 fig, 2 tab, 13 ref

Descriptors: *Waste water treatment, *Denitrification, *Nitrification, Oxygen, Sludge treatment, Trickling filters, *Reviews, *Treatment facilities.
Identifiers: Settling tanks.

Nitrification and denitrification occur in waste water treatment. Nitrification has been considered beneficial because of the oxygen resource that the nitrates provide. The problems of rising sludge in conventional activated sludge and standard rate trickling filter plants are due to denitrification. The common way of controlling the problem was to limit nitrification. Information is needed on how waste water treatment plants can be designed to accomplish nitrification and denitrification. Factors affecting nitrification kinetics including denitrification and population dynamics, nitrification kinetics, and oxygen nitrification systems are discussed. Design criteria of nitrification systems in terms of the nitrification and settling tanks are described. Denitrification tanks, settling tanks, sludge, and effluent quality are discussed. Nitrification-denitrification facilities can achieve 90% removal of total nitrogen from the waste water treated. (Orr-FIRL)
W75-09382

**WASTEWATER FILTRATION, DESIGN CONSIDERATIONS.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
EPA Technology Transfer Seminar Publication, July, 1974. 36 p, 12 fig, 2 tab, 23 ref.

Descriptors: *Waste water treatment, *Filtration, *Filters, *Design criteria, Efficiencies, Costs, Water treatment, Separation techniques, *Reviews.

The efficiency and cost of filtration are a function of the concentration and characteristics of the solids in suspension; the characteristics of the filter media and other filtering aids used, the characteristics of the solids in solution in the water filterd, the characterstics of the filter and its method of operation. Filter design involves finding the operational optimum characteristics and the economic optimum design. The factors necessary for the proper design of granular filters for the filtration of secondary effluents are discussed. Emphasis is placed on the differences between water treatment practices and waste water treatment practices which must be considered for the successful design of waste water filters. Recommendations are: the variable hydraulic and suspended solids load in secondary effluents must be considered; a filter that allows penetration of suspended solids is essential to obtain reasonable filter run lengths; the backwash water flow rate should be large enough to fluidize the coarser-sized grains of each component of the filter media; more uniform media sizes are desirable; auxiliary agitation of the media is essential to proper backwashing; the filtration rate and terminal headloss should be selected to achieve a minimum filter run length of 6-8 hrs. during peak load conditions; and, lower filtration rates or lower influent suspended solids may permit the economical use of gravity filters where multiple filters are needed. (Orr-FIRL)
W75-09383

**PHYSICAL-CHEMICAL NITROGEN REMOVAL, WASTEWATER TREATMENT.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
EPA Technology Transfer Seminar Publication, July, 1974. 24 p, 10 fig, 24 ref.

Descriptors: *Nitrogen, *Waste water treatment, *Ion exchange, *Chlorination, Ammonia, Costs, Municipal water.
Identifiers: *Physical-chemical treatment, *Nitrogen removal, *Ammonia stripping, Selective ion exchange, Breakpoint chlorination, Technology transfer.

Three basic physical-chemical nitrogen removal techniques are available for the treatment of waste water. These are: ammonia stripping, selective ion exchange, and breakpoint chlorination. Each approach has the advantage of being based on the removal of nitrogen in ammonia form, eliminating the cost of converting the ammonia to nitrate in the biological treatment step. The techniques are also unaffected by toxic compounds that might disrupt the removal system. All three methods are predictable in performance, and space requirements for the treatment units are less than for biological treatment units. The ammonia stripping process has the advantages of low cost, ammonia removal with minimal dissolved solids addition, simplicity, and reliability. It performs poorly in cold weather and concern has been expressed over ammonia gas discharge. The selective ion exchange process has the advantages of high efficiency, insensitivity to temperature, ammonia removal with minimal dissolved solids addition, and elimination of nitrogen discharges to the atmosphere. Costs of this process are high, and process control and operation are complex. Breakpoint chlorination has low capital costs, high reliability, temperature insensitivity, and releases nitrogen as nitrogen gas. Its disadvantages are the addition of a substantial amount of dissolved solids to the effluent to remove ammonia, public concern over chlorine gas handling, and complex process controls. Costs and applications are discussed for nine United States cities. (Prague-FIRL)
W75-09384

**PHYSICAL-CHEMICAL WASTEWATER TREATMENT PLANT DESIGN.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
EPA Technology Transfer Seminar Publication, August, 1973, Revised January, 1974. 41 p, 8 fig, 13 tab, 13 ref, 1 append.

Descriptors: *Waste water treatment, Facilities, *Design criteria, Coagulation, Filtration, Flocculation, Carbon filters, Adsorption, *Treatment facilities.
Identifiers: *Physical-chemical treatment.

Discussed are typical design parameters for the unit processes involved in the physical-chemical treatment of raw wastes, and how the design engineer may determine the design criteria best suited for a particular waste water. Chapter I deals with the selection of coagulant and discusses the classes of coagulants, lime coagulation, alum coagulation, iron coagulation, and a comparison of coagulant costs. Chapter II discusses carbon adsorption in terms of powdered carbon and column test results. Chapter III mix, flocculation, clarifier sizing, recarbonation, filtration, granular carbon adsorption, and carbon regeneration. The final chapter details the physical-chemical treatment of small waste flows and covers clarification-filtration-carbon treatment, sludge production, and sludge disposal. Design project descriptions are given of plants in Niagra Falls, N. Y. and Fitchburg, Mass. (Orr-FIRL)
W75-09385

**UPGRADING LAGOONS.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
EPA Technology Transfer Seminar Publication, August, 1973. 43 p, 20 fig, 10 tab, 27 ref.

Descriptors: *Waste water treatment, *Lagoons, *Design criteria, Aerated lagoons, *Oxidation lagoons, Efficiencies, *Reviews.
Identifiers: High-rate aerobic ponds, Facultative ponds, Anaerobic ponds, Maturation ponds.

Lagoons are one of the most commonly used secondary waste treatment systems. Waste treatment lagoons can be divided into five general classes depending on the types of biological actions occurring in the lagoon: high-rate aerobic ponds; facultative ponds; anaerobic ponds; matu-

ration or tertiary ponds; and, aerated lagoons. A well-designed lagoon will incorporate physical features that minimize upsets, maintenance, and nuisances, and that maximize operational flexibility, stability, and BOD removal. Physical design features that should be considered include configuration, recirculation, feed and withdrawal variations, pond transfer inlets and outlets, dike construction, supplementation of oxidation capacity, and algae removal. These criteria are discussed in detail in reference to upgrading existing lagoons. Several examples of upgraded lagoons are presented. (Orr-FIRL)
W75-09386

**OXYGEN ACTIVATED SLUDGE WASTEWATER TREATMENT SYSTEMS, DESIGN CRITERIA AND OPERATING EXPERIENCE.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
EPA Technology Transfer Seminar Publication, August, 1973, Revised January, 1974. 46 p, 14 fig, 13 tab, 3 ref, 2 append.

Descriptors: *Waste water treatment, *Domestic wastes, *Industrial wastes, *Oxygenation, *Activated sludge, Costs, Economics, Aeration, Water pollution control, *Design criteria, *Operation, *Reviews.
Identifiers: Unox.

The use of oxygen instead of air in the activated sludge process (as in the Unox system) is one example of improved technology to aid in pollution control. The primary distinguishing feature of the Unox system is that high purity oxygen is the source of oxygen for the microorganisms in the aeration basin. The Unox system uses a covered and staged oxygenation basin for contact of oxygen gas and mixed liquor. High purity oxygen enters the first stage of the system and flows cocurrently with waste water being treated through the oxygenation basin. Operating data and experience from specific programs are presented including results from treatment of domestic wastes, food processing wastes, pulp and paper mill wastes, textile wastes, metal processing wastes, and chemical and petrochemical wastes. The proper design and a Unox system requires the following basic information concerning the waste to be treated: waste water quantity; waste water quality; effluent quality required; and, definition of the other unit operations or existing facilities in the treatment plant and their relationship to the Unox system. In addition to process design, process safety, and Unox system scope of supply, economics of the system, specifications for final settling tanks, and specifications for oxygenation tanks are also discussed. (Orr-FIRL)
W75-09387

**A GUIDE FOR STATE CERTIFICATION OF WASTEWATER FACILITIES PERSONNEL,**
Water Pollution Control Federation, Washington, D.C.
L. L. Guy, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-232 005, $3.75 in paper copy, $2.25 in microfiche. March, 1973. 29 p, 1 tab. EPA Award No 900181.

Descriptors: *State jurisdiction, *Personnel, Water pollution control, *Treatment facilities, Waste water treatment, Guidelines, Legislation, Surveys.
Identifiers: *Certification, Qualifications.

Certification of personnel in water pollution control facilities has become an accepted practice in the United States. Jurisdiction for making certification optional or mandatory is under the auspices of the states. Concern has been voiced that the diversity of programs weakens their effectiveness, and a national association of state programs may be formed. Efforts of the Environmental vocation skills in operating and managing waste water facilities, including planning, training, and certification programs. This guide details the requirements for an effective state program, and is a preliminary to nationally approved guidelines. Discussed are the results of six state surveys conducted since 1972. A model law which promotes the concept of certification but allows each state to determine its details, and types of operator classification from the entry level trainee up to the class IV plant superintendent, with qualifications for each is included. Difficulties with written examinations, renewal requirements, and enforcement problems are discussed. (Prague-FIRL)
W75-09389

**SYNTHETIC RESINS AND ACTIVATED CARBON FOR WASTEWATER TREATMENT,**
Illinois Univ., Urbana.
V. L. Snoeyink, B. R. Kim, R. L. Hinrichs, and P. Jennings.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-781 196, $4.75 in paper copy, $2.25 in microfiche. Air Force Weapons Laboratory, Kirtland AFB, New Mexico, Report AFWL-TR-74-112, June, 1974. 82 p, 18 fig, 4 tab, 44 ref.

Descriptors: *Waste water treatment, *Adsorption, *Activated carbon, *Resins, Organic wastes, Laboratory tests, Sewage treatment, Municipal wastes, Industrial wastes.
Identifiers: Regeneration.

This study examined the feasibility of using synthetic resins in place of or in combination with, activated carbon for adsorption processes of waste water treatment systems. An in-depth literature review of the use of resins as adsorbents was followed by bench-scale testing of potentially suitable resins using selected test compounds in single-solute systems as well as various types of activated sludge effluent. The choice of resin depends on the type of compounds to be adsorbed. Weak base resins appear to be most suitable for waters which contain a wide variety of organic compounds, such as secondary effluent, many industrial waste waters, and waters containing organic matter of natural origin. Weak base resins not only have the highest capacity and appear to be the most general type of adsorbent for heterogeneous solutions of organic compounds but also seem to have the most favorable properties for regeneration. The adsorption capacity of the resins and the number of species which could be adsorbed by the resins generally appeared to be less than those for activated carbon. Further research needs to be done with resins using the specific waste water to be treated because of the dependence of the performance of the resin on the types of species being adsorbed. (Orr-FIRL)
W75-09390

**IMPLEMENTATION OF WATER SUPPLY AND WASTEWATER PROGRAMS IN THE WASHINGTON, D.C. METROPOLITAN AREA.**
American Society of Civil Engineers, Washington, D.C. Water Pollution Task Force.
July, 1974. 39 p, 2 fig, 7 tab, 35 ref.

Descriptors: *Treatment facilities, Planning, *Water supply, Municipal water, Investigations, *District of Columbia, Water utilization, *Waste water treatment, *Water treatment.
Identifiers: *Washington(DC).

An evaluation of the existing waste water treatment facilities in the metropolitan Washington area was made and recommendations for improvement are given. The area is served by three water systems which are not connected; the combined available storage of treated water in the separate systems totals only about one day's supply. Based on the fact that peak demands have exceeded the low flow record, the situation is critical. On the basis of past problems, organizational changes, the funding situation, urban planning and growth, and general water use, several recommendations were made. These included: within existing management organizational structure, new means for reacting rapidly to problems should be found; design should be completed and construction begun immediately on interconnections between the three major water systems; a comparison of damages which would occur as a consequence of short-term water shortages versus the costs of a guaranteed fully adequate supply at all times should be made; investigations should begin of waste water treatment methods, to be planned for the entire region; disputes in the future should use as a model the new agreement on waste flows and sludge disposal, now implemented by the District of Columbia, Maryland, and Virginia, in order to facilitate admistrative cooperation; and, decisions regarding both money and space for treatment facilities, must involve the public. (Prague-FIRL)
W75-09392

**SEWAGE TREATMENT PLANT DEPENDABILITY WITH SPECIAL REFERENCE TO THE ACTIVATED SLUDGE PROCESS,**
National Field Investigations Center-Cincinnati, Ohio.
A. W. West.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-231 070, $3.25 in paper copy, $2.25 in microfiche. March, 1971. 12 p.

Descriptors: *Sewage treatment, *Design criteria, *Operation and maintenance, Facilities, *Activated sludge, Biological treatment, Water pollution control, Water quality control, *Treatment facilities, *Waste water treatment.

This work is a reference for sewage treatment plant dependability lectures presented at training sessions, symposia, and workshops. Design considerations necessary to achieve consistently satisfactory plant performance and final effluent quality include the proper treatment processes, a generous plant capacity, essential flexibility, and true controllability of the plant. The treatment process or modification most appropriate to the known waste characteristics and effluent quality requirements should be chosen. Examples include the classic activated sludge process, the complete mix modification and the step aeration modification. Pilot studies on a bench, pilot, or demonstration scale may be performed to resolve uncertainties about the correct process to choose. The suggestions contained in design criteria manuals such as the '10-States Standards' and should be considered as minimum requirements needed to provide adequate safety factors to assure plant dependability. Items discussed under flexibility of a plant include: process; aeration tanks; final clarifiers; return sludge pumping facilities; excess sludge wasting; emergency chemical treatment; sludge handling facilities; equalizing tanks; and holding ponds. The activated sludge system is a controllable process that should have the appropriate meters and accurately controllable gates, valves, pumps, and blowers for optimum performance. Qualified operators are needed to achieve the high quality effluent that can be produced by a properly designed waste treatment plant; dedicated, experienced operators are needed even more at plants which have design defects. (Orr-FIRL)
W75-09393

**THE ROLE OF POLYELECTROLYTES IN FILTRATION PROCESSES,**
North Carolina Univ., Chapel Hil. Dept. of Environmental Sciences and Engineering.
C. R. O'Melia.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-233 271, $4.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/2-74-032, April, 1974. 81 p, 24 fig, 5 tab, 34 ref.

Descriptors: *Filtration, *Waste water treatment, *Polyelectrolytes, *Prettreatment, *Chemical reactions, Polymers, Chemicals, Coagulation, Trickling filters, Particle size, Filters.

Research was conducted to determine how destabilizing chemicals act in augmenting the effectiveness of filtration processes and to examine selected applications of destabilizing chemicals in filtration for the treatment of waste water. The chemical destabilization required for effective filtration was similar to that required for effective coagulation. Chemical pretreatment was necessary for effective filtration of all systems considered in this research. The optimum chemical dosage for a jar test or batch coagulation test is the chemical dosage that will provide the best effluent quality in a filtration process. If polymers are used as destabilizing chemicals, overdosing may occur due to restabilization of the suspended particles. For the cationic polymer series tested, the optimum polymer dosage was independent of the molecular weight of the polymer, but the removal efficiency of filters operated at this optimum dosage increased with increasing molecular weight. When proper chemical pretreatment occurs, conventional filter beds are capable of removing almost all particles applied to them, regardless of suspended particle size. If effective filtration is not achieved, it should be attributed to poor chemical pretreatment. Other conclusions made concern the mechanisms of polymer action in filtration, and the results that can be obtained using polymers as filter-aids. (Orr-FIRL)
W75-09394

**CONTROL SCHEMES FOR THE ACTIVATED-SLUDGE PROCESS,**
National Environmental Research Center, Cincinnati, Ohio.
R. Smith, and R. G. Eilers.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-236 086, $4.25 in paper copy, $2.25 in microfiche. Report EPA-670/2-74-069, August, 1974. 55 p, 19 fig, 34 ref.

Descriptors: *Computer model, *Activated sludge, Dissolved oxygen, Settling, Separation techniques, Municipal wastes, Control systems, Model studies, *Waste water treatment.
Identifiers: Sludge inventory control, Sludge wasting control.

A time-dependent computer model for the activated sludge process has been used to investigate potential advantages of a number of control schemes. The systems studied by this model include dissolved oxygen control, sludge wasting control, and sludge inventory control. The program input variables are given; quantitative benefits for control schemes are shown. The dissolved oxygen control installed in a typical 25-mgd (1.1 cu m/sec) municipal plant would reduce electrical power consumption for air supply by about 17 percent. If the blower is scheduled in a step pattern, about 11.5% of the electrical power might be conserved. However, the potential is minimal for reduction of dissolved BOD concentration in the effluent stream by means of food and microorganism control, using the final settler for sludge storage. The effectiveness of the final settler for separation of dissolved and suspended fractions of BOD is an important aspect of the simulation for which adequate relationships are lacking. (Prague-FIRL)
W75-09395

**AN EVALUATION OF THE HAGERSTOWN, MARYLAND WATER POLLUTION CONTROL PLANT,**
National Field Investigations Center-Cincinnati, Ohio.
A. W. West, and R. J. Loubey.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-231 072, $3.75 in paper copy, $2.25 in microfiche. November, 1973. 31 p, 1 fig, 8 tab, 1 append.

Descriptors: *Waste water treatment, *Water pollution control, *Sewage treatment, Control, Equipment, Sludge, Clarification, Sedimentation, Pumps, Aeration, *Treatment facilities, Water quality standards, *Maryland.
Identifiers: Clariers, Hagerstown(Md).

The City of Hagerstown, Maryland, Water Pollution Control Plant experienced difficulty in maintaining consistent effluent quality between January 1972 and April 1973. Reasons for the difficulties were severe overloading of the primary clarifiers, high organic loads imposed on the secondary system because of primary system deficiencies, hydraulic overloading of the aeration tanks and final clairifiers during periods of sustained high flow, hampering of the process control by an overall lack of flow meters and controls, inability to feed the flow to the various units to maximize the efficiency of the secondary system, and inability to accurately control the return and waste sludge flows. Recommendations included these immediate modifications: two rectangular primary clarifiers should be converted into sludge holding/thickening tanks; the circular primary clarifier should be converted into an additional final clarifier; variable speed drive pumps should be provided; meters and control valves should be installed; modification of the circular primary clarifier piping should include plans for its use as a final clarifier; and two blowers should be repaired to provide additional aeration capacity. Long range modification recommendations were for the installation of: separate pumps and meters for excess sludge wasting; meters and valves or gates to measure and control the various sludge, sewage, and liquor flows; a central meter and control panel to permit remote adjustment of valves and pumps; automatic density controllers to aid in sludge handling; and, new primary sedimentation units to replace the inadequate units. (Orr-FIRL)
W75-09396

**WASTEWATER SURVEY, CHANUTE AFB, ILLINOIS.**
Environmental Health Lab., Kelly AFB, Tex.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-784 784, $3.75 in paper copy, $2.25 in microfiche. Report EHL (K) 74-13. July, 1974. 39 p, 3 append.

Descriptors: *Surveys, *Sewage treatment, Sampling, *Treatment facilities, *Water quality standards, Waste discharge, *Illinois, *Waste water treatment, Water pollution sources, Water pollution control, Tertiary treatment.
Identifiers: Storm drainage system, Chanute AFB(Ill).

Data and a discussion of the results of a field waste water survey conducted at Chanute AFB, Illinois, in May 1973 are presented. Physical, chemical, and biological sampling and analyses of the sewage treatment facilities and the receiving stream of the base were accomplished. Existing waste water treatment facilities do not provide an effluent that meets current or projected requirements. Extensive addition and modification or a complete new facility is required to comply with local discharge standards which require as little as four mg/liter BOD5 and five mg/liter of suspended solids in the effluent. This can be achieved with advanced waste treatment methods. In addition, action is required to insure that industrial waste waters are not discharged to the storm drainage system and that the sanitary sewer lift pumps do not overflow to the storm drainage system. (Prague-FIRL)
W75-09397

**SURVEY OF WASTEWATER DISCHARGE--ELMENDORF AFB, ALASKA,**
Environmental Health Lab., Kelly AFB, Tex.
For primary bibliographic entry see Field 5B.
W75-09398

**EVALUATION AND DEMONSTRATION O THE CAPILLARY SUCTION SLUDGE DE WATERING DEVICE.**
Westinghouse Research Labs., Pittsburgh, Pa.
T. E. Lippert, and M. C. Skriba.
Available from the National Technical Informa tion Service, Springfield, Va. 22161, as PB-23 358, $3.75 in paper copy, $2.25 in microfiche. En vironmental Protection Agency, Report EPA 670/2-74-017, March, 1974. 47 p, 30 fig, 5 tab, 3 ap pend.

Descriptors: *Dewatering, *Sludge treatment *Waste water treatment, *Capillary action Anaerobic digestion, Pilot tests, Costs.
Identifiers: Sludge drying.

A device for dewatering waste activated sludge used capillary suction in a porous belt. The system has been demonstrated on a pilot scale test unit. The device uses capillary action to initially de water the sludge, which forms a thin sludge cake. This cake is then mechanically compressed in a final step to obtain a still dryer cake. Both de watering steps are incorporated into a single system endless belt design. Sludge feed capacities from 2.0 to 4.5 lbs/hr ft have been demonstrated using the cake solids at discharges ranging from 1 to 18 percent. Results were obtained with a condi tioned waste activated sludge at a coagulant cost of approximately $4.00/ton. The device also has been tested on an anerobically digested and a mixed primary-activated sludge. (Prague-FIRL)
W75-09399

**WATER, SEWERAGE AND FLOOD CONTROL SYSTEMS PLAN AND IMPLEMENTATION PROGRAM 1973-74.**
San Diego County Comprehensive Planning Organization, Calif.
For primary bibliographic entry see Field 6D.
W75-09400

**SOLID WASTE MILLING AND DISPOSAL ON LAND WITHOUT COVER, VOLUME I. SUMMARY AND MAJOR FINDINGS,**
For primary bibliographic entry see Field 5E.
W75-09401

**SOLID WASTE MILLING AND DISPOSAL ON LAND WITHOUT COVER. VOLUME II. DATA CONDENSATIONS,**
For primary bibliographic entry see Field 5E.
W75-09402

**DOMESTIC WASH WATER RECLAMATION FOR REFUSE AS COMMODE WATER SUPPLY USING A FILTRATION-REVERSE OSMOSIS SEPARATION TECHNIQUE,**
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
J. B. Hall, Jr., C. E. Batten, and J. R. Wilkins.
Available from the National Technical Information Service, Springfield, Va. 22161, as N-74-19607, $3.75 in paper copy, $2.25 in microfiche. NASA TN D-7600, April, 1974. 34 p, 3 fig, 9 tab, 17 ref, 2 append.

Descriptors: *Waste water treatment, *Reverse osmosis, *Filtration, *Water reuse, Water purification, Chlorination, Water conservation, *Water supply, Domestic water, Domestic wastes, *Separation techniques.

An evaluation of a combined filtration-reverse osmosis water recovery system was conducted to determine its capability to reclaim domestic wash water for reuse as a commode water supply. The water produced by this system met all chemical and physical requirements established by the U.S. Public Health Service for drinking water with the

exception of carbon chloroform extractables methylene blue active substances, and phenols. This water is considered to be of a quality able to be reused as commode supply water. The filters used to protect the reverse-osmosis unit from plugging were not capable of removing particles less than one micrometer in size from the waste water. The process rate of the reverse osmosis unit was degraded approximately 46.9% for 713 gallons of filtered wash water processed. Averages of 0.00897 killowatt-hour per gallon and 0.0639 kilowatt-hour per gallon were needed to process the wash water through the filtration unit and reverse osmosis unit, respectively. Treatment of the processed water with 5 ppm chlorine was sufficient to reduce the microorganisms in the commode tank to zero. However, efficient mixing of chlorine was necessary in order to rapidly inhibit microorganisms in the processed water tank. The viability of a combined filtration and reverse osmosis technique for the reclamation of domestic wash water is established by this evaluation. The reverse osmosis module, if sufficiently protected from plugging by a filter capable of removing solid materials less than one micrometer in size, is a good low energy method for removing contaminants form domestic wash water. (Orr-FIRL)
W75-09403

**EVALUATION OF MUNICIPAL SEWAGE TREATMENT ALTERNATIVES.**
Battelle-Pacific Northwest Labs., Richland, Wash.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-233 489, $10.50 in paper copy, $2.25 in microfiche. February, 1974. 411 p, 35 fig, 6 tab, 219 ref, 3 append. EQC 316.

Descriptors: *Waste water treatment, *Reviews, Costs, *Environmental effects, Municipal wastes, Waste disposal, Ocean disposal, Aeration, Sewage treatment, Evaluation, Landfills, *Cost comparisons, *Cost analysis.
Identifiers: Sanitary landfills.

A comparison was made of alternative waste water treatment strategies. Both their costs and environmental effects were considered. Available municipal waste water and sludge treatment processes were selected on the basis of current or projected use in various sized flow regimes. Included were: primary treatment with land disposal of liquid effluents; waste stabilization lagoons; trickling filters with surface water discharge; trickling filters with land disposal; activated sludge with surface water discharge; activated sludge with land disposal; biological-chemical treatment; activated sludge-coagulation-filtration; tertiary treatment; physical-chemical treatment; extended aeration; sludge thickening, chemical conditioning, vacuum filtration, incineration, and landfill; chemical digestion, and ocean dumping by pipeline; and several other options. Each set of liquid treatment strategies and sludge options was characterized as to resource input requirements and subsequent outputs. (Prague-FIRL)
W75-09404

**A PRELIMINARY ASSESSMENT OF WET SYSTEMS FOR RESIDENTIAL REFUSE COLLECTION,**
Curran Associates, Inc., Northhampton, Mass.
P. M. Meier, J. Kuhner, and C. J. Martel.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-234 496, $6.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/2-74-065, July, 1974. 166 p, 36 fig, 25 tab, 2 append.

Descriptors: *Treatment facilities, *Domestic wastes, Waste disposal, Hydraulic conductivity, Planning, Costs, Sewers, Sewage treatment, *Waste water treatment.
Identifiers: *Grinders, Refuse collection, Household grinders.

The most promising wet system alternative for residential refuse collection is described. It involves a system using individual household grinders in low density areas, vacuum collection and neighborhood grinders in high density areas, dilute slurry transport of ground refuse in the existing sanitary sewer systems, and joint treatment of refuse and sewage at an expanded treatment facility, including anaerobic digestion for methane generation. However, the economic feasibility of even the most promising alternative is doubtful because of the high cost of grinding. Hydraulic transport of ground refuse in existing sewer systems may be feasible only if both metals and glass are excluded. A conventional collection of the nongrindable and bulky constituents of residential refuse will still be needed, even if on a diminished frequency. Projected costs are also discussed. (See W75-04577, W75-09406 and W75-09407) (Prague-FIRL)
W75-09405

**ECONOMIC ANALYSIS OF THE PROCESSING AND DISPOSAL OF REFUSE SLUDGES,**
Curran Associates, Inc., Northampton, Mass.
P. Kos, P. M. Meier, and J. M. Joyce.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-234 498, $4.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency Report EPA-670/2-74-037, July, 1974. 69 p, 29 fig, 5 tab, 48 ref.

Descriptors: *Domestic wastes, *Incineration, *Sludge treatment, *Waste disposal, Treatment facilities, *Waste water treatment, Costs, *Cost analysis.
Identifiers: *Wet systems.

The feasibility of sludge handling and disposal at waste water treatment facilities is discussed. These are modified to accept up to 0.5 percent by weight of ground residential refuse in their sewage influents. Using computer simulation techniques, the sensitivity of sluge handling and disposal operations to operating parameters and input conditions is examined. A substantial decrease in the unit cost of sludge handling, on a per ton of dry solids basis, over plants treating sewage alone can be expected. Suitable process chains include gravity thickening, vacuum filtration, and either landfill or incineration. (See also W75-09405) (Prague-FIRL)
W75-09406

**WET SYSTEMS FOR RESIDENTIAL REFUSE COLLECTION: A CASE STUDY FOR SPRINGFIELD, MASSACHUSETTS,**
Curran Associates, Inc., Northampton, Mass.
P. M. Meier, J. Kuhner, and R. E. Bolton.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-234 499, $7.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency Report EPA-670/2-74-038, July, 1974. 207 p, 37 fig, 34 tab, 26 ref.

Descriptors: *Sewerage, *Domestic wastes, Hydraulic conductivity, Costs, Treatment facilities, Planning, *Massachusetts, *Waste water treatment.
Identifiers: *Springfield(Mass), *Wet systems, *Refuse collection.

A case study implementation of the wet systems concept for residential refuse collection in the Springfield, Massachusetts, urbanized area is detailed. Analyses of the problems of hydraulic transport of ground refuse in the Springfield sewer system; treatment of a modified waste water treatment plant; the impact on resource recovery and conventional solid waste management; socioeconomic, institutional and fiscal ramifications; and a total systems cost analysis showing annual per household costs for refuse and sewage management are given. Implementation of the system on a domestic level, however, is thought to be at least ten years distant, due to unresolved technical uncertainties. A program of further laboratory investigations is recommended. (See also W75-09405) (Prague-FIRL)
W75-09407

**AN EVALUATION OF WATER REUSE FOR MUNICIPAL SUPPLY,**
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
D. Dworkin, and D. D. Baumann.
Available from the National Technical Information Service, Springfield, Va. 22161. Army Engineer Institute for Water Resources, Contract Report 74-11; December, 1974. 265 p, 31 fig, 33 tab, 6 append.

Descriptors: *Simulation analysis, *Municipal water, *Water supply, *Water reuse, Evaluation, Recycling, Systems analysis, Costs, Public health, Engineering, Water demand, Colorado, *Computer models, Model studies.
Identifiers: Colorado Springs(Colo), Economic efficiency.

A simulation model for evaluating the economic efficiency of water reuse is given. This is applicable to a single community for planning its possible recycling system. Two problems related to low community adoption of water reuse are the unavailability of such a method to assess the relative value of reuse and the professional biases of consulting engineers and public health officials. The use of renovated waste water in water supply planning is illustrated by the example of Colorado Springs, Colorado. A simulation model gives a plan as well as an alternative plan for the next fifty years, beginning in 1974. Expected water demand is based on demographic patterns and considers residential, industrial, commerical, municipal, military, and nonpotable use. Costs and benefits are included in the computer models. (Prague-FIRL)
W75-09408

**AGRICULTURAL BENEFITS AND ENVIRONMENTAL CHANGES RESULTING FROM THE USE OF DIGESTED SLUDGE ON FIELD CROPS,**
Metropolitan Sanitary District of Greater Chicago, Ill.
T. D. Hinesly.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-236 402, $10.00 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA/530/SW-30d.1, 1974. 375 p, 83 fig, 164 tab, 173 ref.

Descriptors: *Viruses, *Sludge, Land use, Soil, Water samples, Public health, Groundwater, Agriculture, Fertilizers, Drainage, Water quality control, Benefits, *Beneficial use, Water reuse.
Identifiers: Digested sludge, Sludge application.

The effects of digested sludge application on the chemical composition of soil, plant, and water samples from a large field lysimeter facility are discussed. Specific hygienic aspects of digested sludge were also investigated. It was found that viruses are not likely to survive the heated anaerobic digester environment. Although digested sludge contains large populations of fecal coliform bacteria, these organisms die rapidly during storage and after spreading on the soil. Results from green house and field studies indicate that several crop plants show favorable growth responses when fertilized with digested sludge. As long as digested sludge application rates do not exceed those which will result in unacceptable concentration levels of NO3-N in drainage or groundwaters, sludge of the quality employed in this study can be safely used to increase the production of quality crops. (Prague-FIRL)
W75-09409

**COMPREHENSIVE SURVEY OF MAGPIE CREEK, MCCLELLAN AIR FORCE BASE, CALIFORNIA,**
Environmental Health Lab., McClellan AFB, Calif.
C. F. Pauls, and T. R. Doane.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-784 819, $4.25 in paper copy, $2.25 in microfiche. Professional Report No 73M-2, April, 1973. 53 p, 12 fig, 12 tab, 5 ref, 3 append.

Descriptors: *Surveys, *Domestic water, *Sewage treatment, *Treatment facilities, Streams, Effluents, Waste disposal, Sampling, Water quality standards, California, *Waste water treatment.
Identifiers: Magpie Creek(Calif), McClellan AFB(Calif).

A survey of the McClellan AFB domestic sewage treatment plant was conducted. A study was made of the stream water quality of Magpie Creek, which flows through the base and carries the effluents of McClellan Base's domestic and industrial waste treatment plants. The stream was sampled both biologically (Qualitatively) and chemically (quantitatively). Based on studies on the benthic macroinvertebrates found, the stream shows improved quality upon leaving the base as compared to where it enters the base. The McClellan AFB domestic treatment plant effluents are regulated by the State of California as to BOD concentration, settleable solids, oils, and grease; the survey showed that the Base was within specified limits for all these constituents. Industrial discharges into Magpie Creek, from all industries, were also within water quality standard requirement limits. However, an Industrial Waste Treatment Facility, not yet completely installed, does not have sufficient operational control. In addition, several pipes, sink drains, floor drains and pipe drains have outlets discharging directly into Magpie Creek, from unknown origin. It was strongly recommended that these lines be rerouted to the sanitary or industrial waste sewerage system. This will prevent any spill of toxic materials to the now acceptable waters. (Prague-FIRL)
W75-09410

**WASTEWATER TREATMENT FACILITY EVALUATION, MALMSTROM AFB MT,**
Environmental Health Lab., McClellan AFB, Calif.
For primary bibliographic entry see Field 5E.
W75-09411

**PHOSPHATE REMOVAL IN AN ACTIVATED SLUDGE FACILITY,**
Municipality of Metropolitan Seattle, Wash.
R. E. Finger, G. J. Mason, D. A. Carlson, and G. L. Minton.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-235 749, $4.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA 670/2-74-061, August 1974. 92 p, 23 fig, 17 tab, 132 ref.

Descriptors: *Activated sludge, *Alum, *Ferric chloride, Phosphorus, Biological treatment, Chemical treatment, Sludge, Phosphates, *Waste water treatment.
Identifiers: *Phosphorus removal.

Both the biological and the chemical means of phosphorus removal were studied for the activated sludge facility at Seattle's Renton, Washington plant. Tests conducted on secondary activated sludge ranged, from jar tests to full scale plant investigation. Results indicate that the observed removal of phosphorus in this soft water area activated sludge facility is mainly biological. Careful control of organic loading rates, air application rates and excess sludge wasting rates can increase removal somewhat. However, even under optimal conditions, the biological mechanism does not consistently reduce the phosphorus concentration to a desired 1.0 mg/liter. Both ferric chloride and alum can effectively remove the phosphorus, and are controlled by automation. Sludge is produced with the addition of either alum or ferric chloride, with the former causing a denser final sludge. Capital costs for either chemical are the same, but alum requires a larger storage tank area. It was also recommended that the use of polyelectrolytes in conjunction with alum or ferric chloride be investigated. (Prague-FIRL)
W75-09412

**SURVEY OF WASTEWATER DISCHARGE, CAMPION AFS, ALASKA,**
Environmental Health Lab., Kelly AFB, Tex.
C. F. Pauls, and J. F. Thomas.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-784 785, $3.25 in paper copy, $2.25 in microfiche. Technical Report EHL(K) 74-14, July 1974. 8 p, 2 ref, 4 append.

Descriptors: *Waste discharge, Water quality control, Surveys, Waste disposal, Domestic wastes, *Waste water treatment, *Sewage treatment, Water quality standards, Monitoring, Sampling, *Alaska, Tertiary treatment.
Identifiers: Campion AFS(Alas), Model B-Oxigest Treatment.

A survey of waste water discharge at Campion AFS, Alaska, was conducted between June 27 and June 29, 1973. Most of the waste waters from Campion are discharged to a sanitary sewage treatment system. Secondary treatment of domestic waste water generated by 130 persons is provided by a Model B-Oxigest package treatment system. Water pollution monitoring was evaluated in order to comply with water quality criteria of Alaska. In addition, industrial operations which generated waste water were investigated. With the exception of waste brines generated by a water softening plant, non-domestic or industrial sources of pollutants were insignificant. Although Campion AFS had no records of former sewage treatment plant performance and had conducted no previous laboratory testing of effluent water quality, the sewage treatment outfall proved to be clear and showed no evidence of undesirable conditions. It was recommended that water quality be monitored, and that sampling be conducted of the sewage treatment system to assure future water quality control. (Prague-FIRL)
W75-09413

**RECENT DEVELOPMENTS IN SEWAGE TREATMENT BASED ON PHYSICO-CHEMICAL METHODS,**
Water Pollution Research Lab., Stevenage (England).
P. F. Cooper, and E. V. Thomas.
Water Pollution Control, Vol 73, No 5, p 505-520, 1974. 7 fig, 11 tab, 17 ref.

Descriptors: *Sewage treatment, Activated carbon, Pilot plants, *Waste water treatment, Clarification, Treatment facilities, Biological treatment, Costs.
Identifiers: Great Britain, *Physico-chemical treatment.

Physico-chemical treatment for sewage is defined as chemically aided clarification followed by the removal of dissolved organic material usually by adsorption on activated carbon. Physico-chemical treatment (PCT) is more common in the United States than in Great Britain, but is still at the pilot plant stage. Advantages claimed for PCT over biological treatment include reductions in capital costs and land requirements; easier control of the plant in terms of adapting to fluctuations in sewage quantity and quality; reduced susceptibility of the chemical stage to toxic materials; and, almost complete removal of phosphorus and some removal of nitrogen where eutrophication is a problem. Recent developments in the United States and tests in Great Britain are descri
Pilot plants in the UK include one at the Cole
works of the Upper Tame Main Drainage Auth
ty and the Cramlington works of the Seaton Va
Urban District Council of Northumberland.
PCT process may be applicable for primary cla
cation to permit discharge to coastal wa
through a shorter outfall pipe, in the use o
chemical coagulant in the primary sedimenta
stage to relieve an overloaded conventional pl
or by the use of PCT with a biological stag
remove carbonaceous and possibly nitrogen
constituents prior to activated carbon treatm
(Prague-FIRL)
W75-09414

**PHOSPHORUS REMOVAL DEMONSTRATI
STUDIES AT C.F.B. TRENTON,**
Environmental Protection Service, Otta
(Ontario).
W. E. Stepko, and E. E. Shannon.
Technology Development Report EPS 4-WP-74
September 1974. 35 p, 14 fig, 12 tab, 7 ref.

Descriptors: *Alum, *Activated sludge, Treatm
facilities, *Canada, Monitoring, Biochemical
ygen demand, Suspended solids, Digestion, Wa
water treatment, Phosphorus.
Identifiers: *Phosphorus removal.

Full scale phosphorus removal studies, employi
alum addition to an activated sludge treatm
plant, were conducted at Canadian Forces Ba
(C.F.B.) Trenton. Treatment plant performan
was closely monitored with respect to BOD5, to
phosphorus, and suspended solids remova
under baseline conditions, and at various alum a
dition levels. The required alum dosage f
phosphorus removal was 3.0 to 3.5 mg/liter as
and the most effective addition point was at t
exit end of the aeration basins. Alum additions i
proved suspended solids removal efficiencies a
maintained BOD5 and turbidity removal efficie
cies at baseline levels. During periods of zero alu
addition, a residual phosphorus removal effe
was observed. An in-depth investigation of this e
fect was recommended to determine if phosphor
removal requirements can be met at reduced alu
dosages. Digester capacity was inadequate a
digester supernatant quality was poor, so that 70
of the phosphorus removed from the plant in th
raw sludge eventually recycled back to the prim
ry clarifier. A proposed solution to this proble
was the addition of a second digestion stage to th
plant. (Prague-FIRL)
W75-09416

**REMOVAL OF WASTEWATER ORGANICS B
REVERSE OSMOSIS,**
Baker (Michael), Jr., Inc., Beaver, Pa.
W. A. Duvel, Jr., and T. Helfgott.
Journal Water Pollution Control Federation, Vo
47, No 1, p 57-65, January, 1975. 5 fig, 1 tab, 1
ref.

Descriptors: *Waste water treatment, *Revers
osmosis, Organic wastes, Phenols, Municipa
wastes, Industrial wastes, Permeability, Solutes.

Although the advantages and limitations of revers
osmosis as both a separation and a concentratio
technique have been established, the efficiency o
removal of specific organics such as those tha
might be found in municipal and industrial waste
waters is not well known. This investigation wa
undertaken to answer the following questions:
What characteristics of a solute molecule cause to
be rejected or allow it to pass through membranes
in the reverse osmosis process; Why are some
solutes rejected and others not; and, By what
mechanisms do molecules actually pass through
the membrane. Solute rejection was found to be
semiquantitatively related to both molecular
weight and molecular size; molecular size, as
determined by steric geometry, was the more im-
portant factor. The chemical characteristics of a

olecule , particularly its ability to form hydrogen onds, are qualitatively important in determining ermeability. A descriptive mechanism of mem- rane permeation explins the transport of organic aterials through reverse osmosis membranes. his theory makes it possible to predict the suc- ss of reverse osmosis in treating waters con- iminated by soluble and colloidal organic matter, long as the chemical nature of the individual ntaminants is known. In addition, a constituent hich is permeable might be chemically modified a nonpermeable form. For example, phenol hich is a highly permeable solute could be ox- ized with ozone or chlorine dioxide to alter it emically to a less permeable solute. (Orr-FIRL)
75-09417

EDUCTION IN SURFACTANTS BY IRRADIA- ION,
orida Inst. of Tech., Melbourne. Univ. Center r Pollution Research.
. M. Rohrer, and D. D. Woodbridge.
ulletin of Environmental Contamination and oxicology, Vol 13, No 1, p 31-36, January, 1975. fig, 14 ref.

escriptors: *Waste water treatment, Detergents, *Surfactants, *Irradiation, Domestic astes, Municipal wastes, Surface tension, Linear alkylate sulfonates.

lthough detergents have been determined to be me of the largest contributors to water pollution, e pollution is not produced by the total chemical nstituents of the detergents but rather by certain ecific chemical structures. Linear Alkylate Sul- nate (LAS) is used as a wetting agent in certain etergents because it creates an effective surface rrier at the water/air interface. This study was signed to investigate the effect of ionizing radia- on on Linear Alkylate Sulfonate to overcome the rface tension effect of detergents. More than 0 aqueous samples containing LAS at concen- ations of 2.5, 5.0, 7.5, and 10.0 mg/liter were ir- diated such that they absorbed 10, 20, 40, 60, 80, d 100 K rads of energy. The results showed that diation can effectively reduce the concentration LAS in aqueous solutions. It was also demon- rated that the rate of irradiation is not nearly as portant in the reduction of LAS as is the total sorbed energy. (Orr-FIRL)
75-09418

OLUME EXTRACTION OF CHEMICALLY ONTAMINATED WATER,
estinghouse Electric Corp., Abingdon, Va. Wire iv.
. W. Shelley, Jr.
ire Journal, Vol 8, No 3, p 67-75, March, 1975. 8 g, 1 tab.

escriptors: *Waste water treatment, *Separation chniques, *Chemical wastes, Industrial wastes, Waste disposal.

n industrial accident, in which a valve was pened allowing 500 gal of an emulsified cresylic id and ortho-dichlorobenzene solution to enter a ant's sewage system and contaminate a 300,000 l holding tank, created a massive treat- ent/disposal problem for Westinghouse Electric orporation. The original plans called for storage nd subsequent decontamination of this water by ansporting it to a 500,000 gal plastic-lined dry nd, approximately 480 ft above the water table. owever, this plan was not acceptable to the ublic Health Department. Laboratory tests owed that decontamination could be accom- ished by extraction with methylene chloride. ,000 gal of methylene chloride were pumped into e contaminated tank. The water was agitated by vo large compressors pumping air into the 0,000 gal of water. Mixing continued for a period about six hours. The air compressors were rned off and the water layer and methylene hloride layer were allowed to separate for two hours. The methylene chloride was siphoned from the bottom of the holding tank by running a rubber hose to the bottom and pumping it into tank trucks which then carried the contaminated methylene chloride away to be reclaimed. After the removal of all possible methylene chloride, the air compressors were turned on again to agitate the extract and aerate the solution to remove by evaporation trace amounts of methylene chloride still in solution. (Orr-FIRL)
W75-09419

FILTER-PRESSING WASTEWATER SLUDGE.
Water and Sewage Works, Vol 121, No 9, p 108-111, September, 1974. 1 fig, 1 tab.

Descriptors: *Waste water treatment, *Sludge disposal, *Sludge treatment, *Dewatering, *Filtration, Chemicals, Sewage treatment, Suspended solids, Biochemical oxygen demand, *Wisconsin, Landfill.
Identifiers: *Filter pressing, Edwards and Jones filter press, Kenosha(Wisc).

The Kenosha, Wisconsin, waste water treatment plant is the first one in the United States to dewater sewage sludge by filter pressing with the Edwards and Jones filter press. The Edwards and Jones filter press process was chosen because of the limited number of personnel required and the use of ferric chloride and lime instead of fly ash as conditioning chemicals. The sludge is continuously fed into the press at a maximum of 100 psi; as the sludge goes into the press, the solids are retained on the cloths and the filtrate comes out and goes into the head end of the plant to be recycled with the raw sewage. The complete cycle takes 3-4 hours. The moisture content of the sludge cakes is about 60%; the dry cake is disposed of as landfill. Used in the chemical conditioning are 50,000 ppm of ferric chloride on a dry weight basis and 120,000-150,000 ppm lime. The press has a capture rate of at least 99% of the incoming solids. Suspended solids for the filtrate are around 130 mg/liter and BOD is around 58-79. The cloth used to filter the waste water is a polypropylene monofilament of a low to medium porosity and will last a year and a half or two years. (Orr-FIRL)
W75-09420

TECHNOLOGICAL AND ECONOMIC EFFECTS OF THE CHANGE OF THE PRELIMINARY PURIFICATION TIME ON SLUDGE TREATMENT (TECHNOLOGISCHE UND OEKONOMISCHE AUSWIRKUNGEN DER VERAENDERING DER VORKLAERZEIT AUF DIE SCHLAMMBEHANDLUNG),
H. Hagen.
Wasserwirtschaft-Wassertechnik, Vol 24, No 8, p 277-279, 1974. 4 fig, 1 tab, 10 ref.

Descriptors: *Sludge treatment, *Costs, Waste treatment, Organic matter, Aerobic treatment, *Waste water treatment.
Identifiers: Activation basins, Sludge quantity, Residence time.

Sludge quantity within a waste water treatment plant depends upon the origin, the quantity of dry substance, and the water treatment plant depends upon the origin, the quantity of dry substances, and the water content of the sludge. Sludge originating from mechanical purification is different from excess sludge after purification. The quantity of sludge from preliminary purification decreases with decreasing residence time in the preliminary purification basin. An optimization calculation was carried out to determine the residence time in the preliminary purification basin at which the sum of the costs for preliminary purification and for sludge treatment approach a minimum. An optimum preliminary purification time of one to two hours was obtained, assuming a dry substance content of 5.7% in mixed sludge and 2.5% in excess sludge. Thus, the volume of the preliminary purification basin influences the composition of the sludge to be digested. If the residence time in the preliminary purification basin drops, the quantity of organic matter going to the aerobic stage rises, and with it the quantity of excess sludge to be removed from the activation basin. (Nave-FIRL)
W75-09421

DRIP IRRIGATIONS INHERENT REQUISITE - WATER QUALITY,
Scientific Irrigation Systems, El Monte, Calif.
G. O. Fraser.
In: Proceedings of the Second International Drip Irrigation Congress, p 81-85, (1974).

Descriptors: *Coagulation, *Flocculation, *Filtration, Agriculture, Irrigation water, Water quality, Waste water treatment.
Identifiers: *Drip irrigation, *Trickle irrigation.

Discussed are reasons why water quality is of the utmost importance and what factors cause deterioration of water quality. Methods of filtering irrigation water are presented. (See also W75-09423) (Skogerboe-Colorado State)
W75-09435

AUSTRALIAN VINEYARD USES SEWAGE EFFLUENT WITH TRICKLE IRRIGATION,
Kinnaird, Hill, deRohan and Young Ltd., Kensington and Norwood (Australia).
For primary bibliographic entry see Field 3C.
W75-09486

EVALUATION OF RECOVERY IN A POLLUTED CREEK AFTER INSTALLATION OF NEW SEWAGE TREATMENT PROCEDURES,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 5B.
W75-09515

DISPOSAL OF CATTLE FEEDLOT RUNOFF ON AGRICULTURAL LAND,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
H. D. Wittmuss.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 501, $4.25 in paper copy, $2.25 in microfiche. Completion Report, June 1975. 50 p, 11 fig, 26 tab. OWRT A-029-NEB(2). 14-31-0001-5027.

Descriptors: *Farm wastes, *Feed lots, Waste disposal, Crop production, Pollution effluents, Sprinkler irrigation, Nutrients, Deep percolation, Absorption, *Agricultural runoff, Corn(Field), Chemical analysis, Waste treatment.
Identifiers: Feed lot runoff, *Effluent irrigation.

Cattle feedlot runoff was applied to sod planted corn for three years at rates up to 30 inches per year without pollution of soil, crop, surface water or groundwater. Data were collected on many areas of crop production to check the effect of effluent irrigation compared to water irrigation on sod planted corn. All tests to date show no discernible difference in forage or grain nutrient content. The grain yield was suppressed 20% or more by the sprinkler application of effluent every two weeks, compared to water irrigated plots, during the growing season. Water and effluent were applied to sod planted corn in ten applications with maximum applications of 30 inches a year for three years. The application was measured and analyzed chemically for nutrients. Forage and grain yields were determined and each was analyzed for nutrient composition. The percentage of crop uptake of applied nutrients was determined and ranged from 1 to over 100 percent and could be related to crop response in many cases. Percolate samples were collected from the 7-foot depth and analyzed chemically showing a slight increase in the nitrogen content below the effluent plots. The chemical composition of the soil was determined before, during and after the study.

W75-09517

**BIOLOGICAL CONTROL OF SPHAEROTILUS NATANS AND RELATED SPECIES IN WASTE WATERS,**
Nebraska Univ., Lincoln. School of Life Sciences.
T. L. Thompson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 503, $3.25 in paper copy, $2.25 in microfiche. Completion Report, June 30, 1975. 13 p, 2 fig. OWRT A-030-NEB(1). 14-31-0001-5027.

Descriptors: *Biocontrol, *Bacteriophage, Sphaerotilus, *Waste water treatment, Isolation, Pollutant identification, *Aeration.
Identifiers: *Sphaerotilus natans, Extended aeration.

Six bacteriophage specific for Sphaerotilus natans were isolated. One bacteriophage, SN-1, was characterized in detail. Experiments employing an extended aeration unit were conducted to determine the practicality of biological control of Sphaerotilus under simulated field conditions. Streptomycin resistant Sphaerotilus was employed as seed in the system. Numbers of surviving Sphaerotilus, numbers of bacteriophage, sludge volume index and suspended solids were measured over several weeks. Results indicate that bacteriophage control of Sphaerotilus in systems which have a high flow-through rate is impractical because of the high wash-out rate of the bacteriophage.
W75-09520

**UPFLOW FILTRATION OF OXIDATION POND EFFLUENT,**
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
T. J. McGhee.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 529, $3.25 in paper copy, $2.25 in microfiche. Completion Report, June 1975. 12 p, 6 tab, 3 ref. OWRT A-034-NEB(1). 14-31-0001-5027.

Descriptors: *Waste water treatment, Oxidation, Solid wastes, *Filtration, *Oxidation lagoons, Treatment facilities, Chemical oxygen demand, Biochemical oxygen demand, Suspended solids, *Nebraska, Municipal wastes.
Identifiers: *Upflow filtration systems.

An upflow filtration system employing a sand medium was constructed and operated at the Municipal Oxidation Ponds in Lincoln, Nebraska. The system was operated at loading rates of 0.5 to 3.0 gal/ft sq/min (6.25 to 37.5 gal/min) and backwashed at a rate of approximately 15 gal/ft sq/min (190 gal/min). Flow was provided by electrically driven centrifugal pumps. Routine data measures included COD and suspended solids of influent and effluent and BOD of influent and effluent when the solids concentration in the effluent met current discharge standards (30 mg/l). Modifications to the system made during the study included the addition of a steel grid to restrain the filter medium against premature expansion and substitution of a coarser sand (.5mm) for that originally used (.22mm). Conclusions were: (1) the suspended solids and BOD of oxidation pond effluent may be reduced by filtration through a sand medium; and (2) efficiency of removal decreases sharply with increased filtration rate.
W75-09522

**A COVERED DOMESTIC LAGOON SYSTEM FOR NATURAL GROUND WATER RECHARGE NEAR METROPOLITAN AREAS,**
Connecticut Univ., Storrs. Dept. of Civil Engineering
R. Laak.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 506, $3.75 in paper copy, $2.25 in microfiche. Completion Report, June 1975. 45 p, 7 tab, 1 fig, 3 ref, append. OWRT A-039-CONN(1). 14-31-0001-3807.

Descriptors: *Sewage lagoons, *Domestic wastes, *Soil treatment, Waste disposal, Groundwater recharge, Temperature, *Waste water treatment, Cities, Urbanization, Biochemical oxygen demand, Sludge, Septic tanks, Water reuse.
Identifiers: *Lagoon-soil system, *Lagoon treatment, Small community system, Soil clogging, Sub-surface disposal, Decreased biological oxygen demand, BOD5.

A transparent-covered 4,600 gallon facultative lagoon was tested over two years using raw domestic sewage. The effluent was disposed of by use of subsurface seepage beds. The covered lagoon caused no nuisance or odors and was located 125 feet from the nearest residence. The lagoon pretreatment caused less soil clogging than septic tank effluent due to greater BOD5 removal. The lagoon-soil system, however, did not remove more nitrogen or phosphate than the septic tank-soil system. The removal of BOD5 was measured to be temperature dependent in the lagoon. The experiment will be continued to measure the long term effects of sludge accumulation. (See also W73-06742) (deLara-Connecticut)
W75-09524

**MUNICIPAL SLUDGE MANAGEMENT, PROCEEDINGS OF THE NATIONAL CONFERENCE ON MUNICIPAL SLUDGE MANAGEMENT.**
Held June 11-13, 1974 at Pittsburgh, Pennsylvania, The Pittsburgh Section of the American Society of Civil Engineers and the U.S. Environmental Protection Agency. Published 1974, Information Transfer, Inc., Washington, D.C., 218 p.

Descriptors: *Waste water treatment, Conferences, *Reviews, *Sludge disposal, *Sludge treatment, *Treatment facilities, Incineration, Filtration, Dewatering, Thickening, Digestion, Legislation, Regulations, Water quality control, Tertiary treatment.
Identifiers: *Composting, Sludge management, Conferences, State-of-the-art reviews.

Twenty-seven papers as well as the keynote and closing addresses are presented. Engineers, environmentalists, consultants, and municipal and federal administrators were participants. Several papers dealt with specific unit analyses of the methods of sludge handling and disposal. These included: sludge thickening, sludge dewatering, incineration, heat treatment, pressure filtration, composting, ocean disposal, trench incorporation, and pasteurization of liquid digested sludge. Treatment facilities at individual cities were described, detailing those at Chicago (Ill.), Denver (Colo.), Speedway (Ind.), Blue Plains (Washington, D.C.), Cedar Rapids (Iowa), Ontario (Canada), Philadelphia (Pa.), Pensacola (Fla.), St. Louis (Mo.), and Twin Cities (Minn.). The economics of sludge, as a profitable by-product of waste water treatment, are illustrated by its market value as a fertilizer, by experiments with sludge irrigation of agricultural crops, and by its value in the reclamation of soils lacking organic nutrients. The effects of public relations, federal legislation, and water quality standards on sludge management are also examined. (See W75-09533 thru W75-09558) (Prague-FIRL)
W75-09532

**OVERVIEW OF SLUDGE HANDLING AND DISPOSAL,**
National Environmental Research Center, Cincinnati, Ohio.
J. B. Farrell.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 5-10, 1974. 3 fig, 3 tab, 10 ref.

Descriptors: *Sludge treatment, *Sludge disposal, Reviews, Municipal wastes, Dewatering, Filtration, Sewage sludge, Toxicity, Landfill, Tertiary treatment, *Waste water treatment.
Identifiers: Land application, Co-pyrolysis, Co-incineration.

A review is given of both the treatment and u disposal operations now used for municipal was water treatment of sludge. Trends from 1972 1985 are outlined; it is predicted that the amount secondary treatment sludge will be almost do bled, and chemical sludges will be produced quantity. It is also predicted that dewatering cos will increase as more municipalities upgrade facil ties to improve effluent quality because biologic secondary sludges and some types of chemic sludges are difficult to dewater. Treatment oper tions have been classified as thickening, stabiliz tion, dewatering, and conditioning. Dispos operations include knowledge of hazards or toxic ty, and use of land application, landfill, or ir cineration. Trends in disposal are difficult t forecast. Ocean disposal appears negative. Lan application must be subject to many guidelines landfill sites are diminishing; incineration faces th problem of the high cost of fuel and air pollutio control equipment. New methods of disposal bein investigated are co-incineration and co-pyrolysi of sludge with solid wastes. (See also W75-09532 (Prague-FIRL)
W75-09533

**ALTERNATIVE METHODS FOR SLUDGE MANAGEMENT,**
Environmental Quality Systems, Inc., Rockville Md.
H. Bernard.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 11-20, 1974. 4 fig, 4 tab, 6 ref.

Descriptors: *Environmental effects, *Sludge disposal, *Sludge treatment, *Waste water treatment, Costs, Computer models, Sewage treatment, Management.
Identifiers: Disposal alternatives.

The holistic environmental viewpoint is considered in alternatives for sludge handling and disposal from waste water treatment plants. Computer methods can be used to consider economic alternatives, such as costs of power, chemicals, or transportation, coupled with emissions standards and availability of land. The sludge processing system involves both treatment of a liquid phase and treatment of a solid phase. While separated solids from sewage treatment is about 0.5 percent of the total liquid phase volume, sludge disposal has the disproportionate cost of about 30 to 50 percent of the total costs associated with waste treatment. Sludge disposal itself is often considered only after final stages of plant design are complete. Suggested for the determination of sludge management alternatives is a consideration of socio-economic-environmental factors. These are: energy, air pollution, land use, resource recovery, public attitudes, secondary impacts, surface water quality, nitrogen impact, soil pollution, cropping practices, economic impact, social requirements, and ecological impacts. Disposal alternatives of incineration, land disposal, recovery and sale, and composting are described. (See also W75-09532) (Prague-FIRL)
W75-09534

**THICKENING OF SLUDGES,**
Delaware Univ., Newark. Dept. of Civil Engineering.
R. I. Dick.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 21-28, 1974. 5 fig, 13 ref. OWRT A-025-DEL(1).

Descriptors: *Sludge treatment, *Sludge disposal, Mathematical models, Costs, Settling, Waste disposal, Waste water treatment.
Identifiers: *Cost effectiveness, Thickening, *Sludge thickening.

While thickening is involved in any system of sludge treatment and disposal, rational approaches to the design and operation of thickeners for an optimal degree of thickening have not been traditionally implemented. This optimal degree of thickening has a significant effect on the total cost of sludge treatment and disposal, because cost effectiveness is dependent upon the concentration of solids in the sludge. Traditionally, thickeners have been sized arbitrarily without regard to the thickening properties of the sludge being treated. However, the size of a thickener does affect the amount of thickening achieved. Size can be computed or estimated if the settling characteristics of the sludge are known. The degree of concentration of sludge depends upon nature of the sludge, size of the community, and types of other sludge treatment and disposal involved in the same system. Rational analyses to determine potential cost reductions are illustrated. These integrate the design of the thickeners with the design of other processes. (See also W75-09532) (Prague-FIRL)
W75-09535

**ANAEROBIC DIGESTER OPERATION AT THE METROPOLITAN SANITARY DISTRICTS OF GREATER CHICAGO,**
Metropolitan Sanitary District of Greater Chicago, Ill.
S. P. Graef.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 29-35, 1974. 9 tab.

Descriptors: *Anaerobic digestion, *Sludge treatment, *Municipal wastes, Construction costs, Digestion, Operating costs, Sludge disposal, *Illinois, Waste water treatment.
Identifiers: *Chicago(Ill), Thickening, *Sludge thickening.

Anaerobic sludge digestion as utilized by the Metropolitan Sanitary District of Greater Chicago is summarized. The capacities of five digestion facilities are compared. Discussed also are digester construction costs, operation and maintenance costs, sludge conditioning and digester flow regimes, heat transfer, loading intensity, gas production, digested sludge characteristics, sludge disposal, and digester problems. Problems, such as thickening, clogging, foaming, gas recirculation, and supernatant separation have been solved. Bench and pilot scale research indicates that future improvements are possible. These include: shorter residence times, resulting from more homogeneous feed sludges, improved flow regimes and more frequent sludge analysis; uniform digester feeding and withdrawal accomplished by automatic mass balance control; on-line measurement of process stability indicators such as the rate of methane production; and, digester gas scrubbing in order to produce a cleaner fuel of higher BTU value, to reduce gas recirculation compressor fouling, and to provide pH control by removing the weak carbonic acid, rather than adding a base. As a means for sludge processing, anaerobic digestion should continue to be a viable method for the treatment of municipal sludges. (See also W75-09532) (Prague-FIRL)
W75-09536

**METRO DENVER'S EXPERIENCE WITH LARGE SCALE AEROBIC DIGESTION OF WASTE ACTIVATED SLUDGE,**
Metropolitan Denver Sewage Disposal District No. 1, Commerce City, Col.
D. B. Cohen.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 37-53, 1974. 7 fig, 5 tab, 11 ref.

Descriptors: *Aerobic treatment, Aeration, Digestion, Pilot plants, Oxygen, Biological treatment, *Waste water treatment, *Activated sludge, Colorado.
Identifiers: *Denver(Colo), Aerobic digestion, Rotary diffusers, Waste activated sludge.

In 1970, the Metropolitan Denver Sewage District No. 1 (Metro) converted excess secondary aerators to aerobic digestors in two steps. The first part involved plant scale aerobic digestion of dilute W.A.S. in four converted secondary aeration basins. The second part involved extensive research and development to compare pilot open tank oxygen systems using both slot and rotating diffusers with this plant scale system. V.S.S. reductions ranged between 11.2% and 47.2% for the air system. A correlation between V.S.S. reduction and S.R.T. x temperature was shown to be significant. When invertebrates (especially rotifers) comprised a significant fraction of the biomass, digestion was maximum. No correlation between dissolved oxygen concentration and V.S.S. digestion rates was observed. At loadings greater than 0.14 pounds V.S.S. per cu ft per day, oxygen performance is superior. Aerobic digestion reduced sludge disposal costs. The Denver Sewage Disposal District (Metro) is now planning to convert a one million gallon tank to an oxygen aerobic digester with rotary diffusers. (See also W75-09532) (Prague-FIRL)
W75-09537

**HIGH PURITY OXYGEN AEROBIC DIGESTION EXPERIENCES AT SPEEDWAY, INDIANA,**
Union Carbide Corp., Tonawanda, N.Y. Linde Div.
D. W. Gay, R. F. Drnevich, E. J. Breider, and K. W. Young.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 55-66, 1974. 6 fig, 7 tab, 8 ref.

Descriptors: *Aerobic treatment, *Oxygen, *Waste water treatment, Microorganisms, Treatment facilities, Clarification, Costs, *Indiana.
Identifiers: Speedway(Ind), UNOX, *Aerobic digestion, High purity oxygen.

Aerobic digestion stabilizes primary waste and/or waste activated sludge through the catabolism of aerobic microorganisms. At the Speedway Indiana Water Pollution Control Plant, a full scale aerobic digestion study was performed, using high purity oxygen. The goal was to examine the possibility of attaining and operating at elevated temperatures without an external heat source. The facility's existing UNOX system was modified; the entire waste water flow from its primary clarifier was handled by one of two reactor trains while the other train served as an aerobic digestion unit. During winter operation, the oxygen aerobic digestion was capable of sustaining high (greater than 31C) temperatures by the conservation of energy produced by endogenous decay. Data obtained were used to design a full scale aerobic digestion system for Speedway, Indiana. The annual cost for digestion of waste sludge is $53,400, or the equivalent of $34.00 per ton of dry solids treated. (See also W75-09532) (Prague-FIRL)
W75-09538

**SLUDGE DEWATERING,**
Los Angeles County Sanitation Districts, Whittier, Calif.
C. W. Carry, R. P. Miele, and J. F. Stahl.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 67-76, 1974. 5 fig, 2 tab.

Descriptors: *Dewatering, *Sludge treatment, *Suspended solids, Centrifuges, Sanitary landfills, Sludge disposal, Pilot plants, Conditioning, Costs California, *Waste water treatment.
Identifiers: *Los Angeles(Calif), Waste discharge, Sludge dewatering.

Since April 1970 a sludge dewatering investigation was performed by the Los Angeles County Sanitation District and their 380 mgd Joint Water Pollution Control Plant. The Los Angeles Regional Water Quality Control Board had set new discharge requirements that a minimum of 95 percent of the suspended solids in digested sludge be removed. Pilot plant studies showed that five conditioning-dewatering systems were capable of meeting these discharge requirements. An economic evaluation of each alternative was made, assuming a solids quantity of 390 tons per day. The result was the selection of a two stage centrifugation system. The system uses existing horizontal scroll centrifuges followed by imperforate bowl basket centrifuges. In addition, cationic polymers in the dosages of 4 lb/ton were added to the influent of the second stage unit. The composite cake from both units will be hauled by truck to a sanitary landfill. Costs of the total system are predeicted to be $36.40 per ton. (See also W75-09532) (Prague-FIRL)
W75-09539

**PRESSURE FILTRATION--MUNICIPAL WASTEWATER SOLIDS, CEDAR RAPIDS, IOWA,**
Green (Howard R.) Co., Cedar Rapids, Iowa.
J. W. Gerlich.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 77-85, 1974. 5 fig, 1 tab.

Descriptors: *Filtration, *Dewatering, *Sludge treatment, Conditioning, Costs, Fly ash, Filtrate, Iowa, Waste water treatment.
Identifiers: Pressure filtration, Cedar Rapids(Iowa), Filter cakes.

Cedar Rapids, Iowa has the first major installation in the United States using the pressure filter for its dewatering process. In pilot dewatering studies fly ash was effective in reducing chemical conditioning costs from twenty to four dollars per ton of dry solids. A nine month study evaluated full scale plant performance where sludge cake incinerator ash was utilized as a conditioning agent. Economic evaluation found that the process offered a distinct advantage over other forms of sludge dewatering for Cedar Rapids' sludge. Cake quality on the full scale plant was maintained over a broader range of solids concentrations than was expected. The product of pressure filtration is an increase in solids concentration in the cake with a decrease in suspended solids content in the filtrate. Advantages of pressure filtration include: quantities of sludge conditioners are usually reduced; filtration efficiency is maintained for a broad range of sludge characteristics; solids content of the filter cake is increased; filtrate suspended solids and BOD are very low; operation and manpower requirements are minimal; and cake disposal is convenient due to lower moisture and smaller volumes. (See also W75-09532) (Prague-FIRL)
W75-09540

**HEAT TREATMENT AND INCINERATION,**
Dorr-Oliver, Inc., Stamford, Conn.
D. T. Mayrose.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 87-91, 1974. 4 fig, 3 tab, 1 append.

Descriptors: *Heat treatment, *Incineration, *Dewatering, Sludge treatment, Biological treatment, Waste treatment, *Waste water treatment.
Identifiers: Sludge cakes.

Heat treatment, in combination with dewatering, is one alternative for treatment of municipal sludge. Waste sludges are heated to 400 F, and this temperature is maintained for about thirty minutes. A sludge is produced with greatly improved dewaterability characteristics. Illustrations compare dewatering heat treated sludge and chemically conditioned sludge. Advantages of heat treatment over raw chemically conditioned sludge include: twice the cake solids concentration in the dewatering unit is possible with heat treatment, as well as double the cake solids capacity of the dewater device; significant reduction or elimination of chemical condition agents can be achieved; when combined with combustion, a smaller incinerator can be used due to lower feed cake water content; and, no fuel will normally be needed for incineration due to the ratio of volatile matter to water in the dewatered heat treated sludge. The process of incineration of biological sludges is also discussed. This may be used alone or in combination with heat treatment. When used together, heat treatment and incineration improve the economics of sludge disposal by improving dewaterability as well as reducing or eliminating chemical conditioning agents and the need for auxiliary fuel. (See also W75-09532) (Prague-FIRL)
W75-09541

**DRYING OF SLUDGE FOR MARKETING AS FERTILIZER,**
Houston Sewage and Sludge Disposal Plant, Tex.
For primary bibliographic entry see Field 5E.
W75-09542

**GROWTH OF BARLEY IRRIGATED WITH WASTEWATER SLUDGE CONTAINING PHOSPHATE PRECIPITANTS,**
National Environmental Research Center, Cincinnati, Ohio.
M. B. Kirkham, and G. K. Dotson.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 97-106, 1974. 9 tab, 16 ref.

Descriptors: *Irrigation, *Sludge, *Phosphates, *Fertilizers, Agriculture, Barley, Lime, Alum, *Sludge treatment, *Waste water treatment, Water reuse.
Identifiers: Ferric chloride.

It has been unclear as to whether wet sludges containing precipitated phosphates can be used agriculturally. To investigate the use of chemically-treated sludges, barley was grown for 16 weeks in pots of loam soil, and was then irrigated for 7 weeks with wet sludges. Raw primary sludge and primary sludges from alum and ferric chloride addition to raw waste water, either limed or unlimed, were added at two different rates. The rates corresponded to a total application of 23 or 46 m tons/ha/yr. The total and extractable phosphorus in the soil and the elemental composition of the plants were determined. Barley plants irrigated with three types of sludges grew as well as those supplied with inorganic fertilizer. However, fertilized plants yielded more grain than sludge-treated plants. Liming significantly decreased extractable phosphorus only in the iron-treated soil. Ninety-two percent of the phosphorus added by the sludges remained in the sludge crust throughout the experiment. On a short-term basis, for growing barley, it was shown that the presence of phosphate precipitated by Al or Fe did not limit growth and that sludges containing phosphate precipitants may be used. (See also W75-09532) (Prague-FIRL)
W75-09543

**UTILIZATION OF DIGESTED CHEMICAL SEWAGE SLUDGES ON AGRICULTURAL LANDS IN ONTARIO,**
Ontario Ministry of the Environment, Toronto.
For primary bibliographic entry see Field 3F.
W75-09544

**THE ECONOMICS OF SLUDGE IRRIGATION,**
Springfield Sanitary District, Ill.
A. P. Troemper.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 115-121, 1974. 5 tab.

Descriptors: *Sludge disposal, *Sewage treatment, *Irrigation, Liquid wastes, Drainage, Planning, Design criteria, Anaerobic digestion, Waste water treatment, *Costs, Illinois, Water reuse.
Identifiers: Waste discharge, Spray irrigation, Springfield(Ill).

Discharge of liquid anaerobically digested sludge to an experimental plot was begun in 1965 by the Springfield, Illinois Sanitary District. Irrigation continued through 1971, with crops being planted both on the sewage treated area and on a control area. Costs and benefits in terms of crop yield for each season are enumerated. It was concluded that irrigation on cropland with liquid digested sludge is a valid disposal method for municipal sludge. Spray irrigation was the most practical method of application, although wind drift must be taken into account. Given a sufficient amount of land, the method is economically competitive with alternative methods of disposal. The operation requires minimal attention and creates no odor nuisance, so long as the sludge is reasonably well digested. In designing a system for liquid sludge disposal, a permanent disposal area with a sloped distribution system will allow operation in severe winter months without additional problems; with provision of a good underdrainage system, the possibility of groundwater contamination is minimized. (See also W75-09532) (Prague-FIRL)
W75-09545

**COMPOSTING SEWAGE SLUDGE,**
Agricultural Research Service, Beltsville, Md. Biological Waste Management Lab.
E. Epstein, and G. B. Willson.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 123-128, 1974. 3 fig, 1 tab, 5 ref.

Descriptors: *Sewage sludge, *Fertilizer, Sludge disposal, *Waste water treatment, Costs, Digestion, Public relations, Planning, Odors, District of Columbia.
Identifiers: *Composting, Blue Plains(Washington DC).

The composting of sewage sludge was investigated at a pilot plant at the Blue Plains Wastewater treatment plant in Washington, D.C. Sewage sludge has seldom been composted by itself, and various types of bulking agents were tested in order to determine which materials and in what ratio to the sludge gave the desired density and moisture content. The optimal bulking agent was wood chips, incorporated with sludge at a ratio of 3:1. The operation of the composting site at Beltsville, Maryland is detailed. Two major operational problems were how to compost digested sludge under adverse weather conditions and how to compost raw sludge without odors. The addition of material such as chopped hay, straw, or shredded paper to digested sludge accelerates its composting. Further research is being done on odor prevention, using microbiological, chemical, and mechanical methods. Efficient management and coordination between the sewage treatment plant and the composting site is necessary. A public relations program is important. Direct cost-benefit relationships have not been computed; the composting of sewage sludge now has the goal of reducing sludge disposal costs from waste water treatment plants rather than being a profit-making venture. (See also W75-09532) (Prague-FIRL)
W75-09546

**RECENT SANITARY DISTRICT HISTORY LAND RECLAMATION AND SLUI UTILIZATION,**
Metropolitan Sanitary District of Greater Chic Ill.
For primary bibliographic entry see Field 5E.
W75-09547

**SLUDGE MANAGEMENT IN ALLEGHE COUNTY,**
Allegheny County Dept. of Public Works, Pa.
For primary bibliographic entry see Field 5E.
W75-09548

**TRENCH INCORPORATION OF SEWA SLUDGE,**
Agricultural Research Service, Beltsville, Biological Waste Management Lab.
For primary bibliographic entry see Field 5E.
W75-09549

**OCEAN DISPOSAL EXPERIENCES PHILADELPHIA,**
Philadelphia Water Dept., Pa.
For primary bibliographic entry see Field 5E.
W75-09550

**SLUDGE DISPOSAL BY INCINERATION ALCOSAN,**
Allegheny County Sanitary Authority, Pittsbur Pa.
For primary bibliographic entry see Field 5E.
W75-09551

**PASTEURIZATION OF LIQUID DIGESTI SLUDGE,**
Cincinnati, Ohio National Environmen Research Center.
G. Stern.
In: Municipal Sludge Management, Proceedings the National Conference on Municipal Slud Management, June 11-13, 1974, Pittsburg Pennsylvania, p 163-169, 1974. 1 fig, 4 tab, 7 ref.

Descriptors: *Sludge disposal, *Pathogen *Pasteurization, Sludge treatment, Digestio Viruses, Bacteria, Public health, Laboratory test Soils, *Waste water treatment.
Identifiers: *Land application, Liquid digeste sludge.

Liquid digested sludge, when applied to land f final disposal, may contain pathogens such viruses, bacteria, cysts or oocysts or protozoa an worm eggs. There is no evidence that stabilize sludges have caused disease to man or animal However, concern of health officials that thes pathogens be completely destroyed has led laboratory investigations of pasteurization liquid digested sludge as a method of disinfectio In West Germany, pasteurization is used whe sludge is spread during the summer growth seaso The National Environmental Research Center i Cincinnati, Ohio, tested pasteurizatio time/temperature relationships, types and amour of fuel sources and heat required, the transfer an dispersion of heat with liquid sludge, types o equipment, and estimated costs of the pasteuriza tion methods. It was concluded that pasteurizatio at 70 C for 30 to 60 minutes destroys pathogens ef fectively. Methane gas from anaerobic digestion i available as a fuel source, with direct steam injec tion and efficient mixing of steam and liqui sludge recommended. The costs were about te dollars per ton of sludge solids for small plants Studies also showed that pasteurized sludge can b applied to growing lawn grasses as long as th sludge has been cooled to 60 C at the soil surface (See also W75-09532) (Prague-FIRL)
W75-09552

**SLUDGE HANDLING AND DISPOSAL AT BLUE PLAINS,**
District of Columbia Dept. of Environmental Services, Washington.
A. F. Cassel, and R. T. Mohr.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 171-176, 1974. 3 fig, 3 tab.

Descriptors: *Sludge treatment, *Sludge disposal, Treatment facilities, Land use, Dehydration, Incineration, Guidelines, Fertilizer, Energy, Pilot plants, District of Columbia, *Waste water treatment.
Identifiers: *Composting, Blue Plains Treatment Plant(Washington DC), Land application, Thermal dehydration.

Problems of sludge handling and disposal at the Blue Plains Wastewater Treatment Plant in the Washington, D.C. area are described. The plant is currently being expanded with the addition of advanced waste water treatment. Both raw and digested sludge undergo disposal by a variety of techniques including land spreading, burial, composing,d thermal dehydration. New alternatives, including the processing of sludge into a reusable commodity, are being studied. A multi-faceted disposal method that is not totally subject to weather or to biological and chemical upsets is described. Options to consider for future sludge disposal are: all raw sludge disposal, thermally dehydrated, marketed as fertilizer; a combination of raw sludge which is thermally dehydrated for fertilizer and digested sludge disposal of on land or composted, wherby methane from the digestion is used as fuel for drying; a combination of raw sludge which is incinerated with digested sludge disposed of on land or composted; and the incineration of completely raw sludge. These options will be tested by an EPA-D.C. pilot plant, taking into account factors of energy availability as well as specific problems of each alternative method. (See also W75-09532) (Prague-FIRL)
W75-09553

**AGRICULTURAL UTILIZATION OF DIGESTED SLUDGES FROM THE CITY OF PENSACOLA,**
Baseline, Inc., Pensacola, Fla.
For primary bibliographic entry see Field 5E.
W75-09554

**INSTITUTIONAL PROBLEMS ASSOCIATED WITH SLUDGE DISPOSAL,**
Washington Suburban Sanitary Commission, Hyattsville, Md.
For primary bibliographic entry see Field 5E.
W75-09555

**ENERGY CONSERVATION AND RECYCLING PROGRAM OF THE METROPOLITAN SEWER BOARD OF THE TWIN CITIES AREA,**
Metropolitan Sewer Board, St. Paul, Minn.
D. C. Bergstedt.
In: Municipal Sludge Management, Proceedings of the National Conference on Muncipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 187-194, 1974. 8 fig.

Descriptors: *Energy *Sewage treatment, *Sludge treatment, Sludge disposal, *Recycling, Conservation, Treatment facilities, Incineration, Equipment, Operation, Fertilizers, Water reuse, Minnesota, *Waste water treatment.
Identifiers: Sludge recycling, St. Paul(Minn), Minneapolis(Minn).

Recent actions of the Metropolitan Sewer Board of the Twin Cities Area in response to the 1973 energy problems are described. The Board is the regional treatment authority for waste water in the area of Minneapolis and St. Paul, Minnesota and operates 24 treatment plants. Ten major programs have been instituted related to energy saving and recycle, without detriment to the quality of waste water treatment. Major changes include: pyrolysis of municipal refuse to furnish heat value for sludge drying; recovery and beneficial use of heat in exhaust gases from incinerators; continuous pressure dewatering; flameless odor control; and improved results by the modification of existing sludge processing equipment. Additionally, the operations include manufacture of fuel-grade sludge cake and char; preparation of fertilizer, soil conditioner and recyclable metal scrap; use of solid fossil fuel, such as coal, to augment combustion in incinerator furnaces; manufacture of activated carbon for in-plant use; and pulping of refuse fibers for use as filter aid. The important factor in choice of these alternatives for energy conservation and recovery is the reliability of a chosen method. (See also W75-09532) (Prague-FIRL)
W75-09556

**SLUDGE DISPOSAL AT A PROFIT,**
Barber-Colman Co., Irvine, Calif. Resource Recovery Systems Div.
W. M. Fassell.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 195-204, 1974. 7 fig, 6 tab, 16 ref.

Descriptors: *Oxidation, *Sludge disposal, *Sludge treatment, Costs, Energy, Thermal energy, Organic compounds, Recycling, Waste water treatment.
Identifiers: *Wet oxidation system, PURETEC/WETOX System.

The application of hydrometallurgical wet oxidation practice to the destruction of sewage sludge has been investigated. The PURETEC/WETOX Process uses an agitated horizontal, multiple-compartment autoclave. The reactor operates under mildly acid conditions and achieves 75 to 85 percent destruction of the COD in any sewage sludge at 440 to 465 F and 600 psi. Substantial quantities of thermal energy are generated; nitrogen compounds are converted to ammonia which is recoverable. Metals, which now are in short supply, are extractable. The predominant organic compound in the resultant solution is acetic acid, which may be used as a carbon source for denitrification. Economic evaluations of the PURETEC/WETOX system are given, in theory, for Philadelphia and for the Blue Plains Wastewater Treatment Facility (Washington, D.C.). With credits for reusable materials as by-products of the system from the traditional sludge disposal costs of $25 to $47/ton may be reduced to between $10/ton and a theoretical net operating costs. Within the next calendar year, pilot plants for large scale demonstration of the wet oxidation system will be in operation. (See also W75-09532) (Prague-FIRL)
W75-09557

**SLUDGE MANAGEMENT SYSTEM FOR ST. LOUIS,**
Saint Louis Metropolitan Sewer District, Mo.
P. F. Mattei.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 205-210, 1974.

Descriptors: *Sludge treatment, Watersheds(Basins), *Anaerobic digestion, Incineration, Tertiary treatment, Vacuum filtration, Storage, Treatment facilities, *Waste water treatment.
Identifiers: *Land requirements, Solids handling, St. Louis(Mo).

Two types of solids handling systems of the Metropolitan St. Louis Sewer District, each for a major subdistrict, are described. The two systems are based on the individual needs to their watersheds. Anaerobic digestion with storage basins was chosen for a secondary treatment plant at Coldwater Creek. The plant services an area of 41 square miles, with a design average flow of 25 mgd. The two Mississippi River subdistrict plants--Lemay and Bissell Point--provide primary treatment for an average design flow of 424 mgd and serve a watershed of 196 square miles. Vacuum filtration, incineration and ash storage basins were selected for these larger subdistrict plants. Because of the disposal methods chosen for Lemay and Bissell point, the land requirement was significantly reduced. The smaller plant at Coldwater Creek, on the other hand, had adequate land for storing digested sludge, and methane gas from the digestion process provided energy to drive blowers and pumps at an economic cost for the secondary treatment process. Each system is well-adapted to its individual watershed location. (See also W75-09532) (Prague-FIRL)
W75-09558

**DESIGN CRITERIA FOR MECHANICAL, ELECTRIC, AND FLUID SYSTEM AND COMPONENT RELIABILITY, SUPPLEMENT TO FEDERAL GUIDELINES FOR DESIGN, OPERATION, AND MAINTENANCE OF WASTE WATER TREATMENT FACILITIES.**
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
For primary bibliographic entry see Field 8C.
W75-09559

**PHOSPHORUS REMOVAL STUDY AT THE SARNIA WPCP,**
Ontario Ministry of the Environment, Toronto.
I. M. Gray.
Environment Canada, Centre for Inland Waters, Burlington, Ontario. Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No 14, (1974). 20 p, 7 fig, 3 tab, 71-2-1.

Descriptors: *Sludge treatment, *Treatment facilities, *Waste water treatment, Jar tests, Hydraulics, Phosphorus, *Canada.
Identifiers: *Sarnia Water Pollution Control Plant(Ont), *Phosphorus removal, *Ferric chloride.

A research project was conducted at the Sarnia Water Pollution Control Plant from January to June, 1972 to investigate: the effects of ferric chloride dosage, mixing, and hydraulics on the removal of total phosphorus in a primary waste water treatment plant; and, the effects of ferric chloride addition for phosphorus removal on the anaerobic sludge digestion process. The investigation followed a jar test study and a temporary full scale phosphorus study using ferric chloride, which had been conducted previously by the Dow Chemical Company of Canada, Limited. Existing facilities at the Sarnia WPCP are described, and the average process and analytical data obtained are presented. Effects of various dosages of ferric chloride, with and without the addition of polymers, under various mixing and primary clarifier hydraulic conditions are discussed, in terms of phosphorus removal and other effluent quality parameters. Similarly, the effects of the chemical addition on sludge production and anaerobic sludge digestion are presented. (Prague-FIRL)
W75-09562

**PHOSPHORUS REMOVAL IN SEASONAL RETENTION LAGOONS BY BATCH CHEMICAL PRECIPITATION,**
Ontario Ministry of the Environment, Toronto.
H. J. Graham, and R. B. Hunsinger.
Environment Canada, Centre for Inland Waters, Burlington, Ontario. Canada-Ontario Agreement Research Report No 13, (1974). 40 p, 15 fig, 4 tab, 14 ref. 73-1-13.

Descriptors: *Phosphorus, *Nutrient removal, *Waste water treatment, *Precipitation(Chemical), *Water pollution treatment, Chemicals, Sewage treatment, Municipal wastes, Industrial wastes, Coagulation, Lagoons, Lime, *Canada.
Identifiers: *Batch treatment, Alum, Ferric chloride, Ontario, Phosphorus removal.

A result of a Province of Ontario policy requiring phosphorus removal at municipal and institutional waste water treatment facilities in certain areas of the province is the development of a method of reducing the total phosphorus content in waste stabilization pond effluents to below 1.0 mg/liter. The method of achieving this in seasonal retention lagoons is through batch chemical treatment of the pond contents prior to discharge. Three prime coagulants, alum, ferric chloride, and lime were field tested. The required chemical dosage was determined by jar tests using lagoon contents. Batch chemical treatment of seasonal retention lagoons can produce total phosphorus residuals of less than 1.0 mg/liter. The quality of the effluent from a batch treated lagoon is at least as good as that achieved through conventional secondary treatment. Batch treatment can effectively remove algae from the pond contents if the chemical dosage is sufficient. Liquid alum and ferric chloride both produced a high quality effluent. Inconsistent results were obtained from the lime applications. Good dispersal of the chemical and adequate mixing with the pond contents can be accomplished with an outboard motorboat method of application. Batch chemical treatment is feasible on many existing lagoons that have an adequate retention time for winter storage. Some single and large cells can also be batch treated but lagoons built specifically for batch treatment ensure ease of operation. In five successive treatments of one lagoon, the dosage required for adequate phosphorus removal did not increase and there was only a slight increase in the sediment depth with each treatment. (Orr-FIRL)
W75-09563

**IDENTIFICATION OF PROBLEM AREAS IN WATER POLLUTION CONTROL PLANTS,**
Ontario Ministry of the Environment, Toronto.
K. M. Azan, and B. I. Boyko.
Environment Canada, Centre for Inland Waters, Burlington, Ontario, Canada-Ontario Agreement on Great Lake Water Quality, Research Report No 15, (1974). 41 p, 12 fig, 5 tab, append. 73-1-27.

Descriptors: *Water pollution control, *Treatment facilities, *Canada, Flow measurement, Surveys, Design criteria, Personnel, *Waste water treatment.
Identifiers: *Ontario(Canada), Hydraulic overloading.

Problem areas commonly encountered in waste water treatment facilities were determined from responses of Water Pollution Control Plant operators to a questionnaire circulated to 162 WPCP's in Ontario. Overall responses indicated that the major problem area in WPCP operation is hydraulic overloading. The incidence of hydraulic overloading is independent of plant size; a significant percentage of plants constructed in the last five years are overloaded. Hydraulic overloading affects pumping capacity, grit removal and secondary clarifier operation. Responses also indicated a general need for additional flow measurement devices. In addition, a considerable need for further operator education in plant testing procedures, interpretation and application of laboratory results, waste water treatment processes, safety, and equipment repair. (Prague-FIRL)
W75-09564

**WET AIR OXIDATION OF CHEMICAL SLUDGES,**
Waterloo Univ. (Ontario). Dept. of Chemical Engineering
R. R. Hudgins, and P. L. Silveston.
Environment Canada, Centre for Inland Waters, Burlington, Ontario. Canada-Ontario Agreement Research Report No 12, March, 1973. 79 p, 7 fig, 6 tab, 23 ref, 5 append.

Descriptors: *Waste disposal, *Sludge disposal, *Oxidation, Phosphorus, Chemical reactions, *Waste water treatment, Sewage treatment, Municipal wastes, Canada, Foreign research, *Sludge treatment.
Identifiers: *Wet air oxidation.

The Zimmerman process, also called Wet Air Oxidation, or wet oxidation was developed over 20 years ago as a technique for waste disposal. Wet air oxidation was performed on eight Ontario sludges containing phosphorus. Some of the sludges were obtained from primary or secondary clarifiers in which lime, ferric chloride, or alum had been added to precipitate phosphorus. The sludges were oxidized at temperatures up to 550 F in a rocking autoclave; total carbon and total organic carbon values were measured in samples taken during oxidation. Selected total phosphorus and ortho-phosphorus analyses were made on both chemical and non-chemical sludges. For most sludges at 500 F, a reduction of at least 50% of the TOC was produced by 3 hours exposure to wet air oxidation. Mass transfer limitations seemed to be present except in the case of the activated sludges. Cations from chemical stabilization of phosphorus seem to catalyze wet air oxidation. The stabilization of phosphorus by prior chemical treatment was slightly reversed by wet air oxidation of the chemical sludges. Contradictory evidence of increased and reduced stabilization resulting from wet air oxidation of non-chemical sludges illustrates the need for further studies. Sludges containing high levels of chemicals may cause carbonate formation during sludge oxidation. Recovery of a high yield phosphorus in the form of a residual ash from wet oxidation appears feasible. Further studies are needed to establish the kinetics of wet air oxidation more fully and to provide knowledge of the reasons for changes in solubility during the process. (Orr-FIRL)
W75-09565

**PROCESS FOR THE REDUCTION OF THE BIOCHEMICAL OXYGEN DEMAND OF SEWAGE AND FOR THE RECOVERY OF THE INHERENT PROTEIN,**
J. Hollo, J. Toth, and I. Zagyvai.
Canadian Patent 959,586. Patent Office Record, Vol 102, No 51, p 83, December, 1974.

Descriptors: *Sewage treatment, *Patents, *Biochemical oxygen demand, *Proteins, Polymers, Hydrogen ion concentration, Dewatering, Alum, Iron, Chemical precipitation, *Waste water treatment.
Identifiers: Copolymers, Dehydration, Protein recovery.

A process for the reduction of BOD of sewage is described in which the inherent protein is recovered. Sewage is purified by adding to it at least 120 g/cu m of a water-soluble aluminum salt or a bivalent or trivalent iron salt, and possibly 0.5 to 1.0 kg/cu m of bentonite or kaolin, as well as five to ten g/cu m of copolymers of acrylic acid - acrylic amide in the form of an aqueous solution. Sewage is then conditioned, its pH is adjusted to exceed ten by adding a basic calcium compounds, and the protein-containing precipitate thus obtained is separated from the clarified water in a settling tank. The pH of the precipitate is adjusted to seven or less using carbon dioxide. After dehydration the precipitatate may be sterilized at temperatures above 130 C under pressure. (Prague-FIRL)
W75-09566

**WASTEWATER TREATMENT SYSTEM,**
F. A. Karr.
Canadian Patent 959,182. Issued December [illegible] 1974. Patent Office Record, Vol 102, No 50, p [illegible] December, 1974

Descriptors: *Patents, *Waste water treatment, *Oxygen, Sumps, *Biological treatment, Bacteria, Identifiers: Oxygen injection, Bacterial treatment.

An apparatus and method are described for injecting air or other oxygen-containing gases under pressure into waste water from within a gas porous shell capable of passing gas bubbles of a size for retention by the waste water. The injection may be through elements at the bottom of a sump or in stream in a recycle line to and from the sump. The bed of perforate balls on the bottom of the sump provides an excellent surface area for bacterial treatment by coated enzymes injected into the system. (Prague-FIRL)
W75-09567

**WASTEWATER TREATMENT SEQUENCE,**
M. Zuckerman, and A. Molof.
Canadian Patent 957,789. Issued November [illegible] 1974. Patent Office Record, Vol 102, No 46, p [illegible] November, 1974.

Descriptors: *Patents, *Waste water treatment, *Pre-treatment, *Hydrolysis, Biological treatment, Organic matter, Filtration, Membranes, Disinfection.

An improved process for treating waste water based on pretreatment by hydrolysis. This converts high molecular weight soluble organic material in raw waste water into organic matter of low molecular weight. Following this conversion, the waste water is treated with a process sequence tailored to effluent quality requirements. One such sequence may include, for example, the steps of physical or biological adsorption, solids removal, membrane filtration, and disinfection. (Prague-FIRL)
W75-09569

**SEWAGE TREATMENT WITH PRIMARY SLUDGE REMOVAL FROM FINAL CLARIFIER,**
J. D. Walker.
Canadian Patent 959,584. Issued December [illegible] 1974. Patent Office Record, Vol 102, No 51, p [illegible] December, 1974.

Descriptors: *Sewage treatment, *Sludge treatment, *Patents, Settling basins, Tanks, Aeration, Clarification, Sludge disposal, *Waste water treatment.
Identifiers: Settling tanks, Clarification tanks.

A method of sewage treatment with primary sludge removal from a final clarifier is described. The primary settling tank is omitted or reduced in size; the primary type of sludge is carried through the aeration tank by vigorous circulation of its contents, then removed from the system at the final clarification tank. Sludge settles on the floor near the entry to the clarifying area and is scraped separately into a hopper as waste sludge. All sludge settling further remote from the feed is removed from several points for rapid return of a portion to the aeration tank. The reduction of primary settling provides an inventory of fine inert particles. In the aeration tank, these particles adhere to the light activated sludge flocs to increase their weight and aid settling in the clarification tank. (Prague-FIRL)
W75-09570

**WET OXIDATION TREATMENT OF WASTE LIQUOR OR SLUDGE,**
L. A. Pradt.
Canadian Patent 958,507. Issued December 3, 1974. Patent Office Record, Vol 102, No 49, p 2, December, 1974.

Descriptors: *Patents, *Waste water treatment, Oxidation, Waste treatment, *Sewage treatment, Tanks, Sludge treatment, Industrial wastes, Oxidation.
Identifiers: *Wet oxidation, Flash tanks.

Wet oxidation treatment of waste liquor or sludge is described. Raw liquor or sludge derived from either sewage or industrial wastes is introduced to a heat exchanger. It then proceeds through a temperature control valve to a reactor, and to a separator. A flash tank receives oxidized liquor from the separator; another flash tank receives oxidized liquor from the separator at an intermediate pressure. This results in flash steam used for indirect preheating of the liquor or sludge by the heat exchanger in a single stage. (Prague-FIRL)
W75-09571

**BIOLOGICAL AERATED FILTERS,**
J. Tymoszczuk.
Canadian Patent 953,039. Issued August 13, 1974. Patent Office Record, Vol 102, No 33, p 85, August, 1974.

Descriptors: *Filters, *Patents, *Aeration, Domestic wastes, Industrial wastes, *Waste water treatment, Water pollution, Effluents.
Identifiers: *Biological aerated filters.

A process for the treatment of domestic and industrial wastes was a submerged biological filter bed of finely divided particulate filtering media. The wastes enter the biological filter bed and the filter is aerated during the filtration process. Treated effluent is drawn out of the biological filter bed; the bed is backwashed as often as necessary to maintain operating efficiency. The process is different from other processes because of the maintenance of a submerged and aerated filter bed. (Leibowitz-FIRL)
W75-09572

**PROCESS FOR THE RECOVERY OF FORMALDEHYDE AND PHENOL CONTAINED IN WASTE WATERS,**
H. Ackermann, G. Minore, and P. Radici.
Canadian Patent 963,592. Issued February 25, 1975. Patent Office Record, Vol 103, No 8, p 86, February, 1975.

Descriptors: *Patents, *Waste water treatment, Phenols, Water reuse, Ammonia, Liquid wastes, Recycling, Water purification, Industrial wastes.
Identifiers: *Formaldehyde, Waste liquors.

In a process for the purification of waste liquors, formaldehyde and phenol are recovered from the liquors. Ammonia is added to the formaldehyde liquor, to form hexamethylene tetramine. Water is evaporated and the concentrate is added to the phenol liquor, thus recovering the hexamethylene tetramine/phenol adduct formed. (Prague-FIRL)
W75-09573

**PROJECTS IN THE INDUSTRIAL POLLUTION CONTROL DIVISION - DECEMBER 1974.**
Environmental Protection Agency, Washington, D.C. Industrial Pollution Control Div.
Available from the National Technical Information Service, Springfield, Va. 22161. Report EPA-600/2-75-001, December 1975, 439 p. 1BB036 PEMP Task 003.

Descriptors: *Projects, *Waste water treatment, Industrial water, *Research and development, Water pollution control, Documentation.

A compilation is presented of information sheets from projects initiated since fiscal year 1967 through fiscal year 1974. Each sheet contains the objectives, statistical information, and a brief description of the project. General introductory information on the Federal Industrial Pollution Control Program is also presented to provide perspective on the magnitude of industrial pollution and the research directions that must be pursued in order to develop the technology to adequately control this largest point source of pollution in the United States. (EPA)
W75-09578

**STORM WATER MANAGEMENT MODEL: USER'S MANUAL, VERSION II,**
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
W. C. Huber, J. P. Heaney, M. A. Medina, W. A. Peltz, and H. Sheikh.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Report EPA-670/2-75-017, March 1975, 350 p, 42 fig, 90 tab. 1BB034; ROAP 21ATA; Task 022. R-802411.

Descriptors: *Water quality, Runoff, Storm sewers, *Sewers, *Urbanization, Stream pollution, Estuaries, *Mathematical models, Water storage, Water pollution, *Waste water treatment, Surface runoff, Soil erosion, Drainage, Cost analysis, Hydraulics, *Combined sewers, Model studies, Computer models, Overflow, Storm water.
Identifiers: *Urban runoff modeling, *Optimum design, Lancaster(Pa), St Johns River(Fla).

A comprehensive mathematical model (the EPA Storm Water Management Model, SWMM) capable of representing urban stormwater runoff and combined sewer overflow phenomena was developed. SWMM portrays correctional devices in the form of user-selected options for storage and/or treatment with associated estimates of cost. Effectiveness is portrayed by computed treatment efficiencies and modeled changes in receiving water quality. The original project report published in 1971 is divided into four volumes: Volume I, 'Final Report'; Volume II, 'Verification and Testing'; Volume III, 'User's Manual'; and Volume IV, 'Program Listing' (EPA Report Nos 11024DOC07/71, 11024DOC08/71 11024DOC09/71, and 11024DOC10/71, respectively). (See also W71-13370). Effort on modification and improvement of the SWMM has been, and is being continued since its release. As a result, this official 'Release 2' of the SWMM includes additional program components, i.e., new runoff routine, urban erosion prediction, new treatment process performance and cost functions, and new receiving water quality. This report provides a revised and improved User's Manual to accompany 'Release 2' as in the original User's Manual, Volume III. (EPA)
W75-09579

**COUNTERMEASURES FOR POLLUTION FROM OVERFLOWS; THE STATE OF THE ART,**
Environmental Protection Agency, Edison, New Jersey, Storm and Combined Sewer Section.
R. Field, and J. A. Lager.
Available from the National Technical Information Service, Springfield, Va. 22161. Report EPA-670/2-74-090, December 1974. 30 p, 4 fig, 2 tab, 28 ref. 1BB034/ROAP 21ASY/TASK 01. EPA Contract 68-03-0179.

Descriptors: Disinfection, *Waste treatment, *Sewage treatment, Sewage, Water quality, Cost effectiveness, Storage tanks, *Storm sewers, *Overflows, *Combined sewers, Mathematical models, Storm runoff, Drainage systems, Water pollution control, Pollution abatement, *Storm runoff, *Waste water treatment, *Urban hydrology.

Control and/or treatment of stormwater discharges and combined sewage overflows from urban areas are important problems in the field of water quality management. Over the past decade much research effort has been expended and a large amount of data has been generated. Presented are selected results of a comprehensive investigation and assessment of promising, completed and ongoing projects, representative of the state-of-the-art in abatement theory and technology; a look at recent legislation; and the identification of program needs and emphasis. Combined sewer overflows are major sources of water pollution problems, but even discharges of stormwater alone can seriously affect water quality. Current approaches involved control of overflows, treatment and combinations of the two. Control may involve maximizing treatment with existing facilities, control of infiltration and extraneous inflows, surface sanitation and management, as well as flow regulation and storage. A number of treatment methods have been evaluated including high rate screening and microstraining, ultra high rate filtration, dissolved air flotation, physical/chemical treatment, and modified biological processes. A swirl flow regulator/solids separator of annular shape construction with no moving parts has been developed. High rate disinfection methods including new disinfectants have been applied. Promising approaches involve integrated use of controls and treatment. (EPA)
W75-09580

**STATE OF ARIZONA, ENVIRONMENTAL SERVICES NEEDS STUDY FOR GREENLEE COUNTY, 1970-1990.**
Arizona State Office of Economic Planning and Development, Phoenix. Planning Div.
June, 1974. 77 p, 32 tab, 10 fig, 11 plates, 40 ref.

Descriptors: *Arizona, *Water supply, *Sewage disposal, *Environmental sanitation, *Waste disposal, *Solid wastes, Environmental effects, History, Agriculture, Irrigation, Mining, Mine water, Livestock, Forecasting, Waste water treatment, Planning.
Identifiers: Greenlee County(Ariz).

Existing water systems and sewage and solid waste disposal facilities are identified and evaluated, and a projection is made of future needs for these facilities and services in rural areas of Greenlee County. Greenlee County will have only minor problems in maintaining environmental services over the next twenty years because little population growth is foreseen for the rest of the century. Problems that might occur can best be handled on the local level. The area's biota, geology and water supply are reviewed, brief historical sketches are given for the county's few communities. (Bowden-Arizona)
W75-09584

**THE QUALITATIVE AND QUANTITATIVE DETERMINATION OF SOLUBLE AND INSOLUBLE FORMS OF PHOSPHORUS IN SEWAGE TREATMENT PLANTS,**
Michigan State Univ., East Lansing. Inst. of Water Research.
F. M. D'Itri.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 514, $4.75 in paper copy, $2.25 in microfiche. Completion Report, June 1975. 93 p, 13 fig, 23 tab, 58 ref, append. OWRT A-042-MICH(1), 14-31-0001-3222.

Descriptors: *Waste water treatment, Ion exchange, *Sewage treatment, Michigan, *Phosphorus compounds, *Phosphates, Detergents, Sewage effluents, Activated sludge.
Identifiers: East Lansing(Mich), *Biochemical hydrolysis, *Orthophosphates, Pyrophosphates, Tripolyphosphates.

The major source of phosphorus to surface waters in the United States is condensed phosphates in detergents which hydrolize to orthophosphate, the form most readily available to plants and organisms. While the chemical hydrolysis of these compounds occurs at a relatively slow rate, the biochemical hydrolysis which takes place in wastewater is much more rapid. In the East Lansing Sewage Treatment Plant, the total ortho

and condensed phosphate concentration was highly variable. The average yearly tripolyphosphate and pyrophosphate concentrations in filtered primary effluent of 2.44 and 0.44 mg/l respectively decreased to 0.74 and 0.19 mg/l after secondary activated sludge treatment. In the primary effluent the orthophosphate, pyrophosphate and tripolyphosphate concentrations represented 43.5, 6.6, and 37.1 percent of the total phosphorus concentrations of the wastewater. After activated sludge treatment, the relative yearly concentrations of orthosphate, pyrophosphate and tripolyphosphate were 76.9, 3.8, and 14.9 percent of the total phosphorus content. During the same time concentration of organic phosphorus containing compounds also decreased from 0.84 to 0.21 mg/l.
W75-09618

**SOLAR STILL WITH REPLACEABLE SOLAR ABSORBING LINER AND WEIGHT CONTROLLED FEED INLET,**
For primary bibliographic entry see Field 3A.
W75-09643

**WATER TREATMENT PLANT,**
B. C. Bradford.
US Patent No 3,881,700, 4 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 934, No 1, p 182, May 6, 1975.

Descriptors: *Patents, *Waste water treatment, Water quality control, Water pollution control, *Mixing, Aeration, Turbulence, Treatment facilities, *Water purification.
Identifiers: *Turbulent mixing, *Chemical treatment.

A water treatment plant is described which provides for the mixing of chemicals with water and subsequent aeration of the water for aiding in purifying the water. The device includes a vertical tank which contains a hood. The solution of raw water and chemicals enter the top of the tank into the hood and collide with a cup-shaped deflector. The cup-shaped deflector reverses the flow of water with great turbulence and forces the water and chemical solution up into a mixing chamber defined by the upper portion of the hood. The solution then flows down under the bottom of the hood upwards in the tank. Intermediate the top and bottom of the tank is a loc layer which aids in removing impurities from the solution. The solution is then aerated by passing through a launder and a collection well. Subsequent filtration can take place if desired. (Sinha-OEIS)
W75-09645

**WATER TREATMENT APPARATUS,**
Norwich (England). (assignee)
F. Smith.
US Patent No 3,881,704, 5 p, 5 fig, 5 ref; Official Gazette of the US Patent Office, Vol 934, No 1, p 183, May 6, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Coagulation, Mixing, Water quality control, Separation techniques, Chemical reactions, Equipment.

An apparatus is described which is of particular value for forming a complex alkali metal-aluminium-silicate material that is completely soluble in hydrochloric acid and that is of particular value as a coagulant or coagulant aid in the removal of solids from an aqueous suspension. The apparatus is comprised of a mixing chamber, at least three separate inlets for liquids to the chamber, an outlet duct at a position distant from the inlets, a hydraulic ejector to which the outlet duct leads, and means for mixing under high shear within the chamber material introduced through the inlets. (Sinha-OEIS)
W75-09646

**METHOD AND APPARATUS FOR AERATION OF BIODEGRADABLE WASTE MATERIAL,**
Vand (Ren), Inc., Webster City, Iowa. (assignee)
N. R. Wittrup.
US Patent No 3,882,017, 5 p, 8 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 934, No 1, p 281, May 6, 1975.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Aeration, *Water pollution treatment, *Biodegradation, Oxygen, Equipment.
Identifiers: Pressure aeration, Turbulent mixing.

A method of pressure aeration of biodegradable waste material to enhance the rate of degradation by aerobic bacteria present in the waste material is disclosed. Under conditions of high velocity, a waste material slurry taken from a reservoir of biodegradable waste material is introduced into a confining zone to create a pressure greater than atmospheric, and to create high velocity turbulent flow. The aerated slurry is withdrawn from the confining zone and introduced into a mixing and separating zone. The mixing area and separating zone are separated by a back pressure means. Turbulent mixing occurs in the mixing area and the slurry is withdrawn from the separating area and discharged downstream from the back pressure creating means. Excess air and undissolved gases are separated. The aerated slurry is discharged under conditions of high velocity into a reservoir of waste material. (Sinha-OEIS)
W75-09647

**PROCESS FOR EFFLUENT WATER RECOVERY,**
Hill Brothers Chemical Co., Inc., City of Industry, Calif. (assignee)
Z. L. Burke.
US Patent No 3,882,019, 5 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 934, No 1, p 282, May 6, 1975.

Descriptors: *Patents, *Water pollution control, *Water pollution treatment, *Water pollution prevention, *Chemical wastes, Industrial wastes, Filtration, Separation techniques, Chemical reactions, Lead, Sulfur compounds.
Identifiers: Process water.

The invention relates to a process for effluent water recovery by stripping lead and sulfuric acid from the effluent water to a level allowing the water to be recirculated as process water and converting the lead and sulfuric acid to a safe and reusable form. Lead carbonate is added to the effluent water in a first agitated enclosure thereby forming water, carbon dioxide, and insoluble lead sulfate. The water is filtered from the lead sulfate and conducted back to the manufacturing process for reuse. The filtered lead sulfate is added to a solution of ammonia, ammonium sulfate, carbon dioxide, and water in a second agitated enclosure to form ammonium sulfate and lead carbonate. The ammonium sulvate liquid is filtered from the lead carbonate and conducted to a holding tank for reuse in a second agitated enclosure. The filtered lead carbonate is dried to remove residual ammonia and then the dried lead carbonate powder may be conducted back to the first agitated enclosure for reuse. The carbon dioxide from the first agitated enclosure and the liberated ammonia from the dryer may be conducted back to the ammonium sulfate holding tank. Finally, excess ammonium sulfate from the holding tank may be conducted to a crystalizer for generation of ammonium sulfate crystals. (Sinha-OEIS)
W75-09648

**WASTEWATER CONCENTRATOR WITH SLOTTED DISTRIBUTOR,**
Sweco, Inc., Los Angeles, Calif. (assignee)
W. J. Talley, Jr.
US Patent No 3,882,025, 7 p, 8 fig, 1 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 934, No 1, p 284, May 6, 1975.

Descriptors: *Patents, *Waste water treatmen *Separation techniques, *Screens, *Water poll tion sources, Equipment, Storm water, Sol wastes.

A screening apparatus useful for screening of liquid-solids influent, such as storm water ove flow from sewer systems, comprises a cylindric screening device mounted for rotation with a hou ing, a slotted distributor for receiving a feed of i fluent and directing the influent toward the inn surface of the screen as a plurality of influe streams, and outlet means for receiving the e fluent which passes through the screen and th concentrate which does not pass through th screen. The screening structure and distributor ar mounted within a housing, and suitable collectio means are provided for receiving the effluent an the concentrate. The screening structure is in th form of a cylindrical cage and includes a numbe of screen panels, which may be removed fo repair, cleaning or replacement with differen mesh screens or different screen cloth. Th velocity of flow of influent onto the scree preferably is adjusted to be within a range belo which sufficient flow toward the screen does no occur and above which screen damage and splash back possibility may occur. The rate of flow an volume of influent into and from the distributor and the angle of the flows of influent from th slots on the distributor may be adjusted to provid a desired rotational speed for the screening struc ture and a desired centrifugal force. (Sinha-OEIS)
W75-09649

**MATERIAL FOR BIOLOGICAL DEGRADATION OF PETROLEUM,**
Dunn (John) Agencies Ltd., Vancouver (British Columbia). (assignee)
P. M. Townsley.
US Patent No 3,883,397, 2 p, 2 ref; Official Gazette of the United States Patent Office, Vol 934, No 2, p 729, May 13, 1975.

Descriptors: *Waste water treatment, *Patents, *Oil spills, *Oil pollution, *Water pollution treatment, Water pollution control, *Microbial degradation, Nutrients, Nutrient requirements.

The invention contemplates the use of microbial nutrients for fostering microbial activity, the nutrients being in dry particulate form. The particles of nutrient are coated with a lipophilic, partially hydrophobic, and bidegradable coating. The particle size is such that particles will remain at the interface of the oil and water or be suspended in the oil so nutrient is slowly released and thus sustain microbial activity over an extended period. Each particle has a core of solid water soluble microbial available nutrient selected from the group consisting of nitrogen in the form of an ammonium compound, phosphorous in the form of a microbial available phosphate compound, and iron in the form of microbial available iron compound. The particle has a coating encapsulating the core composed of a metalic salt of a fatty acid which is lipophylic, partially hydrophobic and biodegradable, the metal in the salt being selected from the group consisting of magnesium, aluminum and calcium. (Sinha-OEIS)
W75-09652

**SYSTEM FOR THERMAL DESALTING OF WATER,**
For primary bibliographic entry see Field 3A.
W75-09653

**DESALINATION PROCESS,**
Department of the Navy, Washington, D.C. (assignee)
For primary bibliographic entry see Field 3A.
W75-09654

**PROCESS FOR TREATING WASTE WATER,**
Etudes et Procedes d'Assainissement Purator (France). (assignee)
S. O. R. L. Lewandowski, and R. Lewandowski.
US Patent No 3,883,426, 7 p, 9 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 934, No 2, p 737, May 13, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, *Chemical reactions, *Flotation, Equipment, Mercury.
Identifiers: Aluminum amalgam.

Waste water is purified by means of the flotation process by using aluminum having on at least one surface thereof an amalgam of aluminum and mercury. The hydrogen gas and aluminum produced during the reaction between the waste water and the aluminum amalgam is used to float the impurities to the surface of the waste water being treated. The impurities are then removed and the purified water recovered. The flotation apparatus consists of a tank at one end of which the crude fluid is introduced about half way up. The fluid which has undergone flotation is removed through a siphon-type partition, the wall of which descends below the average height of the fluid and which is located at the other end of the tank. The aluminium plates, treated by means of traces of mercury or of a mercury salt are placed slightly above the bottom. A scraping device is placed above the surface of the fluid in the tank in order to remove the excess thickness of the layer of foam. Heavy sludges are removed at the bottom of the tank. (Sinha-OEIS)
W75-09656

**FLOATING SOLIDS RETURN DEVICE,**
Oldham (Robert R.), Inc., Sidney, Ohio. (assignee)
R. R. Oldham, and J. H. Wooddell.
US Patent No 3,883,427, 4 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 934, No 2, p 737, May 13, 1975.

Descriptors: *Patents, *Waste water treatment, Sewage treatment, *Settling basins, Water pollution control, Oxidation, Aeration.
Identifiers: Floating solids return.

A sewage treatment system is described in which liquid sewage, containing solids, is conducted into a first or primary settling tank. Liquid is drawn from an intermediate depth of the first tank and conducted to a reducing tank containing an aerator which is operated on a periodic basis and induces a current pattern into the fluid in the reducing tank. A final or outflow settling tank adjacent the reducing tank includes a wall in common with the reducing tank under which settled solids return to the reducing tank. A floating solids return is provided between the outflow and reducing tanks, and includes a provision for utilizing the current flow induced into the reducing tank by the aerator to conduct floating solids from the outflow settling tank to the reducing tank. The floating solids return is an opening in the reducing tank which faces in the same direction toward which the current, induced by the aerator, flows. The effluent is drawn from an intermediate depth of the outflow settling tank. (Sinha-OEIS)
W75-09657

**PORTABLE WATER SUPPLY SYSTEM,**
World Water Resources, Inc., New York. (assignee)
J. E. Hanford.
US Patent No 3,833,429, 6 p, 4 fig, 6 ref,; Official Gazette of the United States Patent Office, Vol 934, No 2, p 738, May 13, 1975.

Descriptors: *Patents, *Waste water treatment, Water quality control, *Water pollution treatment, Potable water, Water purification, Filtration, Demineralization, Water supply.
Identifiers: Chemical treatment, Portable water supply system.

An apparatus is provided whereby contaminated water is rendered potable. The apparatus comprises: a water source; first and second purification tanks each of which is provided with at least one vertical planar baffle, a prefiltering means; means for pumping water from the source to the filter tank, from the first tank to the second tank and from the second tank to an outlet means; a chemical addition means for chemically treating water in the second tank; and a first and second recycle means for recycling water in the first and second tanks, respectively. (Sinha-OEIS)
W75-09658

**SYSTEM FOR PURIFYING AND DISINFECTING WASTE WATER,**
K. H. Hildebrand.
US Patent No 3,883,432, 4 p, 1 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 934, No 2, p 739, May 13, 1975.

Descriptors: *Patents, *Waste water treatment, Water quality control, *Disinfection, *Water purification, Filtration, Mixing, Equipment, Hospitals. Ships, Water pollution control.

The invention relates to a system for cleaning and disinfecting waste water in hospitals and on ships. The system continuously processes the waste water with small disinfecting agent dosages and produces pure water. A mixing vessel is provided downstream from a container having a disintegrating device. The mixing vessel contains an inlet and an outlet for the waste water and at least one inlet for chemicals. Downstream from the mixing vessel is a closed vessel having an inlet and an outlet for the waste water, a sludge drain, and a filter device. The outlet line of the closed vessel contains a disinfecting apparatus. The inlet and the outlet of the mixing vessel are each connected to a dosage device for a chemical agent. The filter is installed in the vessel in such a way that when cleaning the filter the return sludge of the filter is passed into the sludge drain of the vessel by flowing water through the filter in a reverse direction. (Sinha-OEIS)
W75-09659

**REVERSE OSMOSIS APPARATUS,**
United Kingdom Atomic Energy Authority, London (England). (assignee)
For primary bibliographic entry see Field 3A.
W75-09661

**LIQUID TREATMENT APPARATUS,**
ITT Industries, Inc., New York. (assignee)
H. Lindquist.
US Patent No 3,884,812, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 934, No 3, p 1187, May 20, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Aeration, *Water quality control, Turbulent flow, Water circulation, Hydrodynamics, Sludge treatment, Liquid wastes.

An apparatus is described for waste water treatment in which upper and lower horizontally disposed planes, each having the general configuration of an airfoil, are mounted in a ring channel. An aerator is positioned adjacent to the bottom of the channel. The forward portion of the upper plane is disposed in front of the aerator while the entire lower plane is disposed in front of the aerator near the bottom of the channel. The planes cooperate hydrodynamically in such a way that the aerator itself serves to efficiently circulate the water through the channel, as well as aerate the waste sludge in the water. (Sinha-OEIS)
W75-09666

**APPLICATION OF FILTRATION THROUGH SEMI-PERMEABLE MEMBRANES FOR TREATMENT OF WASTES,**
J. Kepinski, and N. Chlubek.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-781 244, $3.25 in paper copy, $2.25 in microfiche. Translation from Przemysl Chemiczny, Vol 50, No 12, 1971, p 788-791.

Descriptors: *Reverse osmosis, *Membrane processes, *Waste water treatment, Water reuse, Water purification, Reclaimed water, Desalination, Desalination processes, Municipal wastes, Industrial wastes, Radioactive waste disposal, Acid mine water.
Identifiers: Hyperfiltration.

The basis of the hyperfiltration (reverse osmosis) process is discussed as well as the characteristics of membranes and hollow fibers and applications of reverse osmosis in the treatment of industrial and municipal wastes. Reverse osmosis was originally developed as a method of desalting salt and brackish waters. In practice, the pressures used in reverse osmosis are several times greater than the difference between the osmotic pressures of the substrate and the product, in order to compensate for the unfavorable phenomenon of concentration polarization and to increase the speed of the process. Heavy metal ions are relatively easily separated from others by reverse osmosis. It can also be used in the treatment of radioactive wastes where the concern is with reducing the volume before decontamination. An experimental apparatus used for treating the acidic waste water from the Kittanning mine in Pennsylvania was capable of producing over 5 cu m of desalinated water daily. Reverse osmosis is also being used in the treatment of tanning wastes, wastes from cellulose and paper factories, and wastes from other light industrial plants. Reverse osmosis is used for treating municipal waste water where the reuse of water is necessary because of a limited supply. The Los Angeles region reuses municipal wastes treated by reverse osmosis for agricultural and industrial purposes. Regeneration of water from wastes in space-vehicles is another specific application of reverse osmosis. (Orr-FIRL)
W75-09730

**ATTITUDES IN SLUDGE TREATMENT AND DISPOSAL,**
Delaware Univ., Newark. Dept. of Civil Engineering.
R. I. Dick.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EE5, p 1077-1087, October, 1974. 1 fig, 31 ref.

Descriptors: *Sludge treatment, *Sludge disposal, *Waste water treatment, *Reviews, Sewerage, Sewage, Management, Dewatering, *Attitudes.

A critical analysis of current practices of sludge management is presented. Sludge treatment and disposal involve thickening, conditioning, dewatering, conversion, transportation, and ultimate disposal. Materials incompatible with attempts to reclaim sludge materials or disposal of sludge should not be allowed in sewers. Sludge treatment and disposal must both be a part of the design of overall waste management facilities. The effects of both waste water treatment practices on sludge disposal and of sludge treatment practices on waste water treatment processes need to be evaluated more carefully than they have been in the past. Not all waste water treatment plants need sludge treatment and disposal facilities. Large-scale regional collection and disposal systems which would eliminate sludge handling at most plants are economically feasible and ecologically sound. Removal of water from sludges is neither necessary nor economically justified. Many present sludge management techniques do not include provision for ultimate disposal of the sludge but rather provide for the accumulation of sludges. Improvements are needed in the technology involved in present sludge treatment handling and disposal schemes as well as a reevaluation of some

of the basic approaches to the problem. (Orr-FIRL)
W75-09731

OPERATING RESULTS OF ELECTRODIALYSIS AND REVERSE OSMOSIS MUNICIPAL DESALTING PLANTS,
Reynolds, Smith and Hills, Jacksonville, Fla.
R. T. Skinde, and T. L. Tang.
National Water Supply Improvement Association Journal, Vol 1, No 1, p 15-21, July, 1974. 8 tab.

Descriptors: *Desalination, *Reverse osmosis, *Electrodialysis, *Potable water, Public health, Water supply, Membrane processes, Water purification, Facilities, Costs, *Waste water treatment.

Electrodialysis and reverse osmosis are the two primary membrane processes utilized in the desalination of salt and brackish water. Their use to provide potable drinking water from brackish waters is now accelerating rapidly. In January, 1972, there were 812 land-based desalting plants of 25,000 gpd capacity or larger throughout the world. Electrodialysis treatment with 30 percent salt passage of a well water with 2000 ppm TDS results in a product water of 600 ppm TDS, which is 100 ppm higher than the permissible level. However, reverse osmosis can treat well waters with much higher TDS contents. Treatment of a well water of 7000 TDS by reverse osmosis with 6 percent salt passage reduced the TDS content in the product water to 420 ppm TDS. The greatest application of electrodialysis is for low TDS waters which will not increase substantially over the years; reverse osmosis should be used where the TDS level is higher and a degradation of well water quality over the years is expected. The operating results of three electrodialysis and three reverse osmosis municipal treatment plants are summarized. A comparative analysis is presented of product water quality and operating costs in plants based upon these two membrane processes. (Orr-FIRL)
W75-09732

CARBON FROM LIGNITE OR COAL: WHICH IS BETTER,
ICI United States, Inc., Wilmington, Del.
P. B. DeJohn.
Chemical Engineering, Vol 82, No 9, p 113-116, April, 1975. 3 fig, 3 tab, 8 ref.

Descriptors: *Waste water treatment, *Activated carbon, *Adsorption, Municipal wastes, Industrial wastes, *Lignite, *Coals, *Carbon.

Granular carbons produced from medium-volatile bituminous-coal or lignite are the best activated carbons for use in waste water treatment. Factors to be considered when selecting a particular type include: ability to absorb enough impurities to meet allowable effluent standards; reasonable losses during carbon regeneration; minimal pressure drop and operating problems; and, lowest operating costs. More than fifty comparative granular carbon studies were performed on various municipal and industrial effluents including those from tertiary municipal treatment, oil refineries, dye plants, and pulp and paper mills. The two types of carbon produced from coal or lignite performed equally well on an equivalent volume basis when treating domestic waste streams. The most important factor that determines the absorption capacity of a carbon is available surface area. Bituminous-coal carbon has a greater total surface and more surface in the micropore range, while lignite carbon has more surface area in the transitional-pore range. Therefore, a lignite carbon performs better than a bituminous-coal carbon when treating a waste stream containing pollutants with mostly large molecules. Bituminous-coal carbon adsorbs small-molecule pollutants better than lignite carbon because it has more available surface area in the micropore range. However, thermal regeneration destroys the surface area in this range and after several regenerations both carbons perform about the same. Lignite carbons regenerate faster and under milder conditions than bituminous-coal carbons. (Orr-FIRL)
W75-09733

URBAN RUNOFF POLLUTION CONTROL--STATE-OF-THE-ART,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
R. Field, and J. A. Lager.
Journal of the Environmental Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No EE1, Paper 11129, p 107-125, February 1975. 4 fig, 2 tab, 22 ref, 2 append. EPA Contract 68-03-0179.

Descriptors: *Reviews, *Urban runoff, *Storm runoff, *Storm drains, *Surface runoff, *Cost analysis, Environmental sanitation, Waste water treatment, Flow control, Waste storage, Overflow, Combined sewers, Treatment, Hydrology, Sewage treatment, Water pollution, Drainage, Bacteria.
Identifiers: *Swirl regulator/concentrator, *Flow regulators.

Combined sewer overflows are major sources of water pollution problems, but even discharges of stormwater alone can seriously affect water quality. Current approaches involve control of overflows, treatment, and combinations of the two. Control may involve maximizing treatment with existing facilities, control of infiltration and extraneous inflows, surface sanitation and management, as well as flow regulation and storage. A number of treatment methods were evaluated including high rate screening and microstraining, ultra-high rate filtration, dissolved air flotation, physical/chemical treatment, and modified biological processes. A swirl flow regulator/solids separator of annular shape construction with no moving parts was highly developed. High rate disinfection methods including new disinfectants were applied. Promising approaches involve intergrated use of controls and treatment. (Lardner-ISWS)
W75-09762

CATALYTIC OXIDATION OF PHENOL IN AQUEOUS SOLUTION OVER COPPER OXIDE,
Delaware Univ., Newark. Dept. of Chemical Engineering.
A. J. Sadana, and J. R. Katzer.
Industrial and Engineering Chemistry Fundamentals, Vol 13, No 2, p 127-134, 1974. 9 fig, 2 tab, 51 ref, OWRT A-014-DEL(10).

Descriptors: *Oxidation, *Catalysts, *Chemical reactions, *Phenols, Kinetics, Industrial wastes, *Waste water treatment, Ultimate disposal, Chemical wastes, Aqueous solutions.
Identifiers: Aqueous-phase oxidation, *Catalytic oxidation, Free radical.

Catalytic oxidation of phenol in aqueous solution over supported copper oxide was studied in the batchwise mode at atmospheric and above-atmospheric pressure and between 369 and 419K. The reaction undergoes an induction period and transition to a much higher, steady-state activity regime. The reaction is first order with respect to phenol in both regimes, but the oxygen dependency decreases from first to one-half order in shifting from the induction period to the steady-state activity regime. The rate shows other than first-order behavior with respect to catalyst loading. The reaction is proposed to involve a free-radical mechanism. Oxidation rates at atmospheric pressure conditions are too slow to be of practical interest but can easily be brought into the range of practical importance by only moderate increases in temperature and operating pressure.
W75-09772

MODIFICATIONS TO THE EXECUTIVE COMPUTER PROGRAM FOR STEADY-STATE SIMULATION OF WASTEWATER TREATMENT FACILITIES,
Curran Associates, Inc., Northampton, Mass.
P. M. Meier, and G. R. Fisette.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-23-497. $4.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency. Report EPA-670/2-74-066, July 1974. 59 p, 7 fig, 15 ref.

Descriptors: *Computer programs, *Treatment facilities, *Waste water treatment, Water quality control, Sludge, Simulation models, Streams, Costs, Mathematical models, Combined treatment, Tertiary treatment.

An extended version is presented of the executive computer program for the steady-state simulation of waste water treatment facilities. This was originally developed at the National Environmental Research Center of the Environmental Protection Agency at Cincinnati, Ohio. The feasibility of joint treatment of sewage and ground refuse a modified waste water treatment facilities was evaluated. Major modifications of the computer program include an increase from 20 to 50 quality parameters, an increased capacity to accommodate 100 treatment processes and 200 streams rather than the original 25 processes and 25 streams, and an incorporation of the most recently developed cost functions, used for most of the unit processes. New mathematical models of advanced waste treatment processes were adapted for inclusion into the program. In addition, new subroutines were developed for a number of preliminary and sludge handling processes. (Prague-FIRL)
W75-09775

EXTENDED AERATION WASTEWATER TREATMENT,
J. T. Yang, R. Waller, and C. W. Mallory.
Canadian Patent 954,242. Issued September 3, 1974. Patent Office Record, Vol 102, No 36, p 84, September, 1974.

Descriptors: *Patents, *Aeration, *Waste water treatment, *Waste treatment, Sludge, Equipment, Clarification, Design, Construction.
Identifiers: *Extended aeration.

An improved extended aeration process is performed in a single tank. Wastes are aerated for periods ranging from 12 to 24 hours. During this time they are circulated in the tank in a controlled manner to avoid settling and compaction. The concentration of mixed liquor is maintained by the selective removal of clarified effluent. This eliminates the need for quiet zones for the settling of solids and for the return of compacted sludge to the aeration process. The apparatus is of modular construction and avoids the problems associated with sludge compaction. The preferred form is capable of being fabricated from planar elements either as a complete unit or as internals for installation in other types of tankage. (Orr-FIRL)
W75-09776

ACTIVATED CARBON USED TO CONTROL ODORS,
Calgon Corp., Pittsburgh, Pa.
W. D. Lovett, and R. L. Poltorak.
Water and Sewage Works, Vol 121, No 8, p 74-75, August, 1974. 1 fig.

Descriptors: *Activated carbon, *Odor, *Adsorption, *Sewage treatment, Pollution abatement, Tertiary treatment, *Waste water treatment.

Activated carbon adsorption systems are discussed as means for controlling odors from typical low concentration/large volume emissions, storage tanks, reactor vessels, and other small volume sources. Activated carbon's ability to adsorb organic and some inorganic materials in

preference to water vapor is due to its non-polar surface. Organic substances with molecular weights greater than 45 and boiling points higher than 0C are readily absorbed. Activated carbon can be reused after being regenerated. Regeneration can be accomplished by passing hot gas or steam through the carbon bed, by heating the carbon in a furnace, by a pressure swing such as the use of a vacuum, or by a combination of heat and vacuum, solvent washing or chemical treatment. The ability of activated carbon to increase the concentration of a combustible material can be utilized to decrease the fuel requirement for an incinerator. Many complaints about odors have been received by sewage treatment plants throughout the United States. One installation in California is controlling odors from trickling filters with hypochlorite scrubbing and subsequent adsorption. Odors from primary clarifiers can also be adsorbed by activated carbon. Carbon systems may be made more efficient by decreasing cycle times and/or adsorption temperatures. (Orr-FIRL)
W75-09777

**HOW TO GET LOW AMMONIA EFFLUENTS,**
F. F. Sampayo.
Water and Sewage Works, Vol 121, No 8, p 92-94, August, 1974. 3 tab.

Descriptors: *Waste water treatment, *Pilot plants, *Trickling filters, *Ammonia, *Nitrification, *Sewage treatment, Filtration, Biochemical oxygen demand, Suspended solids, Plastics, *Ohio, Treatment facilities.
Identifiers: Surfpac, Plastic media, Lima(Ohio).

The use of a plastic media trickling filter (Surfpac) for removing ammonia from effluents was studied at the Lima, Ohio, waste water treatment plant. The pilot plant was a steel shell 3 ft in diameter and 30 ft high packed with 21.5 ft of Surfpac media. Analysis of the summertime results showed that: plastic media trickling filters can produce effluents with less than 0.5 mg/liter ammonia nitrogen levels; recirculation of the filter effluent was beneficial in producing a more stable ammonia nitrogen concentration when the flow rate was high; the major effect of the tower was nitrification rather than stripping of the ammonia; and no net BOD removal or change in suspended solids concentration or pH value was effected by the tower. Analysis of the wintertime data showed that: ammonia oxidation was reduced in the winter; ammonia nitrogen levels less than 1.0 mg/liter were unobtainable; no BOD removal occurred through the tower; some of the suspended solids were removed by the tower; and the pH of the waste increased 0.1 units through the tower. Plastic media in nitrification towers are a viable means for removing ammonia nitrogen. However, to maintain very low ammonia nitrogen levels all year, breakpoint chlorination may be necessary for final polishing. The process is reliable and does not require skilled operators. (Orr-FIR)
W75-09778

**SOUND WAVES AND OZONE STERILIZE WASTEWATER.**
The American City, Vol 89, No 9, p 137, September, 1974. 2 fig.

Descriptors: *Waste water treatment, *Water pollution, *Chlorination, *Sound waves, *Ozone, Coagulation, Polymers, Sludge removal, Filtration, Bacteria, Virus, Public health.
Identifiers: *Sonozone treatment, *UHF sound waves, Rapid sand filters, Vertical pressure filters.

Effluent sterilization by UHF sound waves and ozone, is an effective method of disinfection and eliminates the hazards associated with chlorinated hydrocarbons released during chlorination. The estimated savings are about one cent per 1000 gallons. The treatment includes chemical coagulation, using iron salts and polymer additives to remove much of the phosphates and some nitrates; settling for sludge removal; rapid sand filtration; and sonics with ozone emitted from Welsbach generators. Bacteria are dispersed by the sonic waves. When the aggregate particles are broken up, a greater surface area is exposed to ozone oxidation, and the ozone demand is reduced. The sonics-ozone treatment is most helpful in plants now requiring prechlorination or intermediate chlorination during the treatment process. Waste water is retained only half the time of a conventional plant. The system destroys polio virus, cholera, salmonella, shigella, E. coli, staphylococcus and other microorganisms of public health concern associated with waste water. (Leibowitz-FIRL)
W75-09779

**ALTERNATIVE METHODS OF DISINFECTION: HOW EFFECTIVE,**
K. J. Roberts, and A. H. Vajdic.
Water and Sewage Works, Vol 121, No 9, p 72-75, September, 1974. 1 tab, 18 ref.

Descriptors: *Chlorination, *Disinfection, *Ozonation, *Gamma rays, *Waste water treatment, Environmental effects, Aquatic life, Bacteria.
Identifiers: Dechlorination, Residual chlorine.

Alternatives to chlorination for waste water or process water disinfection include dechlorination, chemical oxidation, and the use of ultraviolet and gamma ray ionizing radiation. Inactivation of coliforms, fecal coliforms, fecal streptococci, total bacterial count, bacteriophage, and salmonellae by gamma irridation and chlorine were compared. Effluent from an irradiation reactor was non-toxic to goldfish for periods up to six weeks. For certain treatment methods, further toxicity studies are suggested. Of the chemical methods, ozonation shows the most promise, especially with an added benefit of high residual dissolved oxygen in the effluent. With further research, deleterious effects of residual chlorine on aquatic life may be avoided by use of alternate treatment methods. (Prague-FIRL)
W75-09780

**INTEREST IN OXYGEN PROCESS GROWING,**
P. S. Ward.
Journal Water Pollution Control Federation, Vol 46, No 11, p 2449-2451, November, 1974.

Descriptors: *Waste water treatment, *Municipal wastes, *Industrial wastes, *Activated sludge, *Oxygenation, Aeration.
Identifiers: *High-purity oxygen activated sludge.

The high purity oxygen activated sludge process is becoming an established waste water treatment technique. Detroit, Tampa, and New Orleans are planning domestic waste water treatment plants utilizing this approach. Food processors, petrochemical manufacturers, and pulp and paper mills have employed the concept with apparent success. Four primary improvements over conventional air systems are claimed for oxygen activated sludge: increased stability; shorter detention times and consequently, more compact facilities; superior sludge characteristics; and, more efficient energy use. The key element of this system is the high degree of gaseous oxygen utilization. A high purity oxygen system is capable of a much higher level of oxygen dissolution than is a conventional air system, because the partial pressure of the oxygen in the aeration gas is the driving force for dissolution. The continuously renewed high concentration of oxygen supplied by the system preserves aerobic conditions while maintaining mixed liquor suspended solids concentrations ranging from about 4,500 to 8,000 mg/liter. The richly oxygenated, high MLSS concentration is responsible for the rapid rate of treatment obtained, cushions the process to shock loading, and makes it possible to treat a large volume of waste water in a relatively small facility. (Orr-FIRL)
W75-09781

**PHYSICAL CHARACTERISTICS OF MECHANICAL AERATORS,**
G. F. G. Clough.
Water Pollution Control, Vol 73, No 5, p 564-575, 1974. 9 fig, 3 ref.

Descriptors: *Aeration, *Activated sludge, *Sewage treatment, Equipment, Operational costs, Dissolved oxygen, *Waste water treatment.
Identifiers: *Aerators(Mechanical).

Mechanical aerators used for the activated sludge process of sewage treatment are discussed. Selection of an appropriate aerator is dependent upon a number of characteristics. New aerator designs thus far have shown no significant improvement over previous ones. Functions of a mechanical aerator include: dissolving oxygen in the water within the aeration tank; maintaining the activated sludge solids in suspension; mixing the water containing dissolved oxygen with the solids so that the bacteria have a continuous supply of dissolved oxygen; distributing waste throughout the tank; and removing some carbon dioxide from the solution. In addition, the aerator cools the aeration tank contents, produces spray or mist, may cause foaming, and produces some noise. Selection of a particular aerator should be based on the importance of its various functions, the net oxygen transfer efficiency, and the operational costs involved. (Prague-FIRL)
W75-09782

**SEWAGE UTILIZATION IN AGRICULTURE,**
Central Public Health Engineering Research Inst., Nagpur (India).
G. B. Shende.
Indian Farming, Vol 23, No 11, p 25-27, February 1974.

Descriptors: *Sewage, *Water quality, *Irrigation water, *Arid climates, *Sewage effluents, Nutrients, Organic matter, Fertilizers, Soil physical properties, Drainage, Public health, *Water reuse, Waste water treatment.
Identifiers: *Sewage farming, *India.

Reclamation and reuse of waste waters for agricultural use is a practical proposition in India. The problems and solutions should be investigated for maximizing the use of plant nutrients and organic matter without jeopardizing soil productivity and environment. The value of sewage for agricultural purposes lies in the presence of major and minor plant nutrients, irrigation water, and organic matter. Proper management in sewage farming is necessary to prevent public health problems such as food and water contamination, insects and odors. To achieve the maximum benefit from sewage utilization, scientific practice of irrigation is a must. Dilution of the sewage or flooding the soil with good quality water once or twice a year is desirable to leach down accumulated salts. Sewage farming should not be practiced if drainage is poor or where the water table is less than six feet below the soil surface. Additional research is needed and proper management guidelines need to be developed to increase sewage utilization for agriculture. (Mastic-Arizona)
W75-09788

**WASTEWATER TREATMENT FACILITIES CONSTRUCTION GRANTS FOR THE LOWER RARITAN RIVER BASIN AND FOR THE SOUTH SHORE OF RARITAN BAY (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Environmental Protection Agency, New York. Region II.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as, EIS-NJ-73-1167-F, $8.50 in paper copy, $2.25 in microfiche. July 1973. 253 p, 39 map, 1 graph, 40 tab.

Descriptors: *Sewerage, *Water quality, *Waste water(Pollution), Environmental effects, *Waste

water treatment, *New Jersey, *New York Atlantic Ocean, Sewage, Sewers, Sewage districts, Effluents, Waste water disposal, Marine biology, Sludge disposal, Sludge, Bays, Groundwater.
Identifiers: *Environmental Impact Statements, Middlesex and Monmouth Counties(NJ), Atlantic Highlands(NJ), *Raritan Bay(NY).

Funds have been requested from the EPA by the Sewerage Authorities of Middlesex and Monmouth Counties, New Jersey, for projects which involve additions and alterations to an existing sewage treatment plant and construction of sewers and a new sewage treatment plant. The waters of Raritan Bay, contiguous to the state of New York will be affected as will be the Atlantic Ocean, east of Atlantic Highlands, New Jersey. The environmental impact of the project consists of improving the quality of receiving waters by providing secondary treatment of wastewater prior to discharge, allowing cessation of waste water discharge into inland streams that have low assimilative capacities, and providing the concerned communities with centralized sewage treatments. The highly treated effluent will be introduced into the marine environment and there will be a waste sludge produced at the treatment plant. Adverse environmental effects include further lowering of groundwater levels, increased saltwater encroachment, and possible contamination of the marine environment at the sites of effluent and sludge disposal. Alternatives to the project are no action, various degrees of expansion in the service area, a regional sewerage system with bay outfall and a regional sewerage system with ocean outfall. (Gagliardi-Florida)
W75-09817

## 5E. Ultimate Disposal Of Wastes

**TREATMENT AND SAFE DISPOSAL OF CATIONIC COATING COLORS,**
Merck and Co., Pittsburgh, Pa.
For primary bibliographic entry see Field 5D.
W75-09352

**WHERE ARE WE IN FOREST FERTILIZATION,**
State Univ. New York, Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 5D.
W75-09367

**SOLID WASTE MILLING AND DISPOSAL ON LAND WITHOUT COVER, VOLUME I. SUMMARY AND MAJOR FINDINGS,**
J. J. Reinhardt, and R. K. Ham.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-234 930, $6.25 in paper copy, $2.25 in microfiche. EPA Report EPA/530/SW-62d.1, 1974. 165 p, 53 fig, 35 tab, 7 ref, 2 append.

Descriptors: *Landfills, *Solid wastes, Wastes, Design criteria, *Waste disposal, *Wisconsin.
Identifiers: *Madison(Wisc), Millfill, Sanitary landfills, Land application.

Highlights of seven years work at Madison, Wisconsin, are summarized. The concept of landfill disposal of milling refuse without daily cover was tested. Data were gathered on the operation and cost of milling equipment, the use of milled refuse in landfill, and the characteristics of milled refuse. Eventually, detailed investigations were made of both milled and unprocessed solid waste. While landfilled milled solid waste, or millfill, was highly approved by European landfill operators, further experiments in Wisconsin were seen as necessary. Study included determination of the effects of landfill on rats, flies, leachate, gas and trees, for quantification of various factors. (See also W75-09402) (Prague-FIRL)
W75-09401

**SOLID WASTE MILLING AND DISPOSAL ON LAND WITHOUT COVER. VOLUME II. DATA CONDENSATIONS,**
J. J. Reinhardt, and R. K. Ham.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-234 931, $11.25 in paper copy, $2.25 in microfiche. EPA Report EPA/530/SW62d.2, 1974. 445 p, 111 fig, 123 tab, 16 append.

Descriptors: *Solid wastes, *Landfills, Costs, *Waste disposal, Environmental effects, Data collections, *Wisconsin.
Identifiers: Millfill, Sanitary landfill, *Madison(Wisc), Hammermill.

Individual research projects are described on the feasibility of using milling refuse for landfilling without daily cover. The demonstration projects were conducted between 1966 and 1972. Milling was begun in Europe to provide material suitable for composting. Originally single-rotor or double-rotor hammer mills handled homogeneous materials, necessitating manual sorting of larger, ungrindable items. Automation has been used in Europe since the 1950's. The Heil Company of Milwaukee, Wisconsin, installed a Gonard hamermill at the Madison Refuse Reduction Plant in 1967. Topics include: the Gondard operation; the Tollemache operation; two-mill, two-shift operations; and the costs of landfilling milled refuse. Vector studies were done of rats and flies at Madison and of rats at Purdue University. Observations were made on products of decomposition-leachate and gas as well as the effects on tree growth and other vegetation. Sixteen appendices detail the costs and quantities (dollars and tons) for milling and solid wastes at the Gonard and Tollemache operations. (See also W75-09401) (Prague-FIRL)
W75-09402

**EVALUATION OF MUNICIPAL SEWAGE TREATMENT ALTERNATIVES.**
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5D.
W75-09404

**A PRELIMINARY ASSESSMENT OF WET SYSTEMS FOR RESIDENTIAL REFUSE COLLECTION,**
Curran Associates, Inc., Northhampton, Mass.
For primary bibliographic entry see Field 5D.
W75-09405

**ECONOMIC ANALYSIS OF THE PROCESSING AND DISPOSAL OF REFUSE SLUDGES,**
Curran Associates, Inc., Northampton, Mass.
For primary bibliographic entry see Field 5D.
W75-09406

**WET SYSTEMS FOR RESIDENTIAL REFUSE COLLECTION: A CASE STUDY FOR SPRINGFIELD, MASSACHUSETTS,**
Curran Associates, Inc., Northampton, Mass.
For primary bibliographic entry see Field 5D.
W75-09407

**AGRICULTURAL BENEFITS AND ENVIRONMENTAL CHANGES RESULTING FROM THE USE OF DIGESTED SLUDGE ON FIELD CROPS,**
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 5D.
W75-09409

**COMPREHENSIVE SURVEY OF MAGPIE CREEK, MCCLELLAN AIR FORCE BASE, CALIFORNIA,**
Environmental Health Lab., McClellan AFB, Calif
For primary bibliographic entry see Field 5D.
W75-09410

**WASTEWATER TREATMENT FACILI EVALUATION, MALMSTROM AFB MT,**
Environmental Health Lab., McClellan AF Calif.
C. F. Pauls.
Available from the National Technical Inform tion Service, Springfield Va 22161 as AD-784 8 $4.75 in paper copy, $2.25 in microfiche. Prof sional Report No. 74M-1, January 1974. 85 p, 6 f 18 tab, 6 append.

Descriptors: *Surveys, *Waste water treatme Flow rates, Suspended solids, Biochemical o ygen demand, Water quality standards, Wa disposal, Planning, *Treatment facilities, Mo tana, *Evaluation.
Identifiers: Malmstrom AFB(Mont).

A survey was performed of the Malmstrom, Mo tana, AFB waste water treatment facility. Its o jectives included: documentation of existing flo rates; determination of treatment efficiencies f BOD5 and suspended solids removal; analysis influent waste stream chemical composition determine if toxic substances limited bioma growth on trickling filters; evaluation of the qua ty of operation control; and evaluation of laborat ry procedures used for waste water analysis. Du ing the survey period the total daily flow treat averaged 0.89 mgd. The Malmstrom AFB was water treatment facility did not remove a suf cient quantity of BOD and suspended solids meet secondary treatment standards set by the E vironmental Protection Agency. No toxic chem cals were found in the influent waters, howeve The facility's treatment inefficiency was not a tributed to a single factor but to a combination inconsistent operational control, poor mai tenance, and inflexible design. Several specific tions of the treatment facility are detailed whic must be improved to meet both existing wat quality requirements and future performance co ditions to be set forth in the newly require NPDES discharge permit of the Environment Protection Agency. (Prague-FIRL)
W75-09411

**VOLUME EXTRACTION OF CHEMICALL CONTAMINATED WATER,**
Westinghouse Electric Corp., Abingdon, Va. Wi Div.
For primary bibliographic entry see Field 5D.
W75-09419

**FILTER-PRESSING WASTEWATER SLUDGE.**
For primary bibliographic entry see Field 5D.
W75-09420

**DISPOSAL OF CATTLE FEEDLOT RUNOF ON AGRICULTURAL LAND,**
Nebraska Univ., Lincoln. Dept. of Agricultura Engineering.
For primary bibliographic entry see Field 5D.
W75-09517

**MOVEMENT OF POLLUTANT PHOSPHORU IN UNSATURATED SOIL,**
Purdue Univ., Lafayette, Ind. Dept. of Agricul tural Engineering.
For primary bibliographic entry see Field 5B.
W75-09527

**MUNICIPAL SLUDGE MANAGEMENT PROCEEDINGS OF THE NATIONAL CON FERENCE ON MUNICIPAL SLUDGE MANAGE MENT.**
For primary bibliographic entry see Field 5D.
W75-09532

**OVERVIEW OF SLUDGE HANDLING AND DISPOSAL,**
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W75-09533

**LTERNATIVE METHODS FOR SLUDGE MANAGEMENT,**
nvironmental Quality Systems, Inc., Rockville, Md.
or primary bibliographic entry see Field 5D.
75-09534

**HICKENING OF SLUDGES,**
elaware Univ., Newark. Dept. of Civil Engineering.
or primary bibliographic entry see Field 5D.
75-09535

**EAT TREATMENT AND INCINERATION,**
orr-Oliver, Inc., Stamford, Conn.
or primary bibliographic entry see Field 5D.
75-09541

**RYING OF SLUDGE FOR MARKETING AS ERTILIZER,**
ouston Sewage and Sludge Disposal Plant, Tex.
. T. Garrett, Jr.
: Municipal Sludge Management, Proceedings of e National Conference on Municipal Sludge anagement, June 11-13, 1974, Pittsburgh, nnsylvania, p 93-95, 1974. 3 fig, 2 ref.

escriptors: *Fertilizers, *Sludge treatment, Activated sludge, Drying, Texas, Waste treatment.
entifiers: Houston(Tex), *Dried sludge.

e use of the activated sludge process and the bsequent drying and marketing of solids noved as fertilizer are discussed. In order to oduce a marketable fertilizer, the nitrogen con- t must be kept as high as possible. This involves ving activated sludge so as to minimize the isture, ash, grease, and cellulose. Costs of the yer include freight costs on the total weight of material, which in effect determine whether or the sale is profitable. Sludge treatment ocesses at Houston, Texas are described. For City of Houston, the revenue from selling fer- zer is about $21 per ton. (See also W75-09532) ague-FIRL)
5-09542

**OWTH OF BARLEY IRRIGATED WITH ASTEWATER SLUDGE CONTAINING OSPHATE PRECIPITANTS,**
tional Environmental Research Center, Cincinnati, Ohio.
primary bibliographic entry see Field 5D.
5-09543

**E ECONOMICS OF SLUDGE IRRIGATION,**
ingfield Sanitary District, Ill.
primary bibliographic entry see Field 5D.
5-09545

**MPOSTING SEWAGE SLUDGE,**
icultural Research Service, Beltsville, Md. logical Waste Management Lab.
primary bibliographic entry see Field 5D.
5-09546

**CENT SANITARY DISTRICT HISTORY IN ND RECLAMATION AND SLUDGE LIZATION,**
ropolitan Sanitary District of Greater Chicago,
. Halderson, B. T. Lynam, and R. R. Rimkus.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 129-133, 1974.

Descriptors: *Treatment facilities, *Sludge disposal, Nutrients, Irrigation, Agriculture, Experimentation, Land reclamation, Illinois, Waste treatment.
Identifiers: *Land application, Air dried sludge, Chicago(Ill).

Three major treatment plants handle the flow of sewage sludge in the area around Chicago in Cook County, Illinois. The sludge processed by an air dried method has the best nitrogen:phosphorus:potassium ratio for land utilization. The organic content of this air dried sludge is essentially humic matter. With the use of this sludge, land has been reclaimed in seven experimental projects. These occurred at the Northwestern University Campus land, at Ottawa, Illinois, Hanover Park, Calument Farm, at the Palzo Project in the Shawnee National Forest, at the Arcola Project, and at the Elwood Agronomy Research Center. One significant result of the research is an indication that application of freshly digested sludge can inhibit seed germination. If, however, the sludge is applied about one week prior to planting or if the sludge has been lagooned for a long enough time, germination is normal. In 1970, the Sanitary District of Chicago purchased land in Fulton County, Illinois, about 200 miles away from the sludge treatment facilities. Sludge is transported there by barge down the Illinois River, and the system of distribution, application, and subsequent cropping is described. Future plans for the Fulton County site and elsewhere include leveling the reclaiming unproductive land, as well as adding organic matter from sewage sludges to sites of strip mine spoils. (See also W75-09532) (Prague-FIRL)
W75-09547

**SLUDGE MANAGEMENT IN ALLEGHENY COUNTY,**
Allegheny County Dept. of Public Works, Pa.
R. M. Cosentino.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 135-138, 1974. 6 ref.

Descriptors: *Sludge disposal, *Treatment facilities, Fly ash, Municipal wastes, Solid wastes, Planning, Legislation, Pennsylvania.
Identifiers: Allegheny County(Pa), Sludge management.

In the Allegheny County, Pennsylvania, area, solid waste management and sludge management are closely linked. Information is given about current practices. All new applicants for treatment facilities must provide data to the Pennsylvania Department of Environmental Resources as a regulatory agency. A feasibility study is being planned for a project of restoration of strip mine lands using municipal treatment plant residues and fly ash. Another research project planned is processing of dewatered undigested sludge produced at the Pine Creek water pollution control facility. (See also W75-09532) (Prague-FIRL)
W75-09548

**TRENCH INCORPORATION OF SEWAGE SLUDGE,**
Agricultural Research Service, Beltsville, Md. Biological Waste Management Lab.
J. M. Walker.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 139-149, 1974. 4 fig, 4 tab, 5 ref.

Descriptors: *Sludge disposal, *Waste water treatment, *Sewage sludge, Agriculture, Nitrogen, Drainage, Municipal wastes, District of Columbia, Treatment facilities.
Identifiers: Entrenchment, Blue Plains Plant(Washington DC), Trench incorporation.

The Blue Plains Plant, which serves much of the metropolitan Washington, D.C. area, has had serious sludge disposal problems. In order to discharge secondary effluents into the Potomac River, BOD had to be reduced. This reduction, by the use of ferric chloride or alum, increased the quantities of sludge produced, which necessitated additional sludge disposal. A research and demonstration study was undertaken to evaluate the trenching of raw and digested sewage sludge to improve marginally usable agricultural soils and to provide an environmentally and politically acceptable solution to sludge disposal. Field testing of the procedures in all weather, drainage control evaluation, monitoring of nitrogen, pathogens, and heavy metals in groundwater and surface waters, as well as supporting laboratory and greenhouse studies were conducted. The most likely difficulty was that nitrogen from the sludge might reach underground water. This problem could be minimized by underdraining the entrenchment site and retaining the drained water for irrigating the surrounding land. Entrenchment prevented contamination of surface water, buried pathogens, promoted slow nitrogen release, and favored denitrification. (See also W75-09532) (Prague-FIRL)
W75-09549

**OCEAN DISPOSAL EXPERIENCES IN PHILADELPHIA,**
Philadelphia Water Dept., Pa.
C. F. Guarino, and S. Townsend.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 151-155, 1974.

Descriptors: *Sewage disposal, *Legislation, Metals, Ocean disposal, Sewage sludge, Regulation, Mercury, Cadmium, Pennsylvania, Waste treatment.
Identifiers: Philadelphia(Pa), Marine Protection Act.

From 1961 to May, 1973, the city of Philadelphia had been disposing of its sewage by barge to an area 13 miles off Cape Henlopen, Delaware. In 1972, the United States passed the Marine Protection, Research and Sanctuaries Act, which effected a permit system whereby the dumper would have to meet specific requirements. The permit received by Philadelphia required that a new site be chosen 50 miles off the coast, that an expanded cost analysis be conducted, and that monitoring be continuous at the new location. Another provision of the Act requires that the City determine the sources, relative contributions, and controllability of heavy metals within the City's drainage area. At present, Philadelphia sludge exceeds the criteria for mercury and cadmium as defined by the Act. However, there is a conflict as to whether the laboratory analysis is accurate (its range is large) and whether or not the criteria are too stringent. Another problem is the interaction of wastes within a disposal area. Because Philadelphia was required to dump 50 miles offshore, a nearby disposal for acid wastes may be interacting with the sludge to cause flocculation. Alternatives to ocean disposal are three to four times more costly to the City, and land disposal requires a continually increasing amount of land space. Implementation of the Marine Pollution Act pointed out that regulations should not overcontrol or create new problems. However, the regulation has prompted research into new areas of knowledge of sludge disposal. (See also W75-09532) (Prague-FIRL)
W75-09550

**SLUDGE DISPOSAL BY INCINERATION AT ALCOSAN,**
Allegheny County Sanitary Authority, Pittsburgh, Pa.
G. A. Brinsko.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 157-161, 1974. 5 fig, 3 ref.

Descriptors: *Sludge treatment, *Incineration, *Sludge disposal, Odors, Costs, Waste disposal, Public rights, Combustion, Solid wastes, Pennsylvania, Waste treatment.
Identifiers: Pittsburgh(Penna).

The Allegheny County Sanitary Authority, or Alcosan, has controlled the problems of sludge treatment and disposal for the Pittsburgh area since the middle 1940's. It was decided in 1945 that incineration would be used for final sludge disposal rather than to discharge wastes into the rivers. Facilities from 1959 to 1973 provided intermediate treatment only slightly better than primary. Final disposal was accomplished in C. E. Raymond Flash-Drying incinerators. In 1973, modernization occurred, the present incinerators are evaporators of water. This method of disposal has caused many problems, and is extremely costly. Thirty-seven percent of Alcosan's operating budget is related to the incinerator operation and fifty percent of the overall range maintenance budget goes toward upkeep of incinerators. Odors from the incinerators have caused severe public reaction. Hydrogen peroxide has so far been the most effective chemical for combatting this problem. Incineration of primary and waste activated solids together has created the problem of an increased heat value of the sludge. chamber temperatures range from 1650 F to 1900 F and cause slagging. The accumulated slag must be removed, resulting in a loss of furnace time. A new duct system may alleviate this situation. In spite of the problems associated with incineration, the method was chosen because of the lack of available land and the fact that the Pittsburgh sludge is too low in nitrogen to reclaim the material as fertilizer. An alternate solution might be to incinerate both sewage and solid waste materials together for the generation of steam as a profitable by-product. (See also W75-09532) (Prague-FIRL)
W75-09551

**PASTEURIZATION OF LIQUID DIGESTED SLUDGE,**
Cincinnati, Ohio National Environmental Research Center.
For primary bibliographic entry see Field 5D.
W75-09552

**SLUDGE HANDLING AND DISPOSAL AT BLUE PLAINS,**
District of Columbia Dept. of Environmental Services, Washington.
For primary bibliographic entry see Field 5D.
W75-09553

**AGRICULTURAL UTILIZATION OF DIGESTED SLUDGES FROM THE CITY OF PENSACOLA,**
Baseline, Inc., Pensacola, Fla.
J. A. Edmisten.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 177-182, 1974. 9 fig, 5 tab, 4 ref.

Descriptors: *Sludge disposal, *Agriculture, Sewage treatment, Soils, *Florida, Land use, Lagoons, Bacteria, *Sludge treatment, Waste water treatment.
Identifiers: *Liquid digested sludge, Land application, Pensacola(Fla)

Previous to 1974, the digested liquid sewage sludge from the Pensacola Main Street Sewage Treatment Plant was disposed of by dumping the material at a sanitary landfill 18 miles away. In 1973, the County Commission of Escambia County Florida and the City Council of Pensacola conducted an experiment, using liquid digested sludge for agricultural production on deep sandy coastal plains soils. Greenhouse experiments established the rates of sludge application tolerable to tomatoes, corn, and a variety of horticultural materials. Test fields and plots have been designed to control application. When soils are too wet for direct application, tankers carrying sludge dump it into a holding lagoon. Precautions against bacterial hazards are being tested by feeding dried sludge to test animals, which will be slaughtered after six months and their tissues examined. Crops are being grown on small test plots with varying rates of sludge applications; crop responses so far seem to be similar to those of earlier greenhouse studies. With organic matter accumulation, it is likely that cyst nematodes, a pest to soybeans, will be destroyed, thus yielding better crops. (See also W75-09532) (Prague-FIRL)
W75-09554

**INSTITUTIONAL PROBLEMS ASSOCIATED WITH SLUDGE DISPOSAL,**
Washington Suburban Sanitary Commission, Hyattsville, Md.
K. J. Brough.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 183-186, 1974. 4 ref.

Descriptors: *Public rights, *Public health, Information, Regulations, Municipal wastes, Waste water treatment, *Sludge disposal, Treatment facilities, Incineration, Environmental effects, Planning, Maryland, Waste disposal.
Identifiers: Piscataway(Maryland).

Public attitudes on sludge disposal cause institutional problems which effect regulations for municipal sludge treatment and disposal. In one example, at the Piscataway (Maryland) Wastewater Treatment Plant, incineration was used for sludge disposal. Citizens alleged that incinerator test operations caused high blood lead levels in area children; EPA and the County Health Officer could find no evidence of a health hazard. However, a resolution was passed that stopped incineration until some undetermined time when it is proven conclusively that no health hazards exists. The Washington Suburban Sanitary Commission, which controls the Piscataway facility, has millions of dollars invested in the incinerators. In addition, tests for the potential health hazard, ironically, cannot be performed without operating the incinerators and quantitatively measuring their output. It was recommended that the public be involved in planning decisions. The impact of institutional problems will be minimized if the public forms its values and attitudes before disposal methods are in operation. (See also W75-09532) (Prague-FIRL)
W75-09555

**ENERGY CONSERVATION AND RECYCLING PROGRAM OF THE METROPOLITAN SEWER BOARD OF THE TWIN CITIES AREA,**
Metropolitan Sewer Board, St. Paul, Minn.
For primary bibliographic entry see Field 5D.
W75-09556

**SLUDGE DISPOSAL AT A PROFIT,**
Barber-Colman Co., Irvine, Calif. Resource Recovery Systems Div.
For primary bibliographic entry see Field 5D.
W75-09557

**SLUDGE MANAGEMENT SYSTEM FOR ST. LOUIS,**
Saint Louis Metropolitan Sewer District, Mo.
For primary bibliographic entry see Field 5D.
W75-09558

**WET AIR OXIDATION OF CHEMIC/ SLUDGES,**
Waterloo Univ. (Ontario). Dept. of Chemical E gineering.
For primary bibliographic entry see Field 5D.
W75-09565

**EVALUATION OF ENVIRONMENTAL IMPAC OF LANDFILLS,**
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5C.
W75-09761

**SEWAGE DISPOSAL AND WATER SUPPI ALTERNATIVES ON THE BASIS OF WATE QUALITY AND ECONOMIC CRITERIA,**
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5B.
W75-09774

## 5F. Water Treatment and Quality Alteration

**IMPLEMENTATION OF WATER SUPPLY AN WASTEWATER PROGRAMS IN TH WASHINGTON, D.C. METROPOLITAN AREA**
American Society of Civil Engineers, Washingto D.C. Water Pollution Task Force.
For primary bibliographic entry see Field 5D.
W75-09392

**AN EVALUATION OF WATER REUSE FO MUNICIPAL SUPPLY,**
Butler Univ., Indianapolis, Ind. Holcon Research Inst.
For primary bibliographic entry see Field 5D.
W75-09408

**ANTIMICROBIAL AGENTS FOR WATER CO SERVATION,**
Henkel and Cie GmbH, Duesseldorf (West Ge many). (assignee)
G. Koppensteiner, H. W. Eckert, and V. Wehle.
US Patent No 3,874,869, 10 p, 9 tab, 8 ref; Offici Gazette of the United States Patent Office, V 933, No 1, p 290, April 1, 1975.

Descriptors: *Patents, *Water pollution treatmen *Pollution abatement, *Microorganisms, Bacteri Fungi, Algae, Chemical reactions, *Water trea ment.
Identifiers: Sequestering agents.

This invention provides a process for the preve tion of the growth of microorganisms in industri and other service waters such as the water swimming pools, cooling cycle water, wash wat in air conditioning plants. The organisms from th group consisting of gram-positive bacteria, gran negative bacteria, fungi and algae are contacte with an effective antimicrobial amount of a rea tion product of epsilon-caprolactam and an N-a kylalkylene diamine with the reaction being ca ried out in the liquid phase for 3 to 20 hours at temperature above 180 deg C. The process furth comprises incorporating into the industrial wat an effective amount of a sequestering agent con prised of a water-soluble phosphonic acid whic forms a complex with a divalent metal, a wate soluble salt of the acid and the mixtures thereo with the weight ratio of sequestering agent to rea tion product being 1:10 to 10:1. (Sinha-OEIS)
W75-09637

**DETECTOR OF TRACE SUBSTANCE I WATER,**
Shibata Kagaku Kikai Kogyo Kabushiki, Toky (Japan). (assignee)
For primary bibliographic entry see Field 5A.

W75-09655

PORTABLE WATER SUPPLY SYSTEM,
World Water Resources, Inc., New York. (assignee)
For primary bibliographic entry see Field 5D.
W75-09658

UBLIC WATER SUPPLIES OF NORTH AROLINA: PART 3. MOUNTAINS AND ESTERN PIEDMONT,
eological Survey, Raleigh, N.C.
. M. Jackson, Jr.
orth Carolina Department of Natural and conomic Resources, Raleigh, July 1974. 232 p, 4 g, 7 ref.

escriptors: *Water supply, *Municipal water, North Carolina, Water sources, Water quality.

ublic water supplies in 24 counties in the mountains and western Piedmont section of North arolina are described. A map of each county ows the area served by public water supplies. n inventory of each public supply in the county ith 500 or more customers gives the population rved, the adjacent communities served, the mber of metered customers, the source of ater, estimated allowable draft, total and industrial water use, raw and finished water storage, w and finished water-pumping capacity, future ans, a water-resources appraisal in the immediate vicinity of the supply, and the results of emical analyses of raw and finished water. napp-USGS)
75-09711

## G. Water Quality Control

OPTIMAL WATER QUALITY MANAGEENT TECHNIQUE FOR CONJUNCTIVE ROUND AND SURFACE WATER USE,
klahoma Univ., Norman. School of Civil Engeering and Environmental Sciences.
M. Hays, J. F. Harp, and J. G. Laguros.
ailable from the National Technical Information Service, Springfield, Va 22161 as PB-243 383, 25 in paper copy, $2.25 in microfiche. klahoma Water Resources Research Institute, llwater, Completion Report, (June 1975). 41 p, 4 , 3 tab, 27 ref. OWRT A-055-OKLA(1).

scriptors: *Optimum development plans, egression analysis, Aquifers, Alkalinity, roundwater resources, Hardness(Water), onjunctive use, Turbidity, Water table, Water ls, *Water quality, Groundwater, Water dend, Municipal water, Reservoir storage, drogen ion concentration, *Oklahoma, nagement.
ntifiers: Impoundment water, Norman(Okla).

e objectives were to determine time, season, antecedent conditions when impoundment and und water separately reach optimum quality. ther, the project was to compare the quality of e two water supply sources at any given time s to establish quantified combinations which ld give optimum quality. Water quality for the ls was essentially constant, therefore wellr quality parameters, for purposes of this y, were also considered to be constant. The hod used to evaluate the data was stepwise ession utilizing the IBM statistical subroutine kage. Regression analysis was performed on data which were divided into the four seasons. resulting linear equations are multiterm and blished correlation between the independent ables, rainfall, lake-level, surface water used, -water used, and the water quality dependent ables deemed important. The dependent variare pH, alkalinity, hardness, turbidity, and concentration. Only the regression equations est fit are presented.
-09378

A GUIDE FOR STATE CERTIFICATION OF WASTEWATER FACILITIES PERSONNEL,
Water Pollution Control Federation, Washington, D.C.
For primary bibliographic entry see Field 5D.
W75-09389

OCEAN WASTE DISPOSAL PRACTICES IN METROPOLITAN AREAS OF CALIFORNIA,
Interstate Electronics Corp., Anaheim, Calif.
For primary bibliographic entry see Field 3D.
W75-09391

CONTROL SCHEMES FOR THE ACTIVATED-SLUDGE PROCESS,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W75-09395

WASTEWATER SURVEY, CHANUTE AFB, ILLINOIS.
Environmental Health Lab., Kelly AFB, Tex.
For primary bibliographic entry see Field 5D.
W75-09397

WATER, SEWERAGE AND FLOOD CONTROL SYSTEMS PLAN AND IMPLEMENTATION PROGRAM 1973-74.
San Diego County Comprehensive Planning Organization, Calif.
For primary bibliographic entry see Field 6D.
W75-09400

DISINFECTION OF SOIL STRIPS THROUGH THE DRIP IRRIGATION SYSTEM,
Hebrew Univ., Rehovth (Israel).
M. Uzrad, and S. D. Goldberg.
In: Proceedings of the Second International Drip Irrigation Congress, p 137-141, (1974). 3 tab.

Descriptors: *Disinfection, Management, Crop production, Irrigation systems, Irrigation practices, Irrigation, Agriculture, Water pollution control, Path of pollutants.
Identifiers: *Trickle irrigation, *Drip irrigation, *Israel, *Methyl bromide.

Seasonal crops (vegetables) are often grown on a limited area in the Arava agricultural plots. It is also customary to apply manure of unknown origin. After several seasons of cultivation, there is a marked decrease in the level of the agricultural production and the fields become infested with weeds. Usually soils are disinfected with methyl bromide. Row crops in the Arava desert are irrigated by the drip system, thus the cultivation, fertilization, and irrigation are restricted to the cultivated strip. An experiment was conducted to study the possibility of also applying the disinfectant only to the cultivated strip through the drip system. Hot gaseous methyl bromide was applied through the drip laterals and through the drippers which were covered by plastic mulch. Crop yields for the treated areas were three times greater than in the control plot. (See also W75-09423) (Skogerboe-Colorado State)
W75-09444

IRRIGATION RETURN FLOW AS INFLUENCED BY DRIP IRRIGATION,
New Mexico State Univ., University Park.
T. C. Patterson, and P. J. Wierenga.
In: Proceedings of the Second International Drip Irrigation Congress, p 376-381, (1974). 2 fig, 3 tab, 4 ref.

Descriptors: *Return flow, *Water quality, *Salinity, Surface irrigation, *Saline water, Saline soils, New Mexico, Texas, Irrigation practices, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Deterioration of water quality in the Rio Grande is a major problem for water users in New Mexico and Texas. From near Santa Fe, New Mexico to El Paso, Texas, a distance of 270 miles, the total of dissolved solids increases from 221 ppm to 787 ppm while the percent of sodium increases from .25 near Santa Fe to 52 at El Paso. The deterioration in quality is due to the return of lower quality drainage water from the irrigated areas to the river. This paper describes a project designed to determine, under field conditions, rates of water and salt movement in the soil and subsequently to the drains as affected by frequency and amount of trickle irrigation, as compared to frequency and amount of surface water application. Both return flow quality and quantity are evaluated. (See also W75-09423) (Skogerboe-Colorado State)
W75-09485

WEED CONTROL UNDER DRIP IRRIGATION IN ORCHARD AND VINEYARD CROPS,
For primary bibliographic entry see Field 3F.
W75-09493

EFFECTS OF NITROGEN FERTILIZER APPLICATIONS TO PART OF A ROOT SYSTEM,
Victoria Dept. of Agriculture, Ferntree Gully (Australia).
For primary bibliographic entry see Field 3F.
W75-09496

EVALUATION OF RECOVERY IN A POLLUTED CREEK AFTER INSTALLATION OF NEW SEWAGE TREATMENT PROCEDURES,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 5B.
W75-09515

POLLUTION OF IRRIGATION WATERS BY PLANT PATHOGENIC ORGANISMS,
Nebraska Univ., Lincoln. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5B.
W75-09521

SECTORAL AND REGIONAL ECONOMIC IMPACT OF CONTROLLING NONPOINT POLLUTION IN FORESTED AREAS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5B.
W75-09530

IDENTIFICATION OF PROBLEM AREAS IN WATER POLLUTION CONTROL PLANTS,
Ontario Ministry of the Environment, Toronto.
For primary bibliographic entry see Field 5D.
W75-09564

OIL SKIMMER WITH OSCILLATABLE CIRCULAR LOOP,
E. L. Brill, and B. M. Brill.
Canadian Patent 963,398. Issued February 25, 1975. Patent Office Record, Vol 103, No 8, p 42, February 1975.

Descriptors: *Oil spills, *Patents, Equipment, Water pollution control, Oil wastes, *Skimming, Separation techniques, Pollution abatement.
Identifiers: *Oil skimmers, Loops.

A device to skim oil which is floating on top of a pool of water is described. The skimmer consists of an endless substantially rigid loop of a uniform cross-section. This loop is gripped at its upper edge by a pair of rolls which rotate in opposite directions and engage the loop at one zone in diagonally opposed quadrants. The rolls rotate the loop in its own plane and cause it to pass continuously in and out of the pool of water or hydrophilic liquid and thus to attract hydrophobic material

such as oil. The oil or any colloidal material is then lifted by a coil and squeezed out as it passes through the rolls. The loop may oscillate about an axis substantially tangential to the loop at the driving zone. (Prague-FIRL)
W75-09568

**FINANCIAL INCENTIVES AND POLLUTION CONTROL: A CASE STUDY,**
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
T. A. Ferrar, A. B. Brownstein, J. D. Simpson, and S. Streiter.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Report EPA-600/5-75-007, April 1975. 51 p, 7 ref. 1HA093 09 AFD 07. EPA Contract 68-01-2250.

Descriptors: *Pollution abatement, Standards, *Air pollution, Northeast US, Alternative planning, Fuels, *Pollution taxes(Charges).
Identifiers: *Financial incentives, *Fuel oil, *Pollution control variances.

Confronted with shortages of low-sulfur content residual fuel oil, several air-pollution-control authorities in the northeastern states were forced to relax air-quality standards during the winters of 1972-73 and 1973-74. The authorities did so by granting variances to their sulfur-content standards for residual fuel oil. The characteristics of these variances are examined. Alternative policies such as direct regulation, fuel-oil surcharges, emission taxes and quantity control are discussed. (EPA)
W75-09574

**PROJECTS IN THE INDUSTRIAL POLLUTION CONTROL DIVISION - DECEMBER 1974.**
Environmental Protection Agency, Washington, D.C. Industrial Pollution Control Div.
For primary bibliographic entry see Field 5D.
W75-09578

**STORM WATER MANAGEMENT MODEL: USER'S MANUAL, VERSION II,**
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W75-09579

**COUNTERMEASURES FOR POLLUTION FROM OVERFLOWS; THE STATE OF THE ART,**
Environmental Protection Agency, Edison, New Jersey, Storm and Combined Sewer Section.
For primary bibliographic entry see Field 5D.
W75-09580

**STATE-OF-THE-ART FOR THE INORGANIC CHEMICALS INDUSTRY: COMMERCIAL EXPLOSIVES,**
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W75-09581

**RESEARCH NEEDS FOR WATER RESOURCES CONTROL IN CALIFORNIA.**
California State Water Resources Control Board, Sacramento. Div. of Planning and Research.
Publication No 48, April 1973. 48 p.

Descriptors: *Research priorities, *Water resources, *California, *Water quality control, Methodology, Water rights, Waste disposal, Wells, Disinfection, Recycling, Waste water disposal, Erosion, Silting, Surface waters, Groundwater, Salinity, Eutrophication, Toxicity, Oil, Mine wastes, Water reuse, Legal aspects, Economics, Institutions, Data processing, Water pollution control

The research program of the California State Water Resources Control Board assigns highest priority to the development of methodology and data for the State Board and the nine regional water quality control boards in their planning and control functions. Currently acute problems and research for permanent solutions to problems are emphasized. Three classes of research priority are established as guidelines for developing research studies. The Priority I topics include methodology and data for analysis of water rights applications, impact of wastes on groundwater, and influence of toxicants and biostimulants on surface waters. Reliable disinfection systems, recycling and use of wastewater solids and reclaimed wastewater, and the control of pollution from irrigated agriculture are also in the priority I group. Additional guidelines are identified relating to funding of research by the Board, literature search requirements, project duration, and proposal evaluation. The following water resources control problems were discussed: erosion and siltation, degradation of groundwaters, increasing salinity of surface waters, eutrophication, toxicity, oil and other hazardous material spills, mine wastes, and geochemical hazards. Water quality monitoring and data are important in control programs. Problems in wastewater treatment, residue processing and disposal, and wastewater reclamation and reuse were described. Legal, economic, and intitutional problems were identified and may be the most difficult to resolve. A detailed description of overall research and development needs in major water resources control subjects was included. (Dawes-ISWS)
W75-09587

**HYPOLIMNETIC OXYGENATION USING LIQUID OXYGEN,**
Union Carbide Corp., San Francisco, Calif. Aquatic Environmental Sciences.
A. W. Fast, W. J. Overholtz, and R. A. Tubb.
Water Resources Research, Vol 11, No 2, p 294-299, April 1975. 7 fig, 8 ref.

Descriptors: *Ohio, *Oxygenation, *Hypolimnion, *Waste water treatment, *Dissolved oxygen, *Oxygen, Eutrophication, Dissolved oxygen analyzers, Treatment, Zone of aeration, Stratification, Lakes, Thermocline, Water properties, Productivity, Fish, Nutrients, Aquatic life, Aeration, Thermal stratification, Fisheries.
Identifiers: *Side stream pumping, Ottoville Quarry(Ohio).

A new system of hypolimnetic oxygenation called side stream pumping (SSP) was described. The SSP system uses liquid oxygen and a conventional water pump, whereas most other hypolimnetic oxygenation systems use compressed air and a special aeration chamber. The SSP system was tested in Ottoville Quarry, Ottoville, Ohio, during the summer of 1973. Hypolimnetic oxygen concentrations increased from less than 0.5 mg/l to over 8.0 mg/l during 2 months of operation, and thermal stratification was maintained. These improvements created a suitable habitat for cold-water fish, but care must be exercised in the use of the SSP system to avoid potential problems with high, free carbon dioxide concentrations. (Henley-ISWS)
W75-09589

**COMPARATIVE ECOLOGY OF WESTERN STREAMS,**
Montana Univ., Missoula. Dept. of Zoology.
A. L. Sheldon.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 513, $3.75 in paper copy, $2.25 in microfiche. Research Report No 62, Montana University Joint Water Resources Research Center, Bozeman, March 1975. 29 p, 1 fig, 16 ref. OWRT A-058-MONT(1).

Descriptors: Ecology, Ecosystems, Zoology, *Dominant organisms, Biological communities, Fish, Insects, *Stoneflies, Systematics, *Bioindicators, Water quality.
Identifiers: Biological models, Dominance index, *Diversity index, *Simpson's index, Nymphs.

Two papers are presented. The first is entitled, Dominance and Diversity Measures: Separation of Components, by A. L. Sheldon. Simpson's index of dominance is separable into additive independent components related to species richness and equitability. A test of the method suggests richness to be the only meaningful component. If this is generally true, then the expected number of species in a sample of a given size is recommended as a diversity index. This index includes both richness and evenness aspects of diversity. The second report, The Nymphs of the Genus Zapada (Insecta: Plecoptera) of Western North America, by R. A. Haick, lists the major species of this genus. (Holje-Montana State)
W75-09617

**THE EFFECT OF SULFATE AND MANGANESE DIOXIDE ON THE RELEASE OF PHOSPHORUS FROM LAKE MENDOTA SEDIMENTS,**
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5C.
W75-09619

**A CASE STUDY OF ESTUARINE POLLUTION AND LOCAL AGENCY INTERACTIONS,**
University of Southern Mississippi, Hattiesburg. Bureau of Business Research.
C. P. Cartee, N. O. Murray, and D. C. Williams, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 516, $3.75 in paper copy, $2.25 in microfiche. Mississippi Water Resources Reseach Institute, Mississippi State, Completion Report, June 1975. 43 p, 3 fig, 23 ref. OWRT A-089-MISS(1).

Descriptors: *Governmental interrelations, Water pollution, Estuaries, *Mississippi, Gulf of Mexico, *Local governments, Water quality standards, *Jurisdiction, Legal aspects, *Administrative agencies.

A case study analysis was made of a specific pollution problem on the Gulf Coast of Mississippi with emphasis on the agency and governmental interface. Numerous personal interviews with representatives of affected political subdivisions and involved agencies were utilized in addition to secondary sources. Much negative reaction was discovered. Indepth interviewing revealed many points of conflict between the enforcement agencies and the affected local units of government. Much misunderstanding centered around procedures used in collecting and testing water samples and the evolution and interpretation of the water quality criteria. Several intricate legal questions were found to characterize the problem with respect to the 26-mile, man-made sand beach, especially with respect to jurisdictional responsibilities in providing public notice of the water's quality. Overall, the study emphasized (1) the importance of input mechanisms and education of local governmental officials relative to the development, evolution and use of pollution standards, and (2) the need for identifying and establishing jurisdictional authority for bodies of water in terms of public pollution notifications when large expanses of beach front are involved.
W75-09620

**INTEGRATIVE PROCEDURES FOR COORDINATED URBAN LAND AND WATER MANAGEMENT: A SYSTEMS ANALYSIS,**
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
For primary bibliographic entry see Field 6A.
W75-09622

**WATER FOR ENERGY SELF-SUFFICIENCY.**
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 6B.
W75-09626

**WATER FOR ENERGY SELF-SUFFICIENCY, EXECUTIVE SUMMARY.**
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 4C.
W75-09627

**UNDERWATER DRILLING POLLUTION CONTROL CURTAIN,**
Sun Oil Co., Dallas, Tex. (assignee)
C. M. Mason.
US Patent No 3,879,951, 3 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 933, No 5, p 1965, April 29, 1975.

Descriptors: *Patents, *Oil pollution, *Water pollution control, *Oil spills, Offshore platforms, Equipment, Well screens, Pollution abatement.
Identifiers: *Pollution control curtains.

A pollution control curtain attached to the sea floor on one end and to a collar floating on the surface of the sea on the other end for positioning around a drilling platform entraps petroleum fluids seeping from the well head or sea floor being serviced by the platform. Fluids are conveyed to the surface within a predefined area from which they can be collected. The body of the curtain can be fabricated from any flexible or rigid material with sufficient strength and resistance to corrosion to serve in a subsurface structure, such as steel plate and cable, plastic, heaving gauge, Neoprene, canvas or combinations of any of these materials. (Sinha-OEIS)
W75-09639

**WATER QUALITY ANALYSIS SYSTEM WITH MULTICIRCUIT SINGLE SHELL HEAT EXCHANGER,**
E. A. Houser, and B. W. Schwindt.
US Patent No 3,880,226, 7 p, 14 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 933, No 5, p 2055, April 29, 1975.

Descriptors: *Patents, *Water quality control, *Electric powerplants, *Heat exchangers, Water analysis, Sampling, Temperature, Cooling water, Power system operation, Equipment.

A modular water quality analysis system for steam electric power generating plants is disclosed which includes a single shell multicircuit heat exchanger having means to individually vary the rate of flow of cooling water through each of the multiple circuits so that the single heat exchanger can simultaneously cool a number of samples entering it at widely differing high inlet temperatures to the same lower range of outlet temperatures. The heat exchanger has a physical construction such that it can be mounted on top of the system rack which contains modules of apparatus for accepting water or steam samples from various test points in the power generating system, reducing the pressure and temperature, directing and metering the flow of samples, and performing analyses for such water characteristic as pH, specific or cation conductivity, dissolved oxygen, sodium content etc. The fact that the single shell heat exchanger can be mounted on top of the system rack makes possible a considerable saving in cost, space and weight, a greater flexibility in system layout design, together with greatly improved access to the system components for adjustment and maintenance purposes, and faster instrument reponse due to shorter sample tubing runs. (Sinha-OEIS)
W75-09642

**MATERIAL FOR BIOLOGICAL DEGRADATION OF PETROLEUM,**
Dunn (John) Agencies Ltd., Vancouver (British Columbia). (assignee)
For primary bibliographic entry see Field 5D.
W75-09652

**COLLECTION AND RECOVERY SYSTEM FOR OIL SPILLS,**
Ocean Systems, Inc., Reston, Va. (assignee)
F. A. March, and L. S. Brown.
US Patent No 3,883,433, 4 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 934, No 2, p 739, May 13, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Water pollution control, *Separation techniques, Equipment, Weirs.

The apparatus described performs a substantial separation of the oil from the water before the oil is discharged for delivery to a pick-up station or accompanying vessel and is highly conformable to wave motion so that oil escape is minimized. The discharged oil is in an essentially reclaimed state. The invention features a plurality of rigid weir-plates disposed along a primary weir and supported by discrete weir-plate floats, each weir-plate having a weir opening. The weir-plates are spaced from each other along the primary weir and connected to one another by a flexible sheet, thereby making the primary weir conformable to wave motion. Stiffeners connected between the primary weir and the secondary floats maintain the spacing. A number of secondary weirs are supported on secondary floats, each having a lip positioned beneath its associated secondary float, therby admitting fluid from the upper layer of fluid within the basin to an oil discharge without air entrainment. As the apparatus moves over the body of water there is a thickening of the oil ahead of the weir plate and a reduced pressure beneath the basin. The primary weir may be towed with the preponderance of towing forces carried by a tension line. Bridles proportioned in length deploy the primary weir along a parabolic line. (Sinha-OEIS)
W75-09660

**PROCESS FOR SEPARATING LOW API GRAVITY OIL FROM WATER,**
Union Oil Co. of California, Brea. (assignee)
V. L. Traylor.
US Patent No 3,884,803, 5 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 934, No 3, p 1184, May 20, 1975.

Descriptors: *Patents, *Oil pollution, *Oily water, *Pollution abatement, *Water pollution control, *Separation techniques, Water pollution control.
Identifiers: Gas flotation, Low gravity oil.

In cases where gravity separation is not sufficient to obtain the water quality desired, gas flotation processes are employed for oil-water separation. However they are not as effective separating low gravity oils, such as oils having API gravities of about 20 deg or lower. Accordingly it is a primary object of this invention to provide a process for separating low API gravity oil from water. A small amount of a high API gravity oil is added to the oil-contaminated water and the misture thereafter is contacted with finely divided gas bubbles to float the oil and included particulate solid matter to the surface for mechanical separation. A low oil-content product water suitable for discharge into public waters or sewer systems, or for use in industrial and agricultural applications is produced. (Sinha-OEIS)
W75-09664

**ANTI POLLUTION WATERWAY DEVICE AND PROCESS,**
W. Smyrnow.
US Patent No 3,884,810, 5 p, 9 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 934, No 3, p 1186, May 20, 1975.

Descriptors: *Patents, *Water pollution control, Water quality control, *Pollution abatement, Pollution(Stream), Turbulent flow, Air circulation, Equipment, Bubbles.

The process includes the cleansing of waterway flowing water by directing a gaseous fluid such as compressed air through a submerged conduit extending along a line of flow at an oblique angle to the direction of the flowing water, releasing the compressed air in the form of bubbles all along the extension of the conduit at a plurality of closely arranged points such that an oblique barrier of bubbles is formed obliquely across the direction of flow of water, there being a sufficient amount of bubbles released to form a major up-draft current of water toward the surface. Currents counter to the normal flow of water are created at least sufficiently to temporarily deter the movement of debris and other pollutants but with the downstream flow of the current causing the pollutants to slide obliquely along the oblique barrier in a downstream direction to a collection point which includes a collection means of any desired or conventional type. The system consists of a rigid, elongated member having a weight substantially greater than the water; a conduit; mounting means to fix the elongated member to the bottom surface at an angle from about 15 to 75 deg to the direction of flow; a plurality of air escapement perforations; and pump means providing air at a pressure sufficient to cause a rising plane of turbulence from the conduit to the surface of the waterway. (Sinha-OEIS)
W75-09665

**OIL INTERCEPTORS FOR SEPARATING OIL FROM WATER BY GRAVITY,**
Shell Oil Co., Houston, Tex. (assignee)
J. Cornelissen.
US Patent No 3,884,815, 4 p, 10 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 934, No 3, p 1188, May 20, 1975.

Descriptors: *Patents, *Oily water, *Oil pollution, *Water pollution control, *Separation techniques, Gravity, Ships, Equipment.
Identifiers: Separator vessel.

The invention is concerned with an oil interceptor of the type which employs one or more packs of closely-spaced inclined plates between which an oil-water mixture is passed. As the mixture flows downward between the plates under laminar flow conditions, the lighter-than-water oil globules rise and collect under the under surface of each plate and the heavier sludge and sediment settle out on the upper surface of each plate. The oil globules coalesce and rise free of the plate pack and the sludge settles to the bottom of the interceptor vessel containing the plate pack. The object of this invention is to adapt this type of interceptor for use on board ship for cleaning ballast and tank-cleaning water of tankers. The oil interceptor or separator vessel has an outlet oil line with an outlet oil weir and an outlet water line with an outlet water weir. The weirs are mounted adjacent one another and at a position above the main part of the separator vessel, the edge of the oil weir being at a higher level than the edge of the water weir. When the separator vessel is mounted on board a ship, at least the weirs are oriented whereby the edges of the weirs lie in substantially a port-starboard direction. (Sinha-OEIS)
W75-09667

**THE BOTTOM FAUNA OF CHINA CLAY WASTE DEPOSITS IN MEVAGISSEY BAY,**
Otago Univ., Portobello (New Zealand). Marine Biological Station.
For primary bibliographic entry see Field 5C.
W75-09673

**WATER-RESOURCES INVESTIGATIONS IN THE FORT UNION COAL REGION, NORTH DAKOTA, 1974-75.**
Geological Survey, Bismarck, N.Dak.
For primary bibliographic entry see Field 5B.

W75-09715

**ATTITUDES IN SLUDGE TREATMENT AND DISPOSAL,**
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-09731

**A CASE STUDY OF MINE WATER QUALITY DETERIORATION, MAINSFORTH COLLIERY, COUNTY DURHAM,**
Teesside Polytechnic, Middlesbrough (England). Dept. of Civil and Structural Engineering.
For primary bibliographic entry see Field 5B.
W75-09752

**MAKEUP REQUIREMENTS FOR COOLING PONDS,**
Hanford Engineering Development Lab., Richland, Wash.
J. C. Sonnichsen, Jr.
Journal of the Environmental Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No EE1, Paper 11114, p 15-25, February 1975. 3 tab, 10 ref, 3 append.

Descriptors: *Cooling water, *Water utilization, *Ponds, *Environmental engineering, Water requirements, Reservoirs, Artificial lakes, Thermal powerplants, Consumptive use, *Thermal pollution, Heated water, Evaporation, Water temperature.

The United State's demand for electricity has doubled every 10 years for the last few decades. At present, the rate of growth is even greater. Expert opinion suggests that this trend will continue for the next 20 years. Assuming this is true, the number of kilowatt-hours produced annually will quadruple over this same time span. In the future, power plants will rely more heavily on closed evaporative cooling systems. Water makeup requirements for operating power plant cooling ponds was further reviewed. Water loss was first defined and then computed in terms of the type and size of pond. A distinction between using a natural or man-made pond was drawn. For natural ponds, this flux was considered part of the total natural flux. Results suggested that water loss is dependent on the type as well as the size of pond employed. Computed water makeup requirements for man-made and natural cooling ponds with mixed flow or slug flow were tabulated for three different hydrologic regions of the United States: (1) arid, (2) where precipitation approximately balances natural evaporation, and (3) where precipitation exceeds natural evaporation. Mathematical models used for completely mixed ponds, slug flow ponds, and evaporation were given in an appendix. (Humphreys-ISWS)
W75-09760

**DEOXYGENATION IN NATURAL STREAMS,**
Nebraska Natural Resources Commission, Lincoln. Data Bank.
For primary bibliographic entry see Field 5B.
W75-09767

**RESERVOIR OPTIMIZATION FOR WATER QUALITY CONTROL,**
Pennsylvania Univ., Philadelphia.
E. Kaplan.
Available from University Microfilm, Inc., Ann Arbor, Michigan, 48106, Order No 74-22859. PhD Thesis, 1974, 585 p.

Descriptors: *Algorithms, *Water quality control, *Reservoirs, Lakes, Water quality standards, Biochemical oxygen demand, Phosphates, Nitrates, Discharge(Water), Flood control, *Optimization, Hydrogen ion concentration, Dissolved oxygen, Dissolved solid.
Identifiers: Fecal coliforms.

A constrained nonlinear optimization algorithm (COMET) and a program to simulate lake ecology (LAKECO) are used to control both the quantity and the quality of water within and discharged from a reservoir. A multiparameter water quality index was used as an objective function for optimization. Quality parameters included temperature, dissolved oxygen, 5-day BOD, pH, total dissolved solids, phosphates, nitrates, and fecal coliforms. Reservoir elevation and discharge quantity also were considered. An application was given for a proposed reservoir where it was found that stringent design and legal requirements could be met for epilimnetic and discharged water during the period of simulation. The technique can also be used to provide both water quality and flood control capabilities to existing reservoirs capable of selective withdrawal. (Prague-FIRL)
W75-09773

**MODIFICATIONS TO THE EXECUTIVE COMPUTER PROGRAM FOR STEADY-STATE SIMULATION OF WASTEWATER TREATMENT FACILITIES,**
Curran Associates, Inc., Northampton, Mass.
For primary bibliographic entry see Field 5D.
W75-09775

**GYPSUM CAN IMPROVE YOUR WATER ALSO,**
Central Soil Salinity Research Inst., Karnal (India).
R. C. Sharma, and I. P. Abrol.
Indian Farming, Vol 23, No 6, p 21-22, September 1973. 1 tab.

Descriptors: *Gypsum, *Irrigation, *Water quality control, *Groundwater, *Arid lands, *Irrigation water, Sodium, Carbonates, Bicarbonates, Calcium, Application methods.
Identifiers: India.

In arid and semiarid areas where surface water supplies are inadequate, it has been necessary to explore for sub-soil water for agricultural use. Complaints are often received from farmers about the low quality water obtained from tubewells. For successful agriculture, it is necessary to have good quality water for irrigation, or take measures to improve the water quality if it is poor. The main problem is generally one of excess sodium and carbonate or bicarbonate. Their effects can be rectified by adding soluble calcium to the water or soil which is being irrigated. The amount of gypsum needed will depend on the water quality which can be tested at the nearest soil testing laboratory. If the electrical conductivity of water is less than 4000 micromhos/cm and the water contains residual sodium carbonate, gypsum is needed. Gypsum can be applied either to the water or to the soil directly; the application will have to be repeated every year or alternate years depending upon the improvement obtained. (Mastic-Arizona)
W75-09787

**MAINTENANCE OF THE FEDERAL NAVIGATION PROJECT IN SCARBORO RIVER AT SCARBORO, MAINE (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 8A.
W75-09811

**PROPOSED 1973 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE-SALE, OFFSHORE MISSISSIPPI, ALABAMA, AND FLORIDA, VOLUME 2, POTENTIAL ENVIRONMENTAL IMPACTS, ETC. (ENVIRONMENTAL IMPACT STATEMENT).**
Bureau of Land Management, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as EIS-MS-73-1651-F 2, $7.50 in paper copy, $2.25 in microfiche. October 18, 1973. 242 p, 7 fig, 13 tab.

Descriptors: *Oil, *Oil pollution, *Oil spills, *Gulf of Mexico, Alabama, Mississippi, Continental shelf, Florida, Oil industry, Oil wastes, Environmental effects, Shoreline cover, Shore protection, Shores, Gulfs, Marine biology, Estuaries, Wetlands, Fishing, Navigation, Ships, Military aspects, Recreation, Aesthetics, Pipelines.
Identifiers: *Environmental Impact Statements, Energy crisis, Oil Pollution Act.

This second volume of the outer continental shelf oil and gas general lease sale, offshore Mississippi, Alabama and Florida environmental impact statement is addressed to the probable environmental impacts of the project and potential mitigating measures. The following environmental impacts were considered: impacts on the living components of the environment (open gulf, marine life, shoreline, estuaries, and wetlands); impacts on air and water quality; impacts on commercial fishing; conflicts with military uses of the continental shelf; conflicts with ship traffic and navigation; and impacts on the recreational, historical, aesthetic and arechaeological features of the area. Potential mitigating measures include oil spill regulations, enforcement and contingency action, and construction of protective structures and pipelines. The unavoidable adverse environmental effects of the project were also described. (Gagliardi-Florida)
W75-09820

**PROPOSED NAVIGATIONAL MAINTENANCE DREDGING PROJECT AT GUILFORD HARBOR, GUILFORD, CONNECTICUT (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 8A.
W75-09821

**CRUDE OIL AND NATURAL GAS PRODUCTION AND OTHER MINING OPERATIONS IN NAVIGABLE WATERS ALONG THE LOUISIANA COAST (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, New Orleans, La.
Available from the National Technical Information Service, Springfield, Va 22161, USDC, as EIS-LA-73-1897-F, $10.50 in paper copy, $2.25 in microfiche. December 6, 1973. 403 p, 3 map, 4 tab.

Descriptors: *Permits, *Dredging, *Waste disposal, Navigation, Navigable waters, *Louisiana, Turbidity, Oil, Gasoline, Mineralogy, Environment, Fishing, Archaeology, Environmental effects, Fish, Navigation, Salinity, Marshes, Ecosystems, Disposal, Brines.
Identifiers: *Environmental Impact Statements.

The action involves the determination or acceptability of any request for a permit to erect or construct facilities to explore for oil or gas or to develop production and storage of such resources or other mineral resources in navigable waterways. The permit system provides for the orderly and efficient development of the mineral resources of the coast of Louisiana with due regard for minimization of the impact upon the environment. Dredging, spoiling and waste disposal, incident to proposals for which permits are granted, can reduce or expand aquatic and land habitats, alter hydrologic characteristics of areas, create turbidity and cause siltation, and expose, damage, or conceal archaeological sites. Regulation and surveillance systems now employed as well as improved industry awareness and cooperation are expected to minimize these and other impacts. The following adverse environmental effects will result: creation of obstruction to navigation and fishing activities; altered salinity and circulation of marsh areas; possible damage to ecosystems; dredging; and disposal of brines and

sanitary wastes. Alternatives are to cease issuing drilling, structural or dredging permits or to delay development of resources until all environmental problems have been resolved to the satisfaction of all concerned. (Gagliardi-Florida)
W75-09823

**BOROUGH OF MORRISVILLE V. DELAWARE RIVER BASIN COMM'N. (RULING ON MOTION TO DISMISS ACTION BY COMMUNITIES DEPENDENT ON DELAWARE RIVER BASIN COMM'N. WHICH ACTION WAS FOUNDED ON A NEPA COMPLAINT).**
For primary bibliographic entry see Field 6E.
W75-09827

**JOINT CANADA-UNITED STATES MARINE POLLUTION CONTINGENCY PLAN FOR SPILLS OF OIL AND OTHER NOXIOUS SUBSTANCES.**
Coast Guard, Washington, D.C.
Available from National Technical Information Service, Springfield, Va 22161 as AD-782 895, $4.25 in paper copy, $2.25 in microfiche. June 20, 1974. 60 p, 8 fig, 3 tab.

Descriptors: *Pollutants, *Pollution abatement, *Oil pollution, Oil industry, Oil spills, Oil wastes, Oil, State governments, Federal government, United States, Canada, Regional development.
Identifiers: International agreements.

The purpose of the plan is to provide for coordinated and integrated responses to pollution incidents by federal, state, provincial and regional plans of both the United States and Canada. The objectives of the plan are to develop appropriate measures of preparedness and systems for the discovery and reporting of pollution incidents, to institute prompt measures to restrict the further spread of oil or other noxious substances, and to provide adequate resources to respond to a pollution incident. The plan provides for pre-designated on-scene commanders and deputy commanders who will coordinate the response activities to control a spill and for joint response teams to provide advice and assistance to the on-scene commanders. Additionally, it establishes alerting and notification procedures, command structures, post-clean-up requirements and arrangements for assuming the responsibility for the cost of operation. The implementation and maintenance of the plan is the joint responsibility of the United States Coast Guard and Department of Transportation and the Canadian Marine Transportation Administration and Ministry of Transport. (Gagliardi-Florida)
W75-09835

**OFFSHORE OIL AND GAS RIGHTS: A COMPARATIVE STUDY,**
For primary bibliographic entry see Field 6E.
W75-09836

**CONTEMPORARY RESEARCH IN MARINE AFFAIRS,**
Delaware Univ., Newark. Center for the Study of Marine Policy.
For primary bibliographic entry see Field 6B.
W75-09837

**THE RESERVE MINING CASE: PROMISES, PROMISES,**
Minnesota Pollution Control Agency, Minneapolis.
G. J. Merritt.
Great Lakes Focus on Water Quality, Vol 1, No 1, p 1-3, Fall 1974.

Descriptors: *Environmental control, *Environmental effects, *Lake Superior, *Air pollution, *Water pollution, Environment, Air, Air pollution effects, Water pollution control, Water pollution effects, Water pollution sources, Waste disposal, Wastes, Water, Asbestos, International Joint Commission.
Identifiers: *Hazardous substances(Pollution), Injunctive relief.

The difficulties and possible futilities inherent in the environmental movement are manifested by the case of Reserve Mining Company and its discharge of 67,000 tons a day of taconite tailings into Lake Superior. On April 20, 1974, Federal District Judge Miles Lord ordered the plant to cease its discharges into the air and water effective 12:01 a.m., April 21, 1974. Less than 48 hours later, it was ordered reopened by a hastily convened panel of 8th U.S. Circuit Court of Appeals judges. Nevertheless, it now appears certain that Reserve is going to have to recognize its public responsibility and end its dumping of waste materials, including possibly carcinogenic asbestos fibers, into the public air and water. The question still remains, however, when the dumping will eventually cease. Despite action by the Environmental Protection Agency and the International Joint Commission, admissions by Reserve officers that permit conditions have not been followed, and fears of cancer causation, the Supreme Court, on June 10, 1974, refused to overturn the 8th Circuit's stay. Corporate irresponsibility and refusal to accept blame is criticized. Only an enlightened public outcry will result in the cessation of this willful and dangerous pollution. (Gagliardi-Florida)
W75-09838

**CONSERVATION COUNCIL OF NORTH CAROLINA V. COSTANZO (ACTION TO ENJOIN CONSTRUCTION OF A MARINA ON ISLAND IN ATLANTIC OCEAN AND TO REQUIRE ENVIRONMENTAL IMPACT STATEMENT BY CORPS OF ENGINEERS).**
For primary bibliographic entry see Field 6E.
W75-09840

**WATER STRATEGY--STATEMENT OF POLICY FOR IMPLEMENTING CERTAIN REQUIREMENTS OF THE 1972 FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS.**
Environmental Protection Agency, Washington, D.C.
April 30, 1973. 74 p, 5 tab, 4 append.

Descriptors: *Federal Water Pollution Control Act, *Effluents, *Water pollution, *Water quality control, Federal project policy, Administration, Governmental interrelations, Long-term planning, Legislation, Coordination, Water policy, Permits, Discharge(Water), Pollution abatement, Estuaries, Sea water, Groundwater, States, Municipal wastes, Industrial wastes.
Identifiers: Effluent limitations, Federal Water Pollution Control Act Amendments of 1972, Inland surface waters, Point sources, Ocean dumping, Non-point sources.

An outline is presented of part of a management system conceived to implement the Federal Water Pollution Control Act Amendments (FWPCA) of 1972. The purpose is to provide the Environmental Protection Agency (EPA) and the states with a presentation of national objectives and relative areas of emphasis. The basic concern dealt with by the FWPCA Amendments is the control of point source pollution to achieve national water quality. This will be accomplished by the institution of a universal base level of effluent limitation supplemented by a higher level of effluent limitations dictated by water quality requirements. The current water quality problem in inland surface waters and estuaries, marine waters and ground water is discussed. Because the major sources of pollution and the level of effluent control needed differs by geographical area and because of budgetary constraints, the strategy is basically to attack water pollution in the areas where it is most serious and where it results principally from the discharges of point sources. The program is principally concerned with industrial and municipal discharges, ocean dumping and non-point sources. Future goals for the EPA and the states are presented, such as establishment by the states of the necessary water quality analysis procedures. (Altuve-Florida)
W75-09841

**ENVIRONMENTAL CRITIQUE (THE 1972 FEDERAL WATER POLLUTION CONTROL ACT: PROBLEMS AND PROSPECTS AFTER ONE YEAR),**
Natural Resources Defense Council, Washington, D.C.
J. G. Speth.
Natural Resource Lawyer, Vol 7, No 2, p 249-256, 1974. 17 ref.

Descriptors: *Federal Water Pollution Control Act, *Water pollution, *Wastes, Regulation, Control, Legal aspects, Institutional constraints, Pollutants, Navigable waters, Social values, Water quality, Law enforcement, Toxins, Scheduling, Planning, Timing, Research and development, Technology, Permits, Federal government, Government finance, Programs.
Identifiers: Point sources, Non-point sources, Impoundment(Funds).

The 1972 Amendments to the Federal Water Pollution Control Act have created a strong but workable regulatory program. The key goal of the Amendments is to restore and maintain the chemical, physical and biological integrity of the Nation's waters. This is to be achieved through implementation of six national policies stated in the Act; one of which is the elimination of the discharge of pollutants into the navigable waters by 1985. Other goals include swimmable and fishable water by 1983 and the speedy elimination of toxic discharges. The Amendments also include a regulatory program to implement the new national policies. The emphasis is upon a reasonable time table for implementation by means of the best practicable technology currently available. Implementation has been delayed by low federal funding and impoundment of funds. Environmentalists are disappointed with the Environmental Protection Agency's failure to publish a satisfactory list of toxic pollutants, its failure to totally control non-industrial point sources, and failure to issue needed guidelines. (Altuve-Florida)
W75-09844

**FEDERAL MARITIME JURISDICTION AND STATE MARINE POLLUTION LEGISLATION: THE FLORIDA ACT NOT PREEMPTED PER SE,**
Miami Univ., Fla. School of Law.
G. L. Adelman.
University of Miami Law Review, Vol 28, p 209-218, 1973. 69 ref.

Descriptors: *Oil spills, *Oil pollution, *Federal Water Pollution Control Act, Oil, Oil industry, Oil wastes, Pollution abatement, United States, Florida, Pollutants, Water, Water pollution, Water pollution control, Water pollution treatment, Water pollution sources, Water policy, Water quality, Water quality control, Navigable waters, Ships.
Identifiers: Absolute liability, Coastal waters, Hazardous substances(Pollution), Injunctive relief.

A three-judge federal district court for the Middle District of Florida enjoined the enforcement and operation of the Florida Oil Spill Prevention and Pollution Control Act, declaring it null and void as an intrusion into the exclusive federal domain of substantive maritime legislation. The Supreme Court unanimously revised, finding no federal preemption and no direct conflict between the Florida act and the Federal Water Quality Im-

provement Act (WQIA) of 1970. The Court found that the latter act neither touched the subject of the liability of a maritime oil polluter for injuries to property, nor contained any provisions for the recovery by a state of costs it might incur in the abatement and cleanup of oil discharged into the navigable waters of the United States. The Court acknowledged that a state may constitutionally exercise its police power respecting maritime activities concurrently with the federal government and legislate with respect to damages or injuries caused by a vessel on navigable waters, but consummated on land. Questions which might arise in the future concerning the Florida Act involve the effect of the limited liability provisions of the WQIA and of case law prohibiting state legislation which prejudices the characteristic feature of maritime law. (Gagliardi-Florida)
W75-09845

**INTERNATIONAL LAW AND CANADIAN ARCTIC POLLUTION CONTROL,**
J. J. Sherrin.
Albany Law Review, Vol 38, p 921-942, 1974. 130 ref.

Descriptors: *Canada, *Arctic, *Water pollution, *Water pollution control, Ice, Land, International law, Water pollution effects, Water pollution sources, Pollutants, Water quality, Water quality control, Water resources, Natural resources, Islands, Navigation, Ecology, International waters, Coasts, Oceans, Ships.
Identifiers: Coastal waters, Contiguous zone, International agreements, State policy.

On June 26, 1970, the Canadian Parliament passed the Arctic Water Pollution Prevention Act. The act is designed to ensure that the natural resources of the Canadian Arctic are developed and exploited and the Arctic waters adjacent to the mainland and islands of the Canadian Arctic are navigated in a manner cognizant of Canada's responsibility for the welfare of the Eskimo and other inhabitants of the Canadian Arctic. The scope of the act is quite broad and the penalties provided are stringent and far-reaching. Canada's reasons for choosing to act unilaterally on this matter, rather than awaiting international action, appear to be an increasing disillusionment and frustration with international processes. The act seems to be based upon a far-reaching contiguous zone theory and not on the theory that such waters are subject to Canadian sovereignty. The Act is attacked on two grounds: (1) that the requisite coastal state jurisdiction on the high seas does not exist, and (2) that the means of regulation chosen are inconsistent with international standards concerning passage of ships and freedom of the seas. As long as the Canadian government continues to meet acceptable standards of international administrative due process, the act will remain a legitimate exercise of jurisdiction into the high seas. (Gagliardi-Florida)
W75-09846

**ENVIRONMENTAL PROTECTION BY COASTAL STATES: THE PARADIGM FROM MARINE TRANSPORT OF PETROLEUM,**
Fordham Univ., Bronx, N.Y. School of Law.
J. C. Sweeney.
Georgia Journal of International and Comparative Law, Vol 4, No 2, p 278-306, 1974. 129 ref.

Descriptors: *International law, *Oil, *Oil pollution, *Oil spills, Environment, Environmental control, Sea water, International commissions, Coasts, International waters, Environmental effects, Navigation, Pollutants, Water, Oceans, Sewage, Drainage, Rivers, Rainfall, Industries.
Identifiers: Energy crisis, International agreements, Territorial seas(Jurisdiction), Territorial waters.

The principle of freedom of the high seas enunciated by Grotius is the theoretical foundation for the denial to any state, other than the state of the vessel's flag, of the right to interfere with the operations of a vessel on the high seas. However, the effect of the principle of absolute freedom of the high seas when applied to the problem of oil pollution of the oceans is either archaic or misleading. Although world order prefers a multilateral solution to the environmental problems caused by oil pollution, nevertheless the same world order will not condemn unilateral solutions which have the necessary effect of extending coastal state interference with navigation and trade on the high seas. It is believed that an emerging rule of international law permits endangered coastal states to take action to interfere with the operations of polluting vessels outside of territorial water. Although there are many sources of environmental damage to the oceans and the coastal zone, such as sewage, natural drainage, river systems and even rainfall, there is one source which is controllable--the ocean transport of petroleum. Unfortunately, the efforts to control this source can imperil one of the most important industries of industrialized economies. Therefore, the slow process of accommodation will be necessary to reach a viable solution. In the interim, in the interest of international uniformity and the progressive development of international law, the 1969 Civil Liability Convention and the 1971 Fund Convention should be ratified by the United States Congress. (Gagliardi-Florida)
W75-09848

**MARINE OIL SPILLS: A PROBLEM IN ENVIRONMENTAL MANAGEMENT,**
British Columbia Univ., Vancouver. Dept. of Economics.
P. G. Bradley.
Natural Resources Journal, Vol 14, p 337-359, 1974. 5 fig, 3 tab, 27 ref.

Descriptors: *Oil spills, *Water pollution, *Cost-benefit analysis, *Social values, Economic feasibility, Decision making, Economic efficiency, Planning, Cost analysis, Social needs, Regulation, Control, Penalties(Legal), Pollution abatement, Water pollution control, Administration, Programs, Law enforcement, Priorities, Institutional constraints, Oceans, Public benefits.
Identifiers: *Marine oil spills.

Marine oil spills, especially those occurring in connection with ocean transport of petroleum and offshore production, have attracted attention recently from various fields including politics, science, and law. Economics of the spill problem is discussed, focusing on the range of opportunities open to the industry for reducing spillage and incentives to encourage such measures. The problem can be attacked by reducing accidents that cause the spill and by reducing the spillage after occurrence of accidents. The presence of social values and costs in this problem makes it difficult to determine what economic cost should be borne to eliminate oil spills. One proposed solution has been the use of private tort actions. Private actions can serve a useful function but the ultimate solution will have to come after a serious weighing of social and economic costs and benefits. The establishment of a tribunal which would set environmental quality targets and an enforcement agency which would see those targets are reached in an efficient way are a proposed solution. (Altuve-Florida)
W75-09849

# 6. WATER RESOURCES PLANNING

## 6A. Techniques Of Planning

**THE OPTIMUM DISTRIBUTION OF URBAN WATER SUPPLIES IN PUERTO RICO,**
Puerto Rico Univ., Mayaguez. School of Engineering.
For primary bibliographic entry see Field 4A.
W75-09377

**DYNAMIC PROGRAMMING OPTIMIZATION: A WATER DISTRIBUTION SYSTEM DESIGN,**
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 7C.
W75-09525

**SECTORAL AND REGIONAL ECONOMIC IMPACT OF CONTROLLING NONPOINT POLLUTION IN FORESTED AREAS,**
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5B.
W75-09530

**GOUNDWATER MODELS,**
For primary bibliographic entry see Field 2F.
W75-09582

**REGIONAL ANALYSES OF RUNOFF CHARACTERISTICS FOR SMALL URBAN WATERSHEDS,**
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2A.
W75-09621

**INTEGRATIVE PROCEDURES FOR COORDINATED URBAN LAND AND WATER MANAGEMENT: A SYSTEMS ANALYSIS,**
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
A. O. Esogbue, B. W. Lin, and O. Coskunogl.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 518, $7.50 in paper copy, $2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No ERC-0675, June 1975. 231 p, 38 tab, 20 fig, 87 ref, 5 append. B-093-GA(1), B-094-GA(1), B-073-NC(2)-B-062-VA(1), 14-31-0001-4152.

Descriptors: *Systems analysis, Land management, Optimum development plans, *Institutions, Management, Administration, Water quality control, Flood control, Water supply, Urban drainage, Drainage systems, Governmental interrelations, Cost-benefit analysis, *Water management(Applied), Coordination, *Georgia, Planning, *Alternative water use.
Identifiers: *Urban water management, *Atlanta(Geo), *Multiple-objective planning, Communications barriers.

Very complex systems are required for urban water supply, drainage, and water quality control and yet urban water management practice is characterized by little use of modern tools for system design and operation. As an example, land use changes have a major effect on both water needs and water availability, and public goals are not being achieved because basic known systems concepts are not being used to understand, anticipate, or deal with them. In order to probe the barriers between developed analytic tools and practical planning applications, questionnaires were mailed to 60 persons with water or land resource planning and management responsibility in metropolitan Atlanta, Georgia. The responses were used to develop profiles that showed the various groups to possess basically the same training and experience except for the more technical functions of their particular agency; and yet the major problem identified was the need for better communications among managers of impacting land and water subsystems. Regular staff meetings and an activity reporting system were recommended. A method was proposed for ranking alternatives by a matrix in which goals would be weighted by Delphi Techniques. Available techniques for analyzing a number of design and operation problems relating to water quality con-

trol, floodplain management, water supply and stormwater management are tabulated and referenced. (Jones-Geo Tech)
W75-09622

**MATHEMATICAL MODELS IN HYDROLOGY,**
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2A.
W75-09624

**FEDERAL MARITIME JURISDICTION AND STATE MARINE POLLUTION LEGISLATION: THE FLORIDA ACT NOT PREEMPTED PER SE,**
Miami Univ., Fla. School of Law.
For primary bibliographic entry see Field 5G.
W75-09845

## 6B. Evaluation Process

**ECONOMICS AND FINANCE OF NEVADA PUBLIC WATER SYSTEMS,**
Nevada Univ., Reno. Desert Research Inst.
B. V. Dall, and H. H. Chen.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 380, $4.75 in paper copy, $2.25 in microfiche. Nevada Center for Water Resources Research, Project Report No 34, May 1975. 81 p, 7 fig, 16 tab, 21 ref, 3 append. OWRT B-068-NEV(1). 14-31-0001-4104.

Descriptors: Water resources development, *Nevada, *Water supply, Management, *Rural areas, *Costs, *Water demand, *Water utilization, Coordination, Institutional constraints, Economics, Finance.

This study was initiated in response to a growing awareness of serious water management problems in rural communities of Nevada. Many small Nevada towns have stable populations and are faced with deteriorating water systems, rising costs for maintenance and investments, and an inadequate population base to support renovations. The major tasks of this study were to assess conditions of the water systems in the study area by compiling a comprehensive data base of water demand, usages, supply, and costs. Most all small communities and their water supply systems were not self-sufficient, discourage proper investment, and do not try and reduce consumption. The major problem prevalent in small communities in Nevada is the serious lack of coordination between institutional structures and community needs. An overall lack of cooperation between communities in regard to water problems and water system construction further hinders any progressive action within the state. (Fallon-Nevada)
W75-09375

**MINNESOTA'S WATER RESOURCES: A PRIMER,**
Minnesota Univ., St. Paul. Water Resources Research Center.
W. C. Walton.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 500, $3.75 in paper copy, $2.25 in microfiche. Public Report Series Number 2, May 1975. 33 p, 40 fig, 7 ref. OWRT A-999-MINN(36). 14-31-0001-5023.

Descriptors: *Minnesota, Planning, Water policy, *Water resources, Information exchange, Water availability, *Programs.
Identifiers: *Water resources problems, Public understanding.

A digest (primer) is presented of available information concerning Minnesota's water resources in layman's language. Generalization and brevity are emphasized. Although Minnesota does not have an overall water shortage, in 1974, there were serious and undesirable water resources problems. Basic facts concerning the availability of water, nature of problems, and kinds of programs to solve problems are presented. (Waelti-Minnesota)
W75-09516

**SECTORAL AND REGIONAL ECONOMIC IMPACT OF CONTROLLING NONPOINT POLLUTION IN FORESTED AREAS,**
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5B.
W75-09530

**ARIZONA'S REMOTE SUBDIVISIONS: AN INVENTORY,**
Arizona State Office of Economic Planning and Development, Phoenix. Planning Div.
For primary bibliographic entry see Field 6G.
W75-09583

**STATE OF ARIZONA, ENVIRONMENTAL SERVICES NEEDS STUDY FOR GREENLEE COUNTY, 1970-1990.**
Arizona State Office of Economic Planning and Development, Phoenix. Planning Div.
For primary bibliographic entry see Field 5D.
W75-09584

**RESEARCH NEEDS FOR WATER RESOURCES CONTROL IN CALIFORNIA.**
California State Water Resources Control Board, Sacramento. Div. of Planning and Research.
For primary bibliographic entry see Field 5G.
W75-09587

**SURFACE WATER RESOURCES OF ST. JOHNS RIVER, FLORIDA,**
Reynolds, Smith and Hills, Jacksonville, Fla.
For primary bibliographic entry see Field 2A.
W75-09604

**ENVIRONMENTAL GEOLOGY OF AN AREA IN WEST-CENTRAL ALABAMA,**
Geological Survey of Alabama, University. Environmental Div.
For primary bibliographic entry see Field 7C.
W75-09615

**INTEGRATIVE PROCEDURES FOR COORDINATED URBAN LAND AND WATER MANAGEMENT: A SYSTEMS ANALYSIS,**
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
For primary bibliographic entry see Field 6A.
W75-09622

**WATER FOR ENERGY SELF-SUFFICIENCY.**
Water Resources Council, Washington, D.C.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 Price $2.70. October, 1974. 184 p, 31 tab.

Descriptors: *Comprehensive planning, *Institutional constraints, *Energy, *Hydroelectric power, *Water distribution(Applied), Water supply, *Water supply development, *Water quality, Colorado River Basin, Mississippi River, Power system operation, Water delivery, Water cooling, North America, Power plants, Planning, Arid lands, Semiarid climates, Decision making, Financing.

Recommendations are provided for a course of action to meet the energy-related water needs of the U.S. Projects, programs, and investigations are identified which can assist in meeting water requirements for needed energy development, not maximum development. Emphasis is on the availability of water supplies for exploration, extraction, processing, transporting and use of energy; generating hydroelectric power; domestic and industrial needs; and associated needs arising from new energy related developments. Analysis was done on a regional basis and potential actions are suggested to alleviate identified problems. Activities included solicitation, study, and consideration of state information and views on energy related goals, projects, priorities, and problems associated with water for energy development. (See also W75-09627) (Bowden-Arizona)
W75-09626

**WATER FOR ENERGY SELF-SUFFICIENCY, EXECUTIVE SUMMARY.**
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 4C.
W75-09627

**CONTEMPORARY RESEARCH IN MARINE AFFAIRS,**
Delaware Univ., Newark. Center for the Study of Marine Policy.
G. J. Mangone, and J. L. Pedrick, Jr.
Available from National Technical Information Service, Springfield, Va 22161 as COM-74-11559, $4.25 in paper copy, $2.25 in microfiche. July 1974. 58 p, 103 ref.

Descriptors: *Research and development, *Marine biology, Oceans, State governments, Mineralogy, Fisheries, Fish, Fishing, Research facilities, Research priorities, United States, Pollution abatement, Pollutants, Pollutant identification, Coasts, International law.
Identifiers: International agreements.

Various methods of research in marine affairs that are currently being undertaken in the United States are described. A substantial list is presented of principal researchers as a review of achievements and needs in this fast-moving field of study. The areas of marine affairs research are classified as national security policy, merchant marine and port policy, mineral policy, fisheries policy, pollution policy, and coastal zone and general policy issues. It id essential to the wise guidance of public policy for the coastal zone, the seabed, and the oceans that such research be maintained, and broadened to the point of decision-making at state, federal, and international levels. Compared to the investment of resources in marine sciences, research in marine affairs is infinitesimal. Yet the rewards for public welfare through well-informed policies as a result of marine affairs research can be enormous. (Gagliardi-Florida)
W75-09837

**FEDERAL MARITIME JURISDICTION AND STATE MARINE POLLUTION LEGISLATION: THE FLORIDA ACT NOT PREEMPTED PER SE,**
Miami Univ., Fla. School of Law.
For primary bibliographic entry see Field 5G.
W75-09845

## 6C. Cost Allocation, Cost Sharing, Pricing/Repayment

**ECONOMICS AND FINANCE OF NEVADA PUBLIC WATER SYSTEMS,**
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 6B.
W75-09375

**AN INVESTIGATION OF FACTORS AFFECTING THE INTENSITY OF WATER USE IN THE LAJAS VALLEY IRRIGATION PROJECT,**
Puerto Rico Univ., Mayaguez. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W75-09376

**EVALUATION OF MUNICIPAL SEWAGE TREATMENT ALTERNATIVES.**
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5D.
W75-09404

**ECONOMIC ANALYSIS OF THE PROCESSING AND DISPOSAL OF REFUSE SLUDGES,**
Curran Associates, Inc., Northampton, Mass.
For primary bibliographic entry see Field 5D.
W75-09406

**THE ECONOMICS OF SLUDGE IRRIGATION,**
Springfield Sanitary District, Ill.
For primary bibliographic entry see Field 5D.
W75-09545

**FINANCIAL INCENTIVES AND POLLUTION CONTROL: A CASE STUDY,**
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
For primary bibliographic entry see Field 5G.
W75-09574

**BUSHLEY BAYOU, LOUISANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 8D.
W75-09819

## 6D. Water Demand

**AN INVESTIGATION OF FACTORS AFFECTING THE INTENSITY OF WATER USE IN THE LAJAS VALLEY IRRIGATION PROJECT,**
Puerto Rico Univ., Mayaguez. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W75-09376

**WATER, SEWERAGE AND FLOOD CONTROL SYSTEMS PLAN AND IMPLEMENTATION PROGRAM 1973-74.**
San Diego County Comprehensive Planning Organization, Calif.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-231 409, $4.25 in paper copy, $2.25 in microfiche. Prepared for Dept. of Housing and Urban Development, December, 1973. 61 p, 4 tab.

Descriptors: *Comprehensive planning, *Waste water treatment, *Sewerage, *Flood control, *Local governments, Facilities, Sewage treatment, Planning, Water resources development, Water utilization, *California.
Identifiers: *San Diego region(Calif).

Goals and policies are presented for the provision, planning, and extension of water, sewerage, and flood control facilities and services in the San Diego region of California. A summary of an evaluation of the adequacy of the existing facilities to meet present and projected 1981 requirements and a list of proposed projects which are partly based on this evaluation are also presented. The introduction explains San Diego County and the Comprehensive Planning Organization; part 2 sets forth the goals and policies to guide the planning and development of water, sewerage and flood control facilities; part 3 discusses the adequacy of the water resources and existing water resource facilities in the region; part 4 outlines improvements as well as financial considerations, and, part 5 discusses the implementation of the systems in relation to governmental responsibilities and organization. (Orr-FIRL)
W75-09400

**PUBLIC WATER SUPPLIES OF NORTH CAROLINA: PART 3. MOUNTAINS AND WESTERN PIEDMONT,**
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 5F.
W75-09711

**MAKEUP REQUIREMENTS FOR COOLING PONDS,**
Hanford Engineering Development Lab., Richland, Wash.
For primary bibliographic entry see Field 5G.
W75-09760

## 6E. Water Law and Institutions

**A GUIDE FOR STATE CERTIFICATION OF WASTEWATER FACILITIES PERSONNEL,**
Water Pollution Control Federation, Washington, D.C.
For primary bibliographic entry see Field 5D.
W75-09389

**OCEAN DISPOSAL EXPERIENCES IN PHILADELPHIA,**
Philadelphia Water Dept., Pa.
For primary bibliographic entry see Field 5E.
W75-09550

**A CASE STUDY OF ESTUARINE POLLUTION AND LOCAL AGENCY INTERACTIONS,**
University of Southern Mississippi, Hattiesburg. Bureau of Business Research.
For primary bibliographic entry see Field 5G.
W75-09620

**WATER LAWS IN MOSLEM COUNTRIES,**
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
D. A. Caponera.
Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper No 20/1, 1973. 223 p, 118 refs.

Descriptors: *Water resources, *Water law, *Legislation, *Water rights, Legal aspects, Water resources development, Arid lands, Asia, Africa, Irrigation, *Reviews.
Identifiers: *Moslem water law, Afghanistan, Bahrain, Brunei, Iran, Jordan, Kuwait, Morocco, Qatar, Somalia, Tunisia, The Peoples' Democratic Republic of Yemen, Yemen Arab Republic.

This is a revision of FAO Agricultural Development Paper No. 43, 'Water Laws in Moslem Countries' published in 1954. The earlier paper has been outdated by changes in water law and by the emergence of many new nations in the Moslem world. In this, volume one of a two volume update, a general introduction is given and twelve nations (Afghanistan, Bahrain, Brunei, Iran, Jordan, Kuwait, Morocco, Qatar, Somalia, Tunisia, The Peoples' Democratic Republic of Yemen, and the Yemen Arab Republic) are described. Since Moslem law is based upon revelations transmitted from Allah to man through the agency of the Prophet Mohammed, its religious overtones are unmistakable and Western planners must expect plans to be suspect which ignore or contradict this divine law. Moslem law has faced the practical problems of dividing a limited resource among the populace; however, it should be remembered that the scarcer the water is, the more complicated and elaborate the regulations are. Modern tendencies in Moslem water law make water a national resource under central control and ownership. This is compatible with traditional Islamic thinking which has always viewed the concept of community interest as the basis of Moslem water law. (Bowden-Arizona)
W75-09625

**WATER FOR ENERGY SELF-SUFFICIENCY.**
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 6B.
W75-09626

**WATER FOR ENERGY SELF-SUFFICIENCY, EXECUTIVE SUMMARY.**
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 4C.
W75-09627

**BOROUGH OF MORRISVILLE V. DELAWARE RIVER BASIN COMM'N. (RULING ON MOTION TO DISMISS ACTION BY COMMUNITIES DEPENDENT ON DELAWARE RIVER BASIN COMM'N. WHICH ACTION WAS FOUNDED ON A NEPA COMPLAINT).**
382 F. Supp. 543-547 (E.D. Penn. 1974).

Descriptors: *Delaware River Basin Commission, *Water supply, *Water allocation(Policy), *Water costs, Delaware, Delaware River, Rivers, Water demand, Basins, Water supply development, Water policy, Water rates, Water requirements, Water resources, Water users, Pennsylvania, Environmental effects, Environment.
Identifiers: *Environmental Impact Statements, NEPA, Injunctive relief.

A number of communities which depended upon the Delaware River Basin Commission for their water supply filed suit to prevent that agency from imposing a charge for water use. The agency moved to dismiss the complaint. The United States District Court for the Eastern District of Pennsylvania held that jurisdiction for plaintiffs' National Environmental Policy Act (NEPA) complaint could be properly founded upon a federal mandamus statute since the administrative action sought to be compelled or restrained was essentially ministerial rather than discretionary. The court rejected an argument that there was no case or controversy on grounds that the fees had not yet been collected. NEPA requires the preparation of an environmental impact statement for all legislative proposals and other major federal actions significantly affecting the quality of the human environment. (Gagliardi-Florida)
W75-09827

**UNION CAMP CORP. V. SEMINOLE FOREST WATER MANAGEMENT DISTRICT (SUIT BY SINGLE LANDOWNER TO REQUIRE FORMATION OF A DRAINAGE DISTRICT).**
302 So. 2d 419-423 (1st D.C.A. 1974).

Descriptors: *Florida, *Drainage districts, *Judicial decisions, *Wetlands, Legal aspects, Nonstructural alternatives, Water management(Applied), Local governments, State governments, Legislation, Land tenure, Overflow, Water districts, Water control, Drainage.
Identifiers: *Standing(Legal), *Contiguous zone.

Petitioner, a corporate landowner, filed for the formation of a drainage district pursuant to Chapter 298 of the Florida Statutes, which provides that 'owners of the majority of the acreage of any contiguous body of wet or overflowed land or lands subject to overflow' may petition for the creation of a district. Petitioner's lands constituted a contiguous part of an area that is subject to overflow. The State of Florida, the County of Volusia, several adjacent landowners, and owners of lands within the proposed district filed objections. Central to the controversy was whether the statute required a petition by the owners of a majority of the acreage of lands within the proposed district or whether it required a petition by the owners of a majority of the acreage of a contiguous body of lands subject to overflow. The First District Court of Appeal of Florida construed the statute as requiring merely that the lands within the proposed district must be contiguous, and held that a single landowner, such as petitioner, could

apply for the incorporation of a district, but that parties whose lands were within the proposed district must be included in the controversy. The court also held that the adjoining landowners and the county had standing to intervene, while the state did not. (Fernandez-Florida)
W75-09828

**JOHNSON V. STATE FARM FIRE AND CASUALTY CO. (ACTION FOR DEATH BY DROWNING IN ARTIFICIAL CANAL WHICH WAS FOUND TO BE NOT NAVIGABLE).**
303 So. 2d 779-787 (Ct. App. La. 1974).

Descriptors: *Drowning, *Canals, *Navigation, *Negligence, Rivers, Streams, Fishing, Boats, Boating, Navigable rivers, Navigable waters, *Louisiana.
Identifiers: Proximate causation.

An action was brought for the death of the decedent who drowned after being thrown from a fishing boat while the boat's motor was being operated by the defendant's insured. The Louisiana Court of Appeal held that rivers and streams are regarded as public navigable rivers when they are navigable in fact or are susceptible of use in their ordinary condition as highways of commerce over which trade or travel may be conducted in the ordinary mode of trade or travel on water. An artificial canal, however, can not be presumed navigable even though it might be deep enough to float a pirogue or flat-bottomed fishing boat. The court held the waterway in which the accident happened nonnavigable. It also held the insured negligent and the deceased not contributorily negligent. (Gagliardi-Florida)
W75-09829

**PEOPLE V. MCCARTHY (CRIMINAL ACTION FOR OPERATING UNREGISTERED BOAT ON NAVIGABLE WATERS OF PRIVATELY OWNED MARINA).**
362 N.Y.S.2d 785-787 (Crim. Ct. City N.Y. 1974).

Descriptors: *Boats, *Boating regulations, *Navigable waters, Highways, Land, Water law, Marinas, *New York, Boating, Water, Navigation, Trafficability.
Identifiers: State policy.

Defendant was charged with operating an unregistered and unnumbered boat upon navigable waters. The Criminal Court of New York City, reasoning that a navigable waterway is akin to a public highway and therefore subject to regulation by the state under its police powers even though the land under the water is privately owned, held that the defendant as lessee of a marina had only a right of possession, and that ownership still resided in the city. Because the state cannot yield its sovereign power and public obligation in regard to navigable waterways, the court held that the defendant-lessee was not entitled to operate an unregistered and unnumbered boat upon a navigable marina under a statute excluding from registration requirements motor boats operated upon waters privately owned. (Gagliardi-Florida)
W75-09830

**PASSAIC VALLEY COUNCIL BOY SCOUTS OF AMERICA V. HARTWOOD SYNDICATE, INC. (SUIT BY OWNER OF PART OF RESERVOIR BED AGAINST OWNER OF REMAINDER WHO CLAIMED EXCLUSIVE RIGHT TO HUNT, FISH OR SAIL ON RESERVOIR WATERS).**
361 N.Y.S.2d 945-949 (Sup. Ct. App. Div., 3d Dept., 1974).

Descriptors: *Reservoirs, *Easements, Beds, Canals, Fishing, Hunting, Boating, *New York, Dams, Drains, Water, Streams, Rivers, Recreation, Recreation demand.
Identifiers: Evidence, Injunctive relief.

An action was brought by plaintiff as owner of a portion of a reservoir bed under deed from a canal company, claiming rights in the reservoir against defendants, one of whom owned the remainder of the bed and who claimed rights in the reservoir pursuant to a canal company's conveyance of the canal and an earlier grant of hunting, fishing and sailing rights. The New York Supreme Court, Appellate Division, held that determination of whether rights reserved by the canal company in the latter conveyance constituted an easement appurtenant or an easement in gross required a construction of the intent of the parties from the face of the instrument and, in event of ambiguity, examination of the surrounding circumstances. The court found that the deed conveying perpetual and exclusive rights to hunt, fish and sail on the reservoir did not give the defendant the right to exclude plaintiff from undertaking such activities in the area. (Gagliardi-Florida)
W75-09831

**CONCH CREEK CORP. V. GUESS (CONFLICTING TITLE CLAIMS TO TIDELANDS INCLUDED IN GRANT FROM GOVERNOR).**
209 S.E.2d 560-561 (S.C. 1974).

Descriptors: *South Carolina, *Tidal marshes, *High water mark, *Navigable waters, *Ownership of beds, Judicial decisions, Legal aspects, Legal review, Water law, Boundary disputes, Governments, Public rights, Tidal effects, Tidal streams, Land tenure.

Plaintiff, landowner, brought suit against the State of South Carolina to quiet title to 398 acres of marshland. The property was located between two navigable waterways and was below the high water mark. The 398 acres was part of a larger tract which the plaintiff's predecessor had received in a grant from South Carolina. The property in the grant was specifically described to include the 398 acres and all of the granted property was tideland. The defendant demurred and the trial court overruled holding that title was in the plaintiff. On appeal the State contended that title to land below the high water mark on tidal navigable streams is in the State and is not transferable unless the State specifically does so. The appellate court affirmed the trial court stating that the grant of 645 acres all of which were tidelands was specific enough to indicate the State's intent to transfer title. The court felt there was no reasonable purpose for the grant unless it was to convey title to the plaintiff's predecessor. (Altuve-Florida)
W75-09832

**FLORIDA WATER RESOURCES ACT OF 1972 (STATUTE ESTABLISHING WATER MANAGEMENT DISTRICTS FOR THE STATE OF FLORIDA).**
Fla. Stat. Ch. 373, sec. 373.012 thru 373.6161 (1973).

Descriptors: *Permits, *Water policy, *Water management(Applied), *Florida, Local governments, State governments, Groundwater, Groundwater recharge, Surface waters, Water resources, Water shortage, Water supply, Water table aquifers, Water wells, Water law, Water levels.
Identifiers: *State policy, Florida Water Resources Act of 1972.

The Florida Water Resources Act of 1972 was enacted in recognition of the importance of water resources to the State, and the necessity for conservation and control in order to realize their full beneficial use. Among the purposes of the Act are management of water and land resources, the promotion of conservation and proper utilization of surface and ground water, and the preservation of natural resources, fish and wildlife. The Act vests in the Department of Natural Resources, the power and responsibility to implement the purposes of the Act, as well as the authority to delegate appropriate powers to the various water management districts in furtherance of the aims of the Act. The Department has authority to exercise supervisory authority over all water management districts, as well as to exercise any power which may be exercised by a water management district. The Department is directed to proceed as rapidly as possible to study existing water resources and to cooperate with the division of state planning to formulate a comprehensive state plan for the use and development of the waters of the state. The Department and district governing boards are authorized to promulgate regulations necessary or convenient to administer the provisions of the Act. (Denvir-Florida)
W75-09833

**ARTIFICIAL ISLANDS AND INSTALLATIONS IN INTERNATIONAL LAW,**
Rhode Island Univ., Kingston. Law of the Sea Inst.
A. H. A. Soons.
Occasional Paper No 22, July 1974. 30 p, 76 ref, append.

Descriptors: *International law, *International waters, *Law of the sea, *International Boundary and Water Commission, *Islands, Governments, Federal government, Federal jurisdiction, Jurisdiction, Oceanography, Oceans, Shores.
Identifiers: Territory, *Artificial islands.

Legal aspects are discussed of the existence of artificial structures which do not float but are permanently above sea level and of structures which rest upon the seafloor by means of piles or tubes driven into the bottom. The permissibility of constructing artificial islands and installations in internal waters, the territorial sea, and the high seas, respectively, is analyzed, before a discussion of legal ramifications of the construction of such bodies on the legal regimes of surrounding waters is undertaken. The possible effects of the presence of such bodies on delimitation of the territorial sea is also explored. The exercise of jurisdiction to regulate activities on artificial islands and installations is discussed, with a distinction being made between the various jurisdictional zones of the ocean. Finally, draft articles which could be included in a treaty on the law of the sea are presented. (Gerlach-Florida)
W75-09834

**JOINT CANADA-UNITED STATES MARINE POLLUTION CONTINGENCY PLAN FOR SPILLS OF OIL AND OTHER NOXIOUS SUBSTANCES.**
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-09835

**OFFSHORE OIL AND GAS RIGHTS: A COMPARATIVE STUDY,**
M. Crommelin.
Natural Resources Journal, Vol 14, No 4, p 457-500, 1974. 1 tab, 237 ref.

Descriptors: *Gases, *Oil, Canada, Environment, Oil industry, Oil reservoirs, Oil pollution, Land, Sea water, United States, Australia, Marine geology, Economics, Economic efficiency, Fuels.
Identifiers: Coastal waters.

The last decade has witnessed a dramatic shift in the focus of world oil and gas exploration and development from the land to the sea. The offshore oil and gas regimes of the United States, the United Kingdom, Canada and Australia are examined to assess their effectiveness in the management of publicly-owned resources. The allocation process of each country and the nature of the rights acquired in each jurisdiction are thoroughly considered and described. Additionally, the four management systems are compared and contrasted as to their relative merits and

deficiencies. The role of government in the management of offshore oil and gas resources is bound to increase in the future. Public ownership of these resources, their location within a complex marine environment, and their growing importance to economic development make this result inevitable. The alternative forms that government intervention will take are either the establishment of a flexible and efficient management regime controlling the activities of private enterprise or direct governmental participation. (Gagliardi-Florida)
W75-09836

**THE RESERVE MINING CASE: PROMISES, PROMISES,**
Minnesota Pollution Control Agency, Minneapolis.
For primary bibliographic entry see Field 5G.
W75-09838

**NATIONAL AUDOBON SOCIETY V. WHITE (SUIT TO ENJOIN TRESPASS ON PRIVATELY OWNED AND MAINTAINED NAVIGABLE CANAL).**
302 So. 2d 660-668 (La. Ct. App. 3d Cir. 1974).

Descriptors: *Louisiana, *Trespass, *Public access, *Riparian rights, *Canals, Legal aspects, Easements, Public rights, Navigable waters, Permits, Judicial decisions, Land tenure, Right-of-way, Riparian land, Water rights, Prescriptive rights, Legislation, Water law, Equity.
Identifiers: Injunctive relief, Navigation obstruction, Water rights(Non-riparian).

Plaintiffs sought to enjoin defendants from trespassing on a canal located on plaintiff's land. The issue presented was whether a private landowner can prohibit others from using a navigable canal constructed by him on his own property. Plaintiffs contended that the canal is private and that they have the right to restrict the use of the canal. They conceded the defendants previously were granted permission to use the canal, but argued that permission was later withdrawn. Defendants alleged that the canal is a public waterway and plaintiffs have no right to restrict the use of it. They further contend that plaintiffs are barred by Louisiana statute from obstructing a navigable waterway. Granting injunctive relief, the Court of Appeal of Louisiana, Third Circuit, held that a canal which was constructed with private funds on private property, which was posted and which had been open for public use only by written permission was a private canal subject to the owner's right to regulate its use. Further, the court concluded that the statute which prohibits obstruction of a highway of commerce did not apply, even though the canal was navigable. (Fernandez-Florida)
W75-09839

**CONSERVATION COUNCIL OF NORTH CAROLINA V. COSTANZO (ACTION TO ENJOIN CONSTRUCTION OF A MARINA ON ISLAND IN ATLANTIC OCEAN AND TO REQUIRE ENVIRONMENTAL IMPACT STATEMENT BY CORPS OF ENGINEERS).**
505 F.2d 498-502 (4th Cir. 1974).

Descriptors: *North Carolina, *Judicial decisions, *Administrative agencies, *Constitutional law, Legal aspects, Legal review, Law enforcement, Social aspects, Social needs, Social values, Recreation facilities, Recreation demand, Beds, Marinas, Coastal structures, Environmental effects, Regulation, Public rights, Construction.
Identifiers: *Environmental Impact Statements, *Standing(Legal).

Plaintiff, a conservationist group in North Carolina, sought a preliminary injunction restraining a developer from further construction of a marina on Bald Head Island and an order requiring the District Engineer of the Army Corps of Engineers to prepare and file a detailed environmental impact statement. The District Court denied the motion for preliminary injunction and dismissed the action for want of standing. The Court of Appeals affirmed on the ground that to have standing to seek judicial review of agency action, the plaintiff must allege an individualized interest at stake which would place him among the injured. The plaintiff's claim of potential loss of recreational use of the island as a licensee or trespasser was not sufficient to confer standing. The court did find merit in the plaintiff's claim that the construction would interfere with the right to travel through or otherwise use navigable portions of the submerged land and remanded. (Fernandez-Florida)
W75-09840

**WATER STRATEGY--STATEMENT OF POLICY FOR IMPLEMENTING CERTAIN REQUIREMENTS OF THE 1972 FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-09841

**OFFSHORE DEVELOPMENT AND MARINE POLLUTION,**
United Nations Secretariat. Office of Legal Affairs.
For primary bibliographic entry see Field 5B.
W75-09842

**TOWARDS A NEW REGIME FOR OCEAN DEVELOPMENT,**
Tohoku Univ., Sendai (Japan). School of International Law.
S. Oda.
Ocean Development and International Law Journal, Vol 1, No 3, p 291-302, 1973. 25 ref.

Descriptors: *Law of the Sea, *Marine fisheries, *Commercial fishing, *Continental shelf, Coasts, Oceans, Navigation, United Nations, Foreign countires, Governments, International law, Manganese, Foreign trade, Foreign waters, International waters, Water law, Conferences, Fishing, Jurisdiction, Legislation.
Identifiers: *Coastal waters, *Territorial waters, Territorial seas(Jurisdiction), Ocean development, Seabeds.

In light of the great benefits that Japan has received under traditional concepts of the freedom of the high seas, Japan should not close its eyes to the changing concept of the law of the sea, particularly in the field of resources management. Two distinct trends are described: first, the growing interest of coastal states over offshore resources, which may be satisfied only through the exercise of coastal jurisdiction, and second, the aspirations of a number of countries toward international control of the resources of the vast ocean areas, which may eventually replace the concept of free competition. Neither extreme will prove satisfactory, since the implementation of one scheme will ignore competing needs. A new and flexible approach is needed to enable an over-all accommodation of the diverse interests involved. The division of the sea into the traditional concept--the high seas and the territorial sea--will no longer prove satisfactory in view of present-day problems of the sea. A pragmatic basis is proposed for narrowing the differences that exist between the realities and the ultimate objectives of the international community. (Fernandez-Florida)
W75-09843

**ENVIRONMENTAL CRITIQUE (THE 1972 FEDERAL WATER POLLUTION CONTROL ACT: PROBLEMS AND PROSPECTS AFTE ONE YEAR),**
Natural Resources Defense Council, Washingto D.C.
For primary bibliographic entry see Field 5G.
W75-09844

**INTERNATIONAL LAW AND CANADIAN ARC TIC POLLUTION CONTROL,**
For primary bibliographic entry see Field 5G.
W75-09846

**INFLUENCE OF THE ENERGY CRISIS UPO THE FUTURE OF ENVIRONMENTAL POLICY**
Committee on Interior and Insular Affairs (U.S Senate).
D. A. Dreyfus, and R. D. Grundy.
Environmental Affairs, Vol 3, p 252-274, 1974. 5 ref.

Descriptors: *Social values, *Institutional con straints, *Conservation, *Environmental effects Social needs, Social impact, Economic impact Economic justification, Political aspects, Politica constraints, Research and development, Energy budget, Energy, United States, Legal aspects Legislation, Regulation, Control.
Identifiers: Energy needs.

The present energy crisis has emphasized the long standing conflict between energy needs and environmental goals and the need for changing energy consumption patterns. The United States intensive use of energy is closely linked to its high standard of living and the present rate of consumption indicates that in the future the energy shortage will become even more acute. In order to meet the present crisis, certain national policies will have to be restructured. The newest policies, particularly those involving environmental constraints, will be amended or revoked because they have not yet been incorporated into the structure of the energy systems or the cultural and economic structures of society. Three areas where such restructuring of policies will probably take place are federal decisions on surface mining, the Alaska pipeline, and emergency energy measures. Despite this restructuring it is highly unlikely that any major body of environmental law will be stricken from the statutes, because environmentalism has become too well established in society. (Altuve-Florida)
W75-09847

**ENVIRONMENTAL PROTECTION BY COASTAL STATES: THE PARADIGM FROM MARINE TRANSPORT OF PETROLEUM,**
Fordham Univ., Bronx, N.Y. School of Law.
For primary bibliographic entry see Field 5G.
W75-09848

**MARINE OIL SPILLS: A PROBLEM IN ENVIRONMENTAL MANAGEMENT,**
British Columbia Univ., Vancouver. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-09849

**THE PUBLIC TRUST DOCTRINE IS ALIVE AND KICKING IN NEW JERSEY TIDAL-WATERS: NEPTUNE CITY V. AVON-BY-THE-SEA--A CASE OF HAPPY ATAVISM,**
Louisville Univ., Ky. School of Law.
L. R. Jaffee.
Natural Resources Journal, Vol 14, p 309-335, 1974. 137 ref.

Descriptors: *Public access, *Usufructuary right, *Tidal waters, Access routes, Beaches, Navigation, Fisheries, *New Jersey, Public rights, Shores, Recreation, Water, Water purification, Water quality, Water demand, Water policy, Water resources, Roads, Fishing.
Identifiers: Public trust doctrine, Administrative regulations, Standing(Legal).

Neptune City v. Avon-By-The-Sea holds that the public trust doctrine prohibits the state of New Jersey and its subdivisions from discriminating among state citizens in its foreshore access regulations. The decision apparently also secures citizen access to foreshore at points of intersection with dedicated public ways. Neptune City also suggests that the public may have rights of wetbeach access over private drybeach, as well as usufructuary rights respecting wetbeach allocated to private possession. In addition, no person or branch of state government can abridge citizen navigation, fishery, recreation, access and water purity interests. The case also stands for the proposition that New Jersey citizens have standing to challenge private and state-government threats to such tidal water interests. Absolute power to cut off citizen foreshore access by realty grant, or to plan roads not to connect with foreshore cannot, consistently with the public trust doctrine, vest in any branch or arm of the state government. Although principally related to navigation, fishing and attendant interests, the public trust is defined by actual citizenry demand. In order to fully protect citizen remedies, creation is recommended of a special tidal water resource allocation court with technological, scientific and economic expertise as well as juridicial competence, and the power to review legislative and quasi-legislative findings. (Gagliardi-Florida)
W75-09850

## G. Ecologic Impact Of Water Development

**ARIZONA'S REMOTE SUBDIVISIONS: AN INVENTORY,**
Arizona State Office of Economic Planning and Development, Phoenix. Planning Div.
M. Hamernick, and B. A. Brown.
January 1975, 39 p, 15 fig, 9 tab.

Descriptors: *Arizona, *Surveys, *Planning, Land use, *Land development, *Recreation demand, *Colorado River, Projections, Environmental effects, Rural areas.
Identifiers: *Subdivisions.

The basic inventory reveals the magnitude of remote subdividing activity and its effect on Arizona's environment. The statistics show 2,565 remote subdivisions on 943,460 acres cut up into 12,829 lots, of which 83% has been so subdivided since 1959. The supply of lots is far in excess of the estimated population increase projected to the year 2,000. Widely scattered throughout the state, these lands are sparsely settled, in many instances located at a distance from urban retail trade and service areas and some in areas with apparent water supply and flooding problems. Although there is little evidence that these aspects are likely to change, there is still a significant amount of private land that will obviously be subdivided in future. Attention is specifically directed to the 750-mile-long Colorado River, a major water recreation area, where nearly 40,000 acres have already been subdivided into 69,000 lots within 10 miles of the Arizona side of the River. (McLachlan-Arizona)
W75-09583

**ENVIRONMENTAL GEOLOGY OF AN AREA IN WEST-CENTRAL ALABAMA,**
Geological Survey of Alabama, University. Environmental Div.
For primary bibliographic entry see Field 7C.
W75-09615

**EVALUATION OF ENVIRONMENTAL IMPACT OF LANDFILLS,**
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5C.
W75-09761

**EVALUATING EFFECTS OF WATER RESOURCE DEVELOPMENTS ON WILDLIFE HABITAT,**
Missouri Dept. of Conservation, Jefferson City.
C. Daniel, and R. Lamaire.
Wildlife Society Bulletin, Vol 2, No 3, p 114-118, Fall, 1974. 2 tab.

Descriptors: *Wildlife habitats, *Water resources development, *Numerical analysis, *Land use, Wildlife conservation, Statistics, Habitat improvement, Environmental effects, Population, Evaluation.

A system is presented for evaluating effects of water resource development projects on wildlife habitat, based upon existing habitat values rather than on man's utilization of wildlife. Effects of water resource projects on wildlife habitat are summarized numerically, and unique habitat types and endangered fauna or flora are considered. Credit can be given for project benefits as well as losses. The amount of mitigation needed is determined by the same evaluation procedures. The basic philosophy of the system is that all land has an existing wildlife habitat value that can be expressed numerically. (Bowden-Arizona)
W75-09790

**THE ECOLOGICAL MANAGEMENT OF ARID AND SEMI-ARID RANGELANDS IN AFRICA AND THE NEAR EAST: AN INTERNATIONAL PROGRAMME.**
Report on an Expert Consultation, held May 27-31, 1974, Food and Agriculture Organization of the United Nations, Rome, Italy, 1974. 52 p, 6 append.

Descriptors: *Africa, *Carrying capacity, *Climatic data, *Drought, *Arid lands, Asia, United Nations, Ecosystems, Range management, Human population, Research priorities, Governments, Planning, Land use.
Identifiers: Overpopulation, Overgrazing.

Africa and the Near East contain the world's largest expanse of arid and semi-arid rangeland; recent droughts and famine have pointed out that this expanse has several problems of overpopulation, overgrazing and poor land use. The ecological balance of the region is fragile and with few exceptions, recent attempts to develop sedentary live-stock operations similar to those of arid regions of Australia or America have failed. Future exploitation of the region should be limited to a level that the land can support. If this is not done, future droughts will worsen the situation and further limit the region's ability to sustain human and animal life. The Food and Agriculture Organization can help nations in the region by providing the expertise for discovering just what level of exploitation is ecologically sound. Nations in the region must setup agencies to enforce such guidelines. It is concluded that the only way to alleviate human suffering during the recurring droughts that occur in the region is to lower human numbers and human use. (Bowden-Arizona)
W75-09791

**A SURVEY OF THE NESTING HABITATS OF THE WHITE-WINGED DOVE IN ARIZONA,**
Arizona Game and Fish Dept., Phoenix. Research Div.
D. D. Wigal.
Special Report No 2, June, 1973. 37 p, 10 fig, 8 tab, 3 append.

Descriptors: *Arizona, Riparian land, *Tamarisk, *Mesquite, *Nesting cover, *Game birds, *Wildlife habitats, Flood control, Habitats, Wildlife conservation, Habitat improvement, Water reuse.
Identifiers: *White-wing doves.

This study was begun in 1968 when virtually every mile of riparian woodland habitat important to doves was either being cleared, was authorized for clearing, or was being studied for eventual clearing. This habitat destruction was justified by flood control, water salvage, or both. These riparian habitats are the most successful nesting areas for white wing doves. Removal of salt cedar and mesquite thickets will possibly threaten the doves as an important game species for hunters although lower populations will be secure because inferior nesting habitat is not immediately threatened. A conflict exists between destroying riparian habitats for flood control and water salvage and maintaining white dove populations at a level sufficient for widespread hunting. (Bowden-Arizona)
W75-09794

**DROUGHT IN THE GHANA SAVANNAH: A REPORT TO THE U.S. AID MISSION TO GHANA,**
Arizona Univ., Tucson. Office of Arid Lands Studies.
J. D. Johnson.
1974, 5 p.

Descriptors: *Drought, *Africa, *Soil erosion, *Burning, *Arid lands, Forecasting, Human population, Forest management, Range management, Deserts, Agriculture, Climatic data, Research facilities, Research priorities, Remote sensing, Water supply, Carry capacity, *Grasslands, Land use.
Identifiers: *Ghana's Savannah.

The effects of the current drought in the Sahelian zone of Africa on the future of Ghana are explored. While rainfall has not declined in the savannah belt of Ghana, some features of desertification have appeared; increasing soil erosion, loss of forest vegetation, decline of groundwater, drying up of once perennial streams, and reported losses in soil fertility. Also, famine in the Sahel has put pressure on the nation's food resources and necessitated government patrols to control immigration. Possibly, some of the areas's degradation is the result of the use of burning by local farmers. In some areas overgrazing is a problem. By acting now, Ghana, can heighten chances of halting or reversing the desertification process in the savannah belt. Several recommendations are made: research on the area should be integrated; a documentation center should be established; an extension service suitable to the region's farmers should be created; more data must be collected; burning should be curtailed; the carrying capacity of the land should be determined; remote sensing methods should be utilized for automated mapping; various water harvesting methods should be studied and compared; major problems should be identified and given priority. (Bowden-Arizona)
W75-09795

**DROUGHT, A RECURRENT ELEMENT OF CLIMATE,**
Maryland Univ., College Park. Graduate Program in Meteorology.
For primary bibliographic entry see Field 2B.
W75-09799

**DETERIORATION OF THE ECOLOGICAL EQUILIBRIUM IN THE ARID ZONES OF NORTH AFRICA,**
H. N. Le Houerou.
Food and Agriculture Organization of the United Nations, Rome, Italy (1974). 11 p, 1 tab, 39 ref.

Descriptors: *Drought, *Africa, *Balance of nature, *Flood frequency, *Arid climates, Climatic data, Human population, Exploitation, Ecology, Ecosystems, History, Livestock, Range management, Climatology, Environmental effects, Deserts.
Identifiers: *Desertification, Overgrazing, Morocco, Algeria, Tunisia, Libya.

The arid zone of North Africa is considered those parts of Morocco, Algeria, Tunisia and Libya lying

between the 400 mm and 100 mm isohyets. Ecological equilibrium is essential for the sustained productivity of ecosystems; this balance has been broken almost everywhere in the arid zone of North Africa. This break is due to a sharp increase in population since about 1930, a six fold increase since the beginning the the century. Man and his animals have exceeded the carrying capacity of the land. The deterioration of the ecological equilibrium of the past centuries has resulted in expansion of the desert, in decreased production and productivity of the natural or artificial ecosystems. Huge tracts of land have become useless for man and his livestock as a result of erosion; and catastrophic floodings are throught to occur much more often than in the past. There is no evidence so far that the climate has grown more arid in the last century. Thus, the worsening condition of the region is the result of human exploitation, not of climatic change altering the amount of water available. (Bowden-Arizona)
W75-09802

**MAINTENANCE OF THE FEDERAL NAVIGATION PROJECT IN SCARBORO RIVER AT SCARBORO, MAINE (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 8A.
W75-09811

**INITIAL STAGE, OAHE UNIT, PICK-SLOAN MISSOURI BASIN PROGRAM, SOUTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-09812

**DETAILED PROJECT REPORT FOR LOCAL FLOOD PROTECTION, ZACATE CREEK, LAREDO, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 4A.
W75-09813

**NORTH FORK NOLIN RIVER WATERSHED, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-09814

**EDIZ HOOK BEACH EROSION CONTROL, PORT ANGELES, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 8A.
W75-09815

**CHARLES RIVER DAM, BOSTON, MASS (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 8D.
W75-09816

**WASTEWATER TREATMENT FACILITIES CONSTRUCTION GRANTS FOR THE LOWER RARITAN RIVER BASIN AND FOR THE SOUTH SHORE OF RARITAN BAY (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Environmental Protection Agency, New York Region II.
For primary bibliographic entry see Field 5D.
W75-09817

**TABLE ROCK LAKE, WHITE RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Little Rock, Ark.
For primary bibliographic entry see Field 8C.
W75-09818

**PROPOSED 1973 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE-SALE, OFFSHORE MISSISSIPPI, ALABAMA, AND FLORIDA, VOLUME 2, POTENTIAL ENVIRONMENTAL IMPACTS, ETC. (ENVIRONMENTAL IMPACT STATEMENT).**
Bureau of Land Management, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-09820

**PROPOSED NAVIGATIONAL MAINTENANCE DREDGING PROJECT AT GUILFORD HARBOR, GUILFORD, CONNECTICUT (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 8A.
W75-09821

**UPPER MULBERRY RIVER WATERSHED, BARROW, GWINNETT, HALL, AND JACKSON COUNTIES, GEORGIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-09822

**CRUDE OIL AND NATURAL GAS PRODUCTION AND OTHER MINING OPERATIONS IN NAVIGABLE WATERS ALONG THE LOUISIANA COAST (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 5G.
W75-09823

**PROPOSED MAINTENANCE DREDGING OF THE CHANNEL FROM U.S. COAST GUARD SANTA ROSA STATION MOORINGS TO NAVIGABLE WATERSHED IN PENSACOLA BAY (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Coast Guard District (8th), New Orleans, La.
For primary bibliographic entry see Field 8A.
W75-09824

**PREVENTION AND MITIGATION OF SHORE DAMAGES, KAHULUI HARBOR, MAUI, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
For primary bibliographic entry see Field 8A.
W75-09825

**ATCHISON, TOPEKA AND SANTA FE RY. CO. V. CALLAWAY (ACTION BY RAILROAD, ENVIRONMENTALISTS AND OTHERS TO HALT RECONSTRUCTION OF LOCK AND DAM ON UPPER MISSISSIPPI RIVER NAVIGATION SYSTEM BY DEFENDANT CORPS OF ENGINEERS).**
For primary bibliographic entry see Field 8A.
W75-09826

**THE RESERVE MINING CASE: PROMISES, PROMISES,**
Minnesota Pollution Control Agency, Minneapolis.
For primary bibliographic entry see Field 5G.
W75-09838

**INFLUENCE OF THE ENERGY CRISIS UP THE FUTURE OF ENVIRONMENTAL POLIC**
Committee on Interior and Insular Affairs (U Senate).
For primary bibliographic entry see Field 6E.
W75-09847

**ENVIRONMENTAL PROTECTION COASTAL STATES: THE PARADIGM FR MARINE TRANSPORT OF PETROLEUM,**
Fordham Univ., Bronx, N.Y. School of Law.
For primary bibliographic entry see Field 5G.
W75-09848

**MARINE OIL SPILLS: A PROBLEM IN VIRONMENTAL MANAGEMENT,**
British Columbia Univ., Vancouver. Dept. Economics.
For primary bibliographic entry see Field 5G.
W75-09849

## 7. RESOURCES DATA

### 7A. Network Design

**AVERAGING ERRORS IN MONTH EVAPORATION ESTIMATES,**
Alberta Univ., Edmonton. Dept. of Geography.
For primary bibliographic entry see Field 2D.
W75-09590

### 7B. Data Acquisition

**MEASURING FLOW OF POLLUTED FLUENTS (POUR LA MESURE DU DEBIT D EFFLUENTS POLLUES).**
For primary bibliographic entry see Field 5A.
W75-09370

**FLUID SAMPLING DEVICE,**
Houma Valve Service, Inc., La. (assignee)
M. A. Soudelier.
United States Patent 3,812,722. Issued May 1974. Official Gazette of the United States Pat Office, Vol 922, No 4, p 1074, May, 1974. 1 fig.

Descriptors: *Patents, *Sampling, Water analy *Equipment, Liquids, Conduits.
Identifiers: *Fluid sampling device.

Fluid is sampled as it flows through a conduit repeated expansion of a pressure chamber in elongated tubular housing. This is projected i the flow conduit through a sampling outlet wh is releasably clamped to the housing. A press chamber is formed between an inlet check va and reciprocating piston, mounted on a discha check valve, through which fluid travels to passage in the piston plunger during contraction the pressure chamber. Responding to a predet mined pressure of the fluid in the plunger passa a relief valve carried by the plunger opens supply a fluid sample. (Leibowitz-FIRL)
W75-09422

**METHODOLOGICAL APPROACHES HAWAIIAN FOG RESEARCH,**
Hawaii Univ., Honolulu. Water Resourc Research Center.
For primary bibliographic entry see Field 2B.
W75-09526

**DIGITAL INSTRUMENTATION AN TELEMETRY FOR WATER RESOURC RESEARCH,**
Montana State Univ., Bozeman. Dept. of Elect cal Engineering.
Available from the National Technical Inform tion Service, Springfield, Va 22161 as PB-243 51

.25 in paper copy, $2.25 in microfiche. Montana niversity Joint Water Resources Research nter, Bozeman, Completion Report, December 74. 7 p, 3 ref. OWRT B-014-MONT(1).

scriptors: *Instrumentation, *Telemetry, lectronic equipment, *Data collections, Mon-a, Remote sensing, Research and development, easurement, Control systems.
ntifiers: *Data acquisition systems, Bridger a center.

e principal objective was to continue the velopment of digital instrumentations and metry for water resources research. Con-erable study was made as to the specifications the remote instrument package. Several tom data acquisition systems were built for ious sponsors and the experience gained in se developments was used in the prototype elopment used in this study. From the system ign has come the specifications, design, and elopment of a number of system components. ASR33 teletype has been modified to inter-e to other system components. A digital clock multiplexor has been developed that outputs standard time record each time a control signal pplied to the multiplexor control input. Several smitter and receiver units have been incor-ated in remote data acquisition systems rated by other agencies. For example, the Soil servation Service is using them in their Mon-snow survey network and the Northern Plains and Water Research Laboratory (ARS) is g a half duplex radio link to their remote er. (Holje-Montana State)
-09529

**LOGICAL ASSAY OF FRESH WATERS BY EW METHOD, DIELECTROPHORESIS,**
homa State Univ., Stillwater. Dept. of ics.
primary bibliographic entry see Field 5A.
-09531

**NDING CHINOOK, COHO AND SOCKEYE MON FRY WITH HOT AND COLD METAL LS,**
nal Marine Fisheries Service, Seattle, Wash. hwest Fisheries Center.
Smith.
Fish-Cult, Vol 35, No 2, p 94-96, 1973.

riptors: *Chinook salmon, *Sockeye salmon, ington, *Marking techniques, Fry.
ifiers: *Branding techniques(Fish), *Coho on.

hot and 2 cold branding techniques were on chinook, coho and sockeye salmon fry. tests were made at the National Marine ries Service, Northwest Fisheries Center in e, Washington. All produced satisfactory term marks without excessive mortality.--right 1973, Biological Abstracts, Inc.
09561

**THER SATELLITE PICTURE RECEIVING IONS, APT DIGITAL SCAN CONVERTER,**
nal Aeronautics and Space Administration, belt, Md. Goddard Space Flight Center.
Vermillion, and J. C. Kamowski.
Technical Note D-7994, May 1975. 106 p, 1 tab, 1 ref, 5 append.

ptors: *Cloud cover, *Radio waves, lites(Artificial), Clouds, Meteorological Radio communication systems, Radioecolo-eteorology, Weather patterns, Digital com-Weather, Linear programming, Photog-Aircraft.
iers: *Automatic Picture Transmission, ng radiometers, Digital scan converter.

The Automatic Picture Transmission (APT) Digital Scan Converter is used at APT ground stations to convert signals received from APT scanning radiometers to data compatible with ground equipment designed to receive signals from APT vidicons aboard operational meteorological satellites. All information necessary to understand the circuit theory, functional operation, general construction, and calibration of the converter was presented. Brief and detailed descriptions of each of the individual circuits were also given. Each description was accompanied by a schematic diagram. Listings of integral parts and testing equipment required as well as an overall wiring diagram were included. This unit, which can be constructed from locally procured, low-cost components, when connected between the RF receiver and the output display unit as the ground station, will enable the user to readily accept and process, as required, weather photographs from operational meteorological satellites. (Roberts-ISWS)
W75-09588

**DEVICE FOR UNDERWATER OBSERVATION,**
J. F. Clark.
US Patent No 3,879,953, 4 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 933, No 5, p 1966, April 29, 1975.

Descriptors: *Patents, *Underwater, *Turbidity, Water pollution, Water quality, Equipment.
Identifiers: *Underwater observation.

This invention permits observation of objects in a turbid underwater environment. The invention comprises an enclosure which can be fitted around at least a portion of an underwater object which it is desired to observe visually or photographically. The enclosure can be pumped so that the environmental water in it is circulated through a filter to clear the water, or the environmental water can be pumped out and clear water pumped to replace it. The device is made from pieces of clear plastic which are joined together in a watertight manner. It includes hose fittings, pump and filter. (Sinha-OEIS)
W75-09640

**SOIL MOISTURE SENSING SYSTEM,**
For primary bibliographic entry see Field 2G.
W75-09651

**AN INEXPENSIVE MACROINVERTEBRATE BIOASSAY TABLE FOR USE IN CONTINUOUS-FLOW TOXICITY TESTS,**
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 5A.
W75-09676

**AUTOMATION IN A WATER QUALITY LABORATORY SCHEME,**
Geological Survey, Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 5A.
W75-09723

**EVALUATION OF SAMPLE PREPARATION TECHNIQUES FOR ALGAL BIOASSAYS,**
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5A.
W75-09734

**AUTOMATIC U.V.-CONTROL SYSTEM FOR RELATIVE EVALUATION OF ORGANIC WATER POLLUTION,**
Vyzkumny Ustav Vodohospodarsky, Ostrava (Czechoslovakia).
For primary bibliographic entry see Field 5A.
W75-09735

**EVALUATION OF A NEW SPAWNING MAT MATERIAL,**
National Fish Hatchery, Tishomingo, Okla. Warm Water Hatchery Biology Center.
J. P. McCraren, and R. M. Jones.
Prog Fish-Cult, Vol 35, No 2, p 81, 1973, Illus.

Descriptors: Spawning, Fish reproduction, Evaluation.
Identifiers: *Goldfish(Fantail), Maintenance, *Spawning mats, Nylon bristle brushes.

Spawning mats for fantail goldfish were constructed using newly developed nylon bristle brushes. The mats required less maintenance and were more durable and easily handled than the widely-used moss mat. No preference between mat types was displayed by spawning goldfish.--Copyright 1973, Biological Abstracts, Inc.
W75-09749

**ADENOSINE TRIPHOSPHATE MEASUREMENTS IN SOIL AND MARINE SEDIMENTS,**
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W75-09764

**DEOXYGENATION IN NATURAL STREAMS,**
Nebraska Natural Resources Commission, Lincoln. Data Bank.
For primary bibliographic entry see Field 5B.
W75-09767

**DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP) USER'S GUIDE,**
Air Weather Service, Scott AFB, Ill.
L. G. Dickinson, S. E. Boselly, III, and W. S. Burgmann.
AWS-TR-74-250, December 1974. 109 p, 78 fig, 7 tab, 33 ref, 2 append.

Descriptors: *Satellites(Artificial), *Meteorology, *Remote sensing, Instrumentation, Equipment, Clouds, Cloud cover, Hurricanes, Infrared radiation, Data collections, Meteorological data.

The capabilities of the spacecraft, sensors, and data processor for the Defense Meteorological Satellite Program were described. Many meteorological and geophysical uses of these data were examined, and examples were used to illustrate the capabilities of the system to tailor the imagery for a large variety of present and future users. (Sims-ISWS)
W75-09770

**A STUDY OF THE SURFACE FLUID FLOW CHARACTERISTICS OF THE NEW YORK BIGHT AND THE DEVELOPMENT OF RESEARCH DATA DISPLAY TECHNIQUES,**
Earth Satellite Corp., Washington, D.C.
For primary bibliographic entry see Field 5B.
W75-09783

## 7C. Evaluation, Processing and Publication

**RECHARGE SIMULATION MODEL,**
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W75-09518

**DYNAMIC PROGRAMMING OPTIMIZATION: A WATER DISTRIBUTION SYSTEM DESIGN,**
Hawaii Univ., Honolulu. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 507, $4.75 in paper copy, $2.25 in microfiche. Technical

Report No 83, September 1974. 69 p, 13 fig, 4 tab, 16 ref. OWRT B-029-HI(3), and B-034-HI(3). 14-31-0001-3874, and 14-31-0001-4074.

Descriptors: *Distribution systems, Design, Programming languages, *Computer models, *Computer programs, *Hydraulic conduits, *Irrigation, Systems engineering, *Water distribution(Applied), Transmission lines, Fluid mechanics, Flow, Optimization, *Dynamic programming, Networks
Identifiers: *Fluid transport system, Interactive Fortran language.

A computation technique based on the dynamic programming approach using the interactive Fortran language has been developed. The computerized design procedure can be used to obtain optimal design for single source water or other compressed fluid systems with a finite number of diverging branches and loops. Pumping effect on a single source system cannot be optimized; however, the developed procedure does allow quick evaluation of many alternate pumping pressure. Similarly, multiple source network with converging branches can only be evaluated by the repeated use of the computerized procedure. Dynamic programming has been proved to be very powerful for the analysis and design of a water network. From an engineer's point of view, this approach can be used to design any conceptual water network with little limitaion.
W75-09525

**METHODOLOGICAL APPROACHES IN HAWAIIAN FOG RESEARCH,**
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2B.
W75-09526

**DISTRIBUTION AND DYNAMICS OF AQUATIC INSECTS IN THE ELK CREEK EXPERIMENTAL WATERSHED, LUBRECHT FOREST, MONTANA,**
Montana Univ., Missoula. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W75-09528

**DIGITAL INSTRUMENTATION AND TELEMETRY FOR WATER RESOURCES RESEARCH,**
Montana State Univ., Bozeman. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 7B.
W75-09529

**GOUNDWATER MODELS,**
For primary bibliographic entry see Field 2F.
W75-09582

**EVAPORATION FROM WATER SURFACES IN CALIFORNIA,**
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2D.
W75-09586

**AVERAGING ERRORS IN MONTHLY EVAPOTRATION ESTIMATES,**
Alberta Univ., Edmonton. Dept. of Geography.
For primary bibliographic entry see Field 2D.
W75-09590

**INFORMATION EXCHANGE ON WATER RESOURCES COMPUTER PROGRAMS,**
[illegible] Inst., Copenhagen. Computa- [illegible] Center.
[illegible] and A. A. Smith.
Journal of Hydraulics Research, Vol 13, No 1, p [illegible].

Descriptors: *Information retrieval, *Water resources, *Information exchange, *Computer programs, Data storage and retrieval, Documentation, Indexing.

At the fifteenth International Association for Hydraulic Research congress, a task committee was established for information, documentation, and liason of information exchange on water resources computer programs. The committee objectives were: (1) to collect and compile information concerning available computer programs for solution of water resources engineering problems, (2) to make this information available in a convenient and useful form, and (3) to contact other groups and organizations compiling similar information for their comments and cooperation. A pilot project was established as a first step to guide the determination of the format and scope of documentation for available water resources computer programs. A proposed questionnaire given in an appendix comprises a series of data-coding entries of documentation of computer programs (Humphreys-ISWS)
W75-09591

**GEOGRAPHIC VARIATION OF THE STATISTICAL PARAMETERS OF HYDROMETEOROLOGICAL DATA OF THE UNITED STATES,**
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 2B.
W75-09605

**ENVIRONMENTAL GEOLOGY OF AN AREA IN WEST-CENTRAL ALABAMA,**
Geological Survey of Alabama, University. Environmental Div.
P. H. Moser, and M. J. Keener.
Atlas Series 7, 1975. 56 p, 52 fig, 101 ref, 54 photo. HUD Grant P-1020, P-1042.

Descriptors: *Maps, *Environment, *Alabama, *Natural resources, *Regional development, Geology, *Data collections, Channels, Water resources, Energy, Mineralogy, Topography, Transportation, Climatology, Population, Surface waters, Groundwater, Planning, Economics.
Identifiers: Tennessee-Tombigbee Waterway.

The environmental data necessary to plan for development brought on by the construction of the Tennessee-Tombigbee Waterway were presented. The study area includes all of Sumter County and those parts of Greene and Pickens Counties adjacent to the Tombigbee River. Land use is not limited to crops, pasture, forest, and related industries. Substantial supplies of surface water and groundwater are available and should encourage economic development. Sand and gravel are available for construction; abundant chalk and clay are available for use as lighweight aggregate. Energy sources in this area have not been fully developed. A coal-fired stream plant provides electricity to surrounding areas and a narrow band of lignite that has not been developed occurs in Sumter County. This area has the potential to become more productive; therefore, information was provided on the area's positive characteristics and its limiting factors were enumerated so that development will be accomplished in an orderly and efficient manner. (Scott-ISWS)
W75-09615

**ATLAS OF RIVER BASINS OF THE UNITED STATES.**
Soil Conservation Service, Washington, D.C.
Second Edition, June 1970. 92 p.

Descriptors: *River basins, *United States, *Maps, *Regional analysis, Rivers, Tributaries, Streams, *Drainage area, *Water resources, *Land resources, Soils, Climates, Vegetation, Topography, Land use, Agriculture, Soil conservation, Water conservation, *Data collections.

[illegible] United States were given. Seventy-eight [illegible] drainage system of the Columbia River in Canad [illegible] Delineation of rivers and tributaries was limited [illegible] those with drainage areas of 700 sq mi or mo [illegible] because projections of data for smaller areas a [illegible] not statistically reliable. The rivers and tributari [illegible] were [illegible] Some of the regions were divided into areas [illegible] order to arrange natural hydrologic units. [illegible] Alaska and Hawaii, divisions of the regions we [illegible] called subregions. In many areas of the 48 conte [illegible] minous states, particularly in the West, there a [illegible] closed basins have drainage areas of more than 7 [illegible] sq mi. Some of these basins were separate [illegible] delineated, especially if economic developme [illegible] utilizes the available water resource to the ma [illegible] imum extent. An index of river basins lists t [illegible] rivers and tributaries for each of the 18 regions [illegible] the conterminous states. The subregions and si [illegible] nificant streams for Hawaii and the subregions f [illegible] Alaska were listed. The rivers and tributaries ha [illegible] ing drainage areas of more than 700 sq mi we [illegible] listed. Included was a map that shows the distrib [illegible] tion of land resource regions and areas in the co [illegible] terminous states. Each of the 24 land resource r [illegible] gions has a similar broad pattern of soils, climat [illegible] native vegetation, water resources, topograph [illegible] and land use. These regions are further divide [illegible] into major land resource areas which are alike [illegible] their relationships to agriculture. The emphas [illegible] was on combinations and intensities of problem [illegible] in soil and water conservation. (Scott-ISWS)
W75-09616

**MATHEMATICAL MODELS IN HYDROLOGY**
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2A.
W75-09624

**FORMATION FACTORS AND THEIR USE I ESTIMATING WATER QUALITY IN MISSI SIPPI AQUIFERS,**
Geological Survey, Jackson, Miss.
R. Newcome, Jr.
Available from the National Technical Inform tion Service, Springfield, Va 22161 as PB-24 801/AS, $3.25 in paper copy, $2.25 in microfich Water-Resources Investigations 2-75, May 1975. sheet, 6 ref.

Descriptors: *Aquifer characteristics, *Wat quality, *Electrical well logging, Well data, Missi sippi, Electrical resistance, Geology, Boreho geophysics, Sites, Hydrogeology, Forecastin Correlation analysis, Sampling, Geologic form tions, Planning, Water supply, Water type Hydrologic data, Groundwater.
Identifiers: Water-bearing unit, Formation factor

Electric logs constitute one of the most useful da sources in groundwater hydrology. More than 1 calculations of the electrical resistivity formatio factor have been made for sand bed aquifers Mississippi. This 1-sheet atlas shows the locatio of wells at which electric logs and water sampl were used to determine the factors. Because th factors do not all have the same degree of reliabil ty, they are differentiated in three columns of table. Formation factors are presented by wate bearing unit in the table to permit averaging values for a unit and comparison with those other units. The average of all formation factor determined is 3.6 and the median value is 3. There is however, as much range in the values fo a given water-bearing unit as there is among th units. This indicates that in calculation of wat quality the overall average value (3.6) may be valid in many situations as the average determine for the specific water-bearing unit. Differences formation factor appear to be related to water typ and to porosity, cementation, and hydraulic co ductivity of the sand. (Woodard-USGS)
W75-09703

**MAP SHOWING DRAINAGE AREAS, MARLBOROUGH QUADRANGLE, CONNECTICUT,**
Geological Survey, Hartford, Conn.
M. P. Thomas, and J. E. Palmer.
Miscellaneous Field Studies Map MF-645 B (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 128), 1975. 1 sheet, 1 map, 1 ref.

Descriptors: *Maps, *Drainage area, Connecticut, River basins, Watersheds(Basins), Urban hydrology.
Identifiers: *Marlborough(Conn).

This map shows stream system and drainage areas that contribute streamflow to selected sites on streams in the Marlborough quadrangle, Connecticut. The drainage areas have not been adjusted for the manmade changes in the natural regimens such as storm sewers, diversion dams, canals, and tunnels. (Woodard-USGS)
W75-09704

**MAP SHOWING DRAINAGE AREAS, WEST SPRINGFIELD QUADRANGLE, MASSACHUSETTS-CONNECTICUT,**
Geological Survey, Boston, Mass.
C. J. Londquist, and M. P. Thomas.
Miscellaneous Field Studies Map MF-653 A (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 129), 1975. 1 sheet, 1 map, 1 ref.

Descriptors: *Maps, *Drainage area, Connecticut, *Massachusetts, Riverbasins, Watersheds(Basins), Urban hydrology.
Identifiers: *West Springfield(Mass).

This map shows stream systems and drainage areas that contribute streamflow to selected sites on streams in the West Springfield quadrangle, Connecticut-Massachusetts. The drainage areas have not been adjusted for the manmade changes in the natural regimens such as storm sewers, diversion dams, canals, and tunnels. (Woodard-USGS)
W75-09705

**CONTOUR MAP OF THE BEDROCK SURFACE. COLLINSVILLE QUADRANGLE, CONNECTICUT,**
Geological Survey, Hartford, Conn.
H. Handman.
Miscellaneous Field Studies Map MF-654 A (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 130), 1975. 1 sheet, 1 map, 2 ref.

Descriptors: *Soil surveys, *Connecticut, Geologic mapping, *Bedrock, Geologic investigations, Overburden, Soils, Sediments, Rocks.

This map indicates depth to bedrock below land surface in the Collinsville quadrangle, Connecticut. The locations of bedrock outcrops were obtained from field mapping and from a surficial geology map. Depths to bedrock are inferred from logs and wells of test holes and excavations for utility lines and foundations supplemented by data from a contour map of the bedrock surface. Depths shown are a generalization of localized highly variable conditions and do not include any weathered (decomposed) bedrock. (Woodard-USGS)
W75-09706

**MAP SHOWING DRAINAGE AREAS, LUDLOW QUADRANGLE, MASSACHUSETTS,**
Geological Survey, Boston, Mass.
C. J. Londquist.
Miscellaneous Field Studies Map MF-503 D (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 131), 1975. 1 sheet, 1 map.

Descriptors: *Maps, *Drainage area, *Massachusetts, River basins, Watersheds(Basins), Urban hydrology.
Identifiers: *Ludlow(Mass).

This map shows stream systems and drainage areas that contribute streamflow to selected sites on streams in the Ludlow quadrangle, Massachusetts. The drainage areas have not been adjusted for the manmade changes in the natural regimens such as storm sewers, diversion dams, canals, and tunnels. (Woodard-USGS)
W75-09707

**MAP SHOWING DRAINAGE AREAS, MOUNT TOM QUADRANGLE, MASSACHUSETTS,**
Geological Survey, Boston, Mass.
C. J. Londquist.
Miscellaneous Field Studies Map MF-504 B (Connecticut Valley Urban Area Project Environemental, Geologic and Hydrologic Studies Contribution 132), 1975. 1 sheet, 1 map.

Descriptors: *Maps, *Drainage area, *Massachusetts, River basins, Watersheds(Basins), Urban hydrology.
Identifiers: *Mount Tom(Mass).

This map shows stream systems and drainage areas that contribute streamflow to selected sites on streams in the Mount Tom quadrangle, Massachusetts. The drainage areas have not been adjusted for the manmade changes in the natural regimens such as storm sewers, diversion dams, canals, and tunnels. (Woodard-USGS)
W75-09708

**GROUNDWATER LEVELS IN NEBRASKA, 1974,**
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 4B.
W75-09710

**TEMPERATURES OF STREAMS AND SELECTED RESERVOIRS IN PENNSYLVANIA,**
Geological Survey, Harrisburg, Pa.
H. N. Flippo, Jr.
Pennsylvania Department of Environmental Resources, Harrisburg, Water Resources Bulletin No 11, March 1975. 95 p, 13 fig, 1 tab, 17 ref.

Descriptors: *Water temperature, *Surface waters, *Pennsylvania, Streams, Reservoirs, *Data collections, Natural streams, Thermal water, Electric powerplants, Forecasting, Graphical analysis, Curves.

A summary of water-temperature records includes data collected in water years 1944-70 at 72 stream sites in Pennsylvania. Except for some sites with long-term daily records, sites were chosen primarily to portray natural stream-temperature characteristics throughout the Commonwealth. Water temperatures are summarized by months, years, and for the period of record. Average maximum temperature and monthly cumulative-frequency distributions are presented for the daily records. Approximations of daily mean temperature with 1- and 99-percent probabilities of exceedance can be derived from the frequency distributions of daily temperatures at long-term, data-collection sites. Increases in stream temperatures caused by heated wastewater discharges from industry are usually not more than a few degrees Fahrenheit at distances of more than half a mile below the site of entry. Reservoir level manipulations and powerplant operations often cause much greater alterations to stream temperatures, which persist for many miles. In the Allegheny and Ohio Rivers, the average maximum increase in water temperature due to man's activities is about 4 deg F in a 206-mile reach. (Woodard-USGS)
W75-09713

**WATER-RESOURCES INVESTIGATIONS IN THE FORT UNION COAL REGION, NORTH DAKOTA, 1974-75.**
Geological Survey, Bismarck, N.Dak.
For primary bibliographic entry see Field 5B.
W75-09715

**SUMMARY OF HYDROLOGIC CONDITIONS IN COLLIER COUNTY, FLORIDA, 1973,**
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4B.
W75-09716

**THE IMPLEMENTATION OF A HYDROLOGIC DATA PROCESSING SYSTEM IN BRAZIL,**
Geological Survey, Reston, Va.
M. D. Edwards.
Project Report, Brazilian Investigations (IR) BR-70, November 1973. 55 p, 6 fig, 2 ref.

Descriptors: *Data storage and retrieval, *Hydrologic data, *Data processing, Computer programs, South America.
Identifiers: *Brazil.

The formats and file structures of the National Water Data Storage and Retrieval System of the U.S. Geological Survey were used in the implementation of the Hydrologic Information System (HIS) in Brazil. In addition to the Daily Values File, the system contains a Station Inventory File which contains pertinent information related to the geographic location, period of record available and types of data available for each station. (Knapp-USGS)
W75-09726

**GROUND-WATER DATA FOR ORANGE COUNTY AND VICINITY, TEXAS AND LOUISIANA, 1971-74,**
Geological Survey, Houston, Tex.
C. W. Bonnet.
Open-file report, 1975. 25 p, 3 fig, 3 tab, 5 ref.

Descriptors: *Groundwater resources, *Observation wells, *Water levels, *Water quality, *Texas, *Louisiana, Water utilization, Withdrawal, Groundwater, Chemical analysis, Well data, Hydrologic data.
Identifiers: *Groundwater data.

A network of 116 observation wells was maintained for water-level measurements from 1971 to 1974. The area within the network includes Orange County, the southern parts of Jasper and Newton Counties, the eastern part of Jefferson County, the southeastern part of Hardin County, all in Texas; and the western parts of Cameron and Calcasieu Parishes, Louisiana. The heaviest concentration of observation wells is within the industrial area in the southern part of Orange County. A network of 76 wells to observe changes in chemical quality of the groundwater was maintained in Orange County. Data on groundwater pumpage for all major uses during the period 1963-74 also are tabulated. These data are essential to the cause and effect relationships between pumping and the decline in water levels or changes in chemical quality. (Woodard-USGS)
W75-09727

**DATA FROM A 1,000-FOOT (305-METRE) CORE HOLE IN THE LONG VALLEY CALDERA, MONO COUNTY, CALIFORNIA,**
Geological Survey, Menlo Park, Calif.
R. E. Lewis.
Open-file report, May 14, 1975. 16 p, 3 fig, 2 tab, 3 ref.

Descriptors: *Core drilling, *Core logging, *Petrology, *California, Porosity, Hydraulic conductivity, Thermal conductivity, Geophysics, Cores, Sampling, *Data collections.
Identifiers: *Mono County(Calif), Caldera.

Between late September and early November 1973, a 1,000-foot hole was drilled, cored, and logged within the Long Valley caldera, Mono County, Calif. (altitude about 6,980 ft). This report presents data from the core hole and includes geophysical logs, temperature profiles, generalized lithology in the core hole, and results of porosity, hydraulic conductivity, and thermal-conductivity measurements on selected core samples. (Woodard-USGS)
W75-09728

**WATER-RESOURCES DATA FOR SKAGWAY, ALASKA,**
Geological Survey, Anchorage, Alaska.
G. O. Balding.
Open-file report, 1975. 34 p, 9 fig, 5 tab, 21 ref, 2 append.

Descriptors: *Groundwater, *Water supply, *Water quality, *Alaska, Aquifer characteristics, Hydrologic data, Wells, Sampling, Water yield, Chemical analysis, Groundwater resources, *Data collections.
Identifiers: *Skagway(Alas), Public water supply.

In 1966 an investigation of the alluvial aquifer at Skagway, Alaska, by the U.S. Geological Survey indicated that groundwater of good quality was available at relatively shallow depth. Two production wells were constructed for the town at that time and recently a third well was completed. Water from these wells is a calcium bicarbonate type of excellent chemical quality. The public water supply of Skagway originally was obtained from the hydroelectric catchment system. Water for homes not serviced by this system was obtained from private wells. Water from the hydroelectric storage system is no longer used for drinking water; however, a supply is maintained in the storage tanks for emergency standby and fire protection. Use of private wells within the town limits of Skagway has also been discontinued. This report is a compilation of past and present data concerning the source, availability, and quality of the water that the community has used, has considered using, and is presently using for its domestic supply. (Woodard-USGS)
W75-09729

**WIND AND WAVE RELATIONSHIPS IN U.K. COASTAL WATERS,**
British Meteorological Office, Brackness (England).
For primary bibliographic entry see Field 2L.
W75-09737

**STREAM ORDERING AND CONTOUR MAPPING,**
University of Western Ontario, London. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W75-09745

**HYDROGEOLOGY OF THE WATERWAYS-WINEFRED LAKE AREA, ALBERTA,**
Alberta Research, Edmonton.
For primary bibliographic entry see Field 2F.
W75-09769

**WORLD MAPS OF POTENTIAL EVAPOTRANSPIRATION, PLANT DEVELOPMENT, AND SPRING GREENING AND AUTUMN BROWNING OF VEGETATION, BASED ON THE SOLAR THERMAL UNIT MODEL,**
Montana State Univ., Bozeman. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 2D.
W75-09771

**MODIFICATIONS TO THE EXECUTIVE COMPUTER PROGRAM FOR STEADY-STATE SIMULATION OF WASTEWATER TREATMENT FACILITIES,**
Curran Associates, Inc., Northampton, Mass.
For primary bibliographic entry see Field 5D.
W75-09775

**A STUDY OF THE SURFACE FLUID FLOW CHARACTERISTICS OF THE NEW YORK BIGHT AND THE DEVELOPMENT OF RESEARCH DATA DISPLAY TECHNIQUES,**
Earth Satellite Corp., Washington, D.C.
For primary bibliographic entry see Field 5B.
W75-09783

# 8. ENGINEERING WORKS

## 8A. Structures

**DRAINAGE MATERIALS.**
Food and Agriculture Organization of the United Nations, Rome (Italy). Working Party on Water Resources and Irrigation.
For primary bibliographic entry see Field 8G.
W75-09628

**ARCTIC BARRIER FORMATION,**
Exxon Production Research Co., Houston, Tex. (assignee)
D. E. Galloway.
US Patent No 3,881,318, 3 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 934, No 1, p 56, May 6, 1975.

Descriptors: *Patents, *Barriers, Engineering structures, *Breakwaters, *Offshore platforms, Shore protection, Arctic, Sea ice, Ice loads, *Barrier islands.
Identifiers: *Artificial islands(Barriers).

A method and apparatus is described for the construction of multiple artificial islands (barriers) used to prevent the encroachment of pressure ridges, ice islands and sea ice upon offshore structures, marine pipelines or other marine facilities, in regions such as arctic regions, where bodies of water are subject to freezing. Each island structure is anchored to the sea floor by piles and/or the gravity of the structure and spaced from another island a predetermined distance ranging along the seaward side of the facilities to be protected. The predetermined distance between the individual island structures depends upon the design of the facilities that are to be protected and a risk evaluation. The shorter the spacing between individual island structures the sooner the effects of grounding will occur for ice formations that move into the region in the colder seasons. (Sinha-OEIS)
W75-09644

**TIDE ENERGY CONVERSION DEVICE,**
E. Schmeller.
US Patent No 3,882,320, 3 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 934, No 1, p 361, May 6, 1975.

Descriptors: *Patents, *Tidal powerplants, *Tidal energy, Tidal water, Electric power, Equipment.
Identifiers: Tidal energy conversion.

A tide energy conversion device includes a plurality of spaced apart pairs of parallel endless channel members elongated in the direction of tide flow and facing each other. The members include lower flights that are substantially horizontal and straight. Roller frames, each having two pair of spaced apart rollers, one pair in each channel of a pair of channels, carry elongated blades extending outward and transverse of the channels. These blades are connected to the frames by brace arms, each extending diagonally from the frame to locations adjacent the outer edge of a blade, and by support arms, each connected to an edge of a blade. The channel members are supported on base which is secured at a level that supports t blades so they are at least partially submerged the water while they are carried beneath the cha nels. Endless chains connect the several roll frames. The chains extend over longitudinall spaced sprockets rotated on shafts. Force of t tide flow against the movable blades rotates t shafts which are connected to electrical gener tors. Gear reduction and transmission means provided to enable the generators to produce ele tricity regardless of the directional movement the blades. (Sinha-OEIS)
W75-09650

**MAN-INDUCED CHANGES OF MIDDLE MI SISSIPPI RIVER,**
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4A.
W75-09754

**MAINTENANCE OF THE FEDERAL NAVIG TION PROJECT IN SCARBORO RIVER A SCARBORO, MAINE (FINAL ENVIRONME TAL IMPACT STATEMENT).**
Corps of Engineers, Waltham, Mass. New E gland Div.
Available from the National Technical Inform tion Service, Springfield, Va. 22161, USDC, EIS-ME-74-0004-F, $4.25 in paper copy, $2.25 microfiche. January 2, 1974. 66 p, 1 tab, 1 map, append.

Descriptors: *Maintenance, recreatio *Navigable rivers, Sands, Rivers, Channels, Fis *Maine, Fishing, Recreation facilities, Enviro mental effects, Marine biology, Disposa Dredging.
Identifiers: *Environmental Impact Statement *Scarboro River(Maine).

The proposed action involves the continued mai tenance of the federal navigation project in Sca boro River, Scarboro, Maine. Primary mai tenance activities will consist of removal of san from the river and outer channel. Restoration the navigational channel and anchorage to the authorized depths will benefit commercial fishe men, recreational boaters, and others who depen on safe and adequate navigation facilities. No pe durable adverse environmental effects to th marine ecology of the immediate project area a anticipated. Alternatives are complete, partial, no maintenance by offshore disposal with buck dredge, onshore disposal with hydrolic dredge, sidecast dredge. (Gagliardi-Florida)
W75-09811

**INITIAL STAGE, OAHE UNIT, PICK-SLOA MISSOURI BASIN PROGRAM, SOUT DAKOTA (FINAL ENVIRONMENTAL IMPAC STATEMENT).**
Bureau of Reclamation, Washington, D.C.
Available from the National Technical Informa tion Service, Springfield, Va. 22161, USDC, a EIS-SD-73-1953-F, $12.00 in paper copy, $2.25 i microfiche. December 17, 1973. 496 p, 53 fig, 2 tab.

Descriptors: *South Dakota, *Missouri River *Irrigation systems, Flood control, Wildlife con servation, Habitat improvement, Recreation Recreation facilities, Pumping plants, Irrigatio canals, Multiple-purpose reservoirs, Drains Water quality control, Water supply development Irrigation programs, Wetlands, Wildlife habitats Drainage effects, Fresh-water marshes, Stream flow, River flow, Community development.
Identifiers: *Environmental Impact Statements *Lake Oahe(SD).

The Oahe unit will divert water from Lake Oahe t the Missouri River for irrigation of 190,000 acre of land. The project will provide for some flood control, water for municipal use in 17 towns and

ties, fish and wildlife developments at 18 locaons and for recreation development at 5 locaons. Construction will include an Oahe Pumping lant, 200 miles of main supply canals, three regu-ting reservoirs, 1,000 miles of small canals, 935 iles of open drains and 2970 miles of closed ains. The project will enhance farming, create a tter quality water supply for municipalities, and crease the number of recreational facilities. One creational facility will have to be relocated and er 20,000 acres of wetlands will be altered mewhat. The project will have an overall benefi-l impact on waterfowl and wildlife by creating w marsh areas, new habitats, and a more stable ter supply. Alternatives considered were no velopment and alternative locations of main pply works or construction of floodways along e James River, and precipitation management. ltuve-Florida)
75-09812

**TAILED PROJECT REPORT FOR LOCAL OOD PROTECTION, ZACATE CREEK, REDO, TEXAS (FINAL ENVIRONMENTAL PACT STATEMENT).**
my Engineer District, Fort Worth, Tex.
r primary bibliographic entry see Field 4A.
75-09813

**RTH FORK NOLIN RIVER WATERSHED, NTUCKY (FINAL ENVIRONMENTAL IM-CT STATEMENT).**
l Conservation Service, Washington, D.C.
ailable from the National Technical Informa-n Service, Springfield, Va. 22161, USDC, as -KY-74-0033-F, $4.25 in paper copy, $2.25 in rofiche. January 4, 1974. 52 p, 2 map, 2 tab.

scriptors: *Watershed management, oodwater, *Flood protection, Erosion, Sedi-nts, Flood plains, Agriculture, Recreation, ter storage, Fish, Lakes, *Kentucky, Sewage tment, Sewage, Environmental effects, Wil-e, Forestry, Floodproofing, Flood plain zon-Flood plain insurance, Flood forecasting.
ntifiers: *Environmental Impact Statements, rue County(Ky).

project involves construction of a 34,610 acre ershed in Larue County, Kentucky, and also udes land treatment measures, two single-pur-e structures and two multiple-purpose struc-s for floodwater, recreation and municipal er storage. The project will result in a reduc-of erosion rates on uplands and a reduction of dwater and sediment damages. In addition, the ect provides for a 100-year level of flood pro-on to existing flood plain properties including age treatment plants and elimination of raw age overflow. Adverse environmental effects de the permanent loss of approximately 294 s of terrestrial wildlife habitat; the temporary of an additional 70 such acres; increasing sedi-during construction; modification of the gical make-up of approximately 12,400 feet tream; and the interruption of agricultural, try and wildlife use on 476 acres. The follow-lternatives were considered: land treatment, proofing, flood plain zoning, flood insurance flood forecasting; or no action. (Gagliardi-da)
09814

**HOOK BEACH EROSION CONTROL, T ANGELES, WASHINGTON (FINAL EN-ONMENTAL IMPACT STATEMENT).**
Engineer District, Seattle, Wash.
able from the National Technical Informa-Service, Springfield, Va. 22161, USDC, as, WA-73-0821-F., $4.25 in paper copy, $2.25 in fiche. August 1972. 60 p, 1 map.

riptors: *Washington, *Rocks, *Beaches, establishment, Boats, Basins, Fish, En-mental effects, Seashores, Quarries, Fish stocking, Sea walls, Washington, Recreation, Fish populations, Fish management, Breakwaters, Groins(Structures), Road construction, Roads.
Identifiers: *Environmental Impact Statements, *Ediz Hook(Wash), *Port Angeles(Wash).

The project involves new rock revetment and beach nourishment of about 10,000 feet of the seaward shore of Ediz Hook, Washington. Material for the revetment would come from existing quarries in the Puget Sound area. Beach nourishment material would come from a source near Port Angeles. The proposed project would provide protection for Port Angeles Harbor, a small boat basin, and access to a Coast Guard Station, and a day-use recreation area. New habitat for rockfish and bottom fish would be created. The primary adverse environmental effect of the project is that the natural appearance of the project area and borrow sites would be altered. Additionally, increased rockfish populations could displace or reduce other fishery resources. The following alternatives were considered: concrete seawalls; off-shore breakwaters; porous walled breakwaters; groin fields; elevated roadways; beach nourishment; removal of man-made structures which impede the natural supply of feed material to Ediz Hook; industrial fill; and no action. (Gagliardi-Florida)
W75-09815

**WASTEWATER TREATMENT FACILITIES CONSTRUCTION GRANTS FOR THE LOWER RARITAN RIVER BASIN AND FOR THE SOUTH SHORE OF RARITAN BAY (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Environmental Protection Agency, New York. Region II.
For primary bibliographic entry see Field 5D.
W75-09817

**PROPOSED NAVIGATIONAL MAINTENANCE DREDGING PROJECT AT GUILFORD HARBOR, GUILFORD, CONNECTICUT (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Corps of Engineers, Waltham, Mass. New England Div.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as, EIS-CT-73-1860-F, $4.25 in paper copy, $2.25 in microfiche. November 28, 1973. 68 p, 3 map, 2 tab.

Descriptors: *Boating, *Recreation, *Dredging, *Shoals, Water quality, Plankton, Harbors, Navigation, *Connecticut, Environmental effects, Boats.
Identifiers: *Environmental Impact Statement, *Guilford Harbor(Conn).

The proposed action involves the maintenance dredging of the Federal navigation project in Guilford Harbor, Connecticut. The project's authorized dimensions will be maintained, thus enabling safe passage and mooring of recreational boats in the harbor. The chief environmental impact of the project will be the dredging and disposal of approximately 70,000 cubic yards of shoal material at the offshore New Haven dump site. Adverse environmental effects include destruction of marine organisms in the dredged spoil areas; temporary degradation of water quality during the work period; and possible detrimental effects of heavy metals leached from the spoil material on the developing eggs and larvae of the plankton in the harbor and on the benthic life at the spoil site. Boating activity and beach recreation might be temporarily interfered with during the work period. Two alternative methods of dredging were considered--hydraulic and bucket dredging. (Gagliardi-Florida)
W75-09821

**UPPER MULBERRY RIVER WATERSHED, BARROW, GWINNETT, HALL, AND JACKSON COUNTIES, GEORGIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Soil Conservation Service, Washington, D.C.
Available from National Technical Information Service, Springfield, Va 22161, USDC, as EIS-GA-74-0005-F, $4.25 in paper copy, $2.25 in microfiche. January 2, 1974. 57 p, 2 chart, 1 tab.

Descriptors: *Watershed management, *Flood protection, *Water storage, Fishing, Economics, Floodwater, Streams, Channels, Flood control, Streamflow, *Georgia, Agriculture, Environmental effects, Forests, Forestry, Wildlife, Fish, Water quality, Turbidity, Channeling, Flood plains, Flood plain zoning.
Identifiers: *Environmental Impact Statements.

The project involves land treatment conservation and construction of seven single-purpose floodwater retarding structures, two multiple-purpose structures, approximately 8,750 feet of selective debris removal from stream channels, approximately 85,675 feet of stream bank protection, and 241 acres of road bank stabilization in Barrow, Gwinnett, Hall and Jackson Counties, Georgia. Favorable environmental impacts include watershed protection, flood prevention, stream bank stabilization, conservation treatment of agricultural and forest land, municipal water storage, increased fishing opportunities, and economic improvement. Adverse environmental effects of the project consist of loss of habitat for wildlife, decreased habitat values in flood storage pools, inundation of stream segments, temporary damage to game and fish habitat from debris removal, and temporary degradation of water quality due to increased turbidity levels during construction and until disturbed streambanks become stabilized. The following alternatives were considered: conservation land treatment alone; conservation land treatment, floodwater retarding structures, and channel enlargement; conservation land treatment and floodwater retarding structures; conservation land treatment and channel improvement; and purchase of flood plain or zoning. (Gagliardi-Florida)
W75-09822

**CRUDE OIL AND NATURAL GAS PRODUCTION AND OTHER MINING OPERATIONS IN NAVIGABLE WATERS ALONG THE LOUISIANA COAST (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 5G.
W75-09823

**PROPOSED MAINTENANCE DREDGING OF THE CHANNEL FROM U.S. COAST GUARD SANTA ROSA STATION MOORINGS TO NAVIGABLE WATERSHED IN PENSACOLA BAY (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Coast Guard District (8th), New Orleans, La.
Available from National Technical Information Service, Springfield, Va 22161, USDC, as EIS-FL-73-2010-F, $3.25 in paper copy, $2.25 in microfiche. December 26, 1973. 23 p, 3 fig.

Descriptors: *Dredging, *Channel improvement, *Environmental effects, Channel morphology, Channels, Navigable waters, *Florida, Beaches, Beach erosion, Turbidity, Levees, Benthic fauna, Benthic flora.
Identifiers: *Environmental Impact Statements, *Pensacola Bay(Fla).

The proposed project provides for maintenance dredging of the channel from the moorings at the U.S. Coast Guard Station, Santa Rosa, to navigable waters in Pensacola Bay, Florida. Redredging of the channel will ensure safe operation of Coast Guard boats to carry out search and rescue missions, pollution surveillance and enforcement operations. Disposal of the spoil behind retaining levees along the beach will restore the shoreline to a condition approaching its original state. Dredging will cause temporary turbidity near the operation, but will have very little other adverse effect. Some

benthic organisms will be destroyed, but refaunation will occur. Practical engineering alternatives to the proposed dredging do not exist. The Santa Rosa Regional Planning Council commented to the effect that the operation will cause the destruction of productive marine grass beds. (Denvir-Florida)
W75-09824

**PREVENTION AND MITIGATION OF SHORE DAMAGES, KAHULUI HARBOR, MAUI, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
Available from National Technical Information Service, Springfield, Va 22161, USDC, as EIS-HI-73-1862-F, $3.75 in paper copy, $2.25 in microfiche. November 28, 1973. 42 p, 3 map.

Descriptors: *Shore protection, *Beach erosion, *Groins(Structure), *Breakwaters, Construction, Construction materials, Shores, Beaches, Hawaii, Sands, Turbidity, Marine fish, Recreation.
Identifiers: *Environmental Impact Statements, *Kahului Harbor, Maui, HI.

The proposed plan for shoreline protection, and beach restoration at Kahului Harbor, Maui, consists of the construction of about 760 feet of revetment along Kahului Beach Road, the placement of about 11,000 cubic yards of sand along the southern shoreline of Kahului Harbor, and construction of one groin extension, two new groins, and one breakwater to protect the sand placements. Construction activities will create some turbidity in the water and disturb fish and marine life to some extent as well as interfere with recreational use. The revetment will prevent continued erosion of the western shoreline and allow safe use of Kahului Beach Road. The sand placement and protective structures will create additional beach which will result in greater recreational use along the southern shore. Alternatives considered were utilization of portions of the plan in combination or singly, or no action. (Denvir-Florida)
W75-09825

**ATCHISON, TOPEKA AND SANTA FE RY. CO. V. CALLAWAY (ACTION BY RAILROAD, ENVIRONMENTALISTS AND OTHERS TO HALT RECONSTRUCTION OF LOCK AND DAM ON UPPER MISSISSIPPI RIVER NAVIGATION SYSTEM BY DEFENDANT CORPS OF ENGINEERS).**
382 F. Supp. 610-624 (DDC 1974).

Descriptors: *Locks, *Dams, *Mississippi River, *Illinois, Rivers, Navigable rivers, Railroads, Environment, Environmental effects, Environmental control, Navigable waters, Navigation, Rivers and Harbors Act, Water.
Identifiers: *Environmental Impact Statements, Injunctive relief.

The Santa Fe Railway Company and environmentalists brought suit to halt the reconstruction of locks and a dam on the Upper Mississippi River Navigation System, located at Alton, Illinois. On plaintiff's motion for a preliminary injunction, the District Court for the District of Columbia held that, in view of the increased tonnage which the lock would handle and the likelihood that the project was merely the beginning of a complete overhaul of the entire system, the construction required congressional approval. The court found that the Rivers and Harbors Act of 1970 applied to the proposed reconstruction, and that when a federal statute has been violated, the court is not obliged to inquire into traditional requirements for equitable relief before granting an injunction. Because congressional approval had not been given, and the environmental impact statement failed to sufficiently consider the possible environmental effects of the reconstruction of the entire system of locks and dams, the Corps of Engineers was enjoined from taking bids for the proposed reconstruction. (Gaghardi-Florida)
W75-09826

## 8B. Hydraulics

**PROCEEDINGS OF THE SECOND INTERNATIONAL DRIP IRRIGATION CONGRESS.**
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W75-09423

**EVALUATION OF HYDRAULICS OF FLOW THROUGH PIPES OF VARYING SLOPES, LENGTHS AND ORIFICE PLACEMENTS,**
Udaipur Univ. (India).
M. T. Deshmukh, and M. L. Jain.
In: Proceedings of the Second International Drip Irrigation Congress, p 317-321, (1974). 2 fig, 1 tab, 8 ref.

Descriptors: *Hydraulic design, Agriculture, Irrigation, Hydraulics, Irrigation design, Hydraulic equipment.
Identifiers: *Trickle irrigation, *Drip irrigation.

Polythylene pipes with 1/2 inch diameter and 1/16 inch size perforations have been used to study the hydraulics of flow, under laboratory conditions. The variables considered for study were (i) length of the pipe (ii) spacing of perforations (iii) pipe slope (iv) placement of perforations (facing upward, downward and sidewise) and (v) operating pressure (up to 5 ft.). Three repeated readings have been taken for each test and validity of the results showing relationship of discharge with variables considered has been established with suitable tests. (See also W75-09423) (Skogerboe-Colorado State)
W75-09474

**WAVE FORCE COEFFICIENTS FOR CIRCULAR PIERS,**
Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
T. C. Gopalakrishnan, and H. Raman.
Indian Journal of Technology, Vol 12, No 11, p 485-488, November 1974. 5 fig, 1 tab, 5 ref, 1 append.

Descriptors: *Waves(Water), *Drag, *Piers, Wavelengths, Offshore platforms, Hydraulics, Hydraulic models, Ocean waves, Structural behavior, Structural design, Hydrodynamics.
Identifiers: *Inertia, *Circular piers, Morison equation, Phase angles, Wave steepness, Impact pressures.

An experimental procedure was developed to determine the values of two hydrodynamic coefficients, i.e., the drag and inertia coefficients, which are required for the determination of wave forces on circular piers by the Morison equation. By adopting this procedure, the coefficients can be plotted as a function of wave phase angle and wave steepness. (Lee-ISWS)
W75-09593

**THE KARMAN AND REYNOLDS NUMBERS AND THE DRAG COEFFICIENT IN DUCTS AND PIPES,**
M. S. Fomichey, N. T. Fazullin, and A. V. Popov.
Fluid Mechanics - Soviet Research, Vol 3, No 6, p 1-8, November-December 1974. 5 fig, 17 ref.

Descriptors: *Fluid mechanics, *Fluid friction, *Mathematical studies, Pipe flow, Ducts, *Reynolds number, Flow resistance, Hydraulics, Flow characteristics, Equations, Analysis.
Identifiers: *Karman number, Emperical equations, Pulsating flows.

Reynolds equations were used as the point of departure for deriving similitude criteria of averaged and pulsational flows. The functional relatio
was established between the Karman numbe
the amplitude of velocity fluctuations;
Reynolds, Froude, and Euler numbers; an
hydraulic drag coefficient. Empirical expres
obtained relating the pulsational flow featur
the drag coefficient were the average Ka
number K sub u = 0.447(square root of drag
ficient) and the average Karman number K
= 0.224(square root of drag coeffic
(Humphreys-ISWS)
W75-09596

**DRAG REDUCTION BY COLLAPSED AND TENDED POLYELECTROLYTES,**
Indian Inst. of Tech., Madras. Dept. of Che
Engineering.
P. S. Virk.
Nature, Vol 253, No 5487, p 109-110, Januar
1975. 2 fig, 6 ref.

Descriptors: *Pipe flow, *Flow characteri
*Laboratory tests, Drag, Flow friction, Addi
*Polyelectrolytes, Aqueous solutions, Poly
Hydraulics, Flow resistance.
Identifiers: Drag reduction.

Laboratory experiments on drag reduction
pipe (0.945-cm diameter and 189-cm long)
saline solutions of a partially hydro
polyacrylamide (PAMH) showed the effe
macromolecule conformation. The extreme
lapsed and extended PAMH conformations
simulated the deportment of linear random-c
macromolecules in solution and of high a
ratio fibres in suspension; and they indic
possible relationship between the mechanis
drag reduction produced by these addi
Results obtained with collapsed and exte
polyelectrolyte possibly represent two extrem
drag reduction behavior, one (Type A) whi
characteristic of flexible, random-co
deformable additives and the other (Type B)
is characteristic of relatively rigid, elongate
deformable additives. Idealized, a family of
A solutions yield polymeric regime segm
fanning outwards from a common onset poi
the Prandtl-Karman line with slopes incre
with increasing additive concentration and
reduction increasing with increasing valu
Reynolds number times square root of frictio
tor. A family of Type B solutions yield poly
regime segments coming off the maximum
reduction asymptote at characteristic retro-
points and lying roughly parallel to but disp
upwards from the Prandtl-Karman line with
reduction essentially independent of Rey
number times square root of friction factor b
creasing with increasing additive concentra
(Humphreys-ISWS)
W75-09601

**COMPUTATION OF WAVE HEIGHTS DU
REFRACTION AND FRICTION,**
Technical Univ. of Denmark, Lyngby. Ins
Hydrodynamics and Hydraulic Engineering.
O. Skovgaard, I. G. Jonsson, and J. A. Bertels
Journal of the Waterways, Harbors and C
Engineering Division, Proceedings of Ame
Society of Civil Engineers, Vol 101, No W
Proceedings Paper 11100, p 15-32, February
7 fig, 2 tab, 31 ref, 2 append.

Descriptors: *Waves(Water), *Ocean w
*Coastal engineering, *Fric
*Refraction(Water waves), Gravity waves,
gy, Height, Equations, Numerical analysis.
Identifiers: *Surface waves.

The equations for the wave orthogonals an
wave heights were presented for depth refra
of regular, long-crested, small amplitude su
gravity waves over an arbitrary bottom, using
as the independent variable. The effect of t
lent bottom friction on the wave height wa
cluded. The computer outputs were in the fo

matically plotted wave orthogonals with the e heights written at discrete points along these s. Systematic tests were presented for water s with straight and parallel bottom contours. errors inherently connected with the introduc- of a grid plus a set of formulas for differentia- and interpolation were examined for a zontal bottom with an infinite, long, sinusoidal shold. For one plane-sloping bottom, informa- was given for the influence of the initial cur- re of the wave front, bottom roughness, and l wave height. (Bhowmik-ISWS)
-09606

**VE INDUCED PRESSURES IN PERMEABLE BEDS,**
es Tekniske Hoegskole, Trondheim. River Harbor Lab.
oshagen, and A. Torum.
nal of the Waterways, Harbors and Coastal neering Division, Proceedings of American ty of Civil Engineers, Vol 101, No WW1, eedings Paper 11099, p 49-57, February 1975. 8 ref, 2 append.

riptors: *Waves(Water), *Oceans, *Porous a, *Pressure, *Soils, Erosion, Stability, Har- Construction, Underwater.
ifiers: *Ocean bottom.

lts of a theoretical investigation on the trans- on of wave-induced pressures into a permea- a bottom were reported. In the model it was ned that the soil water is compressible and ain skeleton remain rigid. It was postulated the resulting theoretical model should ibe an effective mechanism by which soil eability affected the pressure transmission. nik-ISWS)
09607

**PUTATION OF FLOW THROUGH ONBORO INLET, N.C.,**
Carolina State Univ., Raleigh. Dept. of Civil eering.
rimary bibliographic entry see Field 2L.
09608

**AL BIFURCATION PROCESS IN NATU- CHANNEL NETWORKS,**
South Wales Univ., Kensington (Australia). l of Geography.
Abrahams.
gy, Vol 3, No 2, p 307-308, June 1975. 1 fig, 4

ptors: *Channel morphology, norphology, *Networks, Natural streams, al channels, Channels, Channel erosion, ns, Drainage systems.
iers: *Bifurcation process, *Channel try, Stream order system, Stream links.

es of cis and trans links located near the s of 73 miniature channel networks that are g and expanding headward into the surface lley fill suggest that the initial bifurcation s generates the same number of cis and inks, but confers on them different length ations. (Lee-ISWS)
09609

**UGATED PLASTIC DRAIN TUBING AS UNDERGROUND CONDUIT,**
ri Univ., Columbia. Dept. of Agricultural ering.
Misra, and R. P. Beasley.
ctions of the American Society of Agricul- ngineers, Vol 18, No 2, p 260-262, March- 975. 7 fig, 2 tab, 2 ref.

tors: *Drains, *Drainage systems, *Excess Soils), *Hydraulic models, Drainage prac- ipes, Storm drains, Drainage water, Tiles, Conduits, Subsurface drains, Drainage, Sediment transport, Soils, Movement, Sediments.
Identifiers: *Plastic drain tubing, *Corrugated drain tubing, Soil tanks.

Model studies were made to investigate the effect of high water velocity on the extent of soil movement when corrugated plastic drain tubing is used as conduits for underground terrace outlets on steep slopes. No significant amount of sediment was drawn into the tubing, even when the slope was 10% and velocity approached 9 ft per sec. The magnitude of the flow from the tubing to the soil was low in cohesive soils. But, with less cohesive soils this outflow was greater and there was considerable movement of soil from around the tubing. (Sanderson-ISWS)
W75-09611

**TANGENTIAL STRESS DISTRIBUTION IN TURBULENT BOUNDARY LAYERS AT AN ADVERSE PRESSURE GRADIENT,**
Moskovskii Energetichskii Institut (USSR). Dept. of Steam and Gas Turbines.
V. G. Kalmykov, A. N. Sherstyuk, and T. V. Shul'gina.
Fluid Mechanics - Soviet Research, Vol 3, No 6, p 9-14, November-December 1974. 3 fig, 1 tab, 5 ref.

Descriptors: *Turbulent boundary layers, *Fluid mechanics, *Mathematical studies, *Flow characteristics, Analysis, Spatial distribution, Velocity, Stress, Equations, Approximation method.
Identifiers: Tangential stress distribution, Adverse pressure gradient, Prandtl law.

An approximate solution based on the Prandtl law was presented of the problem of tangential stress distribution in turbulent boundary layers with adverse pressure gradients. It was shown that higher-order derivatives should not be incorporated in determining the law of tangential stresses. Comparison with experimental data points to satisfactory accuracy of the method is separationless flow. (Humphreys-ISWS)
W75-09738

**ON THE DISCHARGE COEFFICIENT OF NOZZLES FOR SINGLE- AND TWO-PHASE FLUIDS,**
Urals Polytechnic Inst., Sverdlovsk (USSR). Hydraulics Div.
V. A. Doroshenko.
Fluid Mechanics - Soviet Research, Vol 3, No 6, p 52-56, November-December 1974. 4 fig, 13 ref.

Descriptors: *Discharge coefficient, *Nozzles, *Laboratory tests, Pipes, Flow, Flow rates, Measurement, Hydraulics, Testing.
Identifiers: *Two-phase flow, Gas-liquid mixture, Water-air mixture.

Experimental data were obtained for the discharge coefficient of standardized nozzles with water and air-water mixtures with volumetric gas concentrations from 10 to 40%. A marked difference was found between experimental data and values recommended by the 1964 Soviet regulations, particularly in the range of low Reynolds numbers and small nozzle modulus (discharge cross section). Additional investigations are needed for working out final recommendations. Standardized nozzles can also be used for determining the volumetric flow rates of gas-liquid mixtures because the data for the flow rate of mixtures with any gas content and pressure drop across the nozzle fit on parabolic curves. (Humphreys-ISWS)
W75-09739

**A SPECIFIC CASE OF WAVE MOTION OF A LIQUID IN PIPES,**
Ye. M. Khatkovskiy.
Fluid Mechanics - Soviet Research, Vol 3, No 6, p 57-63, November-December 1974. 2 fig, 7 ref.

Descriptors: *Water hammer, *Theoretical analysis, *Hydrodynamics, Analytical techniques, Mathematical studies, Equations, *Pipe flow, Pressure, Velocity, Pipes, Continuity equation, Waves(Water).

A case was considered of inception of wave processes in a pipe resulting from changing the pressure at one of its ends and connecting a hydraulic tank at the other. The problem was considered by taking into account the liquid viscosity. By solving differential equations of continuity and motion, general expressions were obtained for the pressure and velocity of the liquid. These expressions can be used to calculate the pressures and velocities in any sections of the pipeline at any time. (Humphreys-ISWS)
W75-09740

**FRICTION FACTOR UNDER OSCILLATORY WAVES,**
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
J. W. Kamphuis.
Journal of the Waterways, Harbors and Coastal Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No WW2, Paper 11292, p 135-144, May 1975. 9 fig, 11 ref, 2 append.

Descriptors: *Coastal engineering, *Roughness coefficient, *Shear stress, *Waves(Water), *Laboratory tests, Flow rates, Sediment transport, Boundary layers, Turbulent flow, Laminar flow, Friction.
Identifiers: *Oscillatory waves, Stanton diagrams, Nikuradse sand grain roughness.

Tests were performed in an oscillating water tunnel to determine the relationships between wave parameters and resulting bottom friction and shear stresses. The test results were presented in Stanton-type wave friction factor diagrams and the results were compared with existing semitheoretical expressions. The wave friction factor in the laminar, the smooth, and the rough turbulent regimes was defined. Some caution must be used when applying the postulated friction factor in the transition region. (Singh-ISWS)
W75-09755

**RAPID TEMPERATURE REDUCTION OF THERMAL DISCHARGE,**
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-09757

**STATISTICAL PROPERTIES OF WAVE FORCE,**
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
C. C. Tung.
Journal of the Engineering Mechanics Division, Proceedings of American Society of Civil Engineers, Vol 101, No EM1, Paper 11116, p 1-11, February 1975. 2 fig, 9 ref, 2 append.

Descriptors: *Waves(Water), *Statistics, *Piers, *Oceans, *Energy, Profiles, Marinas, Structures, Mechanical engineering.
Identifiers: *Wave forces, *Standard deviations, *Vertical cylinders.

Expressions of the mean and standard deviation of wave force on vertical cylinder in a random field were derived. Wave force was evaluated according to Morison's formula and the sea surface was assumed to be Gaussian. The effects of free surface fluctuation were included. The mean and standard deviation were computed and results were presented graphically. It was shown that the mean of wave force is nonzero. The standard deviation of wave force deviated drastically from that when the free surface fluctuation

phenomenon was ignored, especially in the vicinity of the mean water level. Since most of the water movements are around and above the mean water level where the foregoing observed discrepancy was most pronounced, it was concluded that the effects of the free surface fluctuation phenomenon on wave force has important implications on the design considerations of marine structures that protrude above the mean water level. (Bhowmik-ISWS)
W75-09759

## 8C. Hydraulic Machinery

**SEWAGE TREATMENT PLANT DEPENDABILITY WITH SPECIAL REFERENCE TO THE ACTIVATED SLUDGE PROCESS,**
National Field Investigations Center-Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W75-09393

**CONTROL SCHEMES FOR THE ACTIVATED-SLUDGE PROCESS,**
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W75-09395

**CHAMBER METHOD FOR DRIP IRRIGATION SYSTEM DESIGN AND INSTALLATION PROCEDURE,**
Massachusetts Univ., Amherst.
E. S. Pira.
In: Proceedings of the Second International Drip Irrigation Congress, p 121-126, (1974). 4 fig, 2 tab, 2 ref.

Descriptors: *Head loss, *Design criteria, *Irrigation design, Irrigation methods, Flow rates, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

High pressure water is supplied through a 'quick-fill' and pressure reducing device to a low pressure chamber. A minimal pressure drop in the chamber produced a relatively uniform discharge rate from the drippers. Practical field installations based on laboratory tests, field tests and simulation model are discussed. System design criteria, components, materials, detailed illustrations and installation procedures are presented. (See also W75-09423) (Skogerboe-Colorado State)
W75-09441

**REVERSE FLUSHING TECHNIQUE FOR BI-WALL DRIP TUBING,**
Agricultural Research Service, Riverside, Calif. Salinity Lab.
S. L. Rawlins.
In: Proceedings of the Second International Drip Irrigation Congress, p 209-211, (1974). 2 fig.

Descriptors: *Clogging, Irrigation, Agriculture, Irrigation systems.
Identifiers: *Trickle irrigation, *Drip irrigation, *Bi-wall tubing, *Reverse flushing.

Particles carried in the irrigation water first lodge in the inside orifices between the supply and emission chambers of biwall drip tubing. These can be effectively dislodged by briefly applying water at high pressure to the emission chamber. They can then be flushed from the supply chamber in the usual manner. Because the burst pressure of tubing varies inversely with its diameter, the small emission chamber can withstand considerably higher pressures than can the supply chamber. Results of tests using this technique are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09467

**TRICKLE IRRIGATION IN MICHIGAN ORCHARDS: CONTROLLING RATE OF FLOW WITH FLOW REGULATING VALVES AND MICROTUBES,**
Michigan State Univ. Lansing.
A. L. Kenworthy, and C. Kesner.
In: Proceedings of the Second International Drip Irrigation Congress, p 275-280, (1974). 3 fig, 2 tab, 2 ref.

Descriptors: *Flow rates, *Michigan, Irrigation systems, Orchards, Irrigation, Agriculture, Valves, Control.
Identifiers: *Trickle irrigation, *Drip irrigation, *Microtubes, *Flow regulating valves, Flow regulation.

An appropriate combination of flow regulating valves and microtubes of different inside diameter has been found ideal for studying rates of flow in trickle irrigation. The flow regulating valve is installed in a row lateral. Capacity of the valve is selected to provide the amount of water desired for the row. To distribute the water and counter elevation changes, microtubes of different inside diameters are used and thus avoid excessive microtube lengths. Selection of an appropriate microtube ID in accordance to flow rate will permit a uniform value to adjust microtube length according to elevation change. Data on uniformity of water distribution is presented. (See also W75-09423) (Skogerboe-Colorado State)
W75-09467

**HYDRAULICS OF SINGLE-CHAMBER VS. DUAL-CHAMBER TUBING,**
Hawaiian Agronomics, Inc., Honolulu.
C. M. Vaziri.
In: Proceedings of the Second International Drip Irrigation Congress, p 293-298, (1974). 2 tab.

Descriptors: *Hydraulic design, Hydraulic properties, Hydraulics, *Irrigation design, Irrigation system, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

The basic hydraulic relationship of pressure, orifice diameter, coefficient of discharge, and the friction loss along a tube is a necessity before one can design an adequate drip or subsurface irrigation system. There are several types of tubing and emitters available. But the most unique difference hydraulically is the single chamber tubing versus a dual chamber tubing. The single chamber tube is found to provide an acceptable range of orifice flow uniformity from the head of tubing to the end for approximately 300' of length. Beyond this reach the friction loss in the 1/2' polyethylene tubing is excessive and causes a reduction in the orifice flow rate. The flow rate through each plastic orifice is proportional to the square root of the pressure inside the tubing at the orifice point. The other type of tubing that has been experimented with is dual chamber tubing. One chamber is for the conveyance. This in turn is connected to the outside chamber (the distribution tube) and water is emitted to the outside through desired orifice spacing, depending on soil types and plantings. Equations are developed to describe the flow pattern for dual chamber tubing and the relationship between the inner and outer chamber. The effect of orifice diameters and orifice spacing on the outer chamber pressure is discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09470

**DESIGNING TRICKLE IRRIGATION LATERALS FOR UNIFORMITY,**
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 3F.
W75-09471

**DESIGN CHARTS FOR DRIP IRRIGATION SYSTEMS,**
Hawaii Univ., Honolulu.
I. P. Wu, and H. M. Gitlin.
In: Proceedings of the Second International Drip Irrigation Congress, p 305-310, (1974). 3 fig, 4 ref.

Descriptors: *Irrigation design, *Design flow, *Design criteria, *Hydraulic design, Hydraulics, Irrigation systems, Irrigation, Agriculture, Design.
Identifiers: *Trickle irrigation, *Drip irrigation.

A simple design procedure has been developed for drip irrigation systems installed on either uniform or non-uniform slopes. The charts presented can be used to design a system with an allowable discharge (emitter) variation up to 20%. A dimensionless energy gradient curve has been developed theoretically for drip irrigation lines, submain and lateral, and was checked by laboratory and field experiments. It was found that a typical dimensionless energy gradient curve which was developed by using turbulent flow in smooth pipe can be used for flow conditions having 20% discharge (emitter) variation and percentage of laminar flow up to 30%. The dimensionless energy gradient curve combined with different slope conditions will show the pressure variation along the drip irrigation line. Design charts have been developed for both single tubing and twin-chamber drip irrigation systems. Examples are presented showing the design procedure. (See also W75-09423) (Skogerboe-Colorado State)
W75-09472

**HYDRAULIC AND MECHANICAL PROPERTIES OF DRIPPERS,**
Israel Center of Water Works Appliances, Tel Aviv.
Y. Gilaad, L. Krystal, and K. Zanker.
In: Proceedings of the Second International Drip Irrigation Congress, p 311-316, (1974). 1 tab.

Descriptors: *Hydraulic properties, *Hydraulic equipment, *Hydraulic design, *Mechanical properties, Hydraulics, Agriculture, Irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation, *Trickle irrigation, Emitters.

Research is discussed dealing with the hydraulic, mechanical, and functional requirements of the various types of emitters available based on hydraulic tests performed and experience accumulated in the field. The following hydraulic properties have a direct influence on the operation of drippers: the relationship between flow rate and pressure, resistance to the flow of water in the tubing at the place of insertion of the dripper, and shape and size of the water passage in the dripper. (See also W75-09423) (Skogerboe-Colorado State)
W75-09473

**DESIGN CRITERIA FOR MECHANICAL, ELECTRIC, AND FLUID SYSTEM AND COMPONENT RELIABILITY, SUPPLEMENT TO FEDERAL GUIDELINES FOR DESIGN, OPERATION, AND MAINTENANCE OF WASTE WATER TREATMENT FACILITIES.**
Environmental Protection Agency, Washington D.C. Office of Water Program Operations.
For sale by the Superintendent of Documents U.S. Government Printing Office, Washington, D. C. 20402, Price $0.85. Technical Bulletin EPA-430-99-74-001, (1974). 54 p.

Descriptors: *Design criteria, *Municipal wastes, Discharges, Navigable waters, Federal jurisdiction, Guidelines, Legislation, Potable water, Effluents, Hydraulic capacity, Pipes, Maintenance, *Treatment facilities, *Waste water treatment.
Identifiers: Mechanical systems, Electrical system, Fluid systems.

As a supplement to the federal guidelines on design, operation, and maintenance of waste water treatment facilities, this document details design criteria for municipal waste water treatment works. Minimum standards are given for reliability for mechanical, electric, and fluid systems and components. These criteria are necessary for

sign of waste water treatment facilities seeking
ederal financial assistance under PL 92-500.
efinitions of such terms as component, con-
olled diversion, design flow, effluent limitation,
draulic capacity, navigable waters, and reliabili-
are given. Three classes of treatment works are
rks which discharge into navigable waters that
uld be permanently or unacceptably damaged by
luent in only a few hours (near reservoirs for
table water or areas of shellfish); those which
charge into navigable waters which migh be
maged by continued (over several days) effluent
ality degradation (such as recreational waters);
l works not included in the previous two.
sign criteria are detailed, regarding: works loca-
ns; provisions for expansion or upgrading; pip-
requirements; pipes subject to clogging; pipe
ining provisions; feed line maintenance and
air; component access space, repair, and han-
g; and essential services. Systems design
eria are enumerated, and include the electric
ver system, instrumentation, and sludge han-
g systems. (Prague-FIRL)
5-09559

**NTIFICATION OF PROBLEM AREAS IN
TER POLLUTION CONTROL PLANTS,**
ario Ministry of the Environment, Toronto.
primary bibliographic entry see Field 5D.
5-09564

**TER FOR ENERGY SELF-SUFFICIENCY.**
er Resources Council, Washington, D.C.
primary bibliographic entry see Field 6B.
5-09626

**TER FOR ENERGY SELF-SUFFICIENCY,
ECUTIVE SUMMARY.**
er Resources Council, Washington, D.C.
primary bibliographic entry see Field 4C.
-09627

**CIAL POWER GENERATING UNIT USING
IPRESSED AIR PRODUCED BY OCEAN
VE TOGETHER WITH SUPER-HEATED
AM,**
amada.
Patent No 3,879,950, 4 p, 9 fig, 5 ref; Official
tte of the United States Patent Office, Vol
No 5, p 1964, April 29, 1975.

riptors: *Patents, *Electric powerplants,
an waves, Offshore structures, Energy con-
on, Coasts, Steam, Turbines.
ifiers: Energy storage, Compressed air, Su-
ated steam.

invention provides a special seashore or
ore electric power generating unit using com-
ed air together with superheated steam,
stores mechanical energy in the form of
ressed air during off-peak load periods by
superfluous output of the power plant and
wave energy. The power plant regenerates
ic energy during peak-load periods by using
ompressed air thus stored. The compressed
heated to the temperature of the superheated
to be mixed therewith, prior to the delivery
urbine for driving an electric generator. To
utilize the ocean wave energy, a stationary
rm is provided above the sea level, and sta-
y parts of a number of air compressors are
ed to the platform, while movable parts of
compressors are secured to floats which are
on the water level so as to move up and
in response to the wave motion of the sea
Thus, the movable portions of the air com-
rs are driven by the ocean wave motion, so
r at the atmospheric pressure is compressed
igher pressure level by the compressors.
-OEIS)
9638

**TABLE ROCK LAKE, WHITE RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Little Rock, Ark.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as, EIS-MO-73-1469-F, $4.25 in paper copy, $2.25 in microfiche. September 7, 1973. 54 p, 1 map.

Descriptors: *Hydroelectric power, *Hydroelectric plants, *Flood control, Fish genetics, Vegetation, *Arkansas, Lakes, Powerplants, Parks, Land resources, Water resources, Water resources development, Pollutants, Thermal pollution, Air pollution, Environmental effects.
Identifiers: *Environmental Impact Statements, *Table Rock Lake(Ark).

The proposed operation and maintenance of Table Rock Lake, Arkansas includes hydroelectric power generation, flood control, operation and maintenance of parks, and management of land and water resources. The needed electrical energy is produced without air or thermal pollution, but creates a downstream environment dependent upon cold water releases. Accompanying lake fluctuations change the environment along the shoreline with respect to fish spawning and vegetation survival. These lake fluctuations that adversely affect vegetation along the shoreline and fish in the lake are the primary adverse environmental effects of the project. The alternatives to the present activities would be modification or total cessation of hydroelectric power generation, flood control, and different management practices. (Gagliardi-Florida)
W75-09818

## 8D. Soil Mechanics

**PORE AND ERODING FLUID INFLUENCES ON SURFACE EROSION OF SOIL,**
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-09741

**EFFECTS OF DEFORESTATION ON SLOPES,**
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W75-09743

**WATER ESCAPE STRUCTURES IN COARSE-GRAINED SEDIMENTS,**
Louisiana State Univ., Baton Rouge. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W75-09768

**CHARLES RIVER DAM, BOSTON, MASS (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Corps of Engineers, Waltham, Mass. New England Div.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as, EIS-MA-73-1612-F, $5.75 in paper copy, $2.25 in microfiche. October 11, 1973. 127 p, 3 fig, 2 tab.

Descriptors: *Dams, *Earth dams, *Concrete dams, *Locks, *Fish ladders, Recreaction, Flood protection, Fish, *Massachusetts, Aesthetics, Flood control, Rivers, Pumping, Pumping plants, Navigation, Flood damage, Boats, Water quality, Diversion, Fish passages, Environmental effects, Disposal, Reservoir storage, Dikes.
Identifiers: *Environmental Impact Statement, *Charles River(Mass).

The proposed action entails construction of a multiple-purpose earth and concrete dam with river pumping facilities, three navigation locks, and a fish ladder on the Charles River, Massachusetts. The project will enhance the aesthetic and recreational potential of the area, provide a flood-free environment, eliminate extensive flood losses, improve movement of boat traffic, enhance water quality in the Charles River Basin, and improve fish passage. The adverse environmental effects of the action will consist of temporary inconvenience during construction and offshore disposal of polluted material removed for site preparation. The following alternatives were considered: upstream reservoir storage, perimeter diking, diversion, improved pumping vailities, improved locking facilities in the existing dam, or no action. (Gagliardi-Florida)
W75-09816

**BUSHLEY BAYOU, LOUISANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Vicksburg, Miss.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as, EIS-LA-73-1528-F, $4.75 in paper copy, $2.25 in microfiche. September 20, 1973. 88 p, 6 map.

Descriptors: *Flood protection, *Levees, *Floodgates, *Canals, Wildlife management, Water supply, Water control, Backwater, Flooding, Floods, Flood control, Louisiana, Drainage, Pumping plants, Pumping, Pumps, Wildlife, Wildlife habitats, Fish, Headwaters, Drainage, Environmental effects, Forests, Hardwood, Archaeology, Streams, Flood forecasting, Flood plains.
Identifiers: *Environmental Impact Statements, *Bushley Bayou(LA).

The project is designed to determine the advisibility of providing backwater flood protection to the Bushley Bayou, Louisiana, area by means of a loop levee, gravity floodgate, internal drainage canal, and a 1,500 cubic-foot-per-second pumping station. The acquisition of 3,000 acres of suitable wildlife land, water supply and control facilities was recommended as a measure to mitigate project-induced fish and wildlife losses. The proposed action will make feasible headwater flood protection and more efficient drainage of the protected area. Adverse environmental effects of the project include the loss of 5,900 acres of bottomland hardwood forest, the reduction in extent and quality of fish and wildlife habitat, and possible damage to Indian mounds of archaeological value. Levee alignment with the floodway to intercept hill stream headwater flood flows; a levee and floodgate without pumping plant; a flood forecasting and warning system; flood plain regulation; permanent evacuation of the flood plain were considered alternatives. (Gagliardi-Florida)
W75-09819

## 8E. Rock Mechanics and Geology

**DATA FROM A 1,000-FOOT (305-METRE) CORE HOLE IN THE LONG VALLEY CALDERA, MONO COUNTY, CALIFORNIA,**
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-09728

## 8G. Materials

**CORRUGATED PLASTIC DRAIN TUBING USED AS UNDERGROUND CONDUIT,**
Missouri Univ., Columbia. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W75-09611

DRAINAGE MATERIALS.
Food and Agriculture Organization of the United Nations, Rome (Italy). Working Party on Water Resources and Irrigation.
Food and Agriculture Organization of the United Nations, Water Resources and Development Service, Rome, Irrigation and Drainage Paper No 9, 1972. 122 p.

Descriptors: *Drainage, *Drainage engineering, *Tile drainage, *Land reclamation, *Europe, Drainage effects, Drainage practices, Drainage systems, Construction equipment, Dewatering, Lateral conveyance structures, Tiles, Clay pipes, Conduits, Pipes, Plastic pipes, Tile drains, Filters, Soil filters, Screens, Agriculture, Arid lands, Economics.
Identifiers: *Drainage materials, France, The Netherlands, Belgium, Federal Republic of Germany, Hungary, United Kingdom.

This collection of seven essays reviews experiences with drainage materials in The Netherlands, Belgium, France, the Federal Republic of Germany, Hungary, and the United Kingdom. Various types of pipes and filters are considered. Since drainage is a frequent problem in the irrigation districts of arid lands, the papers are pertinent to environments radically different from Western Europe. In the past, drainage materials were manufactured near their place of use. Increasingly, however, such materials are being imported; thus, it is becoming imperative that international standards on pipe sizes, etc., be set to make such equipment compatible. Also, in a world of rising energy prices, information on manual versus mechanical costs in laying out drainage systems has growing pertinence, particularly in the underdeveloped arid regions. (See W75-09629 thru W75-09634) (Bowden-Arizona)
W75-09628

SURVEY OF EXPERIENCE WITH DRAINAGE MATERIALS AND REVIEW OF AVAILABLE SPECIFICATIONS,
Rijksstation voor Landbouwtechniek, Merelbeke (Beligium).
R. Deckx, A. Maton, and W. Dierickx.
In: Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper No 9, p 27-34, 1972. append.

Descriptors: *Specifications, Design standards, *Drainage engineering, Europe, *Clay pipes, *Plastic pipes, *Tile drainage, *Land reclamation, Drainage, Pipes, Filters, Soil filters, Construction equipment, Arid lands, Irrigation, Costs, Reviews.
Identifiers: *Drainage materials, *Belgium.

Three drainage materials used in Belgium, but also very applicable in more arid lands where drainage and irrigation practices are directly linked, are discussed. The materials considered (plastic pipes, pipes of baked clay, and enveloping materials) are supplied in Belgium by Germany or the Netherlands. In Belgium smooth plastic pipes were introduced with a glass fiber sheet as enveloping material but never replaced the more traditional baked clay pipes because of occasional inferior quality. Corrugated pipes have aroused much interest of late, and because of their competitive prices, have the chance of replacing clay pipes. Statistical information is provided about pipe measurement, and resistance to compression and shock; some general characteristics of smooth plastic pipes and pipes baked in clay are described. Glass fiber sheet, glass wool and flax band are compared in their effectiveness as enveloping materials. (See also W75-09628) (Bowden-Arizona)
W75-09629

STUDY OF EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF SPECIFICATIONS AVAILABLE IN FRANCE,
Centre National d'Etudes Techniques et de Recherches Technologiques pour l'Agriculture, les Forets et l'Equipment Rural, Antony (France).
J. Dunglas.
In: Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper No 9, p 35-40, 1972.

Descriptors: *Specifications, Design standards, *Drainage, *Drainage engineering, Europe, *Clay pipes, *Land reclamation, *Construction equipment, Pipes, Clay pipes, Plastic pipes, Filters, Intakes, Dewatering, Tile drainage, Arid lands, Irrigation, Economics, Machinery, Reviews.
Identifiers: *France, *Drainage materials.

France has no national specifications on drainage materials because natural conditions are too diverse and the finding of test and experiments in progress are too uncertain. Results of tests made in the laboratory and under field conditions are presented, showing that smooth plastic pipes promote better water flow than corrugated pipes; wider drain slots are advantageous because they diminish intake resistance but dangerous because they accelerate the entry of fine soil particles into the pipe; and the use of filtering material to envelope drain pipes reduces the amount of sediment build-up in the pipes and prevents the washing away of the soil surrounding the pipes. Pipes, field and pipe-laying equipment and drainage plans made are described. Many of the problems and conditions discussed have value not only for terrains similar to those in France, but can also be applied to more arid areas. (See also W75-09628) (Bowden-Arizona)
W75-09630

EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF AVAILABLE SPECIFICATIONS,
Kuratorium fuer Kulturbauwesen, Hanover (West Germany).
H. Billib.
In: Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper No 9, p 41-48, 1972. 6 tab, 6 ref.

Descriptors: *Specifications, Design standards, *Drainage, *Drainage engineering, *Filters, *Clay pipes, *Land reclamation, Europe, Pipes, Agriculture, Tiles, Plastic pipes, Lateral conveyance structures, Backfill, Irrigation, Arid lands, Mole drainage, Reviews.
Identifiers: *Drainage materials, Germany, *Federal Republic of Germany.

Clay and corrugated plastic pipes have replaced fascines, wooden boxes and concrete pipes in western European drainage practices. Detailed information on pipe sizes and costs are presented in table form, and pipe line fittings and filters are also discussed. Techniques for backfilling drainage ditches are given for several different soil types, thus making the information relevant not only to the drainage areas in western Europe but also to the drier areas of the earth where similar techniques are practiced for irrigation and the associated drainage. (See also W75-09628) (Bowden-Arizona)
W75-09631

A SURVEY OF EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF AVAILABLE SPECIFICATIONS,
Vizgazdalkodasi Tudomanyos Kutato Intezet, Budapest (Hungary).
L. Szabo, and B. Szekrenyi.
In: Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper No 9, p 49-53, 1972. 2 figs.

Descriptors *Specifications Design standa
*Drainage, *Drainage engineering, *Clay pi
*Plastic pipes, *Filters Europe *Land recla
tion, Pipes, Agriculture Construction equipm
Economics, Costs, Irrigation, Arid lands M
drainage, Lime, Reviews.
Identifiers: *Drainage materials, *Hungary

Terra cotta drainage pipes are widely used in H
gary. Drainage systems failed to expand betw
the two World Wars, and only in recent dec
has the construction of new drainage syst
begun. Drainage work currently being underta
is mainly in regions of brown forest soils of p
do-gley and clay-flush which have been dama
by residuary, stagnant surface waters. In the
of mole drainage, gravel is used as a filte
material. According to Hungarian specificati
the gravel used as filter material should not
tain clay, silt, iron, or ochre fractions. Test res
are given from experiments carried out on var
filtering materials and lime treatment of the dr
trench soil. Drainage of soils with heavy min
contents whould be concurrent with deep loo
ing and mole drainage to improve the water h
dling of the soil and to reduce costs. Th
techniques are valuable not only in areas with
rain similar to that in Hungary, but to more
areas. (See also W75-09628) (Bowden-Arizona)
W75-09632

DRAINAGE MATERIALS - PROVISIONAL
PORT OF THE EXPERIENCE GAINED IN T
NETHERLANDS,
Institute for Land and Water Managem
Research, Wageningen (Netherlands).
J. Wesseling, and C. L. van Someren.
In: Food and Agriculture Organization of
United Nations, Rome, Irrigation and Drain
Paper No 9, p 55-84, 1972. 12 fig, 10 tab, 33 ref.

Descriptors: *Specifications, Design standa
*Drainage, *Drainage engineering, *Europe, *
drains, *Clay pipes, Pipes, Soil filters, Agri
ture, Tile drainage, Irrigation, Arid la
Economics, Costs, Hydrologic propert
Backfill, Reviews.
Identifiers: *Drainage materials, *Netherlands.

Modern agriculture, especially in arid regio
requires well-drained areas. Surface drain
systems which make use of furrows and ditc
have to be replaced by subsurface systems. N
machines and new materials have opened new p
sibilities for the application of subsurface syste
The major question is just what proper
drainage materials must have to ensure a g
drainage system. The larger the drainage pipe
better the drainage will be; however, large pi
increase the cost of the system. Opinions diffe
to the necessary minimum gap width between
or concrete pipes; however, the gaps betw
pipes seem to be smaller than in earlier times.
best filter materials are also subject to deb
Various tables give laboratory and field con
sions on the permeability of pipes, filters,
backfill. A table of maximum drainage areas is
cluded. Since drainage has been sorely neglec
in irrigated arid land systems, the information
cost and feasibility could have direct applicatio
the future. (See also W75-09628) (Bowd
Arizona)
W75-09633

SURVEY OF EXPERIENCES WITH DRAINA
MATERIALS AND REVIEW OF AVAILAB
SPECIFICATIONS,
Ministry of Agriculture, Fisheries and Food, C
bridge (England).
B. D. Trafford.
In: Food and Agriculture of the United Natio
Rome, Irrigation and Drainage Paper No 9, p
122, 1972. 2 append, 7 fig.

Descriptors: *Specifications, Design standar
*Drainage engineering, Europe, *Clay pip

Plastic pipes, *Land reclamation, *Tile drains, rainage, Construction equipment, Pipe, Filters, oil filters, Irrigation, Arid lands, Subsurface rains, Manholes, Backfill, Reviews.
entifiers: *Drainage materials, *United King-m.

ngland is increasingly using corrugated polyvinyl loride pipe and trenchless draining techniques. ational specifications for plastic pipe have yet to established in the United Kingdom. Methods e presented for placing pipe. Materials used in dition to P.C.V. pipes, including baked clay pes, pipe junctions, manholes, outfalls and fil-ing materials are described. A provisional ecification for plastic land drainage tubes of up 10 cm is presented with standards for immediate ength, creep strain, impact durability, longitu-al flexibility, water intake, water solubility and sorption, and resistance to exposure. A techni- note from the Ministry of Agriculture, Fishe-s and Food is appended giving guidance infor-tion to applicants for government aid in the in-llation of field drainage schemes. These delines are of interest to those areas similar in rain to the United Kingdom and also to more l areas. (See also W75-09628) (Bowden-zona)
5-09634

## Fisheries Engineering

**FECT OF HARVESTING METHODS ON ODUCTION OF FINGERLING FATHEAD NNOWS,**
orado State Univ., Fort Collins.
. Saylor.
g Fish-Cult. Vol 35, No 2, p 110-114, 1973, .

criptors: Fish harvest, Minnows, Fish ponds, vesting, Mortality, Fish production, Seasonal, perature, Nets, Seston.
tifiers: Draining, Fathead minnows, Fin-ng, Pimephales-promelas, Seining, Sex.

e harvesting procedures were used to remove ead minnows, Pimephales promelas nesque, from experimental ponds. The ods were complete periodic removal by drain-ncomplete periodic removal by seining, and 1 plete removal at the end of the season. dic complete removal by draining increased production in numbers of juveniles erlings) by 41%. After the 1st harvest, drain-arvested smaller fingerlings than seining did. rdless of the method used to harvest fin-gs, 1% handling mortality was observed. The ed optimum sex ratio and density of brood ould not be maintained due to natural adult lity. Water temperature and seston were in-ted by the drained harvest, but both ered quickly after refilling and did not appear tard production of fingerlings.--Copyright Biological Abstracts, Inc.
09415

**RIMENTAL INTRODUCTION OF THE RALIAN CRAYFISH (CHERAX IMANUS) INTO LOUISIANA,**
rsity of Southwestern Louisiana, Lafayette. hireman.
Fish-Cult, Vol 35, No 2, p 107-109, 1973,

ptors: Crayfish, Crustaceans, Louisiana, h stages, Ponds.
iers: Australian crayfish, Cannibalistic sh, Cherax-Tenuimanus, Culture, *Marron, onstruction, Reproduction, Temperature.

marron (C. tenuimanus) attain weights in ex-f 4 lb and are extremely palatable, their al for commercial production in Southern ana, was investigated. Marron probably cannot exist in S Louisiana waters because of water temperature extremes, Even if established there are several factors unfavorable for commercial propagation. Pond construction would be costly since ponds would necessarily have to be deeper than existing crayfish ponds, and each pond should be enclosed so marron would not escape. If marron are density limited (to 100 ponds/acre), as Australian studies indicate, they are poorly suited for intensive culture purposes. Marron are cannibalistic; therefore size classes must be separated. This would necessitate rearing ponds which would not produce harvestable crops each year. The biological potential (growth and reproduction) is low as compared to native crayfish; it would take a number of years to realize returns on initial investments.--Copyright 1973, Biological Abstracts, Inc.
W75-09560

**BRANDING CHINOOK, COHO AND SOCKEYE SALMON FRY WITH HOT AND COLD METAL TOOLS,**
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 7B.
W75-09561

**EFFECTS OF LOGGING ON WATER TEMPERATURE AND DISSOLVED OXYGEN IN SPAWNING BEDS,**
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W75-09685

**EVALUATION OF A NEW SPAWNING MAT MATERIAL,**
National Fish Hatchery, Tishomingo, Okla. Warm Water Hatchery Biology Center.
For primary bibliographic entry see Field 7B.
W75-09749

**CHARLES RIVER DAM, BOSTON, MASS (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 8D.
W75-09816

# 10. SCIENTIFIC AND TECHNICAL INFORMATION

## 10A. Acquisition And Processing

**INFORMATION EXCHANGE ON WATER RESOURCES COMPUTER PROGRAMS,**
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Center.
For primary bibliographic entry see Field 7C.
W75-09591

## 10B. Reference and Retrieval

**INFORMATION EXCHANGE ON WATER RESOURCES COMPUTER PROGRAMS,**
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Center.
For primary bibliographic entry see Field 7C.
W75-09591

## 10C. Secondary Publication And Distribution

**WATER ANALYSIS,**
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5A.
W75-09372

**SECONDARY IMPACTS OF TRANSPORTATION AND WASTEWATER INVESTMENTS: REVIEW AND BIBLIOGRAPHY,**
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5C.
W75-09576

**U.S. ENGINEERING INFORMATION SERVICES AND THE ROLE OF THE WATER RESOURCES SCIENTIFIC INFORMATION CENTER,**
Office of Water Research and Technology, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 10D.
W75-09585

**INDEX 1945-1966, LAND AND WATER.**
Food and Agriculture Organization of the United Nations, Rome (Italy). Documentation Center
PU: DC/Sp. 8, May 1968. 421 p.

Descriptors: *Bibliographies, *Land resources, *Documentation, Information exchange, United Nations, Foreign countries, Agricultural engineering, Land management, Water management(Applied), *Water resources, Soil conservation, Irrigation.

Gathering, selection, analysis, and indexing of the Food and Agriculture Organization publications and documents produced from 1945 to 1966 is in process and will cover successively the broad fields assigned to the FAO technical and economical divisions. The present index - the sixth of a series of Divisional and Departmental indexes - covers most of the publications and documents produced from 1945 to 1966 by the Land and Water Division. It contains some 1300 entries in the bibliographical list, from which the subject index and the author index were derived. (Scott-ISWS)
W75-09635

**WATER FOR AGRICULTURE, ANNOTATED BIBLIOGRAPHY, AUTHOR AND SUBJECT INDEX.**
Food and Agriculture Organization of the United Nations, Rome (Italy). Documentation Center.
DC/Sp. 27, 1973. 776 p.

Descriptors: *Bibliographies, *Agriculture. *Documentation, *Information exchange, Groundwater, Hydraulic engineering, Foreign countries, United Nations, Geology, *Irrigation water drainage, Fertilizers, Hydrology, Floods. *Water resources, Water resources development, Water management(Applied), Equipment, Water balance, Maps, Soil science.

Food and Agriculture Organization publications and documents related to water in agriculture and issued between 1945 and 1973 by the Land and Water Development Division and by other technical Divisions were indexed. A large number of documents arising from the activities of FAO contain some reference to water for agriculture. The present index is therefore a selected list consisting of documents in which these activities are a predominant feature or those directly supporting them, such as reports and working documents dealing with Soil Science. The index consists of three parts: an analytical index, an index by authors, and a bibliographical list. (Scott-ISWS)

W75-09636

**BIBLIOGRAPHY OF U.S. GEOLOGICAL SURVEY WATER-RESOURCES REPORTS FOR UTAH,**
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 2A.
W75-09718

## 10D. Specialized Information Center Services

**U.S. ENGINEERING INFORMATION SERVICES AND THE ROLE OF THE WATER RESOURCES SCIENTIFIC INFORMATION CENTER,**
Office of Water Research and Technology, Washington, D.C. Water Resources Scientific Information Center.
R. A. Jensen.
The Journal of the Institution of Engineers, Australia, p 8-10, 12, 16, November-December 1974.

Descriptors: *Information exchange, *Information retrieval, *Water resources, *United States, Indexing, Abstracts, Publications, Bibliographies, Data collections, Water Resources Research Act, Thesauri, Documentation, Data storage and retrieval, Computers.
Identifiers: *Water Resources Scientific Information Center, Information analysis centers.

General subject areas discussed were: (1) the status of engineering information in the United States, (2) the role of the information analysis center in the engineering information system, (3) secondary services in water resources engineering, and (4) the Water Resources Scientific Information Center (WRSIC). The engineer operates in an information-communication pattern and has performed reasonably well within his present framework, however, there is mounting evidence that the existing engineering and information framework needs greater strengthening to meet the challenges of the future. The information analysis center comprises a group of specialists in science or technology, supplemented by librarians, computer specialists, and other information scientists, who acquire, select, store, analyze, evaluate, and synthesize information in their field of specialization. Such a center produces critical reviews, data compilations, measurement criteria, management recommendations, and other intellectual products requiring a high level of technical sophistication. WRSIC is an information analysis center which disseminates scientific and technical information for the U.S. water resources community. Input information to WRSIC is received from Federal water resources agencies, 51 State water resources research institutes, specialized documentation services, and approximately 13 designated centers of competence. Input information includes an abstract and index of each document entered on a precoded abstract form with other bibliographic data. Input from all sources, when merged, comprises a comprehensive, searchable, information base in machine-readable form. (Humphreys-ISWS)
W75-09585

## 10F. Preparation Of Reviews

**WATER ANALYSIS,**
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05A.
W75-09372

**FLOW EQUALIZATION.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 05D.
W75-09381

**NITRIFICATION AND DENITRIFICATION FACILITIES, WASTEWATER TREATMENT.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 05D.
W75-09382

**WASTEWATER FILTRATION, DESIGN CONSIDERATIONS.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 05D.
W75-09383

**PHYSICAL-CHEMICAL WASTEWATER TREATMENT PLANT DESIGN.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 05D.
W75-09385

**UPGRADING LAGOONS.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 05D.
W75-09386

**OXYGEN ACTIVATED SLUDGE WASTEWATER TREATMENT SYSTEMS, DESIGN CRITERIA AND OPERATING EXPERIENCE.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 05D.
W75-09387

**MUNICIPAL SLUDGE MANAGEMENT, PROCEEDINGS OF THE NATIONAL CONFERENCE ON MUNICIPAL SLUDGE MANAGEMENT.**
For primary bibliographic entry see Field 05D.
W75-09532

**MATHEMATICAL MODELS IN HYDROLOGY,**
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 02A.
W75-09624

**WATER LAWS IN MOSLEM COUNTRIES,**
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
For primary bibliographic entry see Field 06E.
W75-09625

**URBAN RUNOFF POLLUTION CONTROL--STATE-OF-THE-ART,**
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 05D.
W75-09762

# SUBJECT INDEX


oss of Five Pesticides from Cultures of Twen-one Planktonic Algae,
75-09808 5A

ORPTION
ptake, Metabolism and Distribution of DDT Organs of the Blue Crab, Callinectes pidus,
75-09691 5C

k up and Metabolism of DDT, Dieldrin and otodieldrin by a Freshwater Alga nkistrodesmus Amalloides) and a crocrustacean (Daphnta Pulex),
75-09805 5C

ferential Uptake of Endosulfan by the Tis-s of Mytilus Edulis,
5-09810 5A

DHABI
orestation with Saline Water in Abu Dhabi,
5-09483 3C

Investigation into the Potential Uses of kle Irrigation for Desert Reclamation and der Production in the Emirate of Abu bi,
5-09487 4A

MINE WATER
ase Study of Mine Water Quality Deteriora- Mainsforth Colliery, County Durham,
-09752 5B

ATED CARBON
hetic Resins and Activated Carbon for tewater Treatment,
-09390 5D

on from Lignite or Coal: Which is Better,
09733 5D

ated Carbon Used to Control Odors,
09777 5D

ATED SLUDGE
en Activated Sludge Wastewater Treat- Systems, Design Criteria and Operating rience.
09387 5D

ge Treatment Plant Dependability with al Reference to the Activated Sludge ss,
09393 5D

ol Schemes for the Activated-Sludge ss,
09395 5D

hate Removal in an Activated Sludge y,
09412 5D

horus Removal Demonstration Studies at Trenton,
09416 5D

Denver's Experience with Large Scale c Digestion of Waste Activated Sludge,
09537 5D

t in Oxygen Process Growing,
0781 5D

l Characteristics of Mechanical Aera-
0782 5D

**ADENOSINE TRIPHOSPHATE**
Adenosine Triphosphate Measurements in Soil and Marine Sediments,
W75-09764 5A

**ADMINISTRATIVE AGENCIES**
A Case Study of Estuarine Pollution and Local Agency Interactions,
W75-09620 5G

Conservation Council of North Carolina v. Costanzo (Action to Enjoin Construction of a Marina on Island in Atlantic Ocean and to Require Environmental Impact Statement by Corps of Engineers).
W75-09840 6E

**ADSORPTION**
Synthetic Resins and Activated Carbon for Wastewater Treatment,
W75-09390 5D

Carbon from Lignite or Coal: Which is Better,
W75-09733 5D

Activated Carbon Used to Control Odors,
W75-09777 5D

Differential Uptake of Endosulfan by the Tissues of Mytilus Edulis,
W75-09810 5A

**AERATION**
Biological Control of Sphaerotilus Natans and Related Species in Waste Waters,
W75-09520 5D

Biological Aerated Filters,
W75-09572 5D

Method and Apparatus for Aeration of Biodegradable Waste Material,
W75-09647 5D

Liquid Treatment Apparatus,
W75-09666 5D

Extended Aeration Wastewater Treatment,
W75-09776 5D

Physical Characteristics of Mechanical Aerators,
W75-09782 5D

**AERATORS (MECHANICAL)**
Physical Characteristics of Mechanical Aerators,
W75-09782 5D

**AERIAL PHOTOGRAPHY**
Dynamics of Turbidity Plumes in Lake Ontario,
W75-09709 2J

**AEROBIC DIGESTION**
High Purity Oxygen Aerobic Digestion Experiences at Speedway, Indiana,
W75-09538 5D

**AEROBIC TREATMENT**
Metro Denver's Experience with Large Scale Aerobic Digestion of Waste Activated Sludge,
W75-09537 5D

High Purity Oxygen Aerobic Digestion Experiences at Speedway, Indiana,
W75-09538 5D

**AFRICA**
Recent African Rainfall Patterns,
W75-09766 2B

The Ecological Management of Arid and Semi-Arid Rangelands in Africa and the Near East: An International Programme.
W75-09791 6G

Drought in the Ghana Savannah: A Report to the U.S. Aid Mission to Ghana,
W75-09795 6G

Drought, A Recurrent Element of Climate,
W75-09799 2B

Water Requirements and Limitations Imposed on Agricultural Development in Northern Ghana,
W75-09800 3F

Deterioration of the Ecological Equilibrium in the Arid Zones of North Africa,
W75-09802 6G

**AGRICULTURAL RUNOFF**
Disposal of Cattle Feedlot Runoff on Agricultural Land,
W75-09517 5D

Water Quality Study of Nonpoint Source of Agricultural Runoff,
W75-09519 5B

**AGRICULTURE**
Agricultural Utilization of Digested Sludges from the City of Pensacola,
W75-09554 5E

Water for Agriculture, Annotated Bibliography, Author and Subject Index.
W75-09636 10C

**AIR POLLUTION**
Financial Incentives and Pollution Control: A Case Study,
W75-09574 5G

The Reserve Mining Case: Promises, Promises,
W75-09838 5G

**AIR TEMPERATURE**
Water Use by Drip and Sprinkle Irrigated Avocados Related to Plant Cover, Evaporation and Air Temperature,
W75-09479 3F

**ALABAMA**
Environmental Geology of an Area in West-Central Alabama,
W75-09615 7C

**ALASKA**
Survey of Wastewater Discharge--Elmendorf AFB, Alaska,
W75-09398 5B

Survey of Wastewater Discharge, Campion AFS, Alaska,
W75-09413 5D

Water-Resources Data for Skagway, Alaska,
W75-09729 7C

**ALBERTA**
Sediment Yields from Intermediate-Sized Stream Basins in Southern Alberta,
W75-09750 2J

Hydrogeology of the Waterways-Winefred Lake Area, Alberta,
W75-09769 2F

**ALFALFA**
Control of Water by Drip Irrigation for Alfalfa Seed Production,
W75-09450 3F

ALFALFA

See Germination Response to Subsurface Irrigation Depth,
W75-09451 2I

ALGAE
Effects of PCB on Interspecific Competition in Natural and Gnotobiotic Phytoplankton Communities in Continuous and Batch Cultures,
W75-09680 5C

Evaluation of Sample Preparation Techniques for Algal Bioassays,
W75-09734 5A

Pick up and Metabolism of DDT, Dieldrin and Photodieldrin by a Freshwater Alga (Ankistrodesmus Amalloides) and a Microcrustacean (Daphnta Pulex),
W75-09805 5C

Loss of Five Pesticides from Cultures of Twentyone Planktonic Algae,
W75-09808 5A

ALGORITHMS
Reservoir Optimization for Water Quality Control,
W75-09773 5G

ALTERNATIVE WATER USE
Integrative Procedures for Coordinated Urban Land and Water Management: A Systems Analysis,
W75-09622 6A

ALUM
Phosphate Removal in an Activated Sludge Facility,
W75-09412 5D

Phosphorus Removal Demonstration Studies at C.F.B. Trenton,
W75-09416 5D

ALUMINUM
The Accumulation of Fluoride by Marine and Intertidal Animals,
W75-09697 5C

ALUMINUM SULFATE
Optimum Conditions for Chemical Purification of Effluents (Optimal'nye usloviya khimicheskoi ochistki stochnykh vod),
W75-09359 5D

AMAZON RIVER
Quaternary Sedimentation on the Amazon Continental Margin: A Model,
W75-09600 2L

AMAZON RIVER SEDIMENTS
Quaternary Sedimentation on the Amazon Continental Margin: A Model,
W75-09600 2L

AMMONIA
How to Get Low Ammonia Effluents,
W75-09778 5D

AMMONIA REMOVAL
Packed-Bed Reactors for Secondary Effluent BOD and Ammonia Removal,
W75-09379 5D

AMMONIA STRIPPING
Physical-Chemical Nitrogen Removal, Wastewater Treatment.
W75-09384 5D

ANAEROBIC DIGESTION
Anaerobic Digester Operation at the Metropolitan Sanitary Districts of Greater Chicago,
W75-09536 5D

Sludge Management System for St. Louis,
W75-09558 5D

ANALYTICAL TECHNIQUES
Water analysis,
W75-09372 5A

Biological Assay of Fresh Waters by a New Method, Dielectrophoresis,
W75-09531 5A

Effects of PCB on Interspecific Competition in Natural and Gnotobiotic Phytoplankton Communities in Continuous and Batch Cultures,
W75-09680 5C

Selenium Determination on Fish Tissue,
W75-09696 5A

Differentiation Between Natural Hydrocarbons and Low Level Diesel Oil Contamination in Cooked Lobster Meat,
W75-09698 5A

Automatic U.V.-Control System for Relative Evaluation of Organic Water Pollution,
W75-09735 5A

Adenosine Triphosphate Measurements in Soil and Marine Sediments,
W75-09764 5A

ANIMAL METABOLISM
Tritiated Water Turnover Rate in Rodents: Desert and Mountain,
W75-09801 2I

ANIMAL PHYSIOLOGY
Mercury in Seals, Terrestial Carnivores and Principal Food Items of the Inuit, from Holman, N.W.T.,
W75-09679 5A

Tritiated Water Turnover Rate in Rodents: Desert and Mountain,
W75-09801 2I

ANKISTRODESMUS AMALLOIDES
Pick up and Metabolism of DDT, Dieldrin and Photodieldrin by a Freshwater Alga (Ankistrodesmus Amalloides) and a Microcrustacean (Daphnta Pulex),
W75-09805 5C

APPLE
Water Uptake by an Apple Tree with Various Proportions of the Root System Supplied with Water,
W75-09495 3F

APPLES
Effect of Root Temperature and Humidity on the Distribution of Ca in Apple and Sunflower Seedlings,
W75-09351 2I

Effects of Localized Phosphate Treatments and Solution pH on the Growth and Function of Apple Roots,
W75-09488 3C

Effects of Nitrogen Fertilizer Applications to Part of a Root System,
W75-09496 3F

APPLICATION EQUIPMENT
Dripper Flow Consistency,
W75-09468 3F

APRONS
Influence of Surface and Near-Surface Cal
Distribution on Infiltration Characteristics,
Vegas, Nevada,
W75-09374

AQUATIC ANIMALS
A Comparative Study of the Tolerance of T
Freshwater Planarians, Dugesia Tigrina
Polycelis Felina, To Low Oxygen Lev
(Etude Comparative de la Tolerance
Basses Tensions D'Oxygene Chez D
Planaires D'Eau Douce, Dugesia Tigrina
Polycelis Felina),
W75-09675

AQUATIC BACTERIA
Deposition of Zinc and Cadmium by Ma
Bacteria in Estuarine Sediments,
W75-09692

AQUATIC INSECTS
Distribution and Dynamics of Aquatic Ins
in the Elk Creek Experimental Watersh
Lubrecht Forest, Montana,
W75-09528

Aquatic Insect Communities of the Ten
River, Their Composition, Biotic Index
Seasonal Change, (In Japanese),
W75-09807

AQUIFER CHARACTERISTICS
Formation Factors and Their Use in Estima
Water Quality in Mississippi Aquifers,
W75-09703

Hydrologic Analysis of the Valley-Fill Aqui
North Platte River Valley, Goshen Cou
Wyoming,
W75-09722

AQUIFER MANAGEMENT
Goundwater Models,
W75-09582

AQUIFERS
Geology of Griggs and Steele Counties,
W75-09725

Numerical Analysis of Confined-Unconfi
Aquifers,
W75-09751

The Sahelian Drought - A Disaster
Livestock Populations,
W75-09785

ARCTIC
International Law and Canadian Arctic Pol
tion Control,
W75-09846

ARCTIC RINGED SEALS
Organochlorine Residue Levels in Arc
Ringed Seals: Variation with Age and Sex,
W75-09702

ARGON
Changes in Blood Chemistry of Juvenile Ste
head Trout, Salmo Gairdneri, Follow
Sublethal Exposure to Nitrogen Supersatu
tion,
W75-09694

ARID CLIMATES
The Sahelian Drought - A Disaster I
Livestock Populations,
W75-09785

Sewage Utilization in Agriculture,
W75-09788

Flow-Associated Precipitation Reactions in Saline-Sodic Soils and Their Significance,
W75-09792 2G

High Milk Production Under Unfavourable Natural Conditions,
W75-09797 3F

Drought, A Recurrent Element of Climate,
W75-09799 2B

Deterioration of the Ecological Equilibrium in the Arid Zones of North Africa,
W75-09802 6G

ID LANDS
or Improving Water Penetration into Some Arizona Soils-Sulfuric Acid,
W75-09623 3C

Gypsum Can Improve Your Water Also,
W75-09787 5G

Hungry Drylands of Western Rajasthan Need a New Technology,
W75-09789 3F

he Ecological Management of Arid and Semi-rid Rangelands in Africa and the Near East: n International Programme.
75-09791 6G

Drought in the Ghana Savannah: A Report to e U.S. Aid Mission to Ghana,
75-09795 6G

r Rainfed Areas-Improved Velvet Beans for creased Forage Production,
75-09796 3F

ONA
izona's Remote Subdivisions: An Inventory,
5-09583 6G

te of Arizona, Environmental Services eds Study for Greenlee County, 1970-1990.
5-09584 5D

Improving Water Penetration into Some zona Soils-Sulfuric Acid,
5-09623 3C

age Preferences of Trained Mule Deer on Beaver Creek Watersheds,
5-09793 3F

urvey of the Nesting Habitats of the White-ged Dove in Arizona,
5-09794 6G

zona and Tomorrow's Solar Powerplants,
5-09804 3A

NSAS
le Rock Lake, White River, Missouri (Final ironmental Impact Statement).
5-09818 8C

FICIAL ISLANDS
ficial Islands and Installations in Interna-al Law,
-09834 6E

FICIAL ISLANDS (BARRIERS)
ic Barrier Formation,
-09644 8A

FICIAL RECHARGE
harge Simulation Model,
-09518 2A

nical Transport by the Mekong River,
-09603 5B

India Case Study on Improving Productivity in Low Rainfall Areas.
W75-09803 3F

ASYMMETRIC MEMBRANES
Development of Porous Polyvinyl Chloride Coated Tubulets for Seawater Desalination,
W75-09373 3A

ATLANTA (GEO)
Integrative Procedures for Coordinated Urban Land and Water Management: A Systems Analysis,
W75-09622 6A

ATOMIC ABSORPTION SPECTROMETER
Simultaneous Determination of Seven Trace Metals in Potable Water Using a Vidicon Atomic Absorption Spectrometer,
W75-09363 5A

Determination of Lead in Potable Waters Using Delves Cup Atomic Absorption Spectrometer with Signal Integration,
W75-09366 5A

ATRAZINE
Loss of Five Pesticides from Cultures of Twentyone Planktonic Algae,
W75-09808 5A

ATTITUDES
Attitudes in Sludge Treatment and Disposal,
W75-09731 5D

AUSTRIA
Possibilities for Reducing 5-Day BOD-Consuming Materials in Steam Condensates from Spent Sulfite Liquor Evaporation (Moeglichkeiten der Reduktion der BSB(5)-verbrauchenden Stoffe in Brundenkondensaten aus Sulfitablaugeneindampfungen),
W75-09360 5D

AUTOMATIC ANALYZER
Automatic U.V.-Control System for Relative Evaluation of Organic Water Pollution,
W75-09735 5A

AUTOMATIC CONTROL
Automatic Drip Irrigation for Greenhouse Tomato Production in West Texas,
W75-09448 3F

AUTOMATIC IRRIGATION
Automatic Drip Irrigation for Greenhouse Tomato Production in West Texas,
W75-09448 3F

AUTOMATIC PICTURE TRANSMISSION
Weather Satellite Picture Receiving Stations, APT Digital Scan Converter,
W75-09588 7B

AUTOMATION
Drip Irrigation and Automation Tools in Efficient Use of Water Policy,
W75-09426 3F

Automatic Drip Irrigation for Greenhouse Tomato Production in West Texas,
W75-09448 3F

Automation in a Water Quality Laboratory Scheme,
W75-09723 5A

AVERAGING ERRORS
Averaging Errors in Monthly Evaporation Estimates,
W75-09590 2D

AVOCADO
Water Use by Drip and Sprinkle Irrigated Avocados Related to Plant Cover, Evaporation and Air Temperature,
W75-09479 3F

The Relation Between Drip Irrigation, Phytophthora Root Rot of Avocado, and Fungicides,
W75-09512 2I

AVOCADOS
Monitoring Soil Salinity and Leaf Nutrient Levels in a Young Avocado Orchard Under Drip Irrigation,
W75-09482 3F

Drip Irrigation Experiment on Avocados,
W75-09499 3C

AVOIDANCE (FISH)
Avoidance of Fenitrothion by Goldfish (Carassius Auratus),
W75-09677 5C

BACTERIA
Chemical Treatment of Drip Irrigation Water,
W75-09457 3F

Pollution of Irrigation Waters by Plant Pathogenic Organisms,
W75-09521 5B

BACTERIOPHAGE
Biological Control of Sphaerotilus Natans and Related Species in Waste Waters,
W75-09520 5D

BALANCE OF NATURE
Deterioration of the Ecological Equilibrium in the Arid Zones of North Africa,
W75-09802 6G

BARLEY
Mix Gypsum in Shallow Depths--In Saline Soils,
W75-09786 3C

BARNACLES
DDT and the Rugophilic Response of Settling Barnacles Balanus Improvisus,
W75-09686 5C

BARRIER ISLANDS
Arctic Barrier Formation,
W75-09644 8A

BARRIERS
Arctic Barrier Formation,
W75-09644 8A

BATCH TREATMENT
Phosphorus Removal in Seasonal Retention Lagoons by Batch Chemical Precipitation,
W75-09563 5D

BEACH EROSION
Prevention and Mitigation of Shore Damages, Kahului Harbor, Maui, Hawaii (Final Environmental Impact Statement).
W75-09825 8A

BEACHES
Ediz Hook Beach Erosion Control, Port Angeles, Washington (Final Environmental Impact Statement).
W75-09815 8A

BEANS
For Rainfed Areas-Improved Velvet Beans for Increased Forage Production,
W75-09796 3F

**BEAVER CREEK WATERSHEDS (ARIZ)**
Forage Preferences of Trained Mule Deer on the Beaver Creek Watersheds,
W75-09793 3F

**BEDROCK**
Contour Map of the Bedrock Surface, Collinsville Quadrangle, Connecticut,
W75-09706 7C

**BELGIUM**
Survey of Experience with Drainage Materials and Review of Available Specifications,
W75-09629 8G

**BENCH CROP PRODUCTION**
Irrigation for Benches,
W75-09446 3F

**BENEFICIAL USE**
Agricultural Benefits and Environmental Changes Resulting from the Use of Digested Sludge on Field Crops,
W75-09409 5D

**BENTHIC FAUNA**
The Bottom Fauna of China Clay Waste Deposits in Mevagissey Bay,
W75-09673 5C

**BENTHOS**
Diversity of Marine Invertebrates in a Thermal Effluent,
W75-09809 5C

**BI-WALL TUBING**
Reverse Flushing Technique for Bi-Wall Drip Tubing,
W75-09455 8C

**BIBLIOGRAPHIES**
Water analysis,
W75-09372 5A

Secondary Impacts of Transportation and Wastewater Investments: Review and Bibliography,
W75-09576 5C

Mathematical Models in Hydrology,
W75-09624 2A

Index 1945-1966, Land and Water.
W75-09635 10C

Water for Agriculture, Annotated Bibliography, Author and Subject Index.
W75-09636 10C

Bibliography of U.S. Geological Survey Water-Resources Reports for Utah,
W75-09718 2A

**BIFURCATION PROCESS**
Initial Bifurcation Process in Natural Channel Networks,
W75-09609 8B

**BIOACCUMULATION**
Uptake, Metabolism and Distribution of DDT in Organs of the Blue Crab, Callinectes Sapidus,
W75-09691 5C

The Accumulation of Fluoride by Marine and Intertidal Animals,
W75-09697 5C

Differential Uptake of Endosulfan by the Tissues of Mytilus Edulis,
W75-09810 5A

**BIOASSAY**
Biological Assay of Fresh Waters by a New Method, Dielectrophoresis,
W75-09531 5A

An Inexpensive Macroinvertebrate Bioassay Table for Use in Continuous-Flow Toxicity Tests,
W75-09676 5A

Avoidance of Fenitrothion by Goldfish (Carassius Auratus),
W75-09677 5C

Pond Snail Eggs as an Indicatory Material for Water Pollution Bioassay: Preliminary Experiments, (In Japanese),
W75-09682 5C

Use of Sodium Pentachlorophenate and Dehydroabietic Acid as Reference Toxicants for Salmonid Bioassays,
W75-09683 5C

Acute Toxicity of Nitrite to Rainbow Trout (Salmo Gairdneri),
W75-09687 5C

The Effects of Lapsed Time Since Feeding Upon the Toxicity of Zinc to Fish,
W75-09688 5C

Uptake, Metabolism and Distribution of DDT in Organs of the Blue Crab, Callinectes Sapidus,
W75-09691 5C

The Accumulation of Fluoride by Marine and Intertidal Animals,
W75-09697 5C

Effects of Thiourea Treatment on Sexually Maturing and Gonadectomized Male Sockeye Salmon (Oncorhynchus Nerka),
W75-09699 5C

Behavior of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Sumithion (Fenitrothion), An Organophosphate Insecticide,
W75-09700 5C

Evaluation of Sample Preparation Techniques for Algal Bioassays,
W75-09734 5A

Pick up and Metabolism of DDT, Dieldrin and Photodieldrin by a Freshwater Alga (Ankistrodesmus Amalloides) and a Microcrustacean (Daphnta Pulex),
W75-09805 5C

Loss of Five Pesticides from Cultures of Twentyone Planktonic Algae,
W75-09808 5A

Differential Uptake of Endosulfan by the Tissues of Mytilus Edulis,
W75-09810 5A

**BIOASSAYS**
Effect of Zinc on Growth of the Minnow Phoxinus Phoxinus,
W75-09693 5C

**BIOCHEMICAL HYDROLYSIS**
The Qualitative and Quantitative Determination of Soluble and Insoluble Forms of Phosphorus in Sewage Treatment Plants,
W75-09618 5D

**BIOCHEMICAL OXYGEN DEMAND**
Possibilities for Reducing 5-Day BOD-Consu
ing Materials in Steam Condensates from Sp
Sulfite Liquor Evaporation (Moeglichkeiten
Reduktion der BSB(5)-verbrauchenden Sto
in Brundenkondensaten aus Sulfitablaugen
dampfungen),
W75-09360

BOD as a Pollution Indicator (La DBO co
indicador de la polucion),
W75-09368

Process for the Reduction of the Biochem
Oxygen Demand of Sewage and for
Recovery of the Inherent Protein,
W75-09566

Automatic U.V.-Control System for Relat
Evaluation of Organic Water Pollution,
W75-09735

Deoxygenation in Natural Streams,
W75-09767

**BIOCONTROL**
Biological Control of Sphaerotilus Natans
Related Species in Waste Waters,
W75-09520

**BIODEGRADATION**
Method and Apparatus for Aeration
Biodegradable Waste Material,
W75-09647

**BIOINDICATORS**
Comparative Ecology of Western Streams,
W75-09617

Pond Snail Eggs as an Indicatory Material
Water Pollution Bioassay: Preliminary Exp
ments, (In Japanese),
W75-09682

**BIOLOGICAL AERATED FILTERS**
Biological Aerated Filters,
W75-09572

**BIOLOGICAL COMMUNITIES**
Aquatic Insect Communities of the Ten
River, Their Composition, Biotic Index
Seasonal Change, (In Japanese),
W75-09807

Diversity of Marine Invertebrates in a Therm
Effluent,
W75-09809

**BIOLOGICAL FOULING**
Effect of Power Plant Chlorination
Estuarine Productivity,
W75-09684

**BIOLOGICAL TREATMENT**
Biological Treatment of Spent Bisulfite Liq
(Traitement biologique de la liqueur residu
au bisulfite),
W75-09355

Wastewater Treatment System,
W75-09567

**BIOMASS**
Effects of Kokanee Salmon (Oncorhync
Nerka) Decomposition on the Ecology of a
balpine Stream,
W75-09672

**BIOPHYSICAL CONTROL**
Biophysical Control of Water Loss,
W75-09523

BIORHYTHMS
Transpiration Rates of Conifers,
W75-09784 2D

Aquatic Insect Communities of the Tenryu River, Their Composition, Biotic Index and Seasonal Change, (In Japanese),
W75-09807 5C

BIOTIC INDEX
Aquatic Insect Communities of the Tenryu River, Their Composition, Biotic Index and Seasonal Change, (In Japanese),
W75-09807 5C

BLOOD CHEMISTRY
Changes in Blood Chemistry of Juvenile Steelhead Trout, Salmo Gairdneri, Following Sublethal Exposure to Nitrogen Supersaturation,
W75-09694 5C

BOATING
Proposed Navigational Maintenance Dredging Project at Guilford Harbor, Guilford, Connecticut (Final Environmental Impact Statement).
W75-09821 8A

BOATING REGULATIONS
People v. McCarthy (Criminal Action for Operating Unregistered Boat on Navigable Waters of Privately Owned Marina).
W75-09830 6E

BOATS
People v. McCarthy (Criminal Action for Operating Unregistered Boat on Navigable Waters of Privately Owned Marina).
W75-09830 6E

BOD REMOVAL
Packed-Bed Reactors for Secondary Effluent BOD and Ammonia Removal,
W75-09379 5D

BRANCH RIVER BASIN (RI)
Availability of Ground Water in the Branch River Basin, Providence County, Rhode Island,
W75-09721 2F

BRANDING TECHNIQUES (FISH)
Branding Chinook, Coho and Sockeye Salmon Fry with Hot and Cold Metal Tools,
W75-09561 7B

BRAZIL
The Implementation of a Hydrologic Data Processing System in Brazil,
W75-09726 7C

BREAKWATERS
Arctic Barrier Formation,
W75-09644 8A

Prevention and Mitigation of Shore Damages, Kahului Harbor, Maui, Hawaii (Final Environmental Impact Statement).
W75-09825 8A

BURNING
Drought in the Ghana Savannah: A Report to the U.S. Aid Mission to Ghana,
W75-09795 6G

BUSHLEY BAYOU (LA)
Bushley Bayou, Louisana (Final Environmental Impact Statement).
W75-09819 8D

CABBAGE
Trickle Irrigation Management for Cotton and Cabbage,
W75-09480 3F

CADMIUM
Deposition of Zinc and Cadmium by Marine Bacteria in Estuarine Sediments,
W75-09692 5C

CALCIUM
Effect of Root Temperature and Humidity on the Distribution of Ca in Apple and Sunflower Seedlings,
W75-09351 2I

CALICHE
Influence of Surface and Near-Surface Caliche Distribution on Infiltration Characteristics, Las Vegas, Nevada,
W75-09374 2J

CALIFORNIA
Ocean Waste Disposal Practices in Metropolitan Areas of California,
W75-09391 3D

Water, Sewerage and Flood Control Systems Plan and Implementation Program 1973-74.
W75-09400 6D

Evaporation from Water Surfaces in California,
W75-09586 2D

Research Needs for Water Resources Control in California.
W75-09587 5G

Channel Responses to Artificial Stream Capture, Death Valley, California,
W75-09610 2J

Geologic and Hydrologic Features of Indian Wells Valley, California,
W75-09717 2F

Data from a 1,000-Foot (305-Metre) Core Hole in the Long Valley Caldera, Mono County, California,
W75-09728 7C

CAMBODIA
Chemical Transport by the Mekong River,
W75-09603 5B

CANADA
Phosphorus Removal Demonstration Studies at C.F.B. Trenton,
W75-09416 5D

Edaphic Micro-Tubular Continuous Flow Irrigation in Canada,
W75-09436 2G

Phosphorus Removal Study at the Sarnia WPCP,
W75-09562 5D

Phosphorus Removal in Seasonal Retention Lagoons by Batch Chemical Precipitation,
W75-09563 5D

Identification of Problem Areas in Water Pollution Control Plants,
W75-09564 5D

Sediment Yields from Intermediate-Sized Stream Basins in Southern Alberta,
W75-09750 2J

Huronian Glaciation and Polar Wander from the Gowganda Formation, Ontario,
W75-09763 2C

Hydrogeology of the Waterways-Winefred Lake Area, Alberta,
W75-09769 2F

International Law and Canadian Arctic Pollution Control,
W75-09846 5G

CANALS
Pesticides in Fish from a Hawaiian Canal,
W75-09806 5A

Bushley Bayou, Louisana (Final Environmental Impact Statement).
W75-09819 8D

Johnson v. State Farm Fire and Casualty Co. (Action for Death by Drowning in Artificial Canal Which Was Found to Be Not Navigable).
W75-09829 6E

National Audobon Society v. White (Suit to Enjoin Trespass on Privately Owned and Maintained Navigable Canal).
W75-09839 6E

CANTALOUPE
Cantaloupe Response to Drip Irrigation,
W75-09505 3F

CAPILLARY ACTION
Evaluation and Demonstration of the Capillary Suction Sludge Dewatering Device,
W75-09399 5D

CARASSIUS AURATUS
The Effects of Lapsed Time Since Feeding Upon the Toxicity of Zinc to Fish,
W75-09688 5C

CARBARYL
Loss of Five Pesticides from Cultures of Twentyone Planktonic Algae,
W75-09808 5A

CARBON
Carbon from Lignite or Coal: Which is Better,
W75-09733 5D

CARRYING CAPACITY
The Ecological Management of Arid and Semi-Arid Rangelands in Africa and the Near East: An International Programme.
W75-09791 6G

CATALYSTS
Catalytic Oxidation of Phenol in Aqueous Solution Over Copper Oxide,
W75-09772 5D

CATALYTIC OXIDATION
Catalytic Oxidation of Phenol in Aqueous Solution Over Copper Oxide,
W75-09772 5D

CATIONS
Treatment and Safe Disposal of Cationic Coating Colors,
W75-09352 5D

CEDAR BLUFF AREA (KANS)
Changes in Chemical Quality of Water, Cedar Bluff Irrigation District Area, West-Central Kansas,
W75-09719 5B

CELLULOSE ACETATE
Development of Porous Polyvinyl Chloride Coated Tubulets for Seawater Desalination,
W75-09373 3A

CENTRIFUGATION
Use of Centrifuges for Purification of Effluents (Primenenie tsentrifug dlya ochistki stochnykh vod),
W75-09358 5D

CERTIFICATION
A Guide for State Certification of Wastewater Facilities Personnel,
W75-09389 5D

CHANNEL ADJUSTMENTS
Channel Responses to Artificial Stream Capture, Death Valley, California,
W75-09610 2J

CHANNEL EROSION
Channel Responses to Artificial Stream Capture, Death Valley, California,
W75-09610 2J

CHANNEL GEOMETRY
Initial Bifurcation Process in Natural Channel Networks,
W75-09609 8B

CHANNEL IMPROVEMENT
Man-Induced Changes of Middle Mississippi River,
W75-09754 4A

Proposed Maintenance Dredging of the Channel from U.S. Coast Guard Santa Rosa Station Moorings to Navigable Watershed in Pensacola Bay (Final Environmental Impact Statement).
W75-09824 8A

CHANNEL MORPHOLOGY
Initial Bifurcation Process in Natural Channel Networks,
W75-09609 8B

Channel Responses to Artificial Stream Capture, Death Valley, California,
W75-09610 2J

CHANNELS
Detailed Project Report for Local Flood Protection, Zacate Creek, Laredo, Texas (Final Environmental Impact Statement).
W75-09813 4A

CHARLES RIVER (MASS)
Charles River Dam, Boston, Mass (Final Environmental Impact Statement).
W75-09816 8D

CHEMICAL ANALYSIS
Changes in Blood Chemistry of Juvenile Steelhead Trout, Salmo Gairdneri, Following Sublethal Exposure to Nitrogen Supersaturation,
W75-09694 5C

Changes in Chemical Quality of Water, Cedar Bluff Irrigation District Area, West-Central Kansas,
W75-09719 5B

Automation in a Water Quality Laboratory Scheme,
W75-09723 5A

CHEMICAL INDUSTRY
State-of-the-Art for the Inorganic Chemicals Industry: Commercial Explosives,
W75-09581 5B

CHEMICAL PRECIPITATION
Flow-Associated Precipitation Reactions in Saline-Sodic Soils and Their Significance,
W75-09792 2G

CHEMICAL REACTIONS
The Role of Polyelectrolytes in Filtration Processes,
W75-09394 5D

Process for Treating Waste Water,
W75-09656 5D

Catalytic Oxidation of Phenol in Aqueous Solution Over Copper Oxide,
W75-09772 5D

CHEMICAL TREATMENT
Optimum Conditions for Chemical Purification of Effluents (Optimal'nye usloviya khimicheskoi ochistki stochnykh vod),
W75-09359 5D

Ferric Chlorine or Lime for Chemical Treatment,
W75-09380 5D

Chemical Treatment of Drip Irrigation Water,
W75-09457 3F

Water Treatment Plant,
W75-09645 5D

CHEMICAL WASTES
Volume Extraction of Chemically Contaminated Water,
W75-09419 5D

Process for Effluent Water Recovery,
W75-09648 5D

CHICAGO (ILL)
Anaerobic Digester Operation at the Metropolitan Sanitary Districts of Greater Chicago,
W75-09536 5D

CHINA CLAY WASTE
The Bottom Fauna of China Clay Waste Deposits in Mevagissey Bay,
W75-09673 5C

CHINOOK SALMON
Branding Chinook, Coho and Sockeye Salmon Fry with Hot and Cold Metal Tools,
W75-09561 7B

CHLORIDES
Determination of Chloride in Water with a HgS/Hg2Cl2 Electrode,
W75-09361 5A

CHLORINATED HYDROCARBON PESTICIDES
Effect of DDT on Discriminating Ability of Rainbow Trout (Salmo Gairdneri),
W75-09674 5C

DDT Residues in Euphausiids in the Upper Estuary of the Gulf of St. Lawrence,
W75-09690 5C

Uptake, Metabolism and Distribution of DDT in Organs of the Blue Crab, Callinectes Sapidus,
W75-09691 5C

CHLORINATION
Physical-Chemical Nitrogen Removal, Wastewater Treatment.
W75-09384 5D

Effect of Power Plant Chlorination on Estuarine Productivity,
W75-09684 5C

Sound Waves and Ozone Sterilize Wastewater.
W75-09779 5D

Alternative Methods of Disinfection: How Effective,
W75-09780 5D

CHUM SALMON
The Effect of Basic Cuprous Carbonate o
State of the Liver in Juvenile Amur A
Chum (Oncorhynchus keta infrasp. a
nalis),
W75-09668

CIRCULAR PIERS
Wave Force Coefficients for Circular Pier
W75-09593

CITRUS FRUITS
Drip Irrigation on Citrus,
W75-09432

CLAY PIPES
Survey of Experience with Drainage Mat
and Review of Available Specifications,
W75-09629

Study of Experiences with Drainage Mat
and a Review of Specifications Availab
France,
W75-09630

Experiences with Drainage Materials a
Review of Available Specifications,
W75-09631

A Survey of Experiences with Drainage M
als and a Review of Available Specificatio
W75-09632

Drainage Materials - Provisional Report o
Experience Gained in the Netherlands,
W75-09633

Survey of Experiences with Drainage Mat
and Review of Available Specifications,
W75-09634

CLAYS
Recycling a Solid Waste from a Paper Pla
Separation of Wood Fiber from Clay by
ferential Flocculation,
W75-09354

A Wind Tunnel Investigation on Ice Multip
tion by Freezing of Waterdrops Falling at
minal Velocity in Air,
W75-09613

CLEAR-CUTTING
Effects of Logging on Water Temperature
Dissolved Oxygen in Spawning Beds,
W75-09685

CLIMATIC DATA
The Ecological Management of Arid and S
Arid Rangelands in Africa and the Near E
An International Programme.
W75-09791

CLIMATOLOGY
Averaging Errors in Monthly Evaporation I
mates,
W75-09590

Geographic Variation of the Statistical Para
ters of Hydrometeorological Data of the Un
States,
W75-09605

Drought, A Recurrent Element of Climate,
W75-09799

CLOGGING
Some Results of a Field Survey of Drip Irr
tion Systems in the Republic of South Afric
W75-09433

Formation of Blockages in Drip Irriga
Systems: Their Prevention and Removal,
W75-09454

Reverse Flushing Technique for Bi-Wall Drip Tubing,
W75-09455 8C

Clogging of Drip Systems from Metabolic Products of Iron and Sulfur Bacteria,
W75-09456 5B

**CLOUD COVER**
Weather Satellite Picture Receiving Stations, APT Digital Scan Converter,
W75-09588 7B

**COAGULATION**
Drip Irrigations Inherent Requisite - Water Quality,
W75-09435 5D

Water Treatment Apparatus,
W75-09646 5D

**COAL MINE WASTES**
Water-Resources Investigations in the Fort Union Coal Region, North Dakota, 1974-75.
W75-09715 5B

**COAL MINES**
A Case Study of Mine Water Quality Deterioration, Mainsforth Colliery, County Durham,
W75-09752 5B

**COALESCENCE**
The Evolution of Drop Spectra Due to Condensation, Coalescence and Breakup,
W75-09597 2B

**COALS**
Carbon from Lignite or Coal: Which is Better,
W75-09733 5D

**COASTAL ENGINEERING**
Computation of Wave Heights Due to Refraction and Friction,
W75-09606 8B

Computation of Flow Through Masonboro Inlet, N.C.,
W75-09608 2L

Friction Factor Under Oscillatory Waves,
W75-09755 8B

**COASTAL STRUCTURES**
Offshore Development and Marine Pollution,
W75-09842 5B

**COASTAL WATERS**
Towards a New Regime for Ocean Development,
W75-09843 6E

**COASTS**
Wind and Wave Relationships in U.K. Coastal Waters,
W75-09737 2L

A Study of the Surface Fluid Flow Characteristics of the New York Bight and the Development of Research Data Display Techniques,
W75-09783 5B

**COHO SALMON**
Branding Chinook, Coho and Sockeye Salmon Fry with Hot and Cold Metal Tools,
W75-09561 7B

Effects of Logging on Water Temperature and Dissolved Oxygen in Spawning Beds,
W75-09685 5C

Behavior of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Sumithion (Fenitrothion), An Organophosphate Insecticide,
W75-09700 5C

**COLLISIONS**
The Microwave Emission Spectum from Sparking Water Drops,
W75-09614 2B

**COLORADO**
Effects of Metal-Mine Drainage on Water Quality in Selected Areas of Colorado, 1972-73,
W75-09712 5C

**COLORADO RIVER**
Arizona's Remote Subdivisions: An Inventory,
W75-09583 6G

**COMBINED SEWERS**
Storm Water Management Model: User's Manual, Version II,
W75-09579 5D

Countermeasures for Pollution from Overflows; the State of the Art,
W75-09580 5D

**COMMERCIAL FISHING**
Towards a New Regime for Ocean Development,
W75-09843 6E

**COMMERCIAL SHELLFISH**
Differentiation Between Natural Hydrocarbons and Low Level Diesel Oil Contamination in Cooked Lobster Meat,
W75-09698 5A

**COMPOSITE MEMBRANES**
Development of Porous Polyvinyl Chloride Coated Tubulets for Seawater Desalination,
W75-09373 3A

**COMPOSTING**
Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management.
W75-09532 5D

Composting Sewage Sludge,
W75-09546 5D

Sludge Handling and Disposal at Blue Plains,
W75-09553 5D

**COMPREHENSIVE PLANNING**
Water, Sewerage and Flood Control Systems Plan and Implementation Program 1973-74.
W75-09400 6D

Water for Energy Self-Sufficiency.
W75-09626 6B

Water for Energy Self-Sufficiency, Executive Summary.
W75-09627 4C

**COMPUTER MODEL**
Control Schemes for the Activated-Sludge Process,
W75-09395 5D

**COMPUTER MODELS**
An Evaluation of Water Reuse for Municipal Supply,
W75-09408 5D

Dynamic Programming Optimization: A Water Distribution System Design,
W75-09525 7C

Water Quality Effect of Diking a Shallow Arid-Region Lake,
W75-09577 5B

Goundwater Models,
W75-09582 2F

Mathematical Models in Hydrology,
W75-09624 2A

**COMPUTER PROGRAMS**
Dynamic Programming Optimization: A Water Distribution System Design,
W75-09525 7C

Information Exchange on Water Resources Computer Programs,
W75-09591 7C

Modifications to the Executive Computer Program for Steady-State Simulation of Wastewater Treatment Facilities,
W75-09775 5D

**CONCRETE DAMS**
Charles River Dam, Boston, Mass (Final Environmental Impact Statement).
W75-09816 8D

**CONDENSATION**
The Evolution of Drop Spectra Due to Condensation, Coalescence and Breakup,
W75-09597 2B

**CONIFERS**
Transpiration Rates of Conifers,
W75-09784 2D

**CONJUNCTIVE USE**
An Optimal Water Quality Management Technique for Conjunctive Ground and Surface Water Use,
W75-09378 5G

**CONNECTICUT**
Map Showing Drainage Areas, Marlborough Quadrangle, Connecticut,
W75-09704 7C

Map Showing Drainage Areas, West Springfield Quadrangle, Massachusetts-Connecticut,
W75-09705 7C

Contour Map of the Bedrock Surface, Collinsville Quadrangle, Connecticut,
W75-09706 7C

Proposed Navigational Maintenance Dredging Project at Guilford Harbor, Guilford, Connecticut (Final Environmental Impact Statement).
W75-09821 8A

**CONSERVATION**
Influence of the Energy Crisis Upon the Future of Environmental Policy,
W75-09847 6E

**CONSOLIDATION**
Water Escape Structures in Coarse-Grained Sediments,
W75-09768 2J

**CONSTITUTIONAL LAW**
Conservation Council of North Carolina v. Costanzo (Action to Enjoin Construction of a Marina on Island in Atlantic Ocean and to Require Environmental Impact Statement by Corps of Engineers).
W75-09840 6E

**CONSTRUCTION EQUIPMENT**
Study of Experiences with Drainage Materials and a Review of Specifications Available in France,
W75-09630 8G

CONSUMPTIVE USE
Water Use by Drip and Sprinkle Irrigated Avocados Related to Plant Cover, Evaporation and Air Temperature,
W75-09479 3F

Trickle Irrigation Management for Cotton and Cabbage,
W75-09480 3F

CONTAINER GROWING
Irrigation for Container Growing,
W75-09447 3F

CONTIGUOUS ZONE
Union Camp Corp. v. Seminole Forest Water Management District (Suit by Single Landowner to Require Formation of a Drainage District).
W75-09828 6E

CONTINENTAL SHELF
Towards a New Regime for Ocean Development,
W75-09843 6E

COOKED LOBSTER
Differentiation Between Natural Hydrocarbons and Low Level Diesel Oil Contamination in Cooked Lobster Meat,
W75-09698 5A

COOLING WATER
Effect of Power Plant Chlorination on Estuarine Productivity,
W75-09684 5C

Makeup Requirements for Cooling Ponds,
W75-09760 5G

COPPER COMPOUNDS
The Effect of Basic Cuprous Carbonate on the State of the Liver in Juvenile Amur Autumn Chum (Oncorhynchus keta infrasp. autumnalis),
W75-09668 5C

CORE DRILLING
Data from a 1,000-Foot (305-Metre) Core Hole in the Long Valley Caldera, Mono County, California,
W75-09728 7C

CORE LOGGING
Data from a 1,000-Foot (305-Metre) Core Hole in the Long Valley Caldera, Mono County, California,
W75-09728 7C

CORN (FIELD)
Biophysical Control of Water Loss,
W75-09523 3F

CORRELATION ANALYSIS
Distribution and Dynamics of Aquatic Insects in the Elk Creek Experimental Watershed, Lubrecht Forest, Montana,
W75-09528 5C

CORRUGATED DRAIN TUBING
Corrugated Plastic Drain Tubing Used as Underground Conduit,
W75-09611 8B

COST ANALYSIS
Evaluation of Municipal Sewage Treatment Alternatives.
W75-09404 5D

Economic Analysis of the Processing and Disposal of Refuse Sludges,
W75-09406 5D

Traveling Trickle System,
W75-09452 3F

Urban Runoff Pollution Control--State-of-the-Art,
W75-09762 5D

COST-BENEFIT ANALYSIS
Marine Oil Spills: A Problem in Environmental Management,
W75-09849 5G

COST COMPARISONS
Evaluation of Municipal Sewage Treatment Alternatives.
W75-09404 5D

COST EFFECTIVENESS
Thickening of Sludges,
W75-09535 5D

COSTS
Economics and Finance of Nevada Public Water Systems,
W75-09375 6B

Technological and Economic Effects of the Change of the Preliminary Purification Time on Sludge Treatment (Technologische und Oekonomische Auswirkungen der Veraenderung der Vorklaerzeit auf die Schlammbehandlung),
W75-09421 5D

The Economics of Sludge Irrigation,
W75-09545 5D

COTTON
See Germination Response to Subsurface Irrigation Depth,
W75-09451 2I

Trickle Irrigation Management for Cotton and Cabbage,
W75-09480 3F

CRABS
Uptake, Metabolism and Distribution of DDT in Organs of the Blue Crab, Callinectes Sapidus,
W75-09691 5C

CRITICAL SHEAR STRESS
Pore and Eroding Fluid Influences on Surface Erosion of Soil,
W75-09741 2J

CROP PRODUCTION
Drip Irrigation Research in Oregon - A Progress Report,
W75-09428 3F

Automatic Drip Irrigation for Greenhouse Tomato Production in West Texas,
W75-09448 3F

Moisture Profiles and Salinization of Soils Under Drip Irrigation in the Republic of South Africa,
W75-09464 3C

A Study on Different Application Procedures of Drip Irrigation in Tomato Cultivation,
W75-09511 3F

Mix Gypsum in Shallow Depths--In Saline Soils,
W75-09786 3C

Hungry Drylands of Western Rajasthan Need a New Technology,
W75-09789 3F

In Salt-Affected Soils Mulching Aids in G
Growth,
W75-09798

CROP PRODUCTIVITY
Drip Irrigation Experiment on Avocados,
W75-09499

CROP RESPONSE
Drip Irrigation Design Criteria for Tree C
in Florida and Other Humid Regions,
W75-09427

Vegetable Production and Water-Use Effic
cy as Influenced by Drip, Sprinkler, Sub
face, and Furrow Irrigation Methods,
W75-09438

High-Frequency Porous Tube Irrigation
Water-Nutrient Management in Humid
gions,
W75-09449

An Explanation for the Growth Advantag
Drip Irrigation,
W75-09465

Drip and Furrow Irrigation Studies on Su
cane,
W75-09476

Effects of Localized Phosphate Treatments
Solution pH on the Growth and Functio
Apple Roots,
W75-09488

Influence of Different Amounts of Irrigati
Water, Irrigation--Intervals and Fertilizers
the Yield and Quantity of Drip-Irrigated M
and Watermelons,
W75-09494

Drip Irrigation Experiment on Avocados,
W75-09499

Trickle Irrigation on Young Peach Trees,
W75-09501

Drip Irrigation in Citrus Orchards,
W75-09502

Tree and Crop Response to Drip Irrigation,
W75-09504

Cantaloupe Response to Drip Irrigation,
W75-09505

Spring Cucumber Drip vs. Furrow Irrigation
W75-09507

The Irrigation of Olives by Drip and Other
rigation Methods,
W75-09508

Performance of Plants with Drip Irrigation,
W75-09509

Trickle Irrigation Management for Grapes,
W75-09510

A Study on Different Application Procedu
of Drip Irrigation in Tomato Cultivation,
W75-09511

Response of Mature Citrus Trees on D
Sandy Soil to Drip Irrigation,
W75-09514

CRUSTACEANS
DDT and the Rugophilic Response of Settl
Barnacles Balanus Improvisus,
W75-09686

The Effect of Concentration of Suspension and Inert Material on the Assimilation of Algae by Three Bivalves,
W75-09695 5C

UCUMBERS
Spring Cucumber Drip vs. Furrow Irrigation,
W75-09507 3F

UPROUS CARBONATE
The Effect of Basic Cuprous Carbonate on the State of the Liver in Juvenile Amur Autumn Chum (Oncorhynchus keta infrasp. autumnalis),
W75-09668 5C

YCLING NUTRIENTS
Effects of Kokanee Salmon (Oncorhynchus Nerka) Decomposition on the Ecology of a Subalpine Stream,
W75-09672 5C

YPRIDS
DDT and the Rugophilic Response of Settling Barnacles Balanus Improvisus,
W75-09686 5C

YPRINIDS
The Effect of Different Oxygen Conditions During Incubation on the Survival and Some of the Developmental Characteristics of the 'Verkhova' (Leucaspius Delineatus) in the Embryonic Period,
W75-09670 5C

MS
Charles River Dam, Boston, Mass (Final Environmental Impact Statement).
W75-09816 8D

tchison, Topeka and Santa Fe Ry. Co. v. Calway (Action by Railroad, Environmentalists nd Others to Halt Reconstruction of Lock and am on Upper Mississippi River Navigation ystem by Defendant Corps of Engineers).
W75-09826 8A

PHNIA
ck up and Metabolism of DDT, Dieldrin and notodieldrin by a Freshwater Alga Ankistrodesmus Amalloides) and a icrocrustacean (Daphnta Pulex),
75-09805 5C

TA ACQUISITION SYSTEMS
gital Instrumentation and Telemetry for ater Resources Research,
75-09529 7B

A ANALYSIS
Study of the Surface Fluid Flow Characristics of the New York Bight and the velopment of Research Data Display chniques,
75-09783 5B

A COLLECTIONS
gital Instrumentation and Telemetry for ter Resources Research,
5-09529 7B

vironmental Geology of an Area in Westntral Alabama,
5-09615 7C

as of River Basins of the United States.
5-09616 7C

mperatures of Streams and Selected Reserrs in Pennsylvania,
5-09713 7C

Data from a 1,000-Foot (305-Metre) Core Hole in the Long Valley Caldera, Mono County, California,
W75-09728 7C

Water-Resources Data for Skagway, Alaska,
W75-09729 7C

The Prediction of Lake Huron Lake-Effect Snowfall Systems,
W75-09748 2C

A Study of the Surface Fluid Flow Characteristics of the New York Bight and the Development of Research Data Display Techniques,
W75-09783 5B

DATA PROCESSING
The Implementation of a Hydrologic Data Processing System in Brazil,
W75-09726 7C

A Study of the Surface Fluid Flow Characteristics of the New York Bight and the Development of Research Data Display Techniques,
W75-09783 5B

DATA STORAGE AND RETRIEVAL
The Implementation of a Hydrologic Data Processing System in Brazil,
W75-09726 7C

DDD
Pick up and Metabolism of DDT, Dieldrin and Photodieldrin by a Freshwater Alga (Ankistrodesmus Amalloides) and a Microcrustacean (Daphnta Pulex),
W75-09805 5C

Pesticides in Fish from a Hawaiian Canal,
W75-09806 5A

DDE
Organochlorine Residue Levels in Arctic Ringed Seals: Variation with Age and Sex,
W75-09702 5C

Pesticides in Fish from a Hawaiian Canal,
W75-09806 5A

DDT
Effect of DDT on Discriminating Ability of Rainbow Trout (Salmo Gairdneri),
W75-09674 5C

Effect of Temperature on Accumulation of Methylmercuric Chloride and p,p' DDT by Rainbow Trout (Salmo Gairdneri),
W75-09681 5C

DDT and the Rugophilic Response of Settling Barnacles Balanus Improvisus,
W75-09686 5C

DDT Residues in Euphausiids in the Upper Estuary of the Gulf of St. Lawrence,
W75-09690 5C

Uptake, Metabolism and Distribution of DDT in Organs of the Blue Crab, Callinectes Sapidus,
W75-09691 5C

Organochlorine Residue Levels in Arctic Ringed Seals: Variation with Age and Sex,
W75-09702 5C

Pick up and Metabolism of DDT, Dieldrin and Photodieldrin by a Freshwater Alga (Ankistrodesmus Amalloides) and a Microcrustacean (Daphnta Pulex),
W75-09805 5C

Pesticides in Fish from a Hawaiian Canal,
W75-09806 5A

DECOMPOSING ORGANIC MATTER
Effects of Kokanee Salmon (Oncorhynchus Nerka) Decomposition on the Ecology of a Subalpine Stream,
W75-09672 5C

DEER
Forage Preferences of Trained Mule Deer on the Beaver Creek Watersheds,
W75-09793 3F

DEHYDROABIETIC ACID
Use of Sodium Pentachlorophenate and Dehydroabietic Acid as Reference Toxicants for Salmonid Bioassays,
W75-09683 5C

DELAWARE RIVER BASIN COMMISSION
Borough of Morrisville v. Delaware River Basin Comm'n. (Ruling on Motion to Dismiss Action by Communities Dependent on Delaware River Basin Comm'n. Which Action Was Founded on a NEPA Complaint).
W75-09827 6E

DEMONSTRATION FARMS
Water Requirements and Limitations Imposed on Agricultural Development in Northern Ghana,
W75-09800 3F

India Case Study on Improving Productivity in Low Rainfall Areas.
W75-09803 3F

DENITRIFICATION
Nitrification and Denitrification Facilities, Wastewater Treatment.
W75-09382 5D

DENVER (COLO)
Metro Denver's Experience with Large Scale Aerobic Digestion of Waste Activated Sludge,
W75-09537 5D

DEOXYGENATION
Deoxygenation in Natural Streams,
W75-09767 5B

DESALINATION
Development of Porous Polyvinyl Chloride Coated Tubulets for Seawater Desalination,
W75-09373 3A

System for Thermal Desalting of Water,
W75-09653 3A

Multi-Effect Flash Evaporator,
W75-09663 3A

Operating Results of Electrodialysis and Reverse Osmosis Municipal Desalting Plants,
W75-09732 5D

DESALINATION APPARATUS
Solar Still with Replaceable Solar Absorbing Liner and Weight Controlled Feed Inlet,
W75-09643 3A

System for Thermal Desalting of Water,
W75-09653 3A

Reverse Osmosis Apparatus,
W75-09661 3A

Multi-Effect Flash Evaporator,
W75-09663 3A

DESALINATION PROCESSES
Desalination Process,
W75-09654 3A

DESERTIFICATION
Deterioration of the Ecological Equilibrium in the Arid Zones of North Africa,
W75-09802 6G

DESERTS
An Investigation into the Potential Uses of Trickle Irrigation for Desert Reclamation and Fodder Production in the Emirate of Abu Dhabi,
W75-09487 4A

DESIGN
Improving the Design of Practical Field Drainage,
W75-09595 4A

An Inexpensive Macroinvertebrate Bioassay Table for Use in Continuous-Flow Toxicity Tests,
W75-09676 5A

DESIGN CRITERIA
Wastewater Filtration, Design Considerations.
W75-09383 5D

Physical-Chemical Wastewater Treatment Plant Design.
W75-09385 5D

Upgrading Lagoons.
W75-09386 5D

Oxygen Activated Sludge Wastewater Treatment Systems, Design Criteria and Operating Experience.
W75-09387 5D

Sewage Treatment Plant Dependability with Special Reference to the Activated Sludge Process,
W75-09393 5D

Chamber Method for Drip Irrigation System Design and Installation Procedure,
W75-09441 8C

Design Charts for Drip Irrigation Systems,
W75-09472 8C

Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability, Supplement to Federal Guidelines for Design, Operation, and Maintenance of Waste Water Treatment Facilities.
W75-09559 8C

DESIGN FLOW
Design Charts for Drip Irrigation Systems,
W75-09472 8C

DETERGENTS
Reduction in Surfactants by Irradiation,
W75-09418 5D

DEWATERING
Use of Centrifuges for Purification of Effluents (Primenenie tsentrifug dlya ochistki stochnykh vod),
W75-09358 5D

Evaluation and Demonstration of the Capillary Suction Sludge Dewatering Device,
W75-09399 5D

Filter-Pressing Wastewater Sludge.
W75-09420 5D

Sludge Dewatering,
W75-09539 5D

Pressure Filtration--Municipal Wastewater Solids, Cedar Rapids, Iowa,
W75-09540 5D

Heat Treatment and Incineration,
W75-09541 5D

A Case Study of Mine Water Quality Deterioration, Mainsforth Colliery, County Durham,
W75-09752 5B

DIATOMS
Effects of PCB on Interspecific Competition in Natural and Gnotobiotic Phytoplankton Communities in Continuous and Batch Cultures,
W75-09680 5C

DIAZINON
Loss of Five Pesticides from Cultures of Twentyone Planktonic Algae,
W75-09808 5A

DIELDRIN
Pick up and Metabolism of DDT, Dieldrin and Photodieldrin by a Freshwater Alga (Ankistrodesmus Amalloides) and a Microcrustacean (Daphnta Pulex),
W75-09805 5C

Pesticides in Fish from a Hawaiian Canal,
W75-09806 5A

DIELECTROPHORESIS
Biological Assay of Fresh Waters by a New Method, Dielectrophoresis,
W75-09531 5A

DIETS
Mercury in Seals, Terrestial Carnivores and Principal Food Items of the Inuit, from Holman, N.W.T.,
W75-09679 5A

DIKES
Man-Induced Changes of Middle Mississippi River,
W75-09754 4A

DISCHARGE COEFFICIENT
On the Discharge Coefficient of Nozzles for Single- and Two-Phase Fluids,
W75-09739 8B

DISEASE RESISTANCE
The Relation Between Drip Irrigation, Phytophthora Root Rot of Avocado, and Fungicides,
W75-09512 2I

DISEASES
The Relation Between Drip Irrigation, Phytophthora Root Rot of Avocado, and Fungicides,
W75-09512 2I

DISINFECTION
Disinfection of Soil Strips Through the Drip Irrigation System,
W75-09444 5G

System for Purifying and Disinfecting Waste Water,
W75-09659 5D

Alternative Methods of Disinfection: How Effective,
W75-09780 5D

DISSOLVED OXYGEN
Hypolimnetic Oxygenation Using Liquid Oxygen,
W75-09589 5G

The Effect of Different Oxygen Conditions During Incubation on the Survival and Some of the Developmental Characteristics of the 'Verkhova' (Leucaspius Delineatus) in Embryonic Period,
W75-09670

A Comparative Study of the Tolerance of T Freshwater Planarians, Dugesia Tigrina a Polycelis Felina, To Low Oxygen Leve (Etude Comparative de la Tolerance a Basses Tensions D'Oxygene Chez De Planaires D'Eau Douce, Dugesia Tigrina Polycelis Felina),
W75-09675

Effects of Logging on Water Temperature a Dissolved Oxygen in Spawning Beds,
W75-09685

DISTRIBUTION
Influence of Surface and Near-Surface Calic Distribution on Infiltration Characteristics, L Vegas, Nevada,
W75-09374

DISTRIBUTION PATTERNS
Recent African Rainfall Patterns,
W75-09766

DISTRIBUTION SYSTEMS
Dynamic Programming Optimization: A Wat Distribution System Design,
W75-09525

DISTRICT OF COLUMBIA
Implementation of Water Supply and Wast water Programs in the Washington, D.C Metropolitan Area.
W75-09392

DIURNAL
An Explanation for the Growth Advantage Drip Irrigation,
W75-09465

DIVERSITY INDEX
Comparative Ecology of Western Streams,
W75-09617

Diversity of Marine Invertebrates in a Therm Effluent,
W75-09809

DOCUMENTATION
Index 1945-1966, Land and Water.
W75-09635

Water for Agriculture, Annotated Bibliography Author and Subject Index.
W75-09636

DOMESTIC WASTES
Oxygen Activated Sludge Wastewater Treat ment Systems, Design Criteria and Operatin Experience.
W75-09387

A Preliminary Assessment of Wet Systems fo Residential Refuse Collection,
W75-09405

Economic Analysis of the Processing and Disposal of Refuse Sludges,
W75-09406

Wet Systems for Residential Refuse Collection: A Case Study for Springfield, Massachusetts,
W75-09407

A Covered Domestic Lagoon System for Natural Ground Water Recharge Near Metropolitan Areas,
W75-09524 5D

**DOMESTIC WATER**
Comprehensive Survey of Magpie Creek, McClellan Air Force Base, California,
W75-09410 5D

**DOMINANT ORGANISMS**
Comparative Ecology of Western Streams,
W75-09617 5G

**DOUGLAS FIR TREES**
Transpiration Rates of Conifers,
W75-09784 2D

**DRAG**
Wave Force Coefficients for Circular Piers,
W75-09593 8B

**DRAINAGE**
Improving the Design of Practical Field Drainage,
W75-09595 4A

Drainage Materials.
W75-09628 8G

Study of Experiences with Drainage Materials and a Review of Specifications Available in France,
W75-09630 8G

Experiences with Drainage Materials and a Review of Available Specifications,
W75-09631 8G

A Survey of Experiences with Drainage Materials and a Review of Available Specifications,
W75-09632 8G

Drainage Materials - Provisional Report of the Experience Gained in the Netherlands,
W75-09633 8G

**DRAINAGE AREA**
Atlas of River Basins of the United States.
W75-09616 7C

Map Showing Drainage Areas, Marlborough Quadrangle, Connecticut,
W75-09704 7C

Map Showing Drainage Areas, West Springfield Quadrangle, Massachusetts-Connecticut,
W75-09705 7C

Map Showing Drainage Areas, Ludlow Quadrangle, Massachusetts,
W75-09707 7C

Map Showing Drainage Areas, Mount Tom Quadrangle, Massachusetts,
W75-09708 7C

**DRAINAGE DENSITY**
Stream Ordering and Contour Mapping,
W75-09745 4A

**DRAINAGE DISTRICTS**
Union Camp Corp. v. Seminole Forest Water Management District (Suit by Single Landowner to Require Formation of a Drainage District).
W75-09828 6E

**DRAINAGE ENGINEERING**
Drainage Materials.
W75-09628 8G

Survey of Experience with Drainage Materials and Review of Available Specifications,
W75-09629 8G

Study of Experiences with Drainage Materials and a Review of Specifications Available in France,
W75-09630 8G

Experiences with Drainage Materials and a Review of Available Specifications,
W75-09631 8G

A Survey of Experiences with Drainage Materials and a Review of Available Specifications,
W75-09632 8G

Drainage Materials - Provisional Report of the Experience Gained in the Netherlands,
W75-09633 8G

Survey of Experiences with Drainage Materials and Review of Available Specifications,
W75-09634 8G

**DRAINAGE MATERIALS**
Drainage Materials.
W75-09628 8G

Survey of Experience with Drainage Materials and Review of Available Specifications,
W75-09629 8G

Study of Experiences with Drainage Materials and a Review of Specifications Available in France,
W75-09630 8G

Experiences with Drainage Materials and a Review of Available Specifications,
W75-09631 8G

A Survey of Experiences with Drainage Materials and a Review of Available Specifications,
W75-09632 8G

Drainage Materials - Provisional Report of the Experience Gained in the Netherlands,
W75-09633 8G

Survey of Experiences with Drainage Materials and Review of Available Specifications,
W75-09634 8G

**DRAINAGE STRUCTURES**
An Investigation of Factors Affecting the Intensity of Water Use in the Lajas Valley Irrigation Project,
W75-09376 3F

**DRAINAGE SYSTEMS**
Corrugated Plastic Drain Tubing Used as Underground Conduit,
W75-09611 8B

**DRAINS**
Corrugated Plastic Drain Tubing Used as Underground Conduit,
W75-09611 8B

**DREDGING**
Silt Removal from a Lake Bottom.
W75-09575 5C

Proposed Navigational Maintenance Dredging Project at Guilford Harbor, Guilford, Connecticut (Final Environmental Impact Statement).
W75-09821 8A

Crude Oil and Natural Gas Production and Other Mining Operations in Navigable Waters Along the Louisiana Coast (Final Environmental Impact Statement).
W75-09823 5G

Proposed Maintenance Dredging of the Channel from U.S. Coast Guard Santa Rosa Station Moorings to Navigable Watershed in Pensacola Bay (Final Environmental Impact Statement).
W75-09824 8A

**DRIED SLUDGE**
Drying of Sludge for Marketing as Fertilizer,
W75-09542 5E

**DRIP IRRIGATION**
Proceedings of the Second International Drip Irrigation Congress.
W75-09423 3F

Drip Irrigation-Worldwide,
W75-09424 3F

The Progress and Problems of Drip Irrigation in Israel,
W75-09425 3F

Drip Irrigation and Automation Tools in Efficient Use of Water Policy,
W75-09426 3F

Drip Irrigation Design Criteria for Tree Crops in Florida and Other Humid Regions,
W75-09427 3F

Drip Irrigation Research in Oregon - A Progress Report,
W75-09428 3F

Drip Irrigation in Landscaping and Soil Erosion Control,
W75-09429 4D

Researches and Applications on Drip Irrigation and Similar Methods in Italy,
W75-09430 3F

Development and Scope of Drip and Subsurface Irrigation,
W75-09431 3C

Drip Irrigation on Citrus,
W75-09432 3F

Some Results of a Field Survey of Drip Irrigation Systems in the Republic of South Africa,
W75-09433 3F

Use of Drip Irrigation in Germany,
W75-09434 3F

Drip Irrigations Inherent Requisite - Water Quality,
W75-09435 5D

Edaphic Micro-Tubular Continuous Flow Irrigation in Canada,
W75-09436 2G

Trickle Irrigation,
W75-09437 3F

Vegetable Production and Water-Use Efficiency as Influenced by Drip, Sprinkler, Subsurface, and Furrow Irrigation Methods,
W75-09438 3F

Comparison of Irrigation Methods, Rootstocks, and Fertilizer Elements of Valencia Orange Trees,
W75-09439 3F

Drip Irrigation: Surface and Subsurface Compared with Sprinkler and Furrow,
W75-09440 3F

Chamber Method for Drip Irrigation System Design and Installation Procedure,
W75-09441 8C

The Use of Foggers in Drip Irrigation,
W75-09442 3F

A Constant Micro Source of Moisture as a Component in a Gradient System for a High Level Production,
W75-09443 3F

Disinfection of Soil Strips Through the Drip Irrigation System,
W75-09444 5G

Strip Cultivation of the Area Wetted by Drip Irrigation in the Arava Desert,
W75-09445 3C

Irrigation for Benches,
W75-09446 3F

Irrigation for Container Growing,
W75-09447 3F

Automatic Drip Irrigation for Greenhouse Tomato Production in West Texas,
W75-09448 3F

High-Frequency Porous Tube Irrigation for Water-Nutrient Management in Humid Regions,
W75-09449 3F

Control of Water by Drip Irrigation for Alfalfa Seed Production,
W75-09450 3F

See Germination Response to Subsurface Irrigation Depth,
W75-09451 2I

Traveling Trickle System,
W75-09452 3F

Mobile Drip Irrigation Systems,
W75-09453 3F

Formation of Blockages in Drip Irrigation Systems: Their Prevention and Removal,
W75-09454 3F

Reverse Flushing Technique for Bi-Wall Drip Tubing,
W75-09455 8C

Clogging of Drip Systems from Metabolic Products of Iron and Sulfur Bacteria,
W75-09456 5B

Chemical Treatment of Drip Irrigation Water,
W75-09457 3F

Movement of Water and Salts Under High Frequency Irrigation,
W75-09458 3F

Linearized Moisture Flow Solutions for Point, Line, and Strip Sources,
W75-09459 2G

Optimum Lateral Placement for Subsurface Irrigation Systems,
W75-09460 3F

Trickle Irrigation Design for Optimal Soil Wetting,
W75-09461 2G

Soil Moisture Distribution and Wetting Pattern From a Point Source,
W75-09462 2G

Soil Moisture Distribution and Depletion in an Apple Orchard Irrigated by Tricklers,
W75-09463 2G

Moisture Profiles and Salinization of Soils Under Drip Irrigation in the Republic of South Africa,
W75-09464 3C

An Explanation for the Growth Advantage of Drip Irrigation,
W75-09465 3F

Trickle Irrigation in Michigan Orchards,
W75-09466 3F

Trickle Irrigation in Michigan Orchards: Controlling Rate of Flow with Flow Regulating Valves and Microtubes,
W75-09467 8C

Dripper Flow Consistency,
W75-09468 3F

Evaluation of a Trickle Irrigation System,
W75-09469 3F

Hydraulics of Single-Chamber vs. Dual-Chamber Tubing,
W75-09470 8C

Designing Trickle Irrigation Laterals for Uniformity,
W75-09471 3F

Design Charts for Drip Irrigation Systems,
W75-09472 8C

Hydraulic and Mechanical Properties of Drippers,
W75-09473 8C

Evaluation of Hydraulics of Flow Through Pipes of Varying Slopes, Lengths and Orifice Placements,
W75-09474 8B

Plant Water Requirements as Related to Trickle Irrigation,
W75-09475 3F

Drip and Furrow Irrigation Studies on Sugarcane,
W75-09476 3F

Salinity Sensor Control of Drip Irrigation Water Application,
W75-09477 3C

Water Use with Drip Irrigation,
W75-09478 3F

Water Use by Drip and Sprinkle Irrigated Avocados Related to Plant Cover, Evaporation and Air Temperature,
W75-09479 3F

Trickle Irrigation Management for Cotton and Cabbage,
W75-09480 3F

Soil Salinity Distribution in Drip and Subsurface Irrigated Summer Squash,
W75-09481 3C

Monitoring Soil Salinity and Leaf Nutrient Levels in a Young Avocado Orchard Under Drip Irrigation,
W75-09482 3F

Afforestation with Saline Water in Abu Dhabi,
W75-09483 3C

Salinity Management for High Frequency Irrigation,
W75-09484 3C

Irrigation Return Flow as Influenced by Drip Irrigation,
W75-09485 5G

Australian Vineyard Uses Sewage Effluent with Trickle Irrigation,
W75-09486 3C

An Investigation into the Potential Uses Trickle Irrigation for Desert Reclamation Fodder Production in the Emirate of Dhabi,
W75-09487

Effects of Localized Phosphate Treatments Solution pH on the Growth and Function Apple Roots,
W75-09488

Application of Fertilizer Through Drip Irr tion Systems in West Texas,
W75-09489

Investigations in Sugarcane Fertilization Drip Irrigation in Hawaii,
W75-09490

Fertilizer Applications with Drip Irrigation,
W75-09491

Use of Glycerophosphate for Fertilizat Through Trickle Irrigation Systems,
W75-09492

Weed Control Under Drip Irrigation in Orch and Vineyard Crops,
W75-09493

Influence of Different Amounts of Irrigatio Water, Irrigation--Intervals and Fertilizers the Yield and Quantity of Drip-Irrigated Mu and Watermelons,
W75-09494

Water Uptake by an Apple Tree with Varic Proportions of the Root System Supplied w Water,
W75-09495

Effects of Nitrogen Fertilizer Applications Part of a Root System,
W75-09496

Change in Root Distribution of Mature Pe Trees in Response to Trickle Irrigation,
W75-09497

Changes in Root Patterns of Peach Tre Under Trickle Irrigation,
W75-09498

Drip Irrigation Experiment on Avocados,
W75-09499 3

Effects of Drip Irrigation on Soil-Water-Pla Relationship,
W75-09500

Trickle Irrigation on Young Peach Trees,
W75-09501 3

Drip Irrigation in Citrus Orchards,
W75-09502 3

An Investigation on the Use of Drip Irrigatio for the Establishment of Multi-Purpose Park (Green Belts Around the Cities) in Iran,
W75-09503 3I

Tree and Crop Response to Drip Irrigation,
W75-09504 3I

Cantaloupe Response to Drip Irrigation,
W75-09505 3F

Staked Tomato Drip Irrigation in California,
W75-09506 3F

Spring Cucumber Drip vs. Furrow Irrigation,
W75-09507 3F

he Irrigation of Olives by Drip and Other Ir-
gation Methods,
'75-09508 3F

erformance of Plants with Drip Irrigation,
'75-09509 3F

rickle Irrigation Management for Grapes,
75-09510 3F

Study on Different Application Procedures
Drip Irrigation in Tomato Cultivation,
75-09511 3F

ie Relation Between Drip Irrigation,
ytophthora Root Rot of Avocado, and Fungi-
ies,
75-09512 2I

rip Vs. Furrow Irrigation Trials in Potato
nder Subtropical Conditions,
75-09513 3F

esponse of Mature Citrus Trees on Deep
ndy Soil to Drip Irrigation,
75-09514 3F

PLET SIZE
ethodological Approaches in Hawaiian Fog
search,
75-09526 2B

PS (FLUIDS)
e Evolution of Drop Spectra Due to Conden-
ion, Coalescence and Breakup,
75-09597 2B

e Fragmentation and Electrification of
eezing Drops,
75-09598 2C

Wind Tunnel Investigation on Ice Multiplica-
n by Freezing of Waterdrops Falling at Ter-
nal Velocity in Air,
75-09613 2C

e Microwave Emission Spectum from Spark-
Water Drops,
75-09614 2B

UGHT
e Ecological Management of Arid and Semi-
d Rangelands in Africa and the Near East:
International Programme.
5-09791 6G

ought in the Ghana Savannah: A Report to
U.S. Aid Mission to Ghana,
5-09795 6G

ought, A Recurrent Element of Climate,
5-09799 2B

ter Requirements and Limitations Imposed
Agricultural Development in Northern
ana,
5-09800 3F

erioration of the Ecological Equilibrium in
Arid Zones of North Africa,
5-09802 6G

UGHT TOLERANCE
physical Control of Water Loss,
5-09523 3F

UGHTS
ught Crack on Western White Pine in
thern Idaho,
5-09388 2I

Sahelian Drought - A Disaster for
estock Populations,
5-09785 3F

DROWNING
Johnson v. State Farm Fire and Casualty Co. (Action for Death by Drowning in Artificial Canal Which Was Found to Be Not Navigable).
W75-09829 6E

DRY FARMING
India Case Study on Improving Productivity in Low Rainfall Areas.
W75-09803 3F

DUGESIA TIGRINA
A Comparative Study of the Tolerance of Two Freshwater Planarians, Dugesia Tigrina and Polycelis Felina, To Low Oxygen Levels, (Etude Comparative de la Tolerance aux Basses Tensions D'Oxygene Chez Deux Planaires D'Eau Douce, Dugesia Tigrina et Polycelis Felina),
W75-09675 5C

DUTCH WADDEN SEA
Interaction Between the Daily Heat Balance and the Tidal Cycle,
W75-09602 5B

DYNAMIC PROGRAMMING
Dynamic Programming Optimization: A Water Distribution System Design,
W75-09525 7C

EARTH DAMS
Charles River Dam, Boston, Mass (Final Environmental Impact Statement).
W75-09816 8D

EASEMENTS
Passaic Valley Council Boy Scouts of America v. Hartwood Syndicate, Inc. (Suit by Owner of Part of Reservoir Bed Against Owner of Remainder Who Claimed Exclusive Right to Hunt, Fish or Sail on Reservoir Waters).
W75-09831 6E

ECOLOGICAL DISTRIBUTION
Distribution and Dynamics of Aquatic Insects in the Elk Creek Experimental Watershed, Lubrecht Forest, Montana,
W75-09528 5C

ECOLOGICAL RESEARCH
Distribution and Dynamics of Aquatic Insects in the Elk Creek Experimental Watershed, Lubrecht Forest, Montana,
W75-09528 5C

EDIZ HOOK (WASH)
Ediz Hook Beach Erosion Control, Port Angeles, Washington (Final Environmental Impact Statement).
W75-09815 8A

EFFLUENT IRRIGATION
Disposal of Cattle Feedlot Runoff on Agricultural Land,
W75-09517 5D

EFFLUENTS
Measuring Flow of Polluted Effluents (Pour la mesure du debit des effluents pollues).
W75-09370 5A

Water Strategy--Statement of Policy for Implementing Certain Requirements of the 1972 Federal Water Pollution Control Act Amendments.
W75-09841 5G

ELECTRIC POWERPLANTS
Special Power Generating Unit Using Cpmpressed Air Produced by Ocean Wave Together with Super-Heated Steam,
W75-09638 8C

Water Quality Analysis System with Multicircuit Single Shell Heat Exchanger,
W75-09642 5G

ELECTRICAL PROPERTIES
The Fragmentation and Electrification of Freezing Drops,
W75-09598 2C

The Microwave Emission Spectum from Sparking Water Drops,
W75-09614 2B

ELECTRICAL WELL LOGGING
Formation Factors and Their Use in Estimating Water Quality in Mississippi Aquifers,
W75-09703 7C

ELECTRIFICATION
The Fragmentation and Electrification of Freezing Drops,
W75-09598 2C

ELECTRODES
Determination of Chloride in Water with a HgS/Hg2Cl2 Electrode,
W75-09361 5A

Desalination Process,
W75-09654 3A

ELECTRODIALYSIS
Operating Results of Electrodialysis and Reverse Osmosis Municipal Desalting Plants,
W75-09732 5D

ELECTROLYSIS
Detector of Trace Substance in Water,
W75-09655 5A

ELECTRONIC EQUIPMENT
Digital Instrumentation and Telemetry for Water Resources Research,
W75-09529 7B

ELECTROPHORESIS
Biological Assay of Fresh Waters by a New Method, Dielectrophoresis,
W75-09531 5A

EMBRYONIC GROWTH STAGE
The Effect of Different Oxygen Conditions During Incubation on the Survival and Some of the Developmental Characteristics of the 'Verkhova' (Leucaspius Delineatus) in the Embryonic Period,
W75-09670 5C

Selenium Toxicity on the Early Life Stages of Zebrafish (Brachydanio rerio),
W75-09671 5C

ENDOSULFAN
Differential Uptake of Endosulfan by the Tissues of Mytilus Edulis,
W75-09810 5A

ENERGY
Water for Energy Self-Sufficiency.
W75-09626 6B

Water for Energy Self-Sufficiency, Executive Summary.
W75-09627 4C

Statistical Properties of Wave Force,
W75-09759 8B

ENERGY CONVERSION
Arizona and Tomorrow's Solar Powerplants,
W75-09804 3A

ENERGY *SEWAGE TREATMENT
Energy Conservation and Recycling Program of the Metropolitan Sewer Board of the Twin Cities Area,
W75-09556 5D

ENGLAND
Improving the Design of Practical Field Drainage,
W75-09595 4A

ENVIRONMENT
Environmental Geology of an Area in West-Central Alabama,
W75-09615 7C

ENVIRONMENTAL CONTROL
High Milk Production Under Unfavourable Natural Conditions,
W75-09797 3F

The Reserve Mining Case: Promises, Promises,
W75-09838 5G

ENVIRONMENTAL EFFECTS
Evaluation of Municipal Sewage Treatment Alternatives.
W75-09404 5D

Alternative Methods for Sludge Management,
W75-09534 5D

Diversity of Marine Invertebrates in a Thermal Effluent,
W75-09809 5C

Proposed Maintenance Dredging of the Channel from U.S. Coast Guard Santa Rosa Station Moorings to Navigable Watershed in Pensacola Bay (Final Environmental Impact Statement).
W75-09824 8A

The Reserve Mining Case: Promises, Promises,
W75-09838 5G

Influence of the Energy Crisis Upon the Future of Environmental Policy,
W75-09847 6E

ENVIRONMENTAL ENGINEERING
Makeup Requirements for Cooling Ponds,
W75-09760 5G

ENVIRONMENTAL IMPACT
Evaluation of Environmental Impact of Landfills,
W75-09761 5C

ENVIRONMENTAL IMPACT STATEMENT
Charles River Dam, Boston, Mass (Final Environmental Impact Statement).
W75-09816 8D

Proposed Navigational Maintenance Dredging Project at Guilford Harbor, Guilford, Connecticut (Final Environmental Impact Statement).
W75-09821 8A

ENVIRONMENTAL IMPACT STATEMENTS
Maintenance of the Federal Navigation Project in Scarboro River at Scarboro, Maine (Final Environmental Impact Statement).
W75-09811 8A

Initial Stage, Oahe Unit, Pick-Sloan Missouri Basin Program, South Dakota (Final Environmental Impact Statement).
W75-09812 8A

Detailed Project Report for Local Flood Protection, Zacate Creek, Laredo, Texas (Final Environmental Impact Statement).
W75-09813 4A

North Fork Nolin River Watershed, Kentucky (Final Environmental Impact Statement).
W75-09814 8A

Ediz Hook Beach Erosion Control, Port Angeles, Washington (Final Environmental Impact Statement).
W75-09815 8A

Wastewater Treatment Facilities Construction Grants for the Lower Raritan River Basin and for the South Shore of Raritan Bay (Final Environmental Impact Statement).
W75-09817 5D

Table Rock Lake, White River, Missouri (Final Environmental Impact Statement).
W75-09818 8C

Bushley Bayou, Louisana (Final Environmental Impact Statement).
W75-09819 8D

Proposed 1973 Outer Continental Shelf Oil and Gas General Lease-Sale, Offshore Mississippi, Alabama, and Florida, Volume 2, Potential Environmental Impacts, Etc. (Environmental Impact Statement).
W75-09820 5G

Upper Mulberry River Watershed, Barrow, Gwinnett, Hall, and Jackson Counties, Georgia (Final Environmental Impact Statement).
W75-09822 8A

Crude Oil and Natural Gas Production and Other Mining Operations in Navigable Waters Along the Louisiana Coast (Final Environmental Impact Statement).
W75-09823 5G

Proposed Maintenance Dredging of the Channel from U.S. Coast Guard Santa Rosa Station Moorings to Navigable Watershed in Pensacola Bay (Final Environmental Impact Statement).
W75-09824 8A

Prevention and Mitigation of Shore Damages, Kahului Harbor, Maui, Hawaii (Final Environmental Impact Statement).
W75-09825 8A

Atchison, Topeka and Santa Fe Ry. Co. v. Callaway (Action by Railroad, Environmentalists and Others to Halt Reconstruction of Lock and Dam on Upper Mississippi River Navigation System by Defendant Corps of Engineers).
W75-09826 8A

Borough of Morrisville v. Delaware River Basin Comm'n. (Ruling on Motion to Dismiss Action by Communities Dependent on Delaware River Basin Comm'n. Which Action Was Founded on a NEPA Complaint).
W75-09827 6E

Conservation Council of North Carolina v. Costanzo (Action to Enjoin Construction of a Marina on Island in Atlantic Ocean and to Require Environmental Impact Statement by Corps of Engineers).
W75-09840 6E

ENVIRONMENTAL IMPACTS
Secondary Impacts of Transportation and Wastewater Investments: Review and Bibliography,
W75-09576 5C

ENVIRONMENTAL SANITATION
State of Arizona, Environmental Services Needs Study for Greenlee County, 1970-1990.
W75-09584 5D

EQUATIONS
The Composite Roughness of Ice Covered Streams,
W75-09758 2C

EQUIPMENT
Fluid Sampling Device,
W75-09422 7E

An Inexpensive Macroinvertebrate Bioassay Table for Use in Continuous-Flow Toxicity Tests,
W75-09676 5A

EROSION
Pore and Eroding Fluid Influences on Surface Erosion of Soil,
W75-09741 2J

EROSION CONTROL
Sectoral and Regional Economic Impact of Controlling Nonpoint Pollution in Forested Areas,
W75-09530 5B

ESTIMATING
Averaging Errors in Monthly Evaporation Estimates,
W75-09590 2D

ESTUARIES
Deposition of Zinc and Cadmium by Marine Bacteria in Estuarine Sediments,
W75-09692 5C

Sediment Resuspension and Deposition in Narragansett Bay,
W75-09736 2L

EUGLENA
The Effects of Oils on Growth of Freshwater Phytoplankton,
W75-09678 5C

EUGLENA GRACILIS
The Effects of Oils on Growth of Freshwater Phytoplankton,
W75-09678 5C

EUPHAUSIIDS
DDT Residues in Euphausiids in the Upper Estuary of the Gulf of St. Lawrence,
W75-09690 5C

EUROPE
Drainage Materials.
W75-09628 8G

Drainage Materials - Provisional Report of the Experience Gained in the Netherlands,
W75-09633 8G

EURTOPHICATION
The Effect of Sulfate and Manganese Dioxide on the Release of Phosphorus from Lake Mendota Sediments,
W75-09619 5C

EUTROPHICATION
Silt Removal from a Lake Bottom.
W75-09575 5C

EVALUATION
Wastewater Treatment Facility Evaluation, Malmstrom AFB MT,
W75-09411 5E

Evaluation of a Trickle Irrigation System,
W75-09469 3F

Evaluation of Sample Preparation Techniques for Algal Bioassays,
W75-09734 5A

**VAPORATION**
Possibilities for Reducing 5-Day BOD-Consuming Materials in Steam Condensates from Spent Sulfite Liquor Evaporation (Moeglichkeiten der Reduktion der BSB(5)-verbrauchenden Stoffe in Brundenkondensaten aus Sulfitablaugeneindampfungen),
W75-09360 5D

Water Use by Drip and Sprinkle Irrigated Avocados Related to Plant Cover, Evaporation and Air Temperature,
W75-09479 3F

Evaporation from Water Surfaces in California,
W75-09586 2D

Averaging Errors in Monthly Evaporation Estimates,
W75-09590 2D

In Salt-Affected Soils Mulching Aids in Crop Growth,
W75-09798 3C

**'APORATION PANS**
Drip Irrigation on Citrus,
W75-09432 3F

Water Use with Drip Irrigation,
W75-09478 3F

Evaporation from Water Surfaces in California,
W75-09586 2D

**APOTRANSPIRATION**
World Maps of Potential Evapotranspiration, Plant Development, and Spring Greening and Autumn Browning of Vegetation, Based on the Solar Thermal Unit Model,
W75-09771 2D

**CESS WATER (SOILS)**
Corrugated Plastic Drain Tubing Used as Underground Conduit,
W75-09611 8B

**PLOSIVES**
State-of-the-Art for the Inorganic Chemicals Industry: Commercial Explosives,
W75-09581 5B

**TENDED AERATION**
Extended Aeration Wastewater Treatment,
W75-09776 5D

**RM WASTES**
Disposal of Cattle Feedlot Runoff on Agricultural Land,
W75-09517 5D

**'HEAD MINNOWS**
Effects of Saline Water from North Dakota Lakes on Survival of Fathead Minnow (Pimephales Promelas) Embryos and Sac Fry,
W75-09669 5C

**ERAL REPUBLIC OF GERMANY**
Experiences with Drainage Materials and a Review of Available Specifications,
W75-09631 8G

**ERAL WATER POLLUTION CONTROL**
Water Strategy--Statement of Policy for Implementing Certain Requirements of the 1972 Federal Water Pollution Control Act Amendments.
W75-09841 5G

Environmental Critique (The 1972 Federal Water Pollution Control Act: Problems and Prospects After One Year),
W75-09844 5G

Federal Maritime Jurisdiction and State Marine Pollution Legislation: The Florida Act Not Preempted Per Se,
W75-09845 5G

**FEED LOTS**
Disposal of Cattle Feedlot Runoff on Agricultural Land,
W75-09517 5D

**FENITROTHION**
Avoidance of Fenitrothion by Goldfish (Carassius Auratus),
W75-09677 5C

**FERRIC CHLORIDE**
Ferric Chlorine or Lime for Chemical Treatment,
W75-09380 5D

Phosphate Removal in an Activated Sludge Facility,
W75-09412 5D

Phosphorus Removal Study at the Sarnia WPCP,
W75-09562 5D

**FERTILIZATION**
Trickle Irrigation,
W75-09437 3F

Comparison of Irrigation Methods, Rootstocks, and Fertilizer Elements of Valencia Orange Trees,
W75-09439 3F

Application of Fertilizer Through Drip Irrigation Systems in West Texas,
W75-09489 3F

Investigations in Sugarcane Fertilization by Drip Irrigation in Hawaii,
W75-09490 3F

Fertilizer Applications with Drip Irrigation,
W75-09491 3F

Use of Glycerophosphate for Fertilization Through Trickle Irrigation Systems,
W75-09492 5B

Influence of Different Amounts of Irrigation--Water, Irrigation--Intervals and Fertilizers on the Yield and Quantity of Drip-Irrigated Musk- and Watermelons,
W75-09494 3F

Effects of Nitrogen Fertilizer Applications to Part of a Root System,
W75-09496 3F

Spring Cucumber Drip vs. Furrow Irrigation,
W75-09507 3F

**FERTILIZER**
Composting Sewage Sludge,
W75-09546 5D

**FERTILIZERS**
Where are We in Forest Fertilization,
W75-09367 5D

Use of Glycerophosphate for Fertilization Through Trickle Irrigation Systems,
W75-09492 5B

Drying of Sludge for Marketing as Fertilizer,
W75-09542 5E

Growth of Barley Irrigated with Wastewater Sludge Containing Phosphate Precipitants,
W75-09543 5D

Urban Lawn Infiltration Rates and Fertilizer Runoff Losses Under Simulated Rainfall,
W75-09592 5B

**FIBER RECOVERY**
Waste Water Clarification by Flotation (Flotacios szennyviztisztitas),
W75-09356 5D

**FIBERS (PLANT)**
Recycling a Solid Waste from a Paper Plant -- Separation of Wood Fiber from Clay by Differential Flocculation,
W75-09354 5D

**FILTER PRESSING**
Filter-Pressing Wastewater Sludge.
W75-09420 5D

**FILTERS**
Wastewater Filtration, Design Considerations.
W75-09383 5D

Biological Aerated Filters,
W75-09572 5D

Experiences with Drainage Materials and a Review of Available Specifications,
W75-09631 8G

A Survey of Experiences with Drainage Materials and a Review of Available Specifications,
W75-09632 8G

**FILTRATION**
Wastewater Filtration, Design Considerations.
W75-09383 5D

The Role of Polyelectrolytes in Filtration Processes,
W75-09394 5D

Domestic Wash Water Reclamation for Refuse as Commode Water Supply Using a Filtration-Reverse Osmosis Separation Technique,
W75-09403 5D

Filter-Pressing Wastewater Sludge.
W75-09420 5D

Drip Irrigations Inherent Requisite - Water Quality,
W75-09435 5D

Trickle Irrigation,
W75-09437 3F

Upflow Filtration of Oxidation Pond Effluent,
W75-09522 5D

Pressure Filtration--Municipal Wastewater Solids, Cedar Rapids, Iowa,
W75-09540 5D

The Effect of Concentration of Suspension and Inert Material on the Assimilation of Algae by Three Bivalves,
W75-09695 5C

**FINANCIAL INCENTIVES**
Financial Incentives and Pollution Control: A Case Study,
W75-09574 5G

**FISH BEHAVIOR**
Avoidance of Fenitrothion by Goldfish (Carassius Auratus),
W75-09677 5C

FISH BEHAVIOR

Behavior of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Sumithion (Fenitrothion), An Organophosphate Insecticide,
W75-09700 5C

FISH EGGS

The Effect of Different Oxygen Conditions During Incubation on the Survival and Some of the Developmental Characteristics of the 'Verkhova' (Leucaspius Delineatus) in the Embryonic Period,
W75-09670 5C

FISH ESTABLISHMENT

Ediz Hook Beach Erosion Control, Port Angeles, Washington (Final Environmental Impact Statement).
W75-09815 8A

FISH LADDERS

Charles River Dam, Boston, Mass (Final Environmental Impact Statement).
W75-09816 8D

FISH PHYSIOLOGY

The Effect of Different Oxygen Conditions During Incubation on the Survival and Some of the Developmental Characteristics of the 'Verkhova' (Leucaspius Delineatus) in the Embryonic Period,
W75-09670 5C

Effect of Zinc on Growth of the Minnow Phoxinus Phoxinus,
W75-09693 5C

Changes in Blood Chemistry of Juvenile Steelhead Trout, Salmo Gairdneri, Following Sublethal Exposure to Nitrogen Supersaturation,
W75-09694 5C

Effects of Thiourea Treatment on Sexually Maturing and Gonadectomized Male Sockeye Salmon (Oncorhynchus Nerka),
W75-09699 5C

Behavior of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Sumithion (Fenitrothion), An Organophosphate Insecticide,
W75-09700 5C

FISH REPRODUCTION

Effects of Logging on Water Temperature and Dissolved Oxygen in Spawning Beds,
W75-09685 5C

FLOCCULATION

Drip Irrigations Inherent Requisite - Water Quality,
W75-09435 5D

Pore and Eroding Fluid Influences on Surface Erosion of Soil,
W75-09741 2J

FLOOD CONTROL

Water, Sewerage and Flood Control Systems Plan and Implementation Program 1973-74.
W75-09400 6D

Table Rock Lake, White River, Missouri (Final Environmental Impact Statement).
W75-09818 8C

FLOOD FREQUENCY

Deterioration of the Ecological Equilibrium in the Arid Zones of North Africa,
W75-09802 6G

FLOOD PLAINS

Ground-Water Level in the Flood Plain and Adjacent Uplands of the Sangamon River,
W75-09599 4B

FLOOD PROTECTION

Detailed Project Report for Local Flood Protection, Zacate Creek, Laredo, Texas (Final Environmental Impact Statement).
W75-09813 4A

North Fork Nolin River Watershed, Kentucky (Final Environmental Impact Statement).
W75-09814 8A

Bushley Bayou, Louisana (Final Environmental Impact Statement).
W75-09819 8D

Upper Mulberry River Watershed, Barrow, Gwinnett, Hall, and Jackson Counties, Georgia (Final Environmental Impact Statement).
W75-09822 8A

FLOODGATES

Bushley Bayou, Louisana (Final Environmental Impact Statement).
W75-09819 8D

FLOODWATER

North Fork Nolin River Watershed, Kentucky (Final Environmental Impact Statement).
W75-09814 8A

FLORIDA

Drip Irrigation Design Criteria for Tree Crops in Florida and Other Humid Regions,
W75-09427 3F

Agricultural Utilization of Digested Sludges from the City of Pensacola,
W75-09554 5E

Surface Water Resources of St. Johns River, Florida,
W75-09604 2A

Effect of Power Plant Chlorination on Estuarine Productivity,
W75-09684 5C

Summary of Hydrologic Conditions in Collier County, Florida, 1973,
W75-09716 4B

Proposed Maintenance Dredging of the Channel from U.S. Coast Guard Santa Rosa Station Moorings to Navigable Watershed in Pensacola Bay (Final Environmental Impact Statement).
W75-09824 8A

Union Camp Corp. v. Seminole Forest Water Management District (Suit by Single Landowner to Require Formation of a Drainage District).
W75-09828 6E

Florida Water Resources Act of 1972 (Statute Establishing Water Management Districts for the State of Florida).
W75-09833 6E

FLOTATION

Waste Water Clarification by Flotation (Flotacios szennyviztisztitas),
W75-09356 5D

Process for Treating Waste Water,
W75-09656 5D

FLOW CHARACTERISTICS

Dripper Flow Consistency,
W75-09468 3F

Drag Reduction by Collapsed and Extende Polyelectrolytes,
W75-09601 8

Tangential Stress Distribution in Turbule Boundary Layers at an Adverse Pressu Gradient,
W75-09738 8

FLOW EQUALIZATION

Flow Equalization.
W75-09381 5

FLOW MEASUREMENT

Measuring Flow of Polluted Effluents (Pour mesure du debit des effluents pollues).
W75-09370 5

FLOW RATES

Trickle Irrigation in Michigan Orchards: Con trolling Rate of Flow with Flow Regulatin Valves and Microtubes,
W75-09467 8

Dripper Flow Consistency,
W75-09468 3

FLOW REGULATING VALVES

Trickle Irrigation in Michigan Orchards: Con trolling Rate of Flow with Flow Regulatin Valves and Microtubes,
W75-09467 8

FLOW REGULATORS

Urban Runoff Pollution Control--State-of-the Art,
W75-09762 5I

FLOW RESISTANCE

The Composite Roughness of Ice Covered Streams,
W75-09758 2C

FLOW-THROUGH ANALYZER

Automatic U.V.-Control System for Relative Evaluation of Organic Water Pollution,
W75-09735 5A

FLOWMETERS

Measuring Flow of Polluted Effluents (Pour la mesure du debit des effluents pollues).
W75-09370 5A

FLUID FRICTION

The Karman and Reynolds Numbers and the Drag Coefficient in Ducts and Pipes,
W75-09596 8B

FLUID INFLUENCES

Pore and Eroding Fluid Influences on Surface Erosion of Soil,
W75-09741 2J

FLUID MECHANICS

The Karman and Reynolds Numbers and the Drag Coefficient in Ducts and Pipes,
W75-09596 8B

Tangential Stress Distribution in Turbulent Boundary Layers at an Adverse Pressure Gradient,
W75-09738 8B

FLUID SAMPLING DEVICE

Fluid Sampling Device,
W75-09422 7B

FLUID TRANSPORT SYSTEM

Dynamic Programming Optimization: A Water Distribution System Design,
W75-09525 7C

LUIDIZATION
Water Escape Structures in Coarse-Grained Sediments,
W75-09768 2J

OG
Methodological Approaches in Hawaiian Fog Research,
W75-09526 2B

OG ANALYSIS COMPUTER PROGRAM
Methodological Approaches in Hawaiian Fog Research,
W75-09526 2B

OG SAMPLING NETWORK
Methodological Approaches in Hawaiian Fog Research,
W75-09526 2B

OGGERS
The Use of Foggers in Drip Irrigation,
W75-09442 3F

OOD CHAINS
Effects of Kokanee Salmon (Oncorhynchus Nerka) Decomposition on the Ecology of a Subalpine Stream,
W75-09672 5C

ODT Residues in Euphausiids in the Upper Estuary of the Gulf of St. Lawrence,
W75-09690 5C

OOD WEGX
Effects of Kokanee Salmon (Oncorhynchus Nerka) Decomposition on the Ecology of a Subalpine Stream,
W75-09672 5C

RECASTING
Optimizing Long-Term Streamflow Forecasts,
W75-09594 4A

The Prediction of Lake Huron Lake-Effect Snowfall Systems,
W75-09748 2C

Drought, A Recurrent Element of Climate,
W75-09799 2B

REST FIRES
Forest Fire: Effect on Phosphorus Movement Lakes,
W75-09364 5B

REST MANAGEMENT
Where are We in Forest Fertilization,
W75-09367 5D

Sectoral and Regional Economic Impact of Controlling Nonpoint Pollution in Forested Areas,
W75-09530 5B

REST WATERSHEDS
Forest Fire: Effect on Phosphorus Movement Lakes,
W75-09364 5B

RESTRY
Afforestation with Saline Water in Abu Dhabi,
W75-09483 3C

RESTS
Effects of Deforestation on Slopes,
W75-09743 4C

RMALDEHYDE
Process for the Recovery of Formaldehyde and Phenol Contained in Waste Waters,
W75-09573 5D

FORT UNION COAL REGION (N DAK)
Water-Resources Investigations in the Fort Union Coal Region, North Dakota, 1974-75.
W75-09715 5B

FRAGMENTATION
The Fragmentation and Electrification of Freezing Drops,
W75-09598 2C

A Wind Tunnel Investigation on Ice Multiplication by Freezing of Waterdrops Falling at Terminal Velocity in Air,
W75-09613 2C

FRANCE
Study of Experiences with Drainage Materials and a Review of Specifications Available in France,
W75-09630 8G

FREEZING
The Fragmentation and Electrification of Freezing Drops,
W75-09598 2C

A Wind Tunnel Investigation on Ice Multiplication by Freezing of Waterdrops Falling at Terminal Velocity in Air,
W75-09613 2C

FREQUENCY
Trickle Irrigation Management for Cotton and Cabbage,
W75-09480 3F

FRICTION
Computation of Wave Heights Due to Refraction and Friction,
W75-09606 8B

FROZEN SOILS
Heat Transfer in Soil-Water-Ice Systems,
W75-09742 2C

FRUIT CROPS
Tree and Crop Response to Drip Irrigation,
W75-09504 3F

FUEL OIL
Financial Incentives and Pollution Control: A Case Study,
W75-09574 5G

FUNGI
Pollution of Irrigation Waters by Plant Pathogenic Organisms,
W75-09521 5B

FUNGICIDES
The Relation Between Drip Irrigation, Phytophthora Root Rot of Avocado, and Fungicides,
W75-09512 2I

FURROW IRRIGATION
Vegetable Production and Water-Use Efficiency as Influenced by Drip, Sprinkler, Subsurface, and Furrow Irrigation Methods,
W75-09438 3F

Drip Irrigation: Surface and Subsurface Compared with Sprinkler and Furrow,
W75-09440 3F

An Explanation for the Growth Advantage of Drip Irrigation,
W75-09465 3F

Drip and Furrow Irrigation Studies on Sugarcane,
W75-09476 3F

An Investigation on the Use of Drip Irrigation for the Establishment of Multi-Purpose Parks (Green Belts Around the Cities) in Iran,
W75-09503 3F

Cantaloupe Response to Drip Irrigation,
W75-09505 3F

Spring Cucumber Drip vs. Furrow Irrigation,
W75-09507 3F

Drip Vs. Furrow Irrigation Trials in Potato Under Subtropical Conditions,
W75-09513 3F

GAME BIRDS
A Survey of the Nesting Habitats of the White-Winged Dove in Arizona,
W75-09794 6G

GAMMA RAYS
Alternative Methods of Disinfection: How Effective,
W75-09780 5D

GAS CHROMATOGRAPHY
Gas Chromatographic Determination of Selected Organic Compounds Added to Waste Water,
W75-09365 5A

GASES
Offshore Oil and Gas Rights: A Comparative Study,
W75-09836 6E

GEOCHEMISTRY
Geochemistry Applied to the Discovery, Evaluation, and Exploitation of Geothermal Energy Resources,
W75-09724 2K

GEOLOGIC FORMATIONS
Geology of Griggs and Steele Counties,
W75-09725 2J

GEOLOGIC MAPPING
Contour Map of the Bedrock Surface, Collinsville Quadrangle, Connecticut,
W75-09706 7C

GEOLOGICAL SURVEYS
Geology of Griggs and Steele Counties,
W75-09725 2J

GEOLOGY
Geology of Griggs and Steele Counties,
W75-09725 2J

Huronian Glaciation and Polar Wander from the Gowganda Formation, Ontario,
W75-09763 2C

GEOMORPHOLOGY
Initial Bifurcation Process in Natural Channel Networks,
W75-09609 8B

Stream Ordering and Contour Mapping,
W75-09745 4A

GEORGIA
Integrative Procedures for Coordinated Urban Land and Water Management: A Systems Analysis,
W75-09622 6A

Upper Mulberry River Watershed, Barrow, Gwinnett, Hall, and Jackson Counties, Georgia (Final Environmental Impact Statement).
W75-09822 8A

GEOTHERMAL STUDIES
Geochemistry Applied to the Discovery, Evaluation, and Exploitation of Geothermal Energy Resources,
W75-09724 2K

GERMANY
Use of Drip Irrigation in Germany,
W75-09434 3F

GERMINATION
See Germination Response to Subsurface Irrigation Depth,
W75-09451 2I

GHANA
Water Requirements and Limitations Imposed on Agricultural Development in Northern Ghana,
W75-09800 3F

GHANA'S SAVANNAH
Drought in the Ghana Savannah: A Report to the U.S. Aid Mission to Ghana,
W75-09795 6G

GLACIATION
Huronian Glaciation and Polar Wander from the Gowganda Formation, Ontario,
W75-09763 2C

GLYCEROPHOSPHATE
Use of Glycerophosphate for Fertilization Through Trickle Irrigation Systems,
W75-09492 5B

GNOTOBIOTIC COMMUNITIES
Effects of PCB on Interspecific Competition in Natural and Gnotobiotic Phytoplankton Communities in Continuous and Batch Cultures,
W75-09680 5C

GOLDFISH
Avoidance of Fenitrothion by Goldfish (Carassius Auratus),
W75-09677 5C

GOLDFISH (FANTAIL)
Evaluation of a New Spawning Mat Material,
W75-09749 7B

GONADS
Effects of Thiourea Treatment on Sexually Maturing and Gonadectomized Male Sockeye Salmon (Oncorhynchus Nerka),
W75-09699 5C

GOSHEN COUNTY (WYO)
Hydrologic Analysis of the Valley-Fill Aquifer, North Platte River Valley, Goshen County, Wyoming,
W75-09722 2F

GOVERNMENTAL INTERRELATIONS
A Case Study of Estuarine Pollution and Local Agency Interactions,
W75-09620 5G

GOWGANDA FORMATION
Huronian Glaciation and Polar Wander from the Gowganda Formation, Ontario,
W75-09763 2C

GRAPES
Australian Vineyard Uses Sewage Effluent with Trickle Irrigation,
W75-09486 3C

Trickle Irrigation Management for Grapes,
W75-09510 3F

GRASSLANDS
Drought in the Ghana Savannah: A Report to the U.S. Aid Mission to Ghana,
W75-09795 6G

GREAT BRITAIN
A Case Study of Mine Water Quality Deterioration, Mainsforth Colliery, County Durham,
W75-09752 5B

GREAT LAKES REGION
Great Lakes Basin Framework Study: Appendix 3--Geology and Ground Water,
W75-09714 2F

GREENBELTS
An Investigation on the Use of Drip Irrigation for the Establishment of Multi-Purpose Parks (Green Belts Around the Cities) in Iran,
W75-09503 3F

GREENHOUSES
Irrigation for Benches,
W75-09446 3F

GRIGGS AND STEELE COUNTIES (N DAK)
Geology of Griggs and Steele Counties,
W75-09725 2J

GRINDERS
A Preliminary Assessment of Wet Systems for Residential Refuse Collection,
W75-09405 5D

GROINS (STRUCTURE)
Prevention and Mitigation of Shore Damages, Kahului Harbor, Maui, Hawaii (Final Environmental Impact Statement).
W75-09825 8A

GROUNDWATER
Goundwater Models,
W75-09582 2F

Ground-Water Level in the Flood Plain and Adjacent Uplands of the Sangamon River,
W75-09599 4B

Great Lakes Basin Framework Study: Appendix 3--Geology and Ground Water,
W75-09714 2F

Summary of Hydrologic Conditions in Collier County, Florida, 1973,
W75-09716 4B

Water-Resources Data for Skagway, Alaska,
W75-09729 7C

Sewage Disposal and Water Supply Alternatives on the Basis of Water Quality and Economic Criteria,
W75-09774 5B

Gypsum Can Improve Your Water Also,
W75-09787 5G

GROUNDWATER AVAILABILITY
Geologic and Hydrologic Features of Indian Wells Valley, California,
W75-09717 2F

GROUNDWATER DATA
Ground-Water Data for Orange County and Vicinity, Texas and Louisiana, 1971-74,
W75-09727 7C

GROUNDWATER MOVEMENT
Recharge Simulation Model,
W75-09518 2A

Hydrogeology of the Waterways-Winefred Lake Area, Alberta,
W75-09769 2F

GROUNDWATER RESOURCES
An Optimal Water Quality Manage Technique for Conjunctive Ground and Sur Water Use,
W75-09378

Groundwater Levels in Nebraska, 1974,
W75-09710

Geologic and Hydrologic Features of In Wells Valley, California,
W75-09717

Availability of Ground Water in the Bra River Basin, Providence County, Rhode Isl
W75-09721

Ground-Water Data for Orange County Vicinity, Texas and Louisiana, 1971-74,
W75-09727

GROWTH ACCLIMATION
Effect of Constant Temperature on Gro Rates of Pumpkinseed Sunfish (Lepomis bosus),
W75-09701

GROWTH RATES
Trickle Irrigation on Young Peach Trees,
W75-09501

The Effect of Different Oxygen Conditi During Incubation on the Survival and Some the Developmental Characteristics of 'Verkhova' (Leucaspius Delineatus) in Embryonic Period,
W75-09670

The Effects of Oils on Growth of Freshwa Phytoplankton,
W75-09678

Effect of Zinc on Growth of the Minnow Ph inus Phoxinus,
W75-09693

Effect of Constant Temperature on Grov Rates of Pumpkinseed Sunfish (Lepomis G bosus),
W75-09701

GROWTH STAGES
The Effect of Basic Cuprous Carbonate on State of the Liver in Juvenile Amur Autu Chum (Oncorhynchus keta infrasp. autu nalis),
W75-09668

Effects of Saline Water from North Dako Lakes on Survival of Fathead Minno (Pimephales Promelas) Embryos and Sac Fry,
W75-09669

Selenium Toxicity on the Early Life Stages Zebrafish (Brachydanio rerio),
W75-09671

Effect of Zinc on Growth of the Minnow Pho inus Phoxinus,
W75-09693

Effects of Thiourea Treatment on Sexual Maturing and Gonadectomized Male Sockey Salmon (Oncorhynchus Nerka),
W75-09699

GUILFORD HARBOR (CONN)
Proposed Navigational Maintenance Dredgin Project at Guilford Harbor, Guilford, Connec ticut (Final Environmental Impact Statement).
W75-09821

ULF OF MEXICO
Proposed 1973 Outer Continental Shelf Oil and Gas General Lease-Sale, Offshore Mississippi, Alabama, and Florida, Volume 2, Potential Environmental Impacts, Etc. (Environmental Impact Statement).
W75-09820 5G

ULF OF ST. LAWRENCE
DDT Residues in Euphausiids in the Upper Estuary of the Gulf of St. Lawrence,
W75-09690 5C

YPSUM
Mix Gypsum in Shallow Depths--In Saline Soils,
W75-09786 3C

Gypsum Can Improve Your Water Also,
W75-09787 5G

Flow-Associated Precipitation Reactions in Saline-Sodic Soils and Their Significance,
W75-09792 2G

ABITAT
Forage Preferences of Trained Mule Deer on he Beaver Creek Watersheds,
W75-09793 3F

ABITAT IMPROVEMENT
Forage Preferences of Trained Mule Deer on he Beaver Creek Watersheds,
W75-09793 3F

WAII
nvestigations in Sugarcane Fertilization by Drip Irrigation in Hawaii,
W75-09490 3F

Methodological Approaches in Hawaiian Fog Research,
W75-09526 2B

esticides in Fish from a Hawaiian Canal,
W75-09806 5A

WAIIAN UPSLOPE FOG
Methodological Approaches in Hawaiian Fog esearch,
W75-09526 2B

ZARDOUS SUBSTANCES (POLLUTION)
he Reserve Mining Case: Promises, Promises,
75-09838 5G

AD LOSS
hamber Method for Drip Irrigation System esign and Installation Procedure,
75-09441 8C

AT BALANCE
teraction Between the Daily Heat Balance d the Tidal Cycle,
75-09602 5B

AT EXCHANGERS
ater Quality Analysis System with Multicir-it Single Shell Heat Exchanger,
75-09642 5G

AT RESISTANCE
ophysical Control of Water Loss,
75-09523 3F

AT TRANSFER
eat Transfer in Soil-Water-Ice Systems,
75-09742 2C

AT TREATMENT
eat Treatment and Incineration,
75-09541 5D

HEATED WATER
Effect of Temperature on Accumulation of Methylmercuric Chloride and p,p' DDT by Rainbow Trout (Salmo Gairdneri),
W75-09681 5C

Diversity of Marine Invertebrates in a Thermal Effluent,
W75-09809 5C

HEAVY METALS
Aspects of Trace Metal Contamination in the Coastal Rivers of Israel,
W75-09689 5B

Deposition of Zinc and Cadmium by Marine Bacteria in Estuarine Sediments,
W75-09692 5C

Selenium Determination on Fish Tissue,
W75-09696 5A

HERBICIDES
Weed Control Under Drip Irrigation in Orchard and Vineyard Crops,
W75-09493 3F

HICKMAN CREEK (KENT)
Evaluation of Recovery in a Polluted Creek After Installation of New Sewage Treatment Procedures,
W75-09515 5B

HIGH FREQUENCY IRRIGATION
Movement of Water and Salts Under High Frequency Irrigation,
W75-09458 3F

HIGH-PURITY OXYGEN ACTIVATED SLUDGE
Interest in Oxygen Process Growing,
W75-09781 5D

HIGH WATER MARK
Conch Creek Corp. v. Guess (Conflicting Title Claims to Tidelands Included in Grant from Governor).
W75-09832 6E

HISTORY
Drip Irrigation-Worldwide,
W75-09424 3F

HUMID AREA
Drip Irrigation Design Criteria for Tree Crops in Florida and Other Humid Regions,
W75-09427 3F

HUNGARY
A Survey of Experiences with Drainage Materials and a Review of Available Specifications,
W75-09632 8G

HYDRAULIC CONDUITS
Dynamic Programming Optimization: A Water Distribution System Design,
W75-09525 7C

HYDRAULIC DESIGN
Hydraulics of Single-Chamber vs. Dual-Chamber Tubing,
W75-09470 8C

Design Charts for Drip Irrigation Systems,
W75-09472 8C

Hydraulic and Mechanical Properties of Drippers,
W75-09473 8C

Evaluation of Hydraulics of Flow Through Pipes of Varying Slopes, Lengths and Orifice Placements,
W75-09474 8B

HYDRAULIC EQUIPMENT
Hydraulic and Mechanical Properties of Drippers,
W75-09473 8C

HYDRAULIC JUMP
Rapid Temperature Reduction of Thermal Discharge,
W75-09757 5B

HYDRAULIC MODELS
Corrugated Plastic Drain Tubing Used as Underground Conduit,
W75-09611 8B

HYDRAULIC PROPERTIES
Hydraulic and Mechanical Properties of Drippers,
W75-09473 8C

HYDRAULICS
The Composite Roughness of Ice Covered Streams,
W75-09758 2C

HYDRODYNAMICS
A Specific Case of Wave Motion of a Liquid in Pipes,
W75-09740 8B

HYDROELECTRIC PLANTS
Table Rock Lake, White River, Missouri (Final Environmental Impact Statement).
W75-09818 8C

HYDROELECTRIC POWER
Water for Energy Self-Sufficiency.
W75-09626 6B

Water for Energy Self-Sufficiency, Executive Summary.
W75-09627 4C

Table Rock Lake, White River, Missouri (Final Environmental Impact Statement).
W75-09818 8C

HYDROGEOLOGY
Goundwater Models,
W75-09582 2F

Great Lakes Basin Framework Study: Appendix 3--Geology and Ground Water,
W75-09714 2F

Summary of Hydrologic Conditions in Collier County, Florida, 1973,
W75-09716 4B

Geologic and Hydrologic Features of Indian Wells Valley, California,
W75-09717 2F

Hydrogeology of the Waterways-Winefred Lake Area, Alberta,
W75-09769 2F

HYDROGRAPH ANALYSIS
A Laboratory Investigation of Surface Runoff,
W75-09744 2E

A Non-Linear Rainfall-Runoff Model, Providing for Variable Lag Time,
W75-09753 2A

HYDROLOGIC BUDGET
Hydrologic Analysis of the Valley-Fill Aquifer, North Platte River Valley, Goshen County, Wyoming,
W75-09722 2F

HYDROLOGIC DATA
Geologic and Hydrologic Features of Indian Wells Valley, California,
W75-09717 2F

The Implementation of a Hydrologic Data Processing System in Brazil,
W75-09726 7C

Sediment Yields from Intermediate-Sized Stream Basins in Southern Alberta,
W75-09750 2J

HYDROLOGIC MODELS
Mathematical Models in Hydrology,
W75-09624 2A

HYDROLOGY
Geographic Variation of the Statistical Parameters of Hydrometeorological Data of the United States,
W75-09605 2B

HYDROLYSIS
Wastewater Treatment Sequence,
W75-09569 5D

HYPOLIMNION
Hypolimnetic Oxygenation Using Liquid Oxygen,
W75-09589 5G

ICE
Heat Transfer in Soil-Water-Ice Systems,
W75-09742 2C

ICE COVER
The Composite Roughness of Ice Covered Streams,
W75-09758 2C

IDAHO
Drought Crack on Western White Pine in Northern Idaho,
W75-09388 2I

Optimizing Long-Term Streamflow Forecasts,
W75-09594 4A

ILLINOIS
Wastewater Survey, Chanute AFB, Illinois.
W75-09397 5D

Anaerobic Digester Operation at the Metropolitan Sanitary Districts of Greater Chicago,
W75-09536 5D

Ground-Water Level in the Flood Plain and Adjacent Uplands of the Sangamon River,
W75-09599 4B

Atchison, Topeka and Santa Fe Ry. Co. v. Callaway (Action by Railroad, Environmentalists and Others to Halt Reconstruction of Lock and Dam on Upper Mississippi River Navigation System by Defendant Corps of Engineers).
W75-09826 8A

INCINERATION
Economic Analysis of the Processing and Disposal of Refuse Sludges,
W75-09406 5D

Heat Treatment and Incineration,
W75-09541 5D

Sludge Disposal by Incineration at Alcosan,
W75-09551 5E

INDIA
Mix Gypsum in Shallow Depths--In Saline Soils,
W75-09786 3C

Sewage Utilization in Agriculture,
W75-09788 5D

For Rainfed Areas-Improved Velvet Beans for Increased Forage Production,
W75-09796 3F

In Salt-Affected Soils Mulching Aids in Crop Growth,
W75-09798 3C

India Case Study on Improving Productivity in Low Rainfall Areas.
W75-09803 3F

INDIA (RAJASTHAN)
Hungry Drylands of Western Rajasthan Need a New Technology,
W75-09789 3F

INDIAN WELLS VALLEY (CALIF)
Geologic and Hydrologic Features of Indian Wells Valley, California,
W75-09717 2F

INDIANA
Sectoral and Regional Economic Impact of Controlling Nonpoint Pollution in Forested Areas,
W75-09530 5B

High Purity Oxygen Aerobic Digestion Experiences at Speedway, Indiana,
W75-09538 5D

INDICATORS
BOD as a Pollution Indicator (La DBO como indicador de la polucion),
W75-09368 5A

INDUSTRIAL WASTES
Where are We in Forest Fertilization,
W75-09367 5D

Oxygen Activated Sludge Wastewater Treatment Systems, Design Criteria and Operating Experience.
W75-09387 5D

State-of-the-Art for the Inorganic Chemicals Industry: Commercial Explosives,
W75-09581 5B

Process for Treating Waste Water,
W75-09656 5D

The Bottom Fauna of China Clay Waste Deposits in Mevagissey Bay,
W75-09673 5C

The Accumulation of Fluoride by Marine and Intertidal Animals,
W75-09697 5C

Interest in Oxygen Process Growing,
W75-09781 5D

INDUSTRIAL WATER
Paper Machine Circulation Systems -- Flows, Consistencies, Recovery, and Pollution (Les circuits de la machine a papier -- debits, concentrations, recuperations et pollutions),
W75-09357 3E

Projects in the Industrial Pollution Control Division - December 1974.
W75-09578 5D

INERTIA
Wave Force Coefficients for Circular Piers,
W75-09593 8B

INFILTRATION
Influence of Surface and Near-Surface Calic Distribution on Infiltration Characteristics, L Vegas, Nevada,
W75-09374

Movement of Water and Salts Under Hi Frequency Irrigation,
W75-09458

Effects of Drip Irrigation on Soil-Water-Pla Relationship,
W75-09500

Urban Lawn Infiltration Rates and Fertiliz Runoff Losses Under Simulated Rainfall,
W75-09592 5

Simulation of Miscible Displacement in Soi Using the Method of Characteristics,
W75-09612 2

A Laboratory Rainfall Simulator for Infiltratio and Soil Detachment Studies,
W75-09746 2

INFORMATION EXCHANGE
U.S. Engineering Information Services and th Role of the Water Resources Scientific Info mation Center,
W75-09585 10

Information Exchange on Water Resource Computer Programs,
W75-09591 7(

Water for Agriculture, Annotated Bibliography Author and Subject Index.
W75-09636 10(

INFORMATION RETRIEVAL
U.S. Engineering Information Services and th Role of the Water Resources Scientific Infor mation Center,
W75-09585 10I

Information Exchange on Water Resource Computer Programs,
W75-09591 7(

INHIBITION WATER POLLUTION EFFECTS
Pond Snail Eggs as an Indicatory Material fo Water Pollution Bioassay: Preliminary Experi ments, (In Japanese),
W75-09682 5C

INLAND WATERWAYS
Man-Induced Changes of Middle Mississipp River,
W75-09754 4A

INLETS (WATERWAYS)
Computation of Flow Through Masonboro Inlet, N.C.,
W75-09608 2L

INORGANIC COMPOUNDS
State-of-the-Art for the Inorganic Chemicals Industry: Commercial Explosives,
W75-09581 5B

Selenium Toxicity on the Early Life Stages of Zebrafish (Brachydanio rerio),
W75-09671 5C

INSECT BEHAVIOR
Aquatic Insect Communities of the Tenryu River, Their Composition, Biotic Index and Seasonal Change, (In Japanese),
W75-09807 5C

SECTICIDES
Behavior of Juvenile Coho Salmon Oncorhynchus Kisutch) Exposed to Sumithion Fenitrothion), An Organophosphate Insecticide,
W75-09700 5C

Occurrence of Pesticide Residues in Four Streams Draining Land-Use Areas in Pennsylvania,
W75-09720 5B

TITUTIONAL CONSTRAINTS
Water for Energy Self-Sufficiency.
W75-09626 6B

Water for Energy Self-Sufficiency, Executive Summary.
W75-09627 4C

fluence of the Energy Crisis Upon the Future Environmental Policy,
W75-09847 6E

TITUTIONS
tegrative Procedures for Coordinated Urban nd and Water Management: A Systems nalysis,
W75-09622 6A

TRUMENTATION
ater Quality Study of Nonpoint Source of ricultural Runoff,
W75-09519 5B

gital Instrumentation and Telemetry for ater Resources Research,
W75-09529 7B

l Moisture Sensing System,
W75-09651 2G

tomatic U.V.-Control System for Relative aluation of Organic Water Pollution,
W75-09735 5A

RFACES
merical Analysis of Confined-Unconfined uifers,
W75-09751 2F

RNATIONAL BOUNDARY AND WATER MISSION
ficial Islands and Installations in International Law,
W75-09834 6E

RNATIONAL LAW
ficial Islands and Installations in International Law,
W75-09834 6E

shore Development and Marine Pollution,
W75-09842 5B

ironmental Protection by Coastal States: Paradigm from Marine Transport of oleum,
W75-09848 5G

RNATIONAL WATERS
ficial Islands and Installations in International Law,
W75-09834 6E

TEBRATES
rsity of Marine Invertebrates in a Thermal ent,
W75-09809 5C

INVESTMENT
Secondary Impacts of Transportation and Wastewater Investments: Review and Bibliography,
W75-09576 5C

ION EXCHANGE
Physical-Chemical Nitrogen Removal, Wastewater Treatment.
W75-09384 5D

Desalination Process,
W75-09654 3A

IRAN
An Investigation on the Use of Drip Irrigation for the Establishment of Multi-Purpose Parks (Green Belts Around the Cities) in Iran,
W75-09503 3F

IRON BACTERIA
Clogging of Drip Systems from Metabolic Products of Iron and Sulfur Bacteria,
W75-09456 5B

IRRADIATION
Reduction in Surfactants by Irradiation,
W75-09418 5D

IRRIGATION
Dynamic Programming Optimization: A Water Distribution System Design,
W75-09525 7C

Growth of Barley Irrigated with Wastewater Sludge Containing Phosphate Precipitants,
W75-09543 5D

The Economics of Sludge Irrigation,
W75-09545 5D

For Improving Water Penetration into Some Arizona Soils-Sulfuric Acid,
W75-09623 3C

Device for Distributing Irrigation Water,
W75-09662 3F

Gypsum Can Improve Your Water Also,
W75-09787 5G

In Salt-Affected Soils Mulching Aids in Crop Growth,
W75-09798 3C

India Case Study on Improving Productivity in Low Rainfall Areas.
W75-09803 3F

IRRIGATION DESIGN
Chamber Method for Drip Irrigation System Design and Installation Procedure,
W75-09441 8C

Optimum Lateral Placement for Subsurface Irrigation Systems,
W75-09460 3F

Trickle Irrigation Design for Optimal Soil Wetting,
W75-09461 2G

Hydraulics of Single-Chamber vs. Dual-Chamber Tubing,
W75-09470 8C

Designing Trickle Irrigation Laterals for Uniformity,
W75-09471 3F

Design Charts for Drip Irrigation Systems,
W75-09472 8C

IRRIGATION EFFECTS
Proceedings of the Second International Drip Irrigation Congress.
W75-09423 3F

Changes in Chemical Quality of Water, Cedar Bluff Irrigation District Area, West-Central Kansas,
W75-09719 5B

IRRIGATION EFFICIENCY
Proceedings of the Second International Drip Irrigation Congress.
W75-09423 3F

Irrigating Apparatus,
W75-09641 3F

IRRIGATION PRACTICES
Proceedings of the Second International Drip Irrigation Congress.
W75-09423 3F

Drip Irrigation-Worldwide,
W75-09424 3F

The Progress and Problems of Drip Irrigation in Israel,
W75-09425 3F

Vegetable Production and Water-Use Efficiency as Influenced by Drip, Sprinkler, Subsurface, and Furrow Irrigation Methods,
W75-09438 3F

The Use of Foggers in Drip Irrigation,
W75-09442 3F

Traveling Trickle System,
W75-09452 3F

Soil Moisture Distribution and Depletion in an Apple Orchard Irrigated by Tricklers,
W75-09463 2G

Trickle Irrigation in Michigan Orchards,
W75-09466 3F

Soil Salinity Distribution in Drip and Subsurface Irrigated Summer Squash,
W75-09481 3C

Fertilizer Applications with Drip Irrigation,
W75-09491 3F

IRRIGATION STRUCTURES
An Investigation of Factors Affecting the Intensity of Water Use in the Lajas Valley Irrigation Project,
W75-09376 3F

IRRIGATION SYSTEMS
Mobile Drip Irrigation Systems,
W75-09453 3F

Evaluation of a Trickle Irrigation System,
W75-09469 3F

Plant Water Requirements as Related to Trickle Irrigation,
W75-09475 3F

Irrigating Apparatus,
W75-09641 3F

Device for Distributing Irrigation Water,
W75-09662 3F

Initial Stage, Oahe Unit, Pick-Sloan Missouri Basin Program, South Dakota (Final Environmental Impact Statement).
W75-09812 8A

IRRIGATION WATER
An Investigation of Factors Affecting the Intensity of Water Use in the Lajas Valley Irrigation Project,
W75-09376 3F

Pollution of Irrigation Waters by Plant Pathogenic Organisms,
W75-09521 5B

Changes in Chemical Quality of Water, Cedar Bluff Irrigation District Area, West-Central Kansas,
W75-09719 5B

Gypsum Can Improve Your Water Also,
W75-09787 5G

Sewage Utilization in Agriculture,
W75-09788 5D

IRRIGATION WATER DRAINAGE
Water for Agriculture, Annotated Bibliography, Author and Subject Index.
W75-09636 10C

IRRIGATION WELLS
Hydrologic Analysis of the Valley-Fill Aquifer, North Platte River Valley, Goshen County, Wyoming,
W75-09722 2F

ISLANDS
Artificial Islands and Installations in International Law,
W75-09834 6E

ISRAEL
The Progress and Problems of Drip Irrigation in Israel,
W75-09425 3F

Drip Irrigation and Automation Tools in Efficient Use of Water Policy,
W75-09426 3F

Trickle Irrigation,
W75-09437 3F

Disinfection of Soil Strips Through the Drip Irrigation System,
W75-09444 5G

Aspects of Trace Metal Contamination in the Coastal Rivers of Israel,
W75-09689 5B

High Milk Production Under Unfavourable Natural Conditions,
W75-09797 3F

ISRAEL (ARAVA DESERT)
Strip Cultivation of the Area Wetted by Drip Irrigation in the Arava Desert,
W75-09445 3C

ITALY
Researches and Applications on Drip Irrigation and Similar Methods in Italy,
W75-09430 3F

JAPAN
Aquatic Insect Communities of the Tenryu River, Their Composition, Biotic Index and Seasonal Change, (In Japanese),
W75-09807 5C

JAPAN SEA
Sediments and Structure of the Japan Sea,
W75-09756 2J

JUDICIAL DECISIONS
Union Camp Corp. v. Seminole Forest Water Management District (Suit by Single Landowner to Require Formation of a Drainage District).
W75-09828 6E

Conservation Council of North Carolina v. Costanzo (Action to Enjoin Construction of a Marina on Island in Atlantic Ocean and to Require Environmental Impact Statement by Corps of Engineers).
W75-09840 6E

JURISDICTION
A Case Study of Estuarine Pollution and Local Agency Interactions,
W75-09620 5G

JUVENILE GROWTH STAGES
The Effect of Basic Cuprous Carbonate on the State of the Liver in Juvenile Amur Autumn Chum (Oncorhynchus keta infrasp. autumnalis),
W75-09668 5C

KAHULUI HARBOR
Prevention and Mitigation of Shore Damages, Kahului Harbor, Maui, Hawaii (Final Environmental Impact Statement).
W75-09825 8A

KANSAS
Changes in Chemical Quality of Water, Cedar Bluff Irrigation District Area, West-Central Kansas,
W75-09719 5B

KARMAN NUMBER
The Karman and Reynolds Numbers and the Drag Coefficient in Ducts and Pipes,
W75-09596 8B

KENTUCKY
Evaluation of Recovery in a Polluted Creek After Installation of New Sewage Treatment Procedures,
W75-09515 5B

North Fork Nolin River Watershed, Kentucky (Final Environmental Impact Statement).
W75-09814 8A

KINEMATIC WAVE MODEL
A Laboratory Investigation of Surface Runoff,
W75-09744 2E

KOKANEE SALMON
Effects of Kokanee Salmon (Oncorhynchus Nerka) Decomposition on the Ecology of a Subalpine Stream,
W75-09672 5C

LABORATORIES
Automation in a Water Quality Laboratory Scheme,
W75-09723 5A

LABORATORY TESTS
Drag Reduction by Collapsed and Extended Polyelectrolytes,
W75-09601 8B

The Effects of Lapsed Time Since Feeding Upon the Toxicity of Zinc to Fish,
W75-09688 5C

Differentiation Between Natural Hydrocarbons and Low Level Diesel Oil Contamination in Cooked Lobster Meat,
W75-09698 5A

On the Discharge Coefficient of Nozzles f
Single- and Two-Phase Fluids,
W75-09739 8

Friction Factor Under Oscillatory Waves,
W75-09755 8

Rapid Temperature Reduction of Therm
Discharge,
W75-09757 5

LAG TIME
A Non-Linear Rainfall-Runoff Model, Provi
ing for Variable Lag Time,
W75-09753 2

LAGOON-SOIL SYSTEM
A Covered Domestic Lagoon System for Nat
ral Ground Water Recharge Near Metropolit
Areas,
W75-09524 5

LAGOON TREATMENT
A Covered Domestic Lagoon System for Nat
ral Ground Water Recharge Near Metropolit
Areas,
W75-09524 5

LAGOONS
Upgrading Lagoons.
W75-09386 5

LAJAS VALLEY (P.R.)
An Investigation of Factors Affecting the I
tensity of Water Use in the Lajas Valley Irrig
tion Project,
W75-09376 3

LAKE BOTTOMS
Silt Removal from a Lake Bottom.
W75-09575 5

LAKE DIKING
Water Quality Effect of Diking a Shallow Ari
Region Lake,
W75-09577 5

LAKE HERMAN (SODAK)
Silt Removal from a Lake Bottom.
W75-09575 5

LAKE HURON
The Prediction of Lake Huron Lake-Effec
Snowfall Systems,
W75-09748 2

LAKE OAHE (SD)
Initial Stage, Oahe Unit, Pick-Sloan Missou
Basin Program, South Dakota (Final Environ
mental Impact Statement).
W75-09812 8

LAKE ONTARIO
Dynamics of Turbidity Plumes in Lake Ontario
W75-09709 2

LAKE SEDIMENTS
The Effect of Sulfate and Manganese Dioxid
on the Release of Phosphorus from Lake Men
dota Sediments,
W75-09619 5

LAKE SUPERIOR
The Reserve Mining Case: Promises, Promises,
W75-09838 5

LAKES
Forest Fire: Effect on Phosphorus Movement
to Lakes,
W75-09364 5

Water Quality Effect of Diking a Shallow Arid-Region Lake,
W75-09577 5

. Saline Intrusion into Seneca Lake, New ork,
/75-09765 5B

ND APPLICATION
tilization of Digested Chemical Sewage ludges on Agricultural Lands in Ontario,
'75-09544 3F

ecent Sanitary District History in Land Recla- ation and Sludge Utilization,
75-09547 5E

steurization of Liquid Digested Sludge,
75-09552 5D

D DEVELOPMENT
izona's Remote Subdivisions: An Inventory,
75-09583 6G

D RECLAMATION
Investigation into the Potential Uses of ckle Irrigation for Desert Reclamation and dder Production in the Emirate of Abu abi,
'5-09487 4A

inage Materials.
5-09628 8G

rvey of Experience with Drainage Materials Review of Available Specifications,
5-09629 8G

dy of Experiences with Drainage Materials a Review of Specifications Available in nce,
5-09630 8G

eriences with Drainage Materials and a iew of Available Specifications,
5-09631 8G

urvey of Experiences with Drainage Materi- nd a Review of Available Specifications,
-09632 8G

ey of Experiences with Drainage Materials Review of Available Specifications,
-09634 8G

-Associated Precipitation Reactions in e-Sodic Soils and Their Significance,
-09792 2G

REQUIREMENTS
ge Management System for St. Louis,
09558 5D

RESOURCES
of River Basins of the United States.
09616 7C

1945-1966, Land and Water.
09635 10C

USE
na's Remote Subdivisions: An Inventory,
09583 6G

ating Effects of Water Resource opments on Wildlife Habitat,
09790 6G

LLS
Waste Milling and Disposal on Land ut Cover, Volume I. Summary and Major gs,
9401 5E

Waste Milling and Disposal on Land ut Cover. Volume II. Data Condensa-
9402 5E

Evaluation of Environmental Impact of Landfills,
W75-09761 5C

LANDSCAPING
Drip Irrigation in Landscaping and Soil Erosion Control,
W75-09429 4D

LARUE COUNTY (KY)
North Fork Nolin River Watershed, Kentucky (Final Environmental Impact Statement).
W75-09814 8A

LARVAE
Selenium Toxicity on the Early Life Stages of Zebrafish (Brachydanio rerio),
W75-09671 5C

LAW OF THE SEA
Artificial Islands and Installations in International Law,
W75-09834 6E

Towards a New Regime for Ocean Development,
W75-09843 6E

LD50
Effect of DDT on Discriminating Ability of Rainbow Trout (Salmo Gairdneri),
W75-09674 5C

LEACHING
Monitoring Soil Salinity and Leaf Nutrient Levels in a Young Avocado Orchard Under Drip Irrigation,
W75-09482 3F

Salinity Management for High Frequency Irrigation,
W75-09484 3C

In Salt-Affected Soils Mulching Aids in Crop Growth,
W75-09798 3C

LEAD
Determination of Lead in Potable Waters Using Delves Cup Atomic Absorption Spectrometer with Signal Integration,
W75-09366 5A

LEGISLATION
Ocean Disposal Experiences in Philadelphia,
W75-09550 5E

Water Laws in Moslem Countries,
W75-09625 6E

LETHAL LIMIT
Avoidance of Fenitrothion by Goldfish (Carassius Auratus),
W75-09677 5C

Acute Toxicity of Nitrite to Rainbow Trout (Salmo Gairdneri),
W75-09687 5C

LEUCASPIUS DELINEATUS
The Effect of Different Oxygen Conditions During Incubation on the Survival and Some of the Developmental Characteristics of the 'Verkhova' (Leucaspius Delineatus) in the Embryonic Period,
W75-09670 5C

LEVEES
Man-Induced Changes of Middle Mississippi River,
W75-09754 4A

Bushley Bayou, Louisana (Final Environmental Impact Statement).
W75-09819 8D

LIGHT INTENSITY
Effect of DDT on Discriminating Ability of Rainbow Trout (Salmo Gairdneri),
W75-09674 5C

LIGNITE
Carbon from Lignite or Coal: Which is Better,
W75-09733 5D

LIME
Ferric Chlorine or Lime for Chemical Treatment,
W75-09380 5D

LINCOLNSHIRE LIMESTONE (ENGLAND)
Numerical Analysis of Confined-Unconfined Aquifers,
W75-09751 2F

LINE SOURCES
See Germination Response to Subsurface Irrigation Depth,
W75-09451 2I

LINEAR ALKYLATE SULFONATES
Reduction in Surfactants by Irradiation,
W75-09418 5D

LINEAR PROGRAMMING
The Optimum Distribution of Urban Water Supplies in Puerto Rico,
W75-09377 4A

LIPIDS
Organochlorine Residue Levels in Arctic Ringed Seals: Variation with Age and Sex,
W75-09702 5C

LIQUEFACTION
Water Escape Structures in Coarse-Grained Sediments,
W75-09768 2J

LIQUID DIGESTED SLUDGE
Agricultural Utilization of Digested Sludges from the City of Pensacola,
W75-09554 5E

LIVESTOCK
The Sahelian Drought - A Disaster for Livestock Populations,
W75-09785 3F

LOBSTERS
Differentiation Between Natural Hydrocarbons and Low Level Diesel Oil Contamination in Cooked Lobster Meat,
W75-09698 5A

LOCAL GOVERNMENTS
Water, Sewerage and Flood Control Systems Plan and Implementation Program 1973-74.
W75-09400 6D

A Case Study of Estuarine Pollution and Local Agency Interactions,
W75-09620 5G

LOCKS
Charles River Dam, Boston, Mass (Final Environmental Impact Statement).
W75-09816 8D

Atchison, Topeka and Santa Fe Ry. Co. v. Callaway (Action by Railroad, Environmentalists and Others to Halt Reconstruction of Lock and Dam on Upper Mississippi River Navigation System by Defendant Corps of Engineers).
W75-09826 8A

LOS ANGELES (CALIF)
Sludge Dewatering,
W75-09539 5D

LOUISIANA
Ground-Water Data for Orange County and Vicinity, Texas and Louisiana, 1971-74,
W75-09727 7C

Crude Oil and Natural Gas Production and Other Mining Operations in Navigable Waters Along the Louisiana Coast (Final Environmental Impact Statement).
W75-09823 5G

Johnson v. State Farm Fire and Casualty Co. (Action for Death by Drowning in Artificial Canal Which Was Found to Be Not Navigable).
W75-09829 6E

National Audobon Society v. White (Suit to Enjoin Trespass on Privately Owned and Maintained Navigable Canal).
W75-09839 6E

LUDLOW (MASS)
Map Showing Drainage Areas, Ludlow Quadrangle, Massachusetts,
W75-09707 7C

LUMBERING
Effects of Logging on Water Temperature and Dissolved Oxygen in Spawning Beds,
W75-09685 5C

Effects of Deforestation on Slopes,
W75-09743 4C

MADISON (WISC)
Solid Waste Milling and Disposal on Land Without Cover, Volume I. Summary and Major Findings,
W75-09401 5E

Solid Waste Milling and Disposal on Land Without Cover. Volume II. Data Condensations,
W75-09402 5E

MAGNESIAN LIMESTONE
A Case Study of Mine Water Quality Deterioration, Mainsforth Colliery, County Durham,
W75-09752 5B

MAINE
Maintenance of the Federal Navigation Project in Scarboro River at Scarboro, Maine (Final Environmental Impact Statement).
W75-09811 8A

MAINTENANCE
Maintenance of the Federal Navigation Project in Scarboro River at Scarboro, Maine (Final Environmental Impact Statement).
W75-09811 8A

MANGANESE OXIDES
The Effect of Sulfate and Manganese Dioxide on the Release of Phosphorus from Lake Mendota Sediments,
W75-09619 5C

MAPS
Environmental Geology of an Area in West-Central Alabama,
W75-09615 7C

Atlas of River Basins of the United States.
W75-09616 7C

Map Showing Drainage Areas, Marlborough Quadrangle, Connecticut,
W75-09704 7C

Map Showing Drainage Areas, West Springfield Quadrangle, Massachusetts-Connecticut,
W75-09705 7C

Map Showing Drainage Areas, Ludlow Quadrangle, Massachusetts,
W75-09707 7C

Map Showing Drainage Areas, Mount Tom Quadrangle, Massachusetts,
W75-09708 7C

World Maps of Potential Evapotranspiration, Plant Development, and Spring Greening and Autumn Browning of Vegetation, Based on the Solar Thermal Unit Model,
W75-09771 2D

MARINE ANIMALS
The Accumulation of Fluoride by Marine and Intertidal Animals,
W75-09697 5C

MARINE BIOLOGY
Contemporary Research in Marine Affairs,
W75-09837 6B

MARINE FISHERIES
Towards a New Regime for Ocean Development,
W75-09843 6E

MARINE OIL SPILLS
Marine Oil Spills: A Problem in Environmental Management,
W75-09849 5G

MARINE SEDIMENTS
Adenosine Triphosphate Measurements in Soil and Marine Sediments,
W75-09764 5A

MARKING TECHNIQUES
Branding Chinook, Coho and Sockeye Salmon Fry with Hot and Cold Metal Tools,
W75-09561 7B

MARLBOROUGH (CONN)
Map Showing Drainage Areas, Marlborough Quadrangle, Connecticut,
W75-09704 7C

MARRON
Experimental Introduction of the Australian Crayfish (Cherax Tenuimanus) into Louisiana,
W75-09560 8I

MARYLAND
An Evaluation of the Hagerstown, Maryland Water Pollution Control Plant,
W75-09396 5D

MASONBORO INLET (NC)
Computation of Flow Through Masonboro Inlet, N.C.,
W75-09608 2L

MASSACHUSETTS
Wet Systems for Residential Refuse Collection: A Case Study for Springfield, Massachusetts,
W75-09407 5D

Map Showing Drainage Areas, West Springfield Quadrangle, Massachusetts-Connecticut,
W75-09705 7C

Map Showing Drainage Areas, Ludlow Quadrangle, Massachusetts,
W75-09707 7C

Map Showing Drainage Areas, Mount Tom Quadrangle, Massachusetts,
W75-09708 7C

Charles River Dam, Boston, Mass (Final E
vironmental Impact Statement).
W75-09816

MATHEMATICAL MODELS
Optimum Lateral Placement for Subsurface
rigation Systems,
W75-09460

Recharge Simulation Model,
W75-09518

Storm Water Management Model: Use
Manual, Version II,
W75-09579

Goundwater Models,
W75-09582

Computation of Flow Through Masonbo
Inlet, N.C.,
W75-09608

Simulation of Miscible Displacement in So
Using the Method of Characteristics,
W75-09612

Mathematical Models in Hydrology,
W75-09624

Heat Transfer in Soil-Water-Ice Systems,
W75-09742

MATHEMATICAL STUDIES
The Karman and Reynolds Numbers and t
Drag Coefficient in Ducts and Pipes,
W75-09596

Tangential Stress Distribution in Turbule
Boundary Layers at an Adverse Pressu
Gradient,
W75-09738

MCCULLOUGH RANGE (NEV)
Influence of Surface and Near-Surface Calic
Distribution on Infiltration Characteristics, L
Vegas, Nevada,
W75-09374

MECHANICAL PROPERTIES
Hydraulic and Mechanical Properties of Dr
pers,
W75-09473

MELONS
Influence of Different Amounts of Irrigatio
Water, Irrigation--Intervals and Fertilizers
the Yield and Quantity of Drip-Irrigated Mus
and Watermelons,
W75-09494

MEMBRANE PROCESSES
Application of Filtration Through Semi-Perm
able Membranes for Treatment of Wastes,
W75-09730

MEMBRANES
Development of Porous Polyvinyl Chlori
Coated Tubulets for Seawater Desalination,
W75-09373

Reverse Osmosis Apparatus,
W75-09661

MERCURY
Mercury in Seals, Terrestial Carnivores a
Principal Food Items of the Inuit, from H
man, N.W.T.,
W75-09679

Effect of Temperature on Accumulation
Methylmercuric Chloride and p,p' DDT
Rainbow Trout (Salmo Gairdneri),
W75-09681

ESQUITE
A Survey of the Nesting Habitats of the White-Winged Dove in Arizona,
W75-09794 6G

ETABOLISM
Uptake, Metabolism and Distribution of DDT n Organs of the Blue Crab, Callinectes Sapidus,
W75-09691 5C

Pick up and Metabolism of DDT, Dieldrin and Photodieldrin by a Freshwater Alga Ankistrodesmus Amalloides) and a Microcrustacean (Daphnta Pulex),
V75-09805 5C

oss of Five Pesticides from Cultures of Twen-yone Planktonic Algae,
/75-09808 5A

TALS
spects of Trace Metal Contamination in the oastal Rivers of Israel,
75-09689 5B

TEOROLOGICAL DATA
rought, A Recurrent Element of Climate,
75-09799 2B

TEOROLOGY
eographic Variation of the Statistical Parame-rs of Hydrometeorological Data of the United ates,
75-09605 2B

fense Meteorological Satellite Program MSP) User's Guide,
5-09770 7B

HEMOGLOBINEMIA
ute Toxicity of Nitrite to Rainbow Trout lmo Gairdneri),
5-09687 5C

HOXYCHLOR
s of Five Pesticides from Cultures of Twen-ne Planktonic Algae,
5-09808 5A

HYL BROMIDE
nfection of Soil Strips Through the Drip Ir-tion System,
5-09444 5G

HYLMERCURIC CHLORIDE
ct of Temperature on Accumulation of hylmercuric Chloride and p,p' DDT by bow Trout (Salmo Gairdneri),
-09681 5C

L MERCURY
cury in Seals, Terrestial Carnivores and cipal Food Items of the Inuit, from Hol- N.W.T.,
-09679 5A

GAN
le Irrigation in Michigan Orchards,
09466 3F

le Irrigation in Michigan Orchards: Con-g Rate of Flow with Flow Regulating s and Microtubes,
09467 8C

ge Disposal and Water Supply Alterna- on the Basis of Water Quality and omic Criteria,
09774 5B

MICRO-PORE TUBING
A Constant Micro Source of Moisture as a Component in a Gradient System for a High Level Production,
W75-09443 3F

MICROBIAL DEGRADATION
Material for Biological Degradation of Petroleum,
W75-09652 5D

MICROORGANISMS
Chemical Treatment of Drip Irrigation Water,
W75-09457 3F

Antimicrobial Agents for Water Conservation,
W75-09637 5F

MICROTUBES
Trickle Irrigation in Michigan Orchards: Controlling Rate of Flow with Flow Regulating Valves and Microtubes,
W75-09467 8C

MICROTUBING
Edaphic Micro-Tubular Continuous Flow Irrigation in Canada,
W75-09436 2G

MIDDLE MISSISSIPPI RIVER
Man-Induced Changes of Middle Mississippi River,
W75-09754 4A

MILK
High Milk Production Under Unfavourable Natural Conditions,
W75-09797 3F

MILK PRODUCTION
High Milk Production Under Unfavourable Natural Conditions,
W75-09797 3F

MILO
Salinity Sensor Control of Drip Irrigation Water Application,
W75-09477 3C

MINE DRAINAGE
Effects of Metal-Mine Drainage on Water Quality in Selected Areas of Colorado, 1972-73,
W75-09712 5C

MINE WASTES
The Bottom Fauna of China Clay Waste Deposits in Mevagissey Bay,
W75-09673 5C

Effects of Metal-Mine Drainage on Water Quality in Selected Areas of Colorado, 1972-73,
W75-09712 5C

MINNESOTA
Forest Fire: Effect on Phosphorus Movement to Lakes,
W75-09364 5B

Minnesota's Water Resources: A Primer,
W75-09516 6B

MINNOWS
Effects of Saline Water from North Dakota Lakes on Survival of Fathead Minnow (Pimephales Promelas) Embryos and Sac Fry,
W75-09669 5C

Effect of Zinc on Growth of the Minnow Phoxinus Phoxinus,
W75-09693 5C

MISSISSIPPI
A Case Study of Estuarine Pollution and Local Agency Interactions,
W75-09620 5G

MISSISSIPPI RIVER
Atchison, Topeka and Santa Fe Ry. Co. v. Callaway (Action by Railroad, Environmentalists and Others to Halt Reconstruction of Lock and Dam on Upper Mississippi River Navigation System by Defendant Corps of Engineers).
W75-09826 8A

MISSOURI RIVER
Initial Stage, Oahe Unit, Pick-Sloan Missouri Basin Program, South Dakota (Final Environmental Impact Statement).
W75-09812 8A

MIXING
Water Treatment Plant,
W75-09645 5D

Rapid Temperature Reduction of Thermal Discharge,
W75-09757 5B

MODEL STUDIES
Water Quality Study of Nonpoint Source of Agricultural Runoff,
W75-09519 5B

Goundwater Models,
W75-09582 2F

Mathematical Models in Hydrology,
W75-09624 2A

Hydrologic Analysis of the Valley-Fill Aquifer, North Platte River Valley, Goshen County, Wyoming,
W75-09722 2F

A Laboratory Investigation of Surface Runoff,
W75-09744 2E

MOISTURE
A Constant Micro Source of Moisture as a Component in a Gradient System for a High Level Production,
W75-09443 3F

MOISTURE CONTENT
Effects of Drip Irrigation on Soil-Water-Plant Relationship,
W75-09500 2I

MOISTURE PROFILES
Moisture Profiles and Salinization of Soils Under Drip Irrigation in the Republic of South Africa,
W75-09464 3C

MOISTURE STRESS
Drought Crack on Western White Pine in Northern Idaho,
W75-09388 2I

Tritiated Water Turnover Rate in Rodents: Desert and Mountain,
W75-09801 2I

MOJAVE DESERT
Geologic and Hydrologic Features of Indian Wells Valley, California,
W75-09717 2F

MONITORING
Monitoring Soil Salinity and Leaf Nutrient Levels in a Young Avocado Orchard Under Drip Irrigation,
W75-09482 3F

Water Quality Study of Nonpoint Source of Agricultural Runoff,
W75-09519 5B

Pond Snail Eggs as an Indicatory Material for Water Pollution Bioassay: Preliminary Experiments, (In Japanese),
W75-09682 5C

MONO COUNTY (CALIF)
Data from a 1,000-Foot (305-Metre) Core Hole in the Long Valley Caldera, Mono County, California,
W75-09728 7C

MONTANA
Distribution and Dynamics of Aquatic Insects in the Elk Creek Experimental Watershed, Lubrecht Forest, Montana,
W75-09528 5C

Transpiration Rates of Conifers,
W75-09784 2D

MOSLEM WATER LAW
Water Laws in Moslem Countries,
W75-09625 6E

MOUNT TOM (MASS)
Map Showing Drainage Areas, Mount Tom Quadrangle, Massachusetts,
W75-09708 7C

MULCHING
In Salt-Affected Soils Mulching Aids in Crop Growth,
W75-09798 3C

MULTIPLE-OBJECTIVE PLANNING
Integrative Procedures for Coordinated Urban Land and Water Management: A Systems Analysis,
W75-09622 6A

MULTIPLE-PURPOSE PROJECTS
Sectoral and Regional Economic Impact of Controlling Nonpoint Pollution in Forested Areas,
W75-09530 5B

MUNICIPAL WASTES
Where are We in Forest Fertilization,
W75-09367 5D

Flow Equalization.
W75-09381 5D

Anaerobic Digester Operation at the Metropolitan Sanitary Districts of Greater Chicago,
W75-09536 5D

Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability, Supplement to Federal Guidelines for Design, Operation, and Maintenance of Waste Water Treatment Facilities.
W75-09559 8C

Interest in Oxygen Process Growing,
W75-09781 5D

MUNICIPAL WATER
An Evaluation of Water Reuse for Municipal Supply,
W75-09408 5D

Public Water Supplies of North Carolina: Part 3. Mountains and Western Piedmont,
W75-09711 5F

MUSSELS
Differential Uptake of Endosulfan by the Tissues of Mytilus Edulis,
W75-09810 5A

MYTILUS EDULIS
The Accumulation of Fluoride by Marine and Intertidal Animals,
W75-09697 5C

Differential Uptake of Endosulfan by the Tissues of Mytilus Edulis,
W75-09810 5A

NAPLES (FLA)
Summary of Hydrologic Conditions in Collier County, Florida, 1973,
W75-09716 4B

NARRAGANSETT BAY (RI)
Sediment Resuspension and Deposition in Narragansett Bay,
W75-09736 2L

NASH MODEL
A Laboratory Investigation of Surface Runoff,
W75-09744 2E

NATURAL RESOURCES
Environmental Geology of an Area in West-Central Alabama,
W75-09615 7C

NATURAL STREAMS
Deoxygenation in Natural Streams,
W75-09767 5B

NAVIGABLE RIVERS
Maintenance of the Federal Navigation Project in Scarboro River at Scarboro, Maine (Final Environmental Impact Statement).
W75-09811 8A

NAVIGABLE WATERS
People v. McCarthy (Criminal Action for Operating Unregistered Boat on Navigable Waters of Privately Owned Marina).
W75-09830 6E

Conch Creek Corp. v. Guess (Conflicting Title Claims to Tidelands Included in Grant from Governor).
W75-09832 6E

NAVIGATION
Johnson v. State Farm Fire and Casualty Co. (Action for Death by Drowning in Artificial Canal Which Was Found to Be Not Navigable).
W75-09829 6E

NEARSHORE SEDIMENTATION
Quaternary Sedimentation on the Amazon Continental Margin: A Model,
W75-09600 2L

NEBRASKA
Water Quality Study of Nonpoint Source of Agricultural Runoff,
W75-09519 5B

Pollution of Irrigation Waters by Plant Pathogenic Organisms,
W75-09521 5B

Upflow Filtration of Oxidation Pond Effluent,
W75-09522 5D

Groundwater Levels in Nebraska, 1974,
W75-09710 4B

NEGLIGENCE
Johnson v. State Farm Fire and Casualty
(Action for Death by Drowning in Arti
Canal Which Was Found to Be Not Naviga
W75-09829

NESTING COVER
A Survey of the Nesting Habitats of the W
Winged Dove in Arizona,
W75-09794

NETHERLANDS
Drainage Materials - Provisional Report o
Experience Gained in the Netherlands,
W75-09633

NETWORKS
Initial Bifurcation Process in Natural Ch
Networks,
W75-09609

NEUTRALIZATION
Treatment and Safe Disposal of Cationic
ing Colors,
W75-09352

NEUTRON ACTIVATION ANALYSIS
Multielement Neutron Activation Analys
Fresh Water Using Ge(Li) Gamma
trometry,
W75-09362

NEVADA
Influence of Surface and Near-Surface C
Distribution on Infiltration Characteristics
Vegas, Nevada,
W75-09374

Economics and Finance of Nevada
Water Systems,
W75-09375

NEW JERSEY
Wastewater Treatment Facilities Constr
Grants for the Lower Raritan River Basi
for the South Shore of Raritan Bay (Fin
vironmental Impact Statement).
W75-09817

The Public Trust Doctrine Is Alive and K
in New Jersey Tidalwaters: Neptune C
Avon-By-The-Sea--A Case of Happy Atav
W75-09850

NEW YORK
A Saline Intrusion into Seneca Lake,
York,
W75-09765

People v. McCarthy (Criminal Actio
Operating Unregistered Boat on Nav
Waters of Privately Owned Marina).
W75-09830

Passaic Valley Council Boy Scouts of An
v. Hartwood Syndicate, Inc. (Suit by Ow
Part of Reservoir Bed Against Own
Remainder Who Claimed Exclusive Rig
Hunt, Fish or Sail on Reservoir Waters).
W75-09831

NEW YORK ATLANTIC OCEAN
Wastewater Treatment Facilities Constr
Grants for the Lower Raritan River Basi
for the South Shore of Raritan Bay (Fin
vironmental Impact Statement).
W75-09817

NEW YORK BIGHT
A Study of the Surface Fluid Flow Ch
teristics of the New York Bight and

velopment of Research Data Display chniques,
'5-09783 5B

ZEALAND
: Bottom Fauna of China Clay Waste posits in Mevagissey Bay,
5-09673 5C

ATES
ect of Zinc on Growth of the Minnow Phox- Phoxinus,
5-09693 5C

FICATION
ification and Denitrification Facilities, tewater Treatment.
5-09382 5D

to Get Low Ammonia Effluents,
-09778 5D

TES
le Toxicity of Nitrite to Rainbow Trout no Gairdneri),
-09687 5C

GEN
ical-Chemical Nitrogen Removal, Waste- r Treatment.
-09384 5D

cts of Nitrogen Fertilizer Applications to of a Root System,
09496 3F

ges in Blood Chemistry of Juvenile Steel- Trout, Salmo Gairdneri, Following thal Exposure to Nitrogen Supersatura-
09694 5C

GEN REMOVAL
cal-Chemical Nitrogen Removal, Waste- Treatment.
09384 5D

OINT SOURCE POLLUTION
Quality Study of Nonpoint Source of ultural Runoff,
09519 5B

al and Regional Economic Impact of olling Nonpoint Pollution in Forested
09530 5B

CAROLINA
utation of Flow Through Masonboro N.C.,
9608 2L

Water Supplies of North Carolina: Part ntains and Western Piedmont,
9711 5F

vation Council of North Carolina v. zo (Action to Enjoin Construction of a on Island in Atlantic Ocean and to e Environmental Impact Statement by of Engineers).
9840 6E

DAKOTA
of Saline Water from North Dakota on Survival of Fathead Minnow nales Promelas) Embryos and Sac Fry,
669 5C

Resources Investigations in the Fort Coal Region, North Dakota, 1974-75.
715 5B

Geology of Griggs and Steele Counties,
W75-09725 2J

NORTH PLATTE PROJECT (NEB)
Pollution of Irrigation Waters by Plant Pathogenic Organisms,
W75-09521 5B

NOZZLES
On the Discharge Coefficient of Nozzles for Single- and Two-Phase Fluids,
W75-09739 8B

NUCLEATION
The Evolution of Drop Spectra Due to Condensation, Coalescence and Breakup,
W75-09597 2B

A Wind Tunnel Investigation on Ice Multiplication by Freezing of Waterdrops Falling at Terminal Velocity in Air,
W75-09613 2C

NUMERICAL ANALYSIS
Computation of Flow Through Masonboro Inlet, N.C.,
W75-09608 2L

Numerical Analysis of Confined-Unconfined Aquifers,
W75-09751 2F

Evaluating Effects of Water Resource Developments on Wildlife Habitat,
W75-09790 6G

NUTRIENT REMOVAL
Movement of Pollutant Phosphorus In Unsaturated Soil,
W75-09527 5B

Phosphorus Removal in Seasonal Retention Lagoons by Batch Chemical Precipitation,
W75-09563 5D

NUTRIENT REQUIREMENTS
Forage Preferences of Trained Mule Deer on the Beaver Creek Watersheds,
W75-09793 3F

NUTRIENTS
A Constant Micro Source of Moisture as a Component in a Gradient System for a High Level Production,
W75-09443 3F

Irrigation for Container Growing,
W75-09447 3F

Monitoring Soil Salinity and Leaf Nutrient Levels in a Young Avocado Orchard Under Drip Irrigation,
W75-09482 3F

OBSERVATION WELLS
Ground-Water Data for Orange County and Vicinity, Texas and Louisiana, 1971-74,
W75-09727 7C

OCEAN BOTTOM
Wave Induced Pressures in Permeable Seabeds,
W75-09607 8B

OCEAN DISPOSAL
Ocean Waste Disposal Practices in Metropolitan Areas of California,
W75-09391 3D

OCEAN WAVES
Computation of Wave Heights Due to Refraction and Friction,
W75-09606 8B

Special Power Generating Unit Using Cpmpressed Air Produced by Ocean Wave Together with Super-Heated Steam,
W75-09638 8C

OCEANOGRAPHY
Wind and Wave Relationships in U.K. Coastal Waters,
W75-09737 2L

OCEANS
Interaction Between the Daily Heat Balance and the Tidal Cycle,
W75-09602 5B

Wave Induced Pressures in Permeable Seabeds,
W75-09607 8B

Statistical Properties of Wave Force,
W75-09759 8B

ODOR
Activated Carbon Used to Control Odors,
W75-09777 5D

OFFSHORE PLATFORMS
Arctic Barrier Formation,
W75-09644 8A

Offshore Development and Marine Pollution,
W75-09842 5B

OHIO
Hypolimnetic Oxygenation Using Liquid Oxygen,
W75-09589 5G

How to Get Low Ammonia Effluents,
W75-09778 5D

OIL
Proposed 1973 Outer Continental Shelf Oil and Gas General Lease-Sale, Offshore Mississippi, Alabama, and Florida, Volume 2, Potential Environmental Impacts, Etc. (Environmental Impact Statement).
W75-09820 5G

Offshore Oil and Gas Rights: A Comparative Study,
W75-09836 6E

Environmental Protection by Coastal States: The Paradigm from Marine Transport of Petroleum,
W75-09848 5G

OIL POLLUTION
Underwater Drilling Pollution Control Curtain,
W75-09639 5G

Material for Biological Degradation of Petroleum,
W75-09652 5D

Collection and Recovery System for Oil Spills,
W75-09660 5G

Process for Separating Low API Gravity Oil from Water,
W75-09664 5G

Oil Interceptors for Separating Oil from Water by Gravity,
W75-09667 5G

The Effects of Oils on Growth of Freshwater Phytoplankton,
W75-09678 5C

Differentiation Between Natural Hydrocarbons and Low Level Diesel Oil Contamination in Cooked Lobster Meat,
W75-09698 5A

Proposed 1973 Outer Continental Shelf Oil and Gas General Lease-Sale, Offshore Mississippi, Alabama, and Florida, Volume 2, Potential Environmental Impacts, Etc. (Environmental Impact Statement).
W75-09820 5G

Joint Canada-United States Marine Pollution Contingency Plan for Spills of Oil and Other Noxious Substances.
W75-09835 5G

Offshore Development and Marine Pollution,
W75-09842 5B

Federal Maritime Jurisdiction and State Marine Pollution Legislation: The Florida Act Not Preempted Per Se,
W75-09845 5G

Environmental Protection by Coastal States: The Paradigm from Marine Transport of Petroleum,
W75-09848 5G

OIL SKIMMERS
Oil Skimmer with Oscillatable Circular Loop,
W75-09568 5G

OIL SPILLS
Oil Skimmer with Oscillatable Circular Loop,
W75-09568 5G

Underwater Drilling Pollution Control Curtain,
W75-09639 5G

Material for Biological Degradation of Petroleum,
W75-09652 5D

Collection and Recovery System for Oil Spills,
W75-09660 5G

Proposed 1973 Outer Continental Shelf Oil and Gas General Lease-Sale, Offshore Mississippi, Alabama, and Florida, Volume 2, Potential Environmental Impacts, Etc. (Environmental Impact Statement).
W75-09820 5G

Federal Maritime Jurisdiction and State Marine Pollution Legislation: The Florida Act Not Preempted Per Se,
W75-09845 5G

Environmental Protection by Coastal States: The Paradigm from Marine Transport of Petroleum,
W75-09848 5G

Marine Oil Spills: A Problem in Environmental Management,
W75-09849 5G

OILY WATER
Process for Separating Low API Gravity Oil from Water,
W75-09664 5G

Oil Interceptors for Separating Oil from Water by Gravity,
W75-09667 5G

OKLAHOMA
An Optimal Water Quality Management Technique for Conjunctive Ground and Surface Water Use,
W75-09378 5G

OLIVES
The Irrigation of Olives by Drip and Other Irrigation Methods,
W75-09508 3F

ON-SITE INVESTIGATIONS
Sediment Resuspension and Deposition in Narragansett Bay,
W75-09736 2L

Wind and Wave Relationships in U.K. Coastal Waters,
W75-09737 2L

Evaluation of Environmental Impact of Landfills,
W75-09761 5C

Huronian Glaciation and Polar Wander from the Gowganda Formation, Ontario,
W75-09763 2C

A Saline Intrusion into Seneca Lake, New York,
W75-09765 5B

ONCORHYNCHUS KETA
The Effect of Basic Cuprous Carbonate on the State of the Liver in Juvenile Amur Autumn Chum (Oncorhynchus keta infrasp. autumnalis),
W75-09668 5C

ONTARIO (CANADA)
Identification of Problem Areas in Water Pollution Control Plants,
W75-09564 5D

OPERATION
Oxygen Activated Sludge Wastewater Treatment Systems, Design Criteria and Operating Experience.
W75-09387 5D

OPERATION AND MAINTENANCE
Sewage Treatment Plant Dependability with Special Reference to the Activated Sludge Process,
W75-09393 5D

OPTIMIZATION
The Optimum Distribution of Urban Water Supplies in Puerto Rico,
W75-09377 4A

Optimizing Long-Term Streamflow Forecasts,
W75-09594 4A

Improving the Design of Practical Field Drainage,
W75-09595 4A

Reservoir Optimization for Water Quality Control,
W75-09773 5G

OPTIMUM DESIGN
Storm Water Management Model: User's Manual, Version II,
W75-09579 5D

OPTIMUM DEVELOPMENT PLANS
An Optimal Water Quality Management Technique for Conjunctive Ground and Surface Water Use,
W75-09378 5G

ORANGES
Comparison of Irrigation Methods, Rootstocks, and Fertilizer Elements of Valencia Orange Trees,
W75-09439 3F

Drip Irrigation in Citrus Orchards,
W75-09502

Performance of Plants with Drip Irrigation,
W75-09509

Response of Mature Citrus Trees on De Sandy Soil to Drip Irrigation,
W75-09514

ORCHARDS
Drip Irrigation Design Criteria for Tree Cr in Florida and Other Humid Regions,
W75-09427

Monitoring Soil Salinity and Leaf Nutri Levels in a Young Avocado Orchard Un Drip Irrigation,
W75-09482

Tree and Crop Response to Drip Irrigation,
W75-09504

OREGON
Drip Irrigation Research in Oregon - A Progr Report,
W75-09428

ORGANIC COMPOUNDS
Gas Chromatographic Determination Selected Organic Compounds Added to Wa Water,
W75-09365

Differentiation Between Natural Hydrocarbo and Low Level Diesel Oil Contamination Cooked Lobster Meat,
W75-09698

Automatic U.V.-Control System for Relat Evaluation of Organic Water Pollution,
W75-09735

ORGANIC PESTICIDES
DDT and the Rugophilic Response of Settl Barnacles Balanus Improvisus,
W75-09686

ORGANOLEPTIC PROPERTIES
Effect of DDT on Discriminating Ability Rainbow Trout (Salmo Gairdneri),
W75-09674

Differentiation Between Natural Hydrocarbo and Low Level Diesel Oil Contamination Cooked Lobster Meat,
W75-09698

ORGANOPHOSPHORUS PESTICIDES
Behavior of Juvenile Coho Salm (Oncorhynchus Kisutch) Exposed to Sumith (Fenitrothion), An Organophosphate Insec cide,
W75-09700

ORIFICE FLOW
Chemical Treatment of Drip Irrigation Water
W75-09457

ORIFICES
Chemical Treatment of Drip Irrigation Water
W75-09457

ORTHOPHOSPHATES
The Qualitative and Quantitative Determinat of Soluble and Insoluble Forms of Phospho in Sewage Treatment Plants,
W75-09618

OSCILLATORY WAVES
Friction Factor Under Oscillatory Waves,
W75-09755

**VERFLOWS**
Countermeasures for Pollution from Overflows; the State of the Art,
W75-09580 5D

**WNERSHIP OF BEDS**
Conch Creek Corp. v. Guess (Conflicting Title Claims to Tidelands Included in Grant from Governor).
W75-09832 6E

**IDATION**
ludge Disposal at a Profit,
W75-09557 5D

Vet Air Oxidation of Chemical Sludges,
775-09565 5D

Vet Oxidation Treatment of Waste Liquor or ludge,
775-09571 5D

atalytic Oxidation of Phenol in Aqueous Solu-on Over Copper Oxide,
775-09772 5D

**DATION LAGOONS**
pgrading Lagoons.
75-09386 5D

oflow Filtration of Oxidation Pond Effluent,
75-09522 5D

**GEN**
gh Purity Oxygen Aerobic Digestion Exriences at Speedway, Indiana,
75-09538 5D

astewater Treatment System,
75-09567 5D

polimnetic Oxygenation Using Liquid Oxen,
5-09589 5G

oxygenation in Natural Streams,
5-09767 5B

**GEN DEMAND**
Comparative Study of the Tolerance of Two shwater Planarians, Dugesia Tigrina and ycelis Felina, To Low Oxygen Levels, ude Comparative de la Tolerance aux ses Tensions D'Oxygene Chez Deux naires D'Eau Douce, Dugesia Tigrina et ycelis Felina),
5-09675 5C

**GEN REQUIREMENTS**
Effect of Different Oxygen Conditions ing Incubation on the Survival and Some of Developmental Characteristics of the 'khova' (Leucaspius Delineatus) in the ryonic Period,
-09670 5C

xygenation in Natural Streams,
-09767 5B

**ENATION**
gen Activated Sludge Wastewater Treat- Systems, Design Criteria and Operating erience.
-09387 5D

olimnetic Oxygenation Using Liquid Ox-
09589 5G

est in Oxygen Process Growing,
09781 5D

**OZONATION**
Alternative Methods of Disinfection: How Effective,
W75-09780 5D

**OZONE**
Sound Waves and Ozone Sterilize Wastewater.
W75-09779 5D

**PACKED-BED REACTORS**
Packed-Bed Reactors for Secondary Effluent BOD and Ammonia Removal,
W75-09379 5D

**PADDY**
Mix Gypsum in Shallow Depths--In Saline Soils,
W75-09786 3C

**PALEOAPHEBIAN GLACIATION**
Huronian Glaciation and Polar Wander from the Gowganda Formation, Ontario,
W75-09763 2C

**PAPER MACHINES**
Paper Machine Circulation Systems -- Flows, Consistencies, Recovery, and Pollution (Les circuits de la machine a papier -- debits, concentrations, recuperations et pollutions),
W75-09357 3E

**PARKS**
An Investigation on the Use of Drip Irrigation for the Establishment of Multi-Purpose Parks (Green Belts Around the Cities) in Iran,
W75-09503 3F

**PASTEURIZATION**
Pasteurization of Liquid Digested Sludge,
W75-09552 5D

**PATENTS**
Fluid Sampling Device,
W75-09422 7B

Process for the Reduction of the Biochemical Oxygen Demand of Sewage and for the Recovery of the Inherent Protein,
W75-09566 5D

Wastewater Treatment System,
W75-09567 5D

Oil Skimmer with Oscillatable Circular Loop,
W75-09568 5G

Wastewater Treatment Sequence,
W75-09569 5D

Sewage Treatment with Primary Sludge Removal from Final Clarifier,
W75-09570 5D

Wet Oxidation Treatment of Waste Liquor or Sludge,
W75-09571 5D

Biological Aerated Filters,
W75-09572 5D

Process for the Recovery of Formaldehyde and Phenol Contained in Waste Waters,
W75-09573 5D

Antimicrobial Agents for Water Conservation,
W75-09637 5F

Special Power Generating Unit Using Cpmpressed Air Produced by Ocean Wave Together with Super-Heated Steam,
W75-09638 8C

Underwater Drilling Pollution Control Curtain,
W75-09639 5G

Device for Underwater Observation,
W75-09640 7B

Irrigating Apparatus,
W75-09641 3F

Water Quality Analysis System with Multicircuit Single Shell Heat Exchanger,
W75-09642 5G

Solar Still with Replaceable Solar Absorbing Liner and Weight Controlled Feed Inlet,
W75-09643 3A

Arctic Barrier Formation,
W75-09644 8A

Water Treatment Plant,
W75-09645 5D

Water Treatment Apparatus,
W75-09646 5D

Method and Apparatus for Aeration of Biodegradable Waste Material,
W75-09647 5D

Process for Effluent Water Recovery,
W75-09648 5D

Wastewater Concentrator with Slotted Distributor,
W75-09649 5D

Tide Energy Conversion Device,
W75-09650 8A

Soil Moisture Sensing System,
W75-09651 2G

Material for Biological Degradation of Petroleum,
W75-09652 5D

System for Thermal Desalting of Water,
W75-09653 3A

Desalination Process,
W75-09654 3A

Detector of Trace Substance in Water,
W75-09655 5A

Process for Treating Waste Water,
W75-09656 5D

Floating Solids Return Device,
W75-09657 5D

Portable Water Supply System,
W75-09658 5D

System for Purifying and Disinfecting Waste Water,
W75-09659 5D

Collection and Recovery System for Oil Spills,
W75-09660 5G

Reverse Osmosis Apparatus,
W75-09661 3A

Device for Distributing Irrigation Water,
W75-09662 3F

Multi-Effect Flash Evaporator,
W75-09663 3A

Process for Separating Low API Gravity Oil from Water,
W75-09664 5G

Anti Pollution Waterway Device and Process,
W75-09665 5G

PATENTS

Liquid Treatment Apparatus,
W75-09666 5D

Oil Interceptors for Separating Oil from Water by Gravity,
W75-09667 5G

Extended Aeration Wastewater Treatment,
W75-09776 5D

PATH OF POLLUTANTS
Forest Fire: Effect on Phosphorus Movement to Lakes,
W75-09364 5B

Measuring Flow of Polluted Effluents (Pour la mesure du debit des effluents pollues).
W75-09370 5A

Survey of Wastewater Discharge--Elmendorf AFB, Alaska,
W75-09398 5B

Pollution of Irrigation Waters by Plant Pathogenic Organisms,
W75-09521 5B

Movement of Pollutant Phosphorus In Unsaturated Soil,
W75-09527 5B

Urban Lawn Infiltration Rates and Fertilizer Runoff Losses Under Simulated Rainfall,
W75-09592 5B

Chemical Transport by the Mekong River,
W75-09603 5B

Effects of Metal-Mine Drainage on Water Quality in Selected Areas of Colorado, 1972-73,
W75-09712 5C

A Saline Intrusion into Seneca Lake, New York,
W75-09765 5B

PATHOGENS
Pasteurization of Liquid Digested Sludge,
W75-09552 5D

PEACHES
Changes in Root Patterns of Peach Trees Under Trickle Irrigation,
W75-09498 2I

Trickle Irrigation on Young Peach Trees,
W75-09501 3F

PECANS
Application of Fertilizer Through Drip Irrigation Systems in West Texas,
W75-09489 3F

PENETRATION
For Improving Water Penetration into Some Arizona Soils-Sulfuric Acid,
W75-09623 3C

PENNSYLVANIA
Temperatures of Streams and Selected Reservoirs in Pennsylvania,
W75-09713 7C

Occurrence of Pesticide Residues in Four Streams Draining Land-Use Areas in Pennsylvania,
W75-09720 5B

PENSACOLA BAY (FLA)
Proposed Maintenance Dredging of the Channel from U.S. Coast Guard Santa Rosa Station Moorings to Navigable Watershed in Pensacola Bay (Final Environmental Impact Statement).
W75-09824 8A

PERFORMANCE
Evaluation of a Trickle Irrigation System,
W75-09469 3F

PERMEABILITY
Development of Porous Polyvinyl Chloride Coated Tubulets for Seawater Desalination,
W75-09373 3A

PERMITS
Crude Oil and Natural Gas Production and Other Mining Operations in Navigable Waters Along the Louisiana Coast (Final Environmental Impact Statement).
W75-09823 5G

Florida Water Resources Act of 1972 (Statute Establishing Water Management Districts for the State of Florida).
W75-09833 6E

PERSONNEL
A Guide for State Certification of Wastewater Facilities Personnel,
W75-09389 5D

PESTICIDE RESIDUES
Effect of Temperature on Accumulation of Methylmercuric Chloride and p,p' DDT by Rainbow Trout (Salmo Gairdneri),
W75-09681 5C

DDT Residues in Euphausiids in the Upper Estuary of the Gulf of St. Lawrence,
W75-09690 5C

Uptake, Metabolism and Distribution of DDT in Organs of the Blue Crab, Callinectes Sapidus,
W75-09691 5C

Organochlorine Residue Levels in Arctic Ringed Seals: Variation with Age and Sex,
W75-09702 5C

Pesticides in Fish from a Hawaiian Canal,
W75-09806 5A

PESTICIDES
Avoidance of Fenitrothion by Goldfish (Carassius Auratus),
W75-09677 5C

Occurrence of Pesticide Residues in Four Streams Draining Land-Use Areas in Pennsylvania,
W75-09720 5B

Pick up and Metabolism of DDT, Dieldrin and Photodieldrin by a Freshwater Alga (Ankistrodesmus Amalloides) and a Microcrustacean (Daphnta Pulex),
W75-09805 5C

Loss of Five Pesticides from Cultures of Twentyone Planktonic Algae,
W75-09808 5A

Differential Uptake of Endosulfan by the Tissues of Mytilus Edulis,
W75-09810 5A

PETROLOGY
Data from a 1,000-Foot (305-Metre) Core Hole in the Long Valley Caldera, Mono County, California,
W75-09728 7C

PHENOLS
Process for the Recovery of Formaldehyde and Phenol Contained in Waste Waters,
W75-09573 5D

Catalytic Oxidation of Phenol in Aqueous Solution Over Copper Oxide,
W75-09772

PHNOM PENH (MEKONG RIVER)
Chemical Transport by the Mekong River,
W75-09603

PHOSPHATES
Effects of Localized Phosphate Treatments a Solution pH on the Growth and Function Apple Roots,
W75-09488

Movement of Pollutant Phosphorus In Unsa rated Soil,
W75-09527

Growth of Barley Irrigated with Wastewa Sludge Containing Phosphate Precipitants,
W75-09543

The Qualitative and Quantitative Determinat of Soluble and Insoluble Forms of Phospho in Sewage Treatment Plants,
W75-09618

Adenosine Triphosphate Measurements in and Marine Sediments,
W75-09764

PHOSPHORUS
Use of Glycerophosphate for Fertiliza Through Trickle Irrigation Systems,
W75-09492

Phosphorus Removal in Seasonal Reten Lagoons by Batch Chemical Precipitation,
W75-09563

The Effect of Sulfate and Manganese Dio on the Release of Phosphorus from Lake M dota Sediments,
W75-09619

Effects of Kokanee Salmon (Oncorhync Nerka) Decomposition on the Ecology of a balpine Stream,
W75-09672

PHOSPHORUS COMPOUNDS
Forest Fire: Effect on Phosphorus Move to Lakes,
W75-09364

The Qualitative and Quantitative Determina of Soluble and Insoluble Forms of Phospho in Sewage Treatment Plants,
W75-09618

Adenosine Triphosphate Measurements in and Marine Sediments,
W75-09764

PHOSPHORUS REMOVAL
Phosphate Removal in an Activated Sl Facility,
W75-09412

Phosphorus Removal Demonstration Studie C.F.B. Trenton,
W75-09416

Phosphorus Removal Study at the Sa WPCP,
W75-09562

PHOTODIELDRIN
Pick up and Metabolism of DDT, Dieldrin Photodieldrin by a Freshwater (Ankistrodesmus Amalloides) and Microcrustacean (Daphnta Pulex),
W75-09805

HOXINUS PHOXINUS
Effect of Zinc on Growth of the Minnow Phoxinus Phoxinus,
W75-09693 5C

HYSICAL-CHEMICAL TREATMENT
Physical-Chemical Nitrogen Removal, Wastewater Treatment.
W75-09384 5D

Physical-Chemical Wastewater Treatment Plant Design.
W75-09385 5D

YSICO-CHEMICAL TREATMENT
Recent Developments in Sewage Treatment Based on Physico-Chemical Methods,
W75-09414 5D

YTOPATHOGENIC BACTERIA
Pollution of Irrigation Waters by Plant Pathogenic Organisms,
W75-09521 5B

YTOPATHOGENIC FUNGI
Pollution of Irrigation Waters by Plant Pathogenic Organisms,
W75-09521 5B

YTOPLANKTON
The Effects of Oils on Growth of Freshwater Phytoplankton,
W75-09678 5C

Effects of PCB on Interspecific Competition in Natural and Gnotobiotic Phytoplankton Communities in Continuous and Batch Cultures,
W75-09680 5C

RS
Wave Force Coefficients for Circular Piers,
W75-09593 8B

Statistical Properties of Wave Force,
W75-09759 8B

OT PLANTS
How to Get Low Ammonia Effluents,
W75-09778 5D

EPHALES PROMELAS
Effects of Saline Water from North Dakota Lakes on Survival of Fathead Minnow (Pimephales Promelas) Embryos and Sac Fry,
W75-09669 5C

FLOW
Drag Reduction by Collapsed and Extended Polyelectrolytes,
W75-09601 8B

Specific Case of Wave Motion of a Liquid in Tubes,
W75-09740 8B

TARY GLAND
Effects of Thiourea Treatment on Sexually Maturing and Gonadectomized Male Sockeye Salmon (Oncorhynchus Nerka),
W75-09699 5C

ARIANS
A Comparative Study of the Tolerance of Two Freshwater Planarians, Dugesia Tigrina and Polycelis Felina, To Low Oxygen Levels, (Etude Comparative de la Tolerance aux Basses Tensions D'Oxygene Chez Deux Planaires D'Eau Douce, Dugesia Tigrina et Polycelis Felina),
W75-09675 5C

PLANKTON
Loss of Five Pesticides from Cultures of Twentyone Planktonic Algae,
W75-09808 5A

PLANNING
Arizona's Remote Subdivisions: An Inventory,
W75-09583 6G

PLANT BLEEDING
For Rainfed Areas-Improved Velvet Beans for Increased Forage Production,
W75-09796 3F

PLASTIC DRAIN TUBING
Corrugated Plastic Drain Tubing Used as Underground Conduit,
W75-09611 8B

PLASTIC PIPES
Survey of Experience with Drainage Materials and Review of Available Specifications,
W75-09629 8G

A Survey of Experiences with Drainage Materials and a Review of Available Specifications,
W75-09632 8G

Survey of Experiences with Drainage Materials and Review of Available Specifications,
W75-09634 8G

PLUMS
Performance of Plants with Drip Irrigation,
W75-09509 3F

POLLUTANT IDENTIFICATION
Determination of Chloride in Water with a HgS/Hg2Cl2 Electrode,
W75-09361 5A

Multielement Neutron Activation Analysis of Fresh Water Using Ge(Li) Gamma Spectrometry,
W75-09362 5A

Simultaneous Determination of Seven Trace Metals in Potable Water Using a Vidicon Atomic Absorption Spectrometer,
W75-09363 5A

Gas Chromatographic Determination of Selected Organic Compounds Added to Waste Water,
W75-09365 5A

Determination of Lead in Potable Waters Using Delves Cup Atomic Absorption Spectrometer with Signal Integration,
W75-09366 5A

BOD as a Pollution Indicator (La DBO como indicador de la polucion),
W75-09368 5A

Measuring Flow of Polluted Effluents (Pour la mesure du debit des effluents pollues).
W75-09370 5A

Water analysis,
W75-09372 5A

Biological Assay of Fresh Waters by a New Method, Dielectrophoresis,
W75-09531 5A

Chemical Transport by the Mekong River,
W75-09603 5B

Detector of Trace Substance in Water,
W75-09655 5A

Pond Snail Eggs as an Indicatory Material for Water Pollution Bioassay: Preliminary Experiments, (In Japanese),
W75-09682 5C

Selenium Determination on Fish Tissue,
W75-09696 5A

Differentiation Between Natural Hydrocarbons and Low Level Diesel Oil Contamination in Cooked Lobster Meat,
W75-09698 5A

Evaluation of Sample Preparation Techniques for Algal Bioassays,
W75-09734 5A

Automatic U.V.-Control System for Relative Evaluation of Organic Water Pollution,
W75-09735 5A

Adenosine Triphosphate Measurements in Soil and Marine Sediments,
W75-09764 5A

POLLUTANTS
Joint Canada-United States Marine Pollution Contingency Plan for Spills of Oil and Other Noxious Substances.
W75-09835 5G

POLLUTION ABATEMENT
Financial Incentives and Pollution Control: A Case Study,
W75-09574 5G

Antimicrobial Agents for Water Conservation,
W75-09637 5F

Process for Separating Low API Gravity Oil from Water,
W75-09664 5G

Anti Pollution Waterway Device and Process,
W75-09665 5G

Joint Canada-United States Marine Pollution Contingency Plan for Spills of Oil and Other Noxious Substances.
W75-09835 5G

Offshore Development and Marine Pollution,
W75-09842 5B

POLLUTION CONTROL CURTAINS
Underwater Drilling Pollution Control Curtain,
W75-09639 5G

POLLUTION CONTROL VARIANCES
Financial Incentives and Pollution Control: A Case Study,
W75-09574 5G

POLLUTION RECOVERY
Evaluation of Recovery in a Polluted Creek After Installation of New Sewage Treatment Procedures,
W75-09515 5B

POLLUTION TAXES (CHARGES)
Financial Incentives and Pollution Control: A Case Study,
W75-09574 5G

POLYCELIS FELINA
A Comparative Study of the Tolerance of Two Freshwater Planarians, Dugesia Tigrina and Polycelis Felina, To Low Oxygen Levels, (Etude Comparative de la Tolerance aux Basses Tensions D'Oxygene Chez Deux Planaires D'Eau Douce, Dugesia Tigrina et Polycelis Felina),
W75-09675 5C

**POLYCHLORINATED BIPHENYLS**
Effects of PCB on Interspecific Competition in Natural and Gnotobiotic Phytoplankton Communities in Continuous and Batch Cultures,
W75-09680 5C

Organochlorine Residue Levels in Arctic Ringed Seals: Variation with Age and Sex,
W75-09702 5C

**POLYELECTROLYTES**
The Role of Polyelectrolytes in Filtration Processes,
W75-09394 5D

Drag Reduction by Collapsed and Extended Polyelectrolytes,
W75-09601 8B

**PONDS**
Makeup Requirements for Cooling Ponds,
W75-09760 5G

**PORE PRESSURE**
Pore and Eroding Fluid Influences on Surface Erosion of Soil,
W75-09741 2J

**PORE WATER**
Water Escape Structures in Coarse-Grained Sediments,
W75-09768 2J

**POROUS MEDIA**
Wave Induced Pressures in Permeable Seabeds,
W75-09607 8B

Simulation of Miscible Displacement in Soils Using the Method of Characteristics,
W75-09612 2G

**POROUS TUBE IRRIGATION**
High-Frequency Porous Tube Irrigation for Water-Nutrient Management in Humid Regions,
W75-09449 3F

**PORT ANGELES (WASH)**
Ediz Hook Beach Erosion Control, Port Angeles, Washington (Final Environmental Impact Statement).
W75-09815 8A

**POTABLE WATER**
Simultaneous Determination of Seven Trace Metals in Potable Water Using a Vidicon Atomic Absorption Spectrometer,
W75-09363 5A

Determination of Lead in Potable Waters Using Delves Cup Atomic Absorption Spectrometer with Signal Integration,
W75-09366 5A

Operating Results of Electrodialysis and Reverse Osmosis Municipal Desalting Plants,
W75-09732 5D

**POTATOES**
Drip Vs. Furrow Irrigation Trials in Potato Under Subtropical Conditions,
W75-09513 3F

**POTENTIAL EVAPOTRANSPIRATION**
World Maps of Potential Evapotranspiration, Plant Development, and Spring Greening and Autumn Browning of Vegetation, Based on the Solar Thermal Unit Model,
W75-09771 2D

**POWERPLANTS**
Effect of Power Plant Chlorination on Estuarine Productivity,
W75-09684 5C

Arizona and Tomorrow's Solar Powerplants,
W75-09804 3A

**PRE-TREATMENT**
The Role of Polyelectrolytes in Filtration Processes,
W75-09394 5D

Wastewater Treatment Sequence,
W75-09569 5D

**PRECIPITATION (ATMOSPHERIC)**
Methodological Approaches in Hawaiian Fog Research,
W75-09526 2B

A Stochastic Model of N-Day Precipitation,
W75-09747 2B

Hungry Drylands of Western Rajasthan Need a New Technology,
W75-09789 3F

**PRECIPITATION (CHEMICAL)**
Phosphorus Removal in Seasonal Retention Lagoons by Batch Chemical Precipitation,
W75-09563 5D

**PRESSURE**
Wave Induced Pressures in Permeable Seabeds,
W75-09607 8B

**PRIMARY PRODUCTIVITY**
Effects of Kokanee Salmon (Oncorhynchus Nerka) Decomposition on the Ecology of a Subalpine Stream,
W75-09672 5C

The Effects of Oils on Growth of Freshwater Phytoplankton,
W75-09678 5C

DDT Residues in Euphausiids in the Upper Estuary of the Gulf of St. Lawrence,
W75-09690 5C

**PROGRAMS**
Minnesota's Water Resources: A Primer,
W75-09516 6B

**PROJECT PLANNING**
Arizona and Tomorrow's Solar Powerplants,
W75-09804 3A

**PROJECTS**
Projects in the Industrial Pollution Control Division - December 1974.
W75-09578 5D

**PROTEINS**
Process for the Reduction of the Biochemical Oxygen Demand of Sewage and for the Recovery of the Inherent Protein,
W75-09566 5D

**PROVIDENCE COUNTY (RI)**
Availability of Ground Water in the Branch River Basin, Providence County, Rhode Island,
W75-09721 2F

**PRUNES**
Tree and Crop Response to Drip Irrigation,
W75-09504 3F

**PUBLIC ACCESS**
National Audubon Society v. White (Suit t
Enjoin Trespass on Privately Owned and M
tained Navigable Canal).
W75-09839

The Public Trust Doctrine Is Alive and Kicl
in New Jersey Tidalwaters: Neptune City
Avon-By-The-Sea--A Case of Happy Atavis
W75-09850

**PUBLIC HEALTH**
Institutional Problems Associated with Slu
Disposal,
W75-09555

Mercury in Seals, Terrestial Carnivores
Principal Food Items of the Inuit, from I
man, N.W.T.,
W75-09679

**PUBLIC RIGHTS**
Institutional Problems Associated with Slu
Disposal,
W75-09555

**PUBLICATIONS**
Bibliography of U.S. Geological Survey Wa
Resources Reports for Utah,
W75-09718

**PUERTO RICO**
An Investigation of Factors Affecting the
tensity of Water Use in the Lajas Valley Irr
tion Project,
W75-09376

The Optimum Distribution of Urban W
Supplies in Puerto Rico,
W75-09377

**PULP WASTES**
Treatment and Safe Disposal of Cationic C
ing Colors,
W75-09352

Closing Up a Fine Grade Paper Mach
System,
W75-09353

Recycling a Solid Waste from a Paper Plan
Separation of Wood Fiber from Clay by I
ferential Flocculation,
W75-09354

Biological Treatment of Spent Bisulfite Liq
(Traitement biologique de la liqueur residu
au bisulfite),
W75-09355

Waste Water Clarification by Flotat
(Flotacios szennyviztisztitas),
W75-09356

Optimum Conditions for Chemical Purificat
of Effluents (Optimal'nye uslov
khimicheskoi ochistki stochnykh vod),
W75-09359

S(Ociete) I(Industrielle de) C(Eellulose
A(Lizay, France): New Step in Reducing I
luction (S.I.C.A.: Nouvelle etape dans la de
lution).
W75-09369

Cleaning of Circulation Water and Effl
from Paper and Board Mills by Chemicoph
cal Methods (Die Moeglichkeit der Reinig
von Kreislauf- und Restabwasser bei Pap
und Kartonfabriken unter Beruecksichtig
chemisch-physikalischer Verfahren),
W75-09371

MPKINSEED SUNFISH
ffect of Constant Temperature on Growth ates of Pumpkinseed Sunfish (Lepomis Gibsus),
75-09701 5C

DIATION
ne Microwave Emission Spectum from Sparkg Water Drops,
75-09614 2B

DIO WAVES
eather Satellite Picture Receiving Stations,
PT Digital Scan Converter,
75-09588 7B

IOACTIVE ISOTOPES
position of Zinc and Cadmium by Marine cteria in Estuarine Sediments,
75-09692 5C

IX AURICULARIUS JAPONICUS
nd Snail Eggs as an Indicatory Material for ter Pollution Bioassay: Preliminary Experints, (In Japanese),
75-09682 5C

BOW TROUT
ect of DDT on Discriminating Ability of nbow Trout (Salmo Gairdneri),
5-09674 5C

ect of Temperature on Accumulation of thylmercuric Chloride and p,p' DDT by nbow Trout (Salmo Gairdneri),
5-09681 5C

DROPS
hodological Approaches in Hawaiian Fog earch,
5-09526 2B

FALL DISPOSITION
ent African Rainfall Patterns,
-09766 2B

FALL FREQUENCY
Investigation of Factors Affecting the Inity of Water Use in the Lajas Valley Irriga- Project,
-09376 3F

FALL-RUNOFF RELATIONSHIPS
n Lawn Infiltration Rates and Fertilizer off Losses Under Simulated Rainfall,
-09592 5B

boratory Investigation of Surface Runoff,
09744 2E

on-Linear Rainfall-Runoff Model, Provid- r Variable Lag Time,
09753 2A

ALL SIMULATORS
boratory Rainfall Simulator for Infiltration oil Detachment Studies,
09746 2G

AN BAY (NY)
ewater Treatment Facilities Construction s for the Lower Raritan River Basin and e South Shore of Raritan Bay (Final Enmental Impact Statement).
09817 5D

RGE
Sahelian Drought - A Disaster for tock Populations,
09785 3F

RECIRCULATED WATER
Paper Machine Circulation Systems -- Flows, Consistencies, Recovery, and Pollution (Les circuits de la machine a papier -- debits, concentrations, recuperations et pollutions),
W75-09357 3E

Cleaning of Circulation Water and Effluent from Paper and Board Mills by Chemicophysical Methods (Die Moeglichkeit der Reinigung von Kreislauf- und Restabwasser bei Papier- und Kartonfabriken unter Berueecksichtigung chemisch-physikalischer Verfahren),
W75-09371 5D

RECREATION
Proposed Navigational Maintenance Dredging Project at Guilford Harbor, Guilford, Connecticut (Final Environmental Impact Statement).
W75-09821 8A

RECREATION DEMAND
Arizona's Remote Subdivisions: An Inventory,
W75-09583 6G

RECREATION FACILITIES
Detailed Project Report for Local Flood Protection, Zacate Creek, Laredo, Texas (Final Environmental Impact Statement).
W75-09813 4A

RECYCLING
Recycling a Solid Waste from a Paper Plant -- Separation of Wood Fiber from Clay by Differential Flocculation,
W75-09354 5D

Energy Conservation and Recycling Program of the Metropolitan Sewer Board of the Twin Cities Area,
W75-09556 5D

Process for the Recovery of Formaldehyde and Phenol Contained in Waste Waters,
W75-09573 5D

REFRACTION (WATER WAVES)
Computation of Wave Heights Due to Refraction and Friction,
W75-09606 8B

REFUSE COLLECTION
Wet Systems for Residential Refuse Collection: A Case Study for Springfield, Massachusetts,
W75-09407 5D

REGIONAL ANALYSIS
Atlas of River Basins of the United States.
W75-09616 7C

Regional Analyses of Runoff Characteristics for Small Urban Watersheds,
W75-09621 2A

REGIONAL DEVELOPMENT
Environmental Geology of an Area in West-Central Alabama,
W75-09615 7C

REGRESSION ANALYSIS
An Optimal Water Quality Management Technique for Conjunctive Ground and Surface Water Use,
W75-09378 5G

Distribution and Dynamics of Aquatic Insects in the Elk Creek Experimental Watershed, Lubrecht Forest, Montana,
W75-09528 5C

Regional Analyses of Runoff Characteristics for Small Urban Watersheds,
W75-09621 2A

REMOTE SENSING
Defense Meteorological Satellite Program (DMSP) User's Guide,
W75-09770 7B

A Study of the Surface Fluid Flow Characteristics of the New York Bight and the Development of Research Data Display Techniques,
W75-09783 5B

RESEARCH AND DEVELOPMENT
Projects in the Industrial Pollution Control Division - December 1974.
W75-09578 5D

Contemporary Research in Marine Affairs,
W75-09837 6B

RESEARCH PRIORITIES
Research Needs for Water Resources Control in California.
W75-09587 5G

RESERVOIRS
Reservoir Optimization for Water Quality Control,
W75-09773 5G

Passaic Valley Council Boy Scouts of America v. Hartwood Syndicate, Inc. (Suit by Owner of Part of Reservoir Bed Against Owner of Remainder Who Claimed Exclusive Right to Hunt, Fish or Sail on Reservoir Waters).
W75-09831 6E

RESINS
Synthetic Resins and Activated Carbon for Wastewater Treatment,
W75-09390 5D

RESISTANCE
A Comparative Study of the Tolerance of Two Freshwater Planarians, Dugesia Tigrina and Polycelis Felina, To Low Oxygen Levels, (Etude Comparative de la Tolerance aux Basses Tensions D'Oxygene Chez Deux Planaires D'Eau Douce, Dugesia Tigrina et Polycelis Felina),
W75-09675 5C

RETURN FLOW
Irrigation Return Flow as Influenced by Drip Irrigation,
W75-09485 5G

REVERSE FLUSHING
Reverse Flushing Technique for Bi-Wall Drip Tubing,
W75-09455 8C

REVERSE OSMOSIS
Development of Porous Polyvinyl Chloride Coated Tubulets for Seawater Desalination,
W75-09373 3A

Domestic Wash Water Reclamation for Refuse as Commode Water Supply Using a Filtration-Reverse Osmosis Separation Technique,
W75-09403 5D

Removal of Wastewater Organics by Reverse Osmosis,
W75-09417 5D

Reverse Osmosis Apparatus,
W75-09661 3A

Application of Filtration Through Semi-Permeable Membranes for Treatment of Wastes,
W75-09730 5D

**REVERSE OSMOSIS**

Operating Results of Electrodialysis and Reverse Osmosis Municipal Desalting Plants,
W75-09732 5D

**REVIEWS**

Flow Equalization.
W75-09381 5D

Nitrification and Denitrification Facilities, Wastewater Treatment.
W75-09382 5D

Wastewater Filtration, Design Considerations.
W75-09383 5D

Upgrading Lagoons.
W75-09386 5D

Oxygen Activated Sludge Wastewater Treatment Systems, Design Criteria and Operating Experience.
W75-09387 5D

Evaluation of Municipal Sewage Treatment Alternatives.
W75-09404 5D

Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management.
W75-09532 5D

Secondary Impacts of Transportation and Wastewater Investments: Review and Bibliography,
W75-09576 5C

Goundwater Models,
W75-09582 2F

Mathematical Models in Hydrology,
W75-09624 2A

Water Laws in Moslem Countries,
W75-09625 6E

Attitudes in Sludge Treatment and Disposal,
W75-09731 5D

Urban Runoff Pollution Control--State-of-the-Art,
W75-09762 5D

**REYNOLDS NUMBER**

The Karman and Reynolds Numbers and the Drag Coefficient in Ducts and Pipes,
W75-09596 8B

**RHODE ISLAND**

Availability of Ground Water in the Branch River Basin, Providence County, Rhode Island,
W75-09721 2F

Sediment Resuspension and Deposition in Narragansett Bay,
W75-09736 2L

**RICE HUSKS**

In Salt-Affected Soils Mulching Aids in Crop Growth,
W75-09798 3C

**RIPARIAN RIGHTS**

National Audobon Society v. White (Suit to Enjoin Trespass on Privately Owned and Maintained Navigable Canal).
W75-09839 6E

**RIVER BASINS**

Surface Water Resources of St. Johns River, Florida,
W75-09604 2A

Atlas of River Basins of the United States.
W75-09616 7C

Sediment Yields from Intermediate-Sized Stream Basins in Southern Alberta,
W75-09750 2J

**RIVER FLOW**

The Composite Roughness of Ice Covered Streams,
W75-09758 2C

**RIVER REGULATION**

Man-Induced Changes of Middle Mississippi River,
W75-09754 4A

**RIVERS**

Chemical Transport by the Mekong River,
W75-09603 5B

**ROCKS**

Ediz Hook Beach Erosion Control, Port Angeles, Washington (Final Environmental Impact Statement).
W75-09815 8A

**RODENTS**

Tritiated Water Turnover Rate in Rodents: Desert and Mountain,
W75-09801 2I

**ROOT DEVELOPMENT**

Effects of Localized Phosphate Treatments and Solution pH on the Growth and Function of Apple Roots,
W75-09488 3C

Water Uptake by an Apple Tree with Various Proportions of the Root System Supplied with Water,
W75-09495 3F

Change in Root Distribution of Mature Pear Trees in Response to Trickle Irrigation,
W75-09497 3F

Changes in Root Patterns of Peach Trees Under Trickle Irrigation,
W75-09498 2I

**ROOT DEVELOPMENT IRRIGATION**

Irrigation for Container Growing,
W75-09447 3F

**ROOT DISTRIBUTION**

Change in Root Distribution of Mature Pear Trees in Response to Trickle Irrigation,
W75-09497 3F

Changes in Root Patterns of Peach Trees Under Trickle Irrigation,
W75-09498 2I

Cantaloupe Response to Drip Irrigation,
W75-09505 3F

**ROOT SYSTEMS**

Effect of Root Temperature and Humidity on the Distribution of Ca in Apple and Sunflower Seedlings,
W75-09351 2I

Effects of Nitrogen Fertilizer Applications to Part of a Root System,
W75-09496 3F

Changes in Root Patterns of Peach Trees Under Trickle Irrigation,
W75-09498 2I

**ROUGHNESS COEFFICIENT**

Friction Factor Under Oscillatory Waves,
W75-09755 8B

**RUGOPHILIC RESPONSE**

DDT and the Rugophilic Response of Settlir Barnacles Balanus Improvisus,
W75-09686 5

**RUNOFF**

Forest Fire: Effect on Phosphorus Moveme to Lakes,
W75-09364 5

A Non-Linear Rainfall-Runoff Model, Provi ing for Variable Lag Time,
W75-09753 2

**RUNOFF FORECASTING**

Regional Analyses of Runoff Characteristi for Small Urban Watersheds,
W75-09621 2

**RURAL AREAS**

Economics and Finance of Nevada Publ Water Systems,
W75-09375 6

**SAHEL**

Recent African Rainfall Patterns,
W75-09766 2

**SAHELIAN ZONE**

The Sahelian Drought - A Disaster f Livestock Populations,
W75-09785 3

**SALINE SOILS**

Moisture Profiles and Salinization of Soi Under Drip Irrigation in the Republic of Sou Africa,
W75-09464 3

Salinity Sensor Control of Drip Irrigatic Water Application,
W75-09477 3

Salinity Management for High Frequency I rigation,
W75-09484 3

Mix Gypsum in Shallow Depths--In Salir Soils,
W75-09786 3

Flow-Associated Precipitation Reactions i Saline-Sodic Soils and Their Significance,
W75-09792 2

In Salt-Affected Soils Mulching Aids in Cro Growth,
W75-09798 3

**SALINE WATER**

Strip Cultivation of the Area Wetted by Drip I rigation in the Arava Desert,
W75-09445 3

Afforestation with Saline Water in Abu Dhabi,
W75-09483 3

Salinity Management for High Frequency I rigation,
W75-09484 3

Irrigation Return Flow as Influenced by Dri Irrigation,
W75-09485 5

Effects of Saline Water from North Dakot Lakes on Survival of Fathead Minno (Pimephales Promelas) Embryos and Sac Fry,
W75-09669 5

**SALINE WATER INTRUSION**

A Saline Intrusion into Seneca Lake, Ne York,
W75-09765 5

LINITY
trip Cultivation of the Area Wetted by Drip Irgation in the Arava Desert,
75-09445 3C

Lovement of Water and Salts Under High requency Irrigation,
75-09458 3F

oil Salinity Distribution in Drip and Subsurce Irrigated Summer Squash,
75-09481 3C

onitoring Soil Salinity and Leaf Nutrient evels in a Young Avocado Orchard Under ip Irrigation,
75-09482 3F

linity Management for High Frequency Iration,
75-09484 3C

gation Return Flow as Influenced by Drip gation,
75-09485 5G

p Irrigation Experiment on Avocados,
5-09499 3C

NITY SENSORS
inity Sensor Control of Drip Irrigation ter Application,
5-09477 3C

ION
avior of Juvenile Coho Salmon corhynchus Kisutch) Exposed to Sumithion itrothion), An Organophosphate Insecti-,
5-09700 5C

ON CARCASSES
cts of Kokanee Salmon (Oncorhynchus ka) Decomposition on the Ecology of a Suine Stream,
-09672 5C

ONIDS
Effect of Basic Cuprous Carbonate on the e of the Liver in Juvenile Amur Autumn n (Oncorhynchus keta infrasp. autum-),
-09668 5C

cts of Kokanee Salmon (Oncorhynchus a) Decomposition on the Ecology of a Sune Stream,
09672 5C

t of DDT on Discriminating Ability of ow Trout (Salmo Gairdneri),
09674 5C

of Sodium Pentachlorophenate and droabietic Acid as Reference Toxicants lmonid Bioassays,
09683 5C

ts of Logging on Water Temperature and lved Oxygen in Spawning Beds,
09685 5C

Toxicity of Nitrite to Rainbow Trout o Gairdneri),
09687 5C

es in Blood Chemistry of Juvenile Steel- Trout, Salmo Gairdneri, Following hal Exposure to Nitrogen Supersatura-
9694 5C

Behavior of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Sumithion (Fenitrothion), An Organophosphate Insecticide,
W75-09700 5C

SAMPLE PREPARATION TECHNIQUES
Evaluation of Sample Preparation Techniques for Algal Bioassays,
W75-09734 5A

SAMPLING
Fluid Sampling Device,
W75-09422 7B

Evaluation of Sample Preparation Techniques for Algal Bioassays,
W75-09734 5A

SAN DIEGO REGION (CALIF)
Water, Sewerage and Flood Control Systems Plan and Implementation Program 1973-74.
W75-09400 6D

SANGAMON RIVER (ILL)
Ground-Water Level in the Flood Plain and Adjacent Uplands of the Sangamon River,
W75-09599 4B

SARNIA WATER POLLUTION CONTROL PLANT (ONT)
Phosphorus Removal Study at the Sarnia WPCP,
W75-09562 5D

SATELLITES (ARTIFICIAL)
Weather Satellite Picture Receiving Stations, APT Digital Scan Converter,
W75-09588 7B

Defense Meteorological Satellite Program (DMSP) User's Guide,
W75-09770 7B

SCARBORO RIVER (MAINE)
Maintenance of the Federal Navigation Project in Scarboro River at Scarboro, Maine (Final Environmental Impact Statement).
W75-09811 8A

SCENEDESMUS
The Effects of Oils on Growth of Freshwater Phytoplankton,
W75-09678 5C

SCENEDESMUS QUADRICAUDA
The Effects of Oils on Growth of Freshwater Phytoplankton,
W75-09678 5C

SCREENS
Wastewater Concentrator with Slotted Distributor,
W75-09649 5D

SEDIMENT CONTROL
Silt Removal from a Lake Bottom.
W75-09575 5C

SEDIMENT DISTRIBUTION
Quaternary Sedimentation on the Amazon Continental Margin: A Model,
W75-09600 2L

SEDIMENT TRANSPORT
Quaternary Sedimentation on the Amazon Continental Margin: A Model,
W75-09600 2L

Dynamics of Turbidity Plumes in Lake Ontario,
W75-09709 2J

Geology of Griggs and Steele Counties,
W75-09725 2J

SEDIMENT YIELD
Sediment Yields from Intermediate-Sized Stream Basins in Southern Alberta,
W75-09750 2J

SEDIMENTARY STRUCTURES
Water Escape Structures in Coarse-Grained Sediments,
W75-09768 2J

SEDIMENTS
The Bottom Fauna of China Clay Waste Deposits in Mevagissey Bay,
W75-09673 5C

Aspects of Trace Metal Contamination in the Coastal Rivers of Israel,
W75-09689 5B

Deposition of Zinc and Cadmium by Marine Bacteria in Estuarine Sediments,
W75-09692 5C

Sediment Resuspension and Deposition in Narragansett Bay,
W75-09736 2L

Sediments and Structure of the Japan Sea,
W75-09756 2J

SEEDS
Control of Water by Drip Irrigation for Alfalfa Seed Production,
W75-09450 3F

SEISMIC REFLECTION
Sediments and Structure of the Japan Sea,
W75-09756 2J

SEISMIC STUDIES
Sediments and Structure of the Japan Sea,
W75-09756 2J

SELECTIVITY
The Effect of Concentration of Suspension and Inert Material on the Assimilation of Algae by Three Bivalves,
W75-09695 5C

SELENIUM
Selenium Toxicity on the Early Life Stages of Zebrafish (Brachydanio rerio),
W75-09671 5C

Mercury in Seals, Terrestial Carnivores and Principal Food Items of the Inuit, from Holman, N.W.T.,
W75-09679 5A

Selenium Determination on Fish Tissue,
W75-09696 5A

SEPARATION TECHNIQUES
Recycling a Solid Waste from a Paper Plant -- Separation of Wood Fiber from Clay by Differential Flocculation,
W75-09354 5D

Domestic Wash Water Reclamation for Refuse as Commode Water Supply Using a Filtration-Reverse Osmosis Separation Technique,
W75-09403 5D

Volume Extraction of Chemically Contaminated Water,
W75-09419 5D

Wastewater Concentrator with Slotted Distributor,
W75-09649 5D

Collection and Recovery System for Oil Spills,
W75-09660 5G

**SEPARATION TECHNIQUES**

Process for Separating Low API Gravity Oil from Water,
W75-09664 5G

Oil Interceptors for Separating Oil from Water by Gravity,
W75-09667 5G

**SETTLING BASINS**
Floating Solids Return Device,
W75-09657 5D

**SEWAGE**
Australian Vineyard Uses Sewage Effluent with Trickle Irrigation,
W75-09486 3C

Sewage Utilization in Agriculture,
W75-09788 5D

**SEWAGE DISPOSAL**
Australian Vineyard Uses Sewage Effluent with Trickle Irrigation,
W75-09486 3C

Ocean Disposal Experiences in Philadelphia,
W75-09550 5E

State of Arizona, Environmental Services Needs Study for Greenlee County, 1970-1990.
W75-09584 5D

Sewage Disposal and Water Supply Alternatives on the Basis of Water Quality and Economic Criteria,
W75-09774 5B

**SEWAGE EFFLUENTS**
Australian Vineyard Uses Sewage Effluent with Trickle Irrigation,
W75-09486 3C

Sewage Utilization in Agriculture,
W75-09788 5D

**SEWAGE FARMING**
Sewage Utilization in Agriculture,
W75-09788 5D

**SEWAGE LAGOONS**
Evaluation of Recovery in a Polluted Creek After Installation of New Sewage Treatment Procedures,
W75-09515 5B

A Covered Domestic Lagoon System for Natural Ground Water Recharge Near Metropolitan Areas,
W75-09524 5D

**SEWAGE SLUDGE**
Composting Sewage Sludge,
W75-09546 5D

Trench Incorporation of Sewage Sludge,
W75-09549 5E

**SEWAGE TREATMENT**
Ferric Chlorine or Lime for Chemical Treatment,
W75-09380 5D

Sewage Treatment Plant Dependability with Special Reference to the Activated Sludge Process,
W75-09393 5D

An Evaluation of the Hagerstown, Maryland Water Pollution Control Plant,
W75-09396 5D

Wastewater Survey, Chanute AFB, Illinois.
W75-09397 5D

Comprehensive Survey of Magpie Creek, McClellan Air Force Base, California,
W75-09410 5D

Survey of Wastewater Discharge, Campion AFS, Alaska,
W75-09413 5D

Recent Developments in Sewage Treatment Based on Physico-Chemical Methods,
W75-09414 5D

Evaluation of Recovery in a Polluted Creek After Installation of New Sewage Treatment Procedures,
W75-09515 5B

The Economics of Sludge Irrigation,
W75-09545 5D

Process for the Reduction of the Biochemical Oxygen Demand of Sewage and for the Recovery of the Inherent Protein,
W75-09566 5D

Sewage Treatment with Primary Sludge Removal from Final Clarifier,
W75-09570 5D

Wet Oxidation Treatment of Waste Liquor or Sludge,
W75-09571 5D

Countermeasures for Pollution from Overflows; the State of the Art,
W75-09580 5D

The Qualitative and Quantitative Determination of Soluble and Insoluble Forms of Phosphorus in Sewage Treatment Plants,
W75-09618 5D

Method and Apparatus for Aeration of Biodegradable Waste Material,
W75-09647 5D

Floating Solids Return Device,
W75-09657 5D

Activated Carbon Used to Control Odors,
W75-09777 5D

How to Get Low Ammonia Effluents,
W75-09778 5D

Physical Characteristics of Mechanical Aerators,
W75-09782 5D

**SEWERAGE**
Water, Sewerage and Flood Control Systems Plan and Implementation Program 1973-74.
W75-09400 6D

Wet Systems for Residential Refuse Collection: A Case Study for Springfield, Massachusetts,
W75-09407 5D

Wastewater Treatment Facilities Construction Grants for the Lower Raritan River Basin and for the South Shore of Raritan Bay (Final Environmental Impact Statement).
W75-09817 5D

**SEWERS**
Storm Water Management Model: User's Manual, Version II,
W75-09579 5D

**SHEAR STRESS**
Pore and Eroding Fluid Influences on Surface Erosion of Soil,
W75-09741 2J

Friction Factor Under Oscillatory Waves,
W75-09755 2

**SHOALS**
Proposed Navigational Maintenance Dredgi Project at Guilford Harbor, Guilford, Connecticut (Final Environmental Impact Statement)
W75-09821 8

**SHORE PROTECTION**
Prevention and Mitigation of Shore Damage Kahului Harbor, Maui, Hawaii (Final Environmental Impact Statement).
W75-09825 8

**SHORES**
Quaternary Sedimentation on the Amazon Continental Margin: A Model,
W75-09600 2

**SIDE STREAM PUMPING**
Hypolimnetic Oxygenation Using Liquid Oxygen,
W75-09589 5

**SILT REMOVAL**
Silt Removal from a Lake Bottom.
W75-09575 5

**SIMPSON'S INDEX**
Comparative Ecology of Western Streams,
W75-09617 5

**SIMULATED RAINFALL**
A Laboratory Rainfall Simulator for Infiltration and Soil Detachment Studies,
W75-09746 2

**SIMULATION ANALYSIS**
An Evaluation of Water Reuse for Municip Supply,
W75-09408 5

Recharge Simulation Model,
W75-09518 2

Simulation of Miscible Displacement in Soi Using the Method of Characteristics,
W75-09612 2

**SKAGWAY (ALAS)**
Water-Resources Data for Skagway, Alaska,
W75-09729 7

**SKIMMING**
Oil Skimmer with Oscillatable Circular Loop,
W75-09568 5

**SLOPE STABILITY**
Effects of Deforestation on Slopes,
W75-09743 4

**SLUDGE**
Agricultural Benefits and Environment Changes Resulting from the Use of Digeste Sludge on Field Crops,
W75-09409 5

Growth of Barley Irrigated with Wastewat Sludge Containing Phosphate Precipitants,
W75-09543 5

**SLUDGE DISPOSAL**
Filter-Pressing Wastewater Sludge.
W75-09420 5

Municipal Sludge Management, Proceedings the National Conference on Municipal Sludg Management.
W75-09532 5I

Overview of Sludge Handling and Disposal,
W75-09533 5I

lternative Methods for Sludge Management,
V75-09534 5D

hickening of Sludges,
/75-09535 5D

tilization of Digested Chemical Sewage ludges on Agricultural Lands in Ontario,
/75-09544 3F

he Economics of Sludge Irrigation,
/75-09545 5D

ecent Sanitary District History in Land Reclaation and Sludge Utilization,
/75-09547 5E

udge Management in Allegheny County,
75-09548 5E

rench Incorporation of Sewage Sludge,
75-09549 5E

udge Disposal by Incineration at Alcosan,
75-09551 5E

steurization of Liquid Digested Sludge,
75-09552 5D

udge Handling and Disposal at Blue Plains,
75-09553 5D

gricultural Utilization of Digested Sludges om the City of Pensacola,
75-09554 5E

stitutional Problems Associated with Sludge sposal,
75-09555 5E

dge Disposal at a Profit,
75-09557 5D

et Air Oxidation of Chemical Sludges,
75-09565 5D

itudes in Sludge Treatment and Disposal,
75-09731 5D

**GE THICKENING**
ckening of Sludges,
5-09535 5D

aerobic Digester Operation at the tropolitan Sanitary Districts of Greater cago,
5-09536 5D

**GE TREATMENT**
e of Centrifuges for Purification of Effluents menenie tsentrifug dlya ochistki stochnykh ),
5-09358 5D

luation and Demonstration of the Capillary tion Sludge Dewatering Device,
5-09399 5D

nomic Analysis of the Processing and posal of Refuse Sludges,
5-09406 5D

er-Pressing Wastewater Sludge.
5-09420 5D

hnological and Economic Effects of the nge of the Preliminary Purification Time on ge Treatment (Technologische und onomische Auswirkungen der Veraenderder Vorklaerzeit auf die Schlammbehang),
-09421 5D

Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management.
W75-09532 5D

Overview of Sludge Handling and Disposal,
W75-09533 5D

Alternative Methods for Sludge Management,
W75-09534 5D

Thickening of Sludges,
W75-09535 5D

Anaerobic Digester Operation at the Metropolitan Sanitary Districts of Greater Chicago,
W75-09536 5D

Sludge Dewatering,
W75-09539 5D

Pressure Filtration--Municipal Wastewater Solids, Cedar Rapids, Iowa,
W75-09540 5D

Drying of Sludge for Marketing as Fertilizer,
W75-09542 5E

Growth of Barley Irrigated with Wastewater Sludge Containing Phosphate Precipitants,
W75-09543 5D

Sludge Disposal by Incineration at Alcosan,
W75-09551 5E

Sludge Handling and Disposal at Blue Plains,
W75-09553 5D

Agricultural Utilization of Digested Sl iges from the City of Pensacola,
W75-09554 5E

Energy Conservation and Recycling Program of the Metropolitan Sewer Board of the Twin Cities Area,
W75-09556 5D

Sludge Disposal at a Profit,
W75-09557 5D

Sludge Management System for St. Louis,
W75-09558 5D

Phosphorus Removal Study at the Sarnia WPCP,
W75-09562 5D

Wet Air Oxidation of Chemical Sludges,
W75-09565 5D

Sewage Treatment with Primary Sludge Removal from Final Clarifier,
W75-09570 5D

Attitudes in Sludge Treatment and Disposal,
W75-09731 5D

**SNAILS**
Pond Snail Eggs as an Indicatory Material for Water Pollution Bioassay: Preliminary Experiments, (In Japanese),
W75-09682 5C

**SNOWFALL**
The Prediction of Lake Huron Lake-Effect Snowfall Systems,
W75-09748 2C

**SOCIAL VALUES**
Influence of the Energy Crisis Upon the Future of Environmental Policy,
W75-09847 6E

Marine Oil Spills: A Problem in Environmental Management,
W75-09849 5G

**SOCKEYE SALMON**
Branding Chinook, Coho and Sockeye Salmon Fry with Hot and Cold Metal Tools,
W75-09561 7B

Effects of Thiourea Treatment on Sexually Maturing and Gonadectomized Male Sockeye Salmon (Oncorhynchus Nerka),
W75-09699 5C

**SODIUM PENTACHLOROPHENATE**
Use of Sodium Pentachlorophenate and Dehydroabietic Acid as Reference Toxicants for Salmonid Bioassays,
W75-09683 5C

**SOIL AMENDMENTS**
Hungry Drylands of Western Rajasthan Need a New Technology,
W75-09789 3F

**SOIL ENGINEERING**
Effects of Deforestation on Slopes,
W75-09743 4C

**SOIL EROSION**
Drip Irrigation in Landscaping and Soil Erosion Control,
W75-09429 4D

Pore and Eroding Fluid Influences on Surface Erosion of Soil,
W75-09741 2J

A Laboratory Rainfall Simulator for Infiltration and Soil Detachment Studies,
W75-09746 2G

Drought in the Ghana Savannah: A Report to the U.S. Aid Mission to Ghana,
W75-09795 6G

**SOIL MANAGEMENT**
For Improving Water Penetration into Some Arizona Soils-Sulfuric Acid,
W75-09623 3C

**SOIL MOISTURE**
Soil Moisture Distribution and Wetting Pattern From a Point Source,
W75-09462 2G

Soil Moisture Distribution and Depletion in an Apple Orchard Irrigated by Tricklers,
W75-09463 2G

Recharge Simulation Model,
W75-09518 2A

Soil Moisture Sensing System,
W75-09651 2G

For Rainfed Areas-Improved Velvet Beans for Increased Forage Production,
W75-09796 3F

India Case Study on Improving Productivity in Low Rainfall Areas.
W75-09803 3F

**SOIL MOISTURE TENSION**
Movement of Pollutant Phosphorus In Unsaturated Soil,
W75-09527 5B

**SOIL SURFACES**
Mix Gypsum in Shallow Depths--In Saline Soils,
W75-09786 3C

SOIL SURVEYS
Contour Map of the Bedrock Surface, Collinsville Quadrangle, Connecticut,
W75-09706 7C

SOIL TEMPERATURE
An Explanation for the Growth Advantage of Drip Irrigation,
W75-09465 3F

SOIL TREATMENT
A Covered Domestic Lagoon System for Natural Ground Water Recharge Near Metropolitan Areas,
W75-09524 5D

SOIL WATER
Soil Moisture Distribution and Wetting Pattern From a Point Source,
W75-09462 2G

SOIL WATER MOVEMENT
Edaphic Micro-Tubular Continuous Flow Irrigation in Canada,
W75-09436 2G

Movement of Water and Salts Under High Frequency Irrigation,
W75-09458 3F

Linearized Moisture Flow Solutions for Point, Line, and Strip Sources,
W75-09459 2G

Soil Moisture Distribution and Depletion in an Apple Orchard Irrigated by Tricklers,
W75-09463 2G

Soil Salinity Distribution in Drip and Subsurface Irrigated Summer Squash,
W75-09481 3C

Effects of Drip Irrigation on Soil-Water-Plant Relationship,
W75-09500 2I

SOIL-WATER-PLANT RELATIONSHIPS
Effects of Drip Irrigation on Soil-Water-Plant Relationship,
W75-09500 2I

Water Requirements and Limitations Imposed on Agricultural Development in Northern Ghana,
W75-09800 3F

India Case Study on Improving Productivity in Low Rainfall Areas.
W75-09803 3F

SOILS
Wave Induced Pressures in Permeable Seabeds,
W75-09607 8B

Simulation of Miscible Displacement in Soils Using the Method of Characteristics,
W75-09612 2G

SOLAR ENERGY
Arizona and Tomorrow's Solar Powerplants,
W75-09804 3A

SOLAR RADIATION
World Maps of Potential Evapotranspiration, Plant Development, and Spring Greening and Autumn Browning of Vegetation, Based on the Solar Thermal Unit Model,
W75-09771 2D

Arizona and Tomorrow's Solar Powerplants,
W75-09804 3A

SOLAR STILL
Solar Still with Replaceable Solar Absorbing Liner and Weight Controlled Feed Inlet,
W75-09643 3A

SOLAR THERMAL UNIT MODEL
World Maps of Potential Evapotranspiration, Plant Development, and Spring Greening and Autumn Browning of Vegetation, Based on the Solar Thermal Unit Model,
W75-09771 2D

SOLID WASTES
Solid Waste Milling and Disposal on Land Without Cover, Volume I. Summary and Major Findings,
W75-09401 5E

Solid Waste Milling and Disposal on Land Without Cover. Volume II. Data Condensations,
W75-09402 5E

State of Arizona, Environmental Services Needs Study for Greenlee County, 1970-1990.
W75-09584 5D

SONOBUOYS
Sediments and Structure of the Japan Sea,
W75-09756 2J

SONOZONE TREATMENT
Sound Waves and Ozone Sterilize Wastewater.
W75-09779 5D

SORGHUM GENOTYPES
Biophysical Control of Water Loss,
W75-09523 3F

SOUND WAVES
Sound Waves and Ozone Sterilize Wastewater.
W75-09779 5D

SOUTH AFRICA
Some Results of a Field Survey of Drip Irrigation Systems in the Republic of South Africa,
W75-09433 3F

Moisture Profiles and Salinization of Soils Under Drip Irrigation in the Republic of South Africa,
W75-09464 3C

SOUTH CAROLINA
Conch Creek Corp. v. Guess (Conflicting Title Claims to Tidelands Included in Grant from Governor).
W75-09832 6E

SOUTH DAKOTA
Silt Removal from a Lake Bottom.
W75-09575 5C

Initial Stage, Oahe Unit, Pick-Sloan Missouri Basin Program, South Dakota (Final Environmental Impact Statement).
W75-09812 8A

SPARKS
The Microwave Emission Spectum from Sparking Water Drops,
W75-09614 2B

SPAWNING
Effects of Kokanee Salmon (Oncorhynchus Nerka) Decomposition on the Ecology of a Subalpine Stream,
W75-09672 5C

Effects of Logging on Water Temperature and Dissolved Oxygen in Spawning Beds,
W75-09685 5C

SPAWNING MATS
Evaluation of a New Spawning Mat Materi
W75-09749

SPECIFICATIONS
Survey of Experience with Drainage Mate and Review of Available Specifications,
W75-09629

Study of Experiences with Drainage Mate and a Review of Specifications Availabl France,
W75-09630

Experiences with Drainage Materials an Review of Available Specifications,
W75-09631

A Survey of Experiences with Drainage Ma als and a Review of Available Specification
W75-09632

Drainage Materials - Provisional Report of Experience Gained in the Netherlands,
W75-09633

Survey of Experiences with Drainage Mate and Review of Available Specifications,
W75-09634

SPECTROMETERS
Simultaneous Determination of Seven Ti Metals in Potable Water Using a Vidi Atomic Absorption Spectrometer,
W75-09363

SPECTROSCOPY
Determination of Lead in Potable Waters U Delves Cup Atomic Absorption Spectrom with Signal Integration,
W75-09366

SPHAEROTILUS NATANS
Biological Control of Sphaerotilus Natans Related Species in Waste Waters,
W75-09520

SPLINTERING
A Wind Tunnel Investigation on Ice Multipli tion by Freezing of Waterdrops Falling at T minal Velocity in Air,
W75-09613

SPRINGFIELD (MASS)
Wet Systems for Residential Refuse Collecti A Case Study for Springfield, Massachusetts
W75-09407

SPRINKLER IRRIGATION
Drip Irrigation Research in Oregon - A Progr Report,
W75-09428

Use of Drip Irrigation in Germany,
W75-09434

Vegetable Production and Water-Use Effici cy as Influenced by Drip, Sprinkler, Subs face, and Furrow Irrigation Methods,
W75-09438

Comparison of Irrigation Methods, Rootstoc and Fertilizer Elements of Valencia Oran Trees,
W75-09439

Drip Irrigation: Surface and Subsurface Co pared with Sprinkler and Furrow,
W75-09440

Strip Cultivation of the Area Wetted by Drip rigation in the Arava Desert,
W75-09445

/ater Use by Drip and Sprinkle Irrigated vocados Related to Plant Cover, Evaporation nd Air Temperature,
/75-09479 3F

evice for Distributing Irrigation Water,
/75-09662 3F

**/ASH**
il Salinity Distribution in Drip and Subsurce Irrigated Summer Squash,
75-09481 3C

**JOHNS RIVER (FLA)**
rface Water Resources of St. Johns River, orida,
75-09604 2A

**NDARD DEVIATIONS**
atistical Properties of Wave Force,
75-09759 8B

**NDING (LEGAL)**
ion Camp Corp. v. Seminole Forest Water nagement District (Suit by Single Lanwner to Require Formation of a Drainage trict).
75-09828 6E

nservation Council of North Carolina v. stanzo (Action to Enjoin Construction of a rina on Island in Atlantic Ocean and to quire Environmental Impact Statement by rps of Engineers).
5-09840 6E

**E JURISDICTION**
Guide for State Certification of Wastewater ilities Personnel,
5-09389 5D

**E POLICY**
rida Water Resources Act of 1972 (Statute ablishing Water Management Districts for State of Florida).
5-09833 6E

**IONS**
poration from Water Surfaces in California,
5-09586 2D

**ISTICS**
graphic Variation of the Statistical Parame- of Hydrometeorological Data of the United es,
5-09605 2B

istical Properties of Wave Force,
-09759 8B

**M CONDENSATES**
ibilities for Reducing 5-Day BOD-Consum- Materials in Steam Condensates from Spent te Liquor Evaporation (Moeglichkeiten der uktion der BSB(5)-verbrauchenden Stoffe rundenkondensaten aus Sulfitablaugeneinpfungen),
-09360 5D

**HASTIC PROCESSES**
ochastic Model of N-Day Precipitation,
-09747 2B

**ATA**
hysical Control of Water Loss,
09523 3F

**FLIES**
parative Ecology of Western Streams,
09617 5G

**STORM DRAINS**
Urban Runoff Pollution Control--State-of-the-Art,
W75-09762 5D

**STORM RUNOFF**
Countermeasures for Pollution from Overflows; the State of the Art,
W75-09580 5D

Regional Analyses of Runoff Characteristics for Small Urban Watersheds,
W75-09621 2A

Urban Runoff Pollution Control--State-of-the-Art,
W75-09762 5D

**STORM SEWERS**
Countermeasures for Pollution from Overflows; the State of the Art,
W75-09580 5D

**STREAM CAPTURE**
Channel Responses to Artificial Stream Capture, Death Valley, California,
W75-09610 2J

**STREAM ECOLOGY**
Distribution and Dynamics of Aquatic Insects in the Elk Creek Experimental Watershed, Lubrecht Forest, Montana,
W75-09528 5C

**STREAM ORDER**
Stream Ordering and Contour Mapping,
W75-09745 4A

**STREAMFLOW**
Optimizing Long-Term Streamflow Forecasts,
W75-09594 4A

**STREAMFLOW FORECASTING**
Optimizing Long-Term Streamflow Forecasts,
W75-09594 4A

**STREAMS**
Evaluation of Recovery in a Polluted Creek After Installation of New Sewage Treatment Procedures,
W75-09515 5B

Channel Responses to Artificial Stream Capture, Death Valley, California,
W75-09610 2J

**STRIP CROPPING**
Strip Cultivation of the Area Wetted by Drip Irrigation in the Arava Desert,
W75-09445 3C

**SUBDIVISIONS**
Arizona's Remote Subdivisions: An Inventory,
W75-09583 6G

**SUBLETHAL EFFECTS**
Avoidance of Fenitrothion by Goldfish (Carassius Auratus),
W75-09677 5C

**SUBSURFACE IRRIGATION**
Vegetable Production and Water-Use Efficiency as Influenced by Drip, Sprinkler, Subsurface, and Furrow Irrigation Methods,
W75-09438 3F

Drip Irrigation: Surface and Subsurface Compared with Sprinkler and Furrow,
W75-09440 3F

High-Frequency Porous Tube Irrigation for Water-Nutrient Management in Humid Regions,
W75-09449 3F

See Germination Response to Subsurface Irrigation Depth,
W75-09451 2I

Optimum Lateral Placement for Subsurface Irrigation Systems,
W75-09460 3F

Soil Salinity Distribution in Drip and Subsurface Irrigated Summer Squash,
W75-09481 3C

**SUBTROPIC**
Drip Vs. Furrow Irrigation Trials in Potato Under Subtropical Conditions,
W75-09513 3F

**SUGARCANE**
Drip and Furrow Irrigation Studies on Sugarcane,
W75-09476 3F

Investigations in Sugarcane Fertilization by Drip Irrigation in Hawaii,
W75-09490 3F

**SULFATES**
The Effect of Sulfate and Manganese Dioxide on the Release of Phosphorus from Lake Mendota Sediments,
W75-09619 5C

**SULFITE LIQUORS**
Biological Treatment of Spent Bisulfite Liquor (Traitement biologique de la liqueur residuelle au bisulfite),
W75-09355 5D

Possibilities for Reducing 5-Day BOD-Consuming Materials in Steam Condensates from Spent Sulfite Liquor Evaporation (Moeglichkeiten der Reduktion der BSB(5)-verbrauchenden Stoffe in Brundenkondensaten aus Sulfitablaugeneindampfungen),
W75-09360 5D

**SULFUR BACTERIA**
Clogging of Drip Systems from Metabolic Products of Iron and Sulfur Bacteria,
W75-09456 5B

**SULFUR COMPOUNDS**
For Improving Water Penetration into Some Arizona Soils-Sulfuric Acid,
W75-09623 3C

**SULFURIC ACID**
For Improving Water Penetration into Some Arizona Soils-Sulfuric Acid,
W75-09623 3C

**SULFURIC ACID-EDTA METHOD**
Adenosine Triphosphate Measurements in Soil and Marine Sediments,
W75-09764 5A

**SUMITHION**
Behavior of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Sumithion (Fenitrothion), An Organophosphate Insecticide,
W75-09700 5C

**SUNFISHES**
Effect of Constant Temperature on Growth Rates of Pumpkinseed Sunfish (Lepomis Gibbosus),
W75-09701 5C

SUNFLOWER
Effect of Root Temperature and Humidity on the Distribution of Ca in Apple and Sunflower Seedlings,
W75-09351 2I

SURFACE-GROUNDWATER RELATIONSHIPS
Ground-Water Level in the Flood Plain and Adjacent Uplands of the Sangamon River,
W75-09599 4B

SURFACE IRRIGATION
Comparison of Irrigation Methods, Rootstocks, and Fertilizer Elements of Valencia Orange Trees,
W75-09439 3F

SURFACE RUNOFF
A Laboratory Investigation of Surface Runoff,
W75-09744 2E

Urban Runoff Pollution Control--State-of-the-Art,
W75-09762 5D

SURFACE WATER AVAILABILITY
Surface Water Resources of St. Johns River, Florida,
W75-09604 2A

SURFACE WATERS
Temperatures of Streams and Selected Reservoirs in Pennsylvania,
W75-09713 7C

SURFACE WAVES
Computation of Wave Heights Due to Refraction and Friction,
W75-09606 8B

SURFACTANTS
Reduction in Surfactants by Irradiation,
W75-09418 5D

SURVEYS
Ocean Waste Disposal Practices in Metropolitan Areas of California,
W75-09391 3D

Wastewater Survey, Chanute AFB, Illinois.
W75-09397 5D

Survey of Wastewater Discharge--Elmendorf AFB, Alaska,
W75-09398 5B

Comprehensive Survey of Magpie Creek, McClellan Air Force Base, California,
W75-09410 5D

Wastewater Treatment Facility Evaluation, Malmstrom AFB MT,
W75-09411 5E

Some Results of a Field Survey of Drip Irrigation Systems in the Republic of South Africa,
W75-09433 3F

Arizona's Remote Subdivisions: An Inventory,
W75-09583 6G

SUSPENDED SOLIDS
Use of Centrifuges for Purification of Effluents (Primenenie tsentrifug dlya ochistki stochnykh vod),
W75-09358 5D

Sludge Dewatering,
W75-09539 5D

The Effect of Concentration of Suspension and Inert Material on the Assimilation of Algae by Three Bivalves,
W75-09695 5C

SWEET CORN
Vegetable Production and Water-Use Efficiency as Influenced by Drip, Sprinkler, Subsurface, and Furrow Irrigation Methods,
W75-09438 3F

High-Frequency Porous Tube Irrigation for Water-Nutrient Management in Humid Regions,
W75-09449 3F

An Explanation for the Growth Advantage of Drip Irrigation,
W75-09465 3F

SWIMMING PERFORMANCE
Changes in Blood Chemistry of Juvenile Steelhead Trout, Salmo Gairdneri, Following Sublethal Exposure to Nitrogen Supersaturation,
W75-09694 5C

SWIRL REGULATOR/CONCENTRATOR
Urban Runoff Pollution Control--State-of-the-Art,
W75-09762 5D

SYSTEMS ANALYSIS
Integrative Procedures for Coordinated Urban Land and Water Management: A Systems Analysis,
W75-09622 6A

TABLE ROCK LAKE (ARK)
Table Rock Lake, White River, Missouri (Final Environmental Impact Statement).
W75-09818 8C

TAMARISK
A Survey of the Nesting Habitats of the White-Winged Dove in Arizona,
W75-09794 6G

TELEMETRY
Digital Instrumentation and Telemetry for Water Resources Research,
W75-09529 7B

TEMPERATURE
An Explanation for the Growth Advantage of Drip Irrigation,
W75-09465 3F

Rapid Temperature Reduction of Thermal Discharge,
W75-09757 5B

Diversity of Marine Invertebrates in a Thermal Effluent,
W75-09809 5C

TERRITORIAL WATERS
Towards a New Regime for Ocean Development,
W75-09843 6E

TEXAS
Drip and Furrow Irrigation Studies on Sugarcane,
W75-09476 3F

Regional Analyses of Runoff Characteristics for Small Urban Watersheds,
W75-09621 2A

Deposition of Zinc and Cadmium by Marine Bacteria in Estuarine Sediments,
W75-09692 5C

Ground-Water Data for Orange County and Vicinity, Texas and Louisiana, 1971-74,
W75-09727 7C

Detailed Project Report for Local Flood [illegible] tection, Zacate Creek, Laredo, Texas ([illegible] Environmental Impact Statement).
W75-09813

THALASSIOSIRA PSEUDONANA
Effects of PCB on Interspecific Competiti[illegible] Natural and Gnotobiotic Phytoplankton [illegible] munities in Continuous and Batch Culture[illegible]
W75-09680

THEORETICAL ANALYSIS
A Specific Case of Wave Motion of a Liqu[illegible] Pipes,
W75-09740

THERMAL DESALINATION
System for Thermal Desalting of Water,
W75-09653

THERMAL POLLUTION
Interaction Between the Daily Heat Ba[illegible] and the Tidal Cycle,
W75-09602

Rapid Temperature Reduction of The[illegible] Discharge,
W75-09757

Makeup Requirements for Cooling Ponds,
W75-09760

Diversity of Marine Invertebrates in a The[illegible] Effluent,
W75-09809

THIOUREA
Effects of Thiourea Treatment on Sex[illegible] Maturing and Gonadectomized Male Soc[illegible] Salmon (Oncorhynchus Nerka),
W75-09699

THYROID
Effects of Thiourea Treatment on Sex[illegible] Maturing and Gonadectomized Male Soc[illegible] Salmon (Oncorhynchus Nerka),
W75-09699

TIDAL EFFECTS
Interaction Between the Daily Heat Bal[illegible] and the Tidal Cycle,
W75-09602

TIDAL ENERGY
Tide Energy Conversion Device,
W75-09650

TIDAL MARSHES
Conch Creek Corp. v. Guess (Conflicting [illegible] Claims to Tidelands Included in Grant [illegible] Governor).
W75-09832

TIDAL POWERPLANTS
Tide Energy Conversion Device,
W75-09650

TIDAL WATERS
Interaction Between the Daily Heat Bal[illegible] and the Tidal Cycle,
W75-09602

The Public Trust Doctrine Is Alive and Kic[illegible] in New Jersey Tidalwaters: Neptune Cit[illegible] Avon-By-The-Sea--A Case of Happy Atavi[illegible]
W75-09850

TILE DRAINAGE
Drainage Materials.
W75-09628

Survey of Experience with Drainage Mate[illegible] and Review of Available Specifications,
W75-09629

DRAINS
inage Materials - Provisional Report of the erience Gained in the Netherlands,
-09633 8G

ey of Experiences with Drainage Materials Review of Available Specifications,
-09634 8G

Effects of Lapsed Time Since Feeding n the Toxicity of Zinc to Fish,
-09688 5C

E ANALYSIS
cury in Seals, Terrestial Carnivores and cipal Food Items of the Inuit, from Hol- N.W.T.,
-09679 5A

ges in Blood Chemistry of Juvenile Steel- Trout, Salmo Gairdneri, Following ethal Exposure to Nitrogen Supersatura-
09694 5C

ium Determination on Fish Tissue,
09696 5A

ts of Thiourea Treatment on Sexually ring and Gonadectomized Male Sockeye on (Oncorhynchus Nerka),
09699 5C

rential Uptake of Endosulfan by the Tis- of Mytilus Edulis,
09810 5A

OES
natic Drip Irrigation for Greenhouse To- Production in West Texas,
09448 3F

d Tomato Drip Irrigation in California,
09506 3F

dy on Different Application Procedures p Irrigation in Tomato Cultivation,
09511 3F

RAPHIC MAPPING
n Ordering and Contour Mapping,
09745 4A

NTS
of Sodium Pentachlorophenate and roabietic Acid as Reference Toxicants monid Bioassays,
09683 5C

ffects of Lapsed Time Since Feeding he Toxicity of Zinc to Fish,
09688 5C

Y
ffect of Different Oxygen Conditions Incubation on the Survival and Some of evelopmental Characteristics of the ova' (Leucaspius Delineatus) in the onic Period,
09670 5C

m Toxicity on the Early Life Stages of sh (Brachydanio rerio),
09671 5C

Toxicity of Nitrite to Rainbow Trout Gairdneri),
09687 5C

ffects of Lapsed Time Since Feeding ne Toxicity of Zinc to Fish,
09688 5C

The Accumulation of Fluoride by Marine and Intertidal Animals,
W75-09697 5C

TOXICITY TESTS
An Inexpensive Macroinvertebrate Bioassay Table for Use in Continuous-Flow Toxicity Tests,
W75-09676 5A

Use of Sodium Pentachlorophenate and Dehydroabietic Acid as Reference Toxicants for Salmonid Bioassays,
W75-09683 5C

TRACE ELEMENTS
Determination of Chloride in Water with a HgS/Hg2Cl2 Electrode,
W75-09361 5A

Multielement Neutron Activation Analysis of Fresh Water Using Ge(Li) Gamma Spectrometry,
W75-09362 5A

Simultaneous Determination of Seven Trace Metals in Potable Water Using a Vidicon Atomic Absorption Spectrometer,
W75-09363 5A

Aspects of Trace Metal Contamination in the Coastal Rivers of Israel,
W75-09689 5B

TRANSPIRATION
Transpiration Rates of Conifers,
W75-09784 2D

TRANSPORTATION
Secondary Impacts of Transportation and Wastewater Investments: Review and Bibliography,
W75-09576 5C

TRAVELING TRICKLE SYSTEMS
Traveling Trickle System,
W75-09452 3F

TREATMENT FACILITIES
Nitrification and Denitrification Facilities, Wastewater Treatment.
W75-09382 5D

Physical-Chemical Wastewater Treatment Plant Design.
W75-09385 5D

A Guide for State Certification of Wastewater Facilities Personnel,
W75-09389 5D

Implementation of Water Supply and Wastewater Programs in the Washington, D.C. Metropolitan Area.
W75-09392 5D

Sewage Treatment Plant Dependability with Special Reference to the Activated Sludge Process,
W75-09393 5D

An Evaluation of the Hagerstown, Maryland Water Pollution Control Plant,
W75-09396 5D

Wastewater Survey, Chanute AFB, Illinois.
W75-09397 5D

A Preliminary Assessment of Wet Systems for Residential Refuse Collection,
W75-09405 5D

Comprehensive Survey of Magpie Creek, McClellan Air Force Base, California,
W75-09410 5D

Wastewater Treatment Facility Evaluation, Malmstrom AFB MT,
W75-09411 5E

Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management.
W75-09532 5D

Recent Sanitary District History in Land Reclamation and Sludge Utilization,
W75-09547 5E

Sludge Management in Allegheny County,
W75-09548 5E

Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability, Supplement to Federal Guidelines for Design, Operation, and Maintenance of Waste Water Treatment Facilities.
W75-09559 8C

Phosphorus Removal Study at the Sarnia WPCP,
W75-09562 5D

Identification of Problem Areas in Water Pollution Control Plants,
W75-09564 5D

Modifications to the Executive Computer Program for Steady-State Simulation of Wastewater Treatment Facilities,
W75-09775 5D

TRESPASS
National Audobon Society v. White (Suit to Enjoin Trespass on Privately Owned and Maintained Navigable Canal).
W75-09839 6E

TRICKLE IRRIGATION
Proceedings of the Second International Drip Irrigation Congress.
W75-09423 3F

Drip Irrigation-Worldwide,
W75-09424 3F

The Progress and Problems of Drip Irrigation in Israel,
W75-09425 3F

Drip Irrigation and Automation Tools in Efficient Use of Water Policy,
W75-09426 3F

Drip Irrigation Design Criteria for Tree Crops in Florida and Other Humid Regions,
W75-09427 3F

Drip Irrigation Research in Oregon - A Progress Report,
W75-09428 3F

Drip Irrigation in Landscaping and Soil Erosion Control,
W75-09429 4D

Researches and Applications on Drip Irrigation and Similar Methods in Italy,
W75-09430 3F

Development and Scope of Drip and Subsurface Irrigation,
W75-09431 3C

Drip Irrigation on Citrus,
W75-09432 3F

Some Results of a Field Survey of Drip Irrigation Systems in the Republic of South Africa,
W75-09433 3F

Use of Drip Irrigation in Germany,
W75-09434 3F

Drip Irrigations Inherent Requisite - Water Quality,
W75-09435 5D

Edaphic Micro-Tubular Continuous Flow Irrigation in Canada,
W75-09436 2G

Trickle Irrigation,
W75-09437 3F

Vegetable Production and Water-Use Efficiency as Influenced by Drip, Sprinkler, Subsurface, and Furrow Irrigation Methods,
W75-09438 3F

Comparison of Irrigation Methods, Rootstocks, and Fertilizer Elements of Valencia Orange Trees,
W75-09439 3F

Drip Irrigation: Surface and Subsurface Compared with Sprinkler and Furrow,
W75-09440 3F

Chamber Method for Drip Irrigation System Design and Installation Procedure,
W75-09441 8C

The Use of Foggers in Drip Irrigation,
W75-09442 3F

A Constant Micro Source of Moisture as a Component in a Gradient System for a High Level Production,
W75-09443 3F

Disinfection of Soil Strips Through the Drip Irrigation System,
W75-09444 5G

Strip Cultivation of the Area Wetted by Drip Irrigation in the Arava Desert,
W75-09445 3C

Irrigation for Benches,
W75-09446 3F

Irrigation for Container Growing,
W75-09447 3F

Automatic Drip Irrigation for Greenhouse Tomato Production in West Texas,
W75-09448 3F

High-Frequency Porous Tube Irrigation for Water-Nutrient Management in Humid Regions,
W75-09449 3F

Control of Water by Drip Irrigation for Alfalfa Seed Production,
W75-09450 3F

See Germination Response to Subsurface Irrigation Depth,
W75-09451 2I

Traveling Trickle System,
W75-09452 3F

Mobile Drip Irrigation Systems,
W75-09453 3F

Formation of Blockages in Drip Irrigation Systems: Their Prevention and Removal,
W75-09454 3F

Reverse Flushing Technique for Bi-Wall Drip Tubing,
W75-09455 8C

Clogging of Drip Systems from Metabolic Products of Iron and Sulfur Bacteria,
W75-09456 5B

Chemical Treatment of Drip Irrigation Water,
W75-09457 3F

Movement of Water and Salts Under High Frequency Irrigation,
W75-09458 3F

Linearized Moisture Flow Solutions for Point, Line, and Strip Sources,
W75-09459 2G

Optimum Lateral Placement for Subsurface Irrigation Systems,
W75-09460 3F

Trickle Irrigation Design for Optimal Soil Wetting,
W75-09461 2G

Soil Moisture Distribution and Wetting Pattern From a Point Source,
W75-09462 2G

Soil Moisture Distribution and Depletion in an Apple Orchard Irrigated by Tricklers,
W75-09463 2G

Moisture Profiles and Salinization of Soils Under Drip Irrigation in the Republic of South Africa,
W75-09464 3C

An Explanation for the Growth Advantage of Drip Irrigation,
W75-09465 3F

Trickle Irrigation in Michigan Orchards,
W75-09466 3F

Trickle Irrigation in Michigan Orchards: Controlling Rate of Flow with Flow Regulating Valves and Microtubes,
W75-09467 8C

Dripper Flow Consistency,
W75-09468 3F

Evaluation of a Trickle Irrigation System,
W75-09469 3F

Hydraulics of Single-Chamber vs. Dual-Chamber Tubing,
W75-09470 8C

Designing Trickle Irrigation Laterals for Uniformity,
W75-09471 3F

Design Charts for Drip Irrigation Systems,
W75-09472 8C

Hydraulic and Mechanical Properties of Drippers,
W75-09473 8C

Hydraulic and Mechanical Properties of Drippers,
W75-09473 8C

Evaluation of Hydraulics of Flow Through Pipes of Varying Slopes, Lengths and Orifice Placements,
W75-09474 8B

Plant Water Requirements as Related to Trickle Irrigation,
W75-09475 3F

Drip and Furrow Irrigation Studies on Su
cane,
W75-09476

Salinity Sensor Control of Drip Irriga
Water Application,
W75-09477

Water Use with Drip Irrigation,
W75-09478

Water Use by Drip and Sprinkle Irrig
Avocados Related to Plant Cover, Evapora
and Air Temperature,
W75-09479

Trickle Irrigation Management for Cotton
Cabbage,
W75-09480

Soil Salinity Distribution in Drip and Sub
face Irrigated Summer Squash,
W75-09481

Monitoring Soil Salinity and Leaf Nutr
Levels in a Young Avocado Orchard Ur
Drip Irrigation,
W75-09482

Afforestation with Saline Water in Abu Dha
W75-09483

Salinity Management for High Frequency
rigation,
W75-09484

Irrigation Return Flow as Influenced by I
Irrigation,
W75-09485

Australian Vineyard Uses Sewage Effl
with Trickle Irrigation,
W75-09486

An Investigation into the Potential Uses
Trickle Irrigation for Desert Reclamation
Fodder Production in the Emirate of
Dhabi,
W75-09487

Effects of Localized Phosphate Treatments
Solution pH on the Growth and Function
Apple Roots,
W75-09488

Application of Fertilizer Through Drip Irri
tion Systems in West Texas,
W75-09489

Investigations in Sugarcane Fertilization
Drip Irrigation in Hawaii,
W75-09490

Fertilizer Applications with Drip Irrigation,
W75-09491

Use of Glycerophosphate for Fertilizat
Through Trickle Irrigation Systems,
W75-09492

Weed Control Under Drip Irrigation in Orch
and Vineyard Crops,
W75-09493

Influence of Different Amounts of Irrigatio
Water, Irrigation--Intervals and Fertilizers
the Yield and Quantity of Drip-Irrigated Mu
and Watermelons,
W75-09494

Water Uptake by an Apple Tree with Vari
Proportions of the Root System Supplied w
Water,
W75-09495

Effects of Nitrogen Fertilizer Applications to Part of a Root System,
W75-09496 3F

Change in Root Distribution of Mature Pear Trees in Response to Trickle Irrigation,
W75-09497 3F

Changes in Root Patterns of Peach Trees Under Trickle Irrigation,
W75-09498 2I

Drip Irrigation Experiment on Avocados,
W75-09499 3C

Effects of Drip Irrigation on Soil-Water-Plant Relationship,
W75-09500 2I

Trickle Irrigation on Young Peach Trees,
W75-09501 3F

Drip Irrigation in Citrus Orchards,
W75-09502 3F

An Investigation on the Use of Drip Irrigation for the Establishment of Multi-Purpose Parks (Green Belts Around the Cities) in Iran,
W75-09503 3F

Tree and Crop Response to Drip Irrigation,
W75-09504 3F

Cantaloupe Response to Drip Irrigation,
W75-09505 3F

Staked Tomato Drip Irrigation in California,
W75-09506 3F

Spring Cucumber Drip vs. Furrow Irrigation,
W75-09507 3F

The Irrigation of Olives by Drip and Other Irrigation Methods,
W75-09508 3F

Performance of Plants with Drip Irrigation,
W75-09509 3F

Trickle Irrigation Management for Grapes,
W75-09510 3F

Study on Different Application Procedures of Drip Irrigation in Tomato Cultivation,
W75-09511 3F

The Relation Between Drip Irrigation, Phytophthora Root Rot of Avocado, and Fungicides,
W75-09512 2I

Drip Vs. Furrow Irrigation Trials in Potato Under Subtropical Conditions,
W75-09513 3F

Response of Mature Citrus Trees on Deep Sandy Soil to Drip Irrigation,
W75-09514 3F

**TRICKLING FILTERS**
How to Get Low Ammonia Effluents,
W75-09778 5D

**TRITIATED WATER TURNOVER RATE**
Tritiated Water Turnover Rate in Rodents: Desert and Mountain,
W75-09801 2I

**TROUT**
Acute Toxicity of Nitrite to Rainbow Trout (Salmo Gairdneri),
W75-09687 5C

Changes in Blood Chemistry of Juvenile Steelhead Trout, Salmo Gairdneri, Following Sublethal Exposure to Nitrogen Supersaturation,
W75-09694 5C

**TURBIDITY**
Device for Underwater Observation,
W75-09640 7B

**TURBIDITY CURRENTS**
Dynamics of Turbidity Plumes in Lake Ontario,
W75-09709 2J

**TURBIDITY PLUME TRACERS**
Dynamics of Turbidity Plumes in Lake Ontario,
W75-09709 2J

**TURBULENT BOUNDARY LAYERS**
Tangential Stress Distribution in Turbulent Boundary Layers at an Adverse Pressure Gradient,
W75-09738 8B

**TURBULENT MIXING**
Water Treatment Plant,
W75-09645 5D

**TWO-PHASE FLOW**
On the Discharge Coefficient of Nozzles for Single- and Two-Phase Fluids,
W75-09739 8B

**UHF SOUND WAVES**
Sound Waves and Ozone Sterilize Wastewater.
W75-09779 5D

**ULTRAVIOLET ANALYZER**
Automatic U.V.-Control System for Relative Evaluation of Organic Water Pollution,
W75-09735 5A

**ULTRAVIOLET RADIATION**
Automatic U.V.-Control System for Relative Evaluation of Organic Water Pollution,
W75-09735 5A

**UNDERWATER**
Device for Underwater Observation,
W75-09640 7B

**UNDERWATER OBSERVATION**
Device for Underwater Observation,
W75-09640 7B

**UNIFORM FLOW**
Designing Trickle Irrigation Laterals for Uniformity,
W75-09471 3F

**UNIFORMITY**
Evaluation of a Trickle Irrigation System,
W75-09469 3F

**UNIFORMITY COEFFICIENT**
Designing Trickle Irrigation Laterals for Uniformity,
W75-09471 3F

**UNIT HYDROGRAPHS**
A Non-Linear Rainfall-Runoff Model, Providing for Variable Lag Time,
W75-09753 2A

**UNITED KINGDOM**
Survey of Experiences with Drainage Materials and Review of Available Specifications,
W75-09634 8G

Wind and Wave Relationships in U.K. Coastal Waters,
W75-09737 2L

**UNITED STATES**
U.S. Engineering Information Services and the Role of the Water Resources Scientific Information Center,
W75-09585 10D

Geographic Variation of the Statistical Parameters of Hydrometeorological Data of the United States,
W75-09605 2B

Atlas of River Basins of the United States.
W75-09616 7C

**UNSATURATED FLOW**
Movement of Pollutant Phosphorus In Unsaturated Soil,
W75-09527 5B

**UPFLOW FILTRATION SYSTEMS**
Upflow Filtration of Oxidation Pond Effluent,
W75-09522 5D

**URBAN HYDROLOGY**
Countermeasures for Pollution from Overflows; the State of the Art,
W75-09580 5D

**URBAN RUNOFF**
Urban Lawn Infiltration Rates and Fertilizer Runoff Losses Under Simulated Rainfall,
W75-09592 5B

Urban Runoff Pollution Control--State-of-the-Art,
W75-09762 5D

**URBAN RUNOFF MODELING**
Storm Water Management Model: User's Manual, Version II,
W75-09579 5D

**URBAN WATER MANAGEMENT**
Integrative Procedures for Coordinated Urban Land and Water Management: A Systems Analysis,
W75-09622 6A

**URBAN WATERSHEDS**
Regional Analyses of Runoff Characteristics for Small Urban Watersheds,
W75-09621 2A

**URBANIZATION**
Storm Water Management Model: User's Manual, Version II,
W75-09579 5D

**USUFRUCTUARY RIGHT**
The Public Trust Doctrine Is Alive and Kicking in New Jersey Tidalwaters: Neptune City v. Avon-By-The-Sea--A Case of Happy Atavism,
W75-09850 6E

**UTAH**
Bibliography of U.S. Geological Survey Water-Resources Reports for Utah,
W75-09718 2A

**UTAH LAKE (UTAH)**
Water Quality Effect of Diking a Shallow Arid-Region Lake,
W75-09577 5B

**VALVES**
Irrigating Apparatus,
W75-09641 3F

**VARIABILITY**
Geographic Variation of the Statistical Parameters of Hydrometeorological Data of the United States,
W75-09605 2B

**VARIANCE ANALYSIS**
Geographic Variation of the Statistical Parameters of Hydrometeorological Data of the United States,
W75-09605 2B

**VEGETABLE CROPS**
Vegetable Production and Water-Use Efficiency as Influenced by Drip, Sprinkler, Subsurface, and Furrow Irrigation Methods,
W75-09438 3F

**VELVET BEANS**
For Rainfed Areas-Improved Velvet Beans for Increased Forage Production,
W75-09796 3F

**VERTICAL CYLINDERS**
Statistical Properties of Wave Force,
W75-09759 8B

**VERTICAL INFILTRATION**
Simulation of Miscible Displacement in Soils Using the Method of Characteristics,
W75-09612 2G

**VIRGINIA**
Uptake, Metabolism and Distribution of DDT in Organs of the Blue Crab, Callinectes Sapidus,
W75-09691 5C

**VIRUSES**
Agricultural Benefits and Environmental Changes Resulting from the Use of Digested Sludge on Field Crops,
W75-09409 5D

**VISUAL DISCRIMINATION**
Effect of DDT on Discriminating Ability of Rainbow Trout (Salmo Gairdneri),
W75-09674 5C

**WASHINGTON**
Ediz Hook Beach Erosion Control, Port Angeles, Washington (Final Environmental Impact Statement).
W75-09815 8A

**WASHINGTON (DC)**
Implementation of Water Supply and Wastewater Programs in the Washington, D.C. Metropolitan Area.
W75-09392 5D

**WASTE DISCHARGE**
Survey of Wastewater Discharge, Campion AFS, Alaska,
W75-09413 5D

**WASTE DISPOSAL**
Treatment and Safe Disposal of Cationic Coating Colors,
W75-09352 5D

Where are We in Forest Fertilization,
W75-09367 5D

Ocean Waste Disposal Practices in Metropolitan Areas of California,
W75-09391 3D

Survey of Wastewater Discharge--Elmendorf AFB, Alaska,
W75-09398 5B

Solid Waste Milling and Disposal on Land Without Cover, Volume I. Summary and Major Findings,
W75-09401 5E

Solid Waste Milling and Disposal on Land Without Cover. Volume II. Data Condensations,
W75-09402 5E

Economic Analysis of the Processing and Disposal of Refuse Sludges,
W75-09406 5D

Volume Extraction of Chemically Contaminated Water,
W75-09419 5D

Wet Air Oxidation of Chemical Sludges,
W75-09565 5D

State of Arizona, Environmental Services Needs Study for Greenlee County, 1970-1990.
W75-09584 5D

Crude Oil and Natural Gas Production and Other Mining Operations in Navigable Waters Along the Louisiana Coast (Final Environmental Impact Statement).
W75-09823 5G

**WASTE DUMPS**
Evaluation of Environmental Impact of Landfills,
W75-09761 5C

**WASTE TREATMENT**
Countermeasures for Pollution from Overflows; the State of the Art,
W75-09580 5D

Extended Aeration Wastewater Treatment,
W75-09776 5D

**WASTE WATER DISPOSAL**
Movement of Pollutant Phosphorus In Unsaturated Soil,
W75-09527 5B

**WASTE WATER (POLLUTION)**
Wastewater Treatment Facilities Construction Grants for the Lower Raritan River Basin and for the South Shore of Raritan Bay (Final Environmental Impact Statement).
W75-09817 5D

**WASTE WATER TREATMENT**
Treatment and Safe Disposal of Cationic Coating Colors,
W75-09352 5D

Biological Treatment of Spent Bisulfite Liquor (Traitement biologique de la liqueur residuelle au bisulfite),
W75-09355 5D

Waste Water Clarification by Flotation (Flotacios szennyviztisztitas),
W75-09356 5D

Use of Centrifuges for Purification of Effluents (Primenenie tsentrifug dlya ochistki stochnykh vod),
W75-09358 5D

Optimum Conditions for Chemical Purification of Effluents (Optimal'nye usloviya khimicheskoi ochistki stochnykh vod),
W75-09359 5D

S(Ociete) I(Industrielle de) C(Eellulose d') A(Lizay, France): New Step in Reducing Pollution (S.I.C.A.: Nouvelle etape dans la depollution).
W75-09369 5D

Cleaning of Circulation Water and Effluent from Paper and Board Mills by Chemicophysical Methods (Die Moeglichkeit der Re von Kreislauf- und Restabwasser bei und Kartonfabriken unter Beruecksic chemisch-physikalischer Verfahren),
W75-09371

Packed-Bed Reactors for Secondary E BOD and Ammonia Removal,
W75-09379

Ferric Chlorine or Lime for Chemical ment,
W75-09380

Flow Equalization.
W75-09381

Nitrification and Denitrification Fa Wastewater Treatment.
W75-09382

Wastewater Filtration, Design Considera
W75-09383

Physical-Chemical Nitrogen Removal, water Treatment.
W75-09384

Physical-Chemical Wastewater Treatmer Design.
W75-09385

Upgrading Lagoons.
W75-09386

Oxygen Activated Sludge Wastewater ment Systems, Design Criteria and Op Experience.
W75-09387

Synthetic Resins and Activated Carb Wastewater Treatment,
W75-09390

Implementation of Water Supply and W water Programs in the Washington, Metropolitan Area.
W75-09392

Sewage Treatment Plant Dependability Special Reference to the Activated S Process,
W75-09393

The Role of Polyelectrolytes in Filt Processes,
W75-09394

Control Schemes for the Activated-S Process,
W75-09395

An Evaluation of the Hagerstown, Mar Water Pollution Control Plant,
W75-09396

Wastewater Survey, Chanute AFB, Illinoi
W75-09397

Survey of Wastewater Discharge--Elme AFB, Alaska,
W75-09398

Evaluation and Demonstration of the Cap Suction Sludge Dewatering Device,
W75-09399

Water, Sewerage and Flood Control Sys Plan and Implementation Program 1973-74.
W75-09400

estic Wash Water Reclamation for Refuse
ommode Water Supply Using a Filtration-
rse Osmosis Separation Technique,
09403 5D

ation of Municipal Sewage Treatment Al-
tives.
09404 5D

eliminary Assessment of Wet Systems for
ential Refuse Collection,
09405 5D

omic Analysis of the Processing and
sal of Refuse Sludges,
09406 5D

ystems for Residential Refuse Collection:
e Study for Springfield, Massachusetts,
09407 5D

rehensive Survey of Magpie Creek, Mc-
n Air Force Base, California,
09410 5D

water Treatment Facility Evaluation,
trom AFB MT,
09411 5E

nate Removal in an Activated Sludge
y,
09412 5D

of Wastewater Discharge, Campion
Alaska,
09413 5D

Developments in Sewage Treatment
on Physico-Chemical Methods,
09414 5D

al of Wastewater Organics by Reverse
is,
09417 5D

ion in Surfactants by Irradiation,
09418 5D

e Extraction of Chemically Con-
ed Water,
09419 5D

Pressing Wastewater Sludge.
420 5D

logical and Economic Effects of the
of the Preliminary Purification Time on
Treatment (Technologische und
omische Auswirkungen der Veraender-
Vorklaerzeit auf die Schlammbehan-
421 5D

cal Control of Sphaerotilus Natans and
Species in Waste Waters,
520 5D

Filtration of Oxidation Pond Effluent,
522 5D

red Domestic Lagoon System for Natu-
nd Water Recharge Near Metropolitan
524 5D

al Sludge Management, Proceedings of
ional Conference on Municipal Sludge
ment.
32 5D

w of Sludge Handling and Disposal,
33 5D

Alternative Methods for Sludge Management,
W75-09534 5D

Metro Denver's Experience with Large Scale Aerobic Digestion of Waste Activated Sludge,
W75-09537 5D

High Purity Oxygen Aerobic Digestion Experiences at Speedway, Indiana,
W75-09538 5D

Sludge Dewatering,
W75-09539 5D

Heat Treatment and Incineration,
W75-09541 5D

Growth of Barley Irrigated with Wastewater Sludge Containing Phosphate Precipitants,
W75-09543 5D

Composting Sewage Sludge,
W75-09546 5D

Trench Incorporation of Sewage Sludge,
W75-09549 5E

Pasteurization of Liquid Digested Sludge,
W75-09552 5D

Sludge Handling and Disposal at Blue Plains,
W75-09553 5D

Energy Conservation and Recycling Program of the Metropolitan Sewer Board of the Twin Cities Area,
W75-09556 5D

Sludge Management System for St. Louis,
W75-09558 5D

Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability, Supplement to Federal Guidelines for Design, Operation, and Maintenance of Waste Water Treatment Facilities.
W75-09559 8C

Phosphorus Removal Study at the Sarnia WPCP,
W75-09562 5D

Phosphorus Removal in Seasonal Retention Lagoons by Batch Chemical Precipitation,
W75-09563 5D

Identification of Problem Areas in Water Pollution Control Plants,
W75-09564 5D

Wet Air Oxidation of Chemical Sludges,
W75-09565 5D

Process for the Reduction of the Biochemical Oxygen Demand of Sewage and for the Recovery of the Inherent Protein,
W75-09566 5D

Wastewater Treatment System,
W75-09567 5D

Wastewater Treatment Sequence,
W75-09569 5D

Sewage Treatment with Primary Sludge Removal from Final Clarifier,
W75-09570 5D

Wet Oxidation Treatment of Waste Liquor or Sludge,
W75-09571 5D

Biological Aerated Filters,
W75-09572 5D

Process for the Recovery of Formaldehyde and Phenol Contained in Waste Waters,
W75-09573 5D

Projects in the Industrial Pollution Control Division - December 1974.
W75-09578 5D

Storm Water Management Model: User's Manual, Version II,
W75-09579 5D

Countermeasures for Pollution from Overflows; the State of the Art,
W75-09580 5D

Hypolimnetic Oxygenation Using Liquid Oxygen,
W75-09589 5G

The Qualitative and Quantitative Determination of Soluble and Insoluble Forms of Phosphorus in Sewage Treatment Plants,
W75-09618 5D

Solar Still with Replaceable Solar Absorbing Liner and Weight Controlled Feed Inlet,
W75-09643 3A

Water Treatment Plant,
W75-09645 5D

Water Treatment Apparatus,
W75-09646 5D

Method and Apparatus for Aeration of Biodegradable Waste Material,
W75-09647 5D

Wastewater Concentrator with Slotted Distributor,
W75-09649 5D

Material for Biological Degradation of Petroleum,
W75-09652 5D

System for Thermal Desalting of Water,
W75-09653 3A

Desalination Process,
W75-09654 3A

Process for Treating Waste Water,
W75-09656 5D

Floating Solids Return Device,
W75-09657 5D

Portable Water Supply System,
W75-09658 5D

System for Purifying and Disinfecting Waste Water,
W75-09659 5D

Reverse Osmosis Apparatus,
W75-09661 3A

Multi-Effect Flash Evaporator,
W75-09663 3A

Liquid Treatment Apparatus,
W75-09666 5D

Application of Filtration Through Semi-Permeable Membranes for Treatment of Wastes,
W75-09730 5D

Attitudes in Sludge Treatment and Disposal,
W75-09731 5D

Operating Results of Electrodialysis and Reverse Osmosis Municipal Desalting Plants,
W75-09732 5D

Carbon from Lignite or Coal: Which is Better,
W75-09733 5D

Catalytic Oxidation of Phenol in Aqueous Solution Over Copper Oxide,
W75-09772 5D

Modifications to the Executive Computer Program for Steady-State Simulation of Wastewater Treatment Facilities,
W75-09775 5D

Extended Aeration Wastewater Treatment,
W75-09776 5D

Activated Carbon Used to Control Odors,
W75-09777 5D

How to Get Low Ammonia Effluents,
W75-09778 5D

Sound Waves and Ozone Sterilize Wastewater.
W75-09779 5D

Alternative Methods of Disinfection: How Effective,
W75-09780 5D

Interest in Oxygen Process Growing,
W75-09781 5D

Physical Characteristics of Mechanical Aerators,
W75-09782 5D

Wastewater Treatment Facilities Construction Grants for the Lower Raritan River Basin and for the South Shore of Raritan Bay (Final Environmental Impact Statement).
W75-09817 5D

WASTES
Environmental Critique (The 1972 Federal Water Pollution Control Act: Problems and Prospects After One Year),
W75-09844 5G

WATER ALLOCATION (POLICY)
Borough of Morrisville v. Delaware River Basin Comm'n. (Ruling on Motion to Dismiss Action by Communities Dependent on Delaware River Basin Comm'n. Which Action Was Founded on a NEPA Complaint).
W75-09827 6E

WATER ANALYSIS
Determination of Chloride in Water with a HgS/Hg2Cl2 Electrode,
W75-09361 5A

Multielement Neutron Activation Analysis of Fresh Water Using Ge(Li) Gamma Spectrometry,
W75-09362 5A

Simultaneous Determination of Seven Trace Metals in Potable Water Using a Vidicon Atomic Absorption Spectrometer,
W75-09363 5A

Gas Chromatographic Determination of Selected Organic Compounds Added to Waste Water,
W75-09365 5A

Determination of Lead in Potable Waters Using Delves Cup Atomic Absorption Spectrometer with Signal Integration,
W75-09366 5A

Water analysis,
W75-09372 5A

Automation in a Water Quality Laboratory Scheme,
W75-09723 5A

Evaluation of Sample Preparation Techniques for Algal Bioassays,
W75-09734 5A

WATER BALANCE
Summary of Hydrologic Conditions in Collier County, Florida, 1973,
W75-09716 4B

WATER CIRCULATION
Paper Machine Circulation Systems -- Flows, Consistencies, Recovery, and Pollution (Les circuits de la machine a papier -- debits, concentrations, recuperations et pollutions),
W75-09357 3E

WATER CONSERVATION
Closing Up a Fine Grade Paper Machine System,
W75-09353 3E

Paper Machine Circulation Systems -- Flows, Consistencies, Recovery, and Pollution (Les circuits de la machine a papier -- debits, concentrations, recuperations et pollutions),
W75-09357 3E

Drip Irrigation and Automation Tools in Efficient Use of Water Policy,
W75-09426 3F

Transpiration Rates of Conifers,
W75-09784 2D

Hungry Drylands of Western Rajasthan Need a New Technology,
W75-09789 3F

WATER CONSUMPTION
Tritiated Water Turnover Rate in Rodents: Desert and Mountain,
W75-09801 2I

WATER COSTS
Borough of Morrisville v. Delaware River Basin Comm'n. (Ruling on Motion to Dismiss Action by Communities Dependent on Delaware River Basin Comm'n. Which Action Was Founded on a NEPA Complaint).
W75-09827 6E

WATER DEMAND
Economics and Finance of Nevada Public Water Systems,
W75-09375 6B

WATER DISTRIBUTIO (APPLIED)
Water for Energy Self-Sufficiency, Executive Summary.
W75-09627 4C

WATER DISTRIBUTION (APPLIED)
The Optimum Distribution of Urban Water Supplies in Puerto Rico,
W75-09377 4A

Dynamic Programming Optimization: A Water Distribution System Design,
W75-09525 7C

Water for Energy Self-Sufficiency.
W75-09626 6B

Device for Distributing Irrigation Water,
W75-09662 3F

WATER ESCAPE
Water Escape Structures in Coarse-Grained Sediments,
W75-09768 2J

WATER HAMMER
A Specific Case of Wave Motion of a Liqui Pipes,
W75-09740

WATER LAW
Water Laws in Moslem Countries,
W75-09625

WATER LEVEL FLUCTUATIONS
Groundwater Levels in Nebraska, 1974,
W75-09710

WATER LEVELS
Soil Moisture Distribution and Wetting Patt From a Point Source,
W75-09462

Ground-Water Data for Orange County Vicinity, Texas and Louisiana, 1971-74,
W75-09727

WATER LOSS
Biophysical Control of Water Loss,
W75-09523

WATER MANAGEMENT (APPLIED)
Integrative Procedures for Coordinated Urb Land and Water Management: A Syste Analysis,
W75-09622

Florida Water Resources Act of 1972 (Stat Establishing Water Management Districts the State of Florida).
W75-09833

WATER POLICY
Drip Irrigation and Automation Tools in Ef cient Use of Water Policy,
W75-09426

Florida Water Resources Act of 1972 (Statu Establishing Water Management Districts f the State of Florida).
W75-09833

WATER POLLUTION
BOD as a Pollution Indicator (La DBO con indicador de la polucion),
W75-09368 5

Evaluation of Recovery in a Polluted Cre After Installation of New Sewage Treatme Procedures,
W75-09515 5

A Case Study of Mine Water Quality Deterior tion, Mainsforth Colliery, County Durham,
W75-09752 5

Sound Waves and Ozone Sterilize Wastewater
W75-09779 5

A Study of the Surface Fluid Flow Chara teristics of the New York Bight and th Development of Research Data Displa Techniques,
W75-09783 5

Aquatic Insect Communities of the Tenry River, Their Composition, Biotic Index an Seasonal Change, (In Japanese),
W75-09807 5

The Reserve Mining Case: Promises, Promises
W75-09838 5

Water Strategy--Statement of Policy for Imple menting Certain Requirements of the 197 Federal Water Pollution Control Act Amend ments.
W75-09841 5

vironmental Critique (The 1972 Federal ater Pollution Control Act: Problems and ospects After One Year),
75-09844 5G

ernational Law and Canadian Arctic Pollun Control,
75-09846 5G

rine Oil Spills: A Problem in Environmental nagement,
75-09849 5G

ER POLLUTION CONTROL
Evaluation of the Hagerstown, Maryland ter Pollution Control Plant,
5-09396 5D

ntification of Problem Areas in Water Pollun Control Plants,
5-09564 5D

jects in the Industrial Pollution Control ision - December 1974.
5-09578 5D

derwater Drilling Pollution Control Curtain,
5-09639 5G

cess for Effluent Water Recovery,
5-09648 5D

ector of Trace Substance in Water,
5-09655 5A

lection and Recovery System for Oil Spills,
5-09660 5G

cess for Separating Low API Gravity Oil n Water,
5-09664 5G

i Pollution Waterway Device and Process,
5-09665 5G

Interceptors for Separating Oil from Water Gravity,
5-09667 5G

rnational Law and Canadian Arctic Pollu Control,
-09846 5G

R POLLUTION EFFECTS
cury in Seals, Terrestial Carnivores and cipal Food Items of the Inuit, from Hol, N.W.T.,
-09679 5A

ct of Power Plant Chlorination on arine Productivity,
-09684 5C

erentiation Between Natural Hydrocarbons Low Level Diesel Oil Contamination in ked Lobster Meat,
-09698 5A

avior of Juvenile Coho Salmon orhynchus Kisutch) Exposed to Sumithion itrothion), An Organophosphate Insecti-
-09700 5C

R POLLUTION PREVENTION
ess for Effluent Water Recovery,
-09648 5D

R POLLUTION SOURCE
oral and Regional Economic Impact of rolling Nonpoint Pollution in Forested s,
09530 5B

WATER POLLUTION SOURCES
Clogging of Drip Systems from Metabolic Products of Iron and Sulfur Bacteria,
W75-09456 5B

Urban Lawn Infiltration Rates and Fertilizer Runoff Losses Under Simulated Rainfall,
W75-09592 5B

Wastewater Concentrator with Slotted Distributor,
W75-09649 5D

Aspects of Trace Metal Contamination in the Coastal Rivers of Israel,
W75-09689 5B

Effects of Metal-Mine Drainage on Water Quality in Selected Areas of Colorado, 1972-73,
W75-09712 5C

Water-Resources Investigations in the Fort Union Coal Region, North Dakota, 1974-75.
W75-09715 5B

Occurrence of Pesticide Residues in Four Streams Draining Land-Use Areas in Pennsylvania,
W75-09720 5B

WATER POLLUTION TREATMENT
Phosphorus Removal in Seasonal Retention Lagoons by Batch Chemical Precipitation,
W75-09563 5D

Antimicrobial Agents for Water Conservation,
W75-09637 5F

Water Treatment Apparatus,
W75-09646 5D

Method and Apparatus for Aeration of Biodegradable Waste Material,
W75-09647 5D

Process for Effluent Water Recovery,
W75-09648 5D

Material for Biological Degradation of Petroleum,
W75-09652 5D

Process for Treating Waste Water,
W75-09656 5D

Portable Water Supply System,
W75-09658 5D

Liquid Treatment Apparatus,
W75-09666 5D

WATER PURIFICATION
Use of Centrifuges for Purification of Effluents (Primenenie tsentrifug dlya ochistki stochnykh vod),
W75-09358 5D

S(Ociete) I(Industrielle de) C(Eellulose d') A(Lizay, France): New Step in Reducing Pollution (S.I.C.A.: Nouvelle etape dans la depollution).
W75-09369 5D

Water Treatment Plant,
W75-09645 5D

System for Purifying and Disinfecting Waste Water,
W75-09659 5D

Effect of Power Plant Chlorination on Estuarine Productivity,
W75-09684 5C

WATER QUALITY
An Optimal Water Quality Management Technique for Conjunctive Ground and Surface Water Use,
W75-09378 5G

Irrigation Return Flow as Influenced by Drip Irrigation,
W75-09485 5G

Water Quality Study of Nonpoint Source of Agricultural Runoff,
W75-09519 5B

Water Quality Effect of Diking a Shallow Arid-Region Lake,
W75-09577 5B

Storm Water Management Model: User's Manual, Version II,
W75-09579 5D

Chemical Transport by the Mekong River,
W75-09603 5B

Water for Energy Self-Sufficiency.
W75-09626 6B

Water for Energy Self-Sufficiency, Executive Summary.
W75-09627 4C

Formation Factors and Their Use in Estimating Water Quality in Mississippi Aquifers,
W75-09703 7C

Water-Resources Investigations in the Fort Union Coal Region, North Dakota, 1974-75.
W75-09715 5B

Changes in Chemical Quality of Water, Cedar Bluff Irrigation District Area, West-Central Kansas,
W75-09719 5B

Availability of Ground Water in the Branch River Basin, Providence County, Rhode Island,
W75-09721 2F

Ground-Water Data for Orange County and Vicinity, Texas and Louisiana, 1971-74,
W75-09727 7C

Water-Resources Data for Skagway, Alaska,
W75-09729 7C

A Case Study of Mine Water Quality Deterioration, Mainsforth Colliery, County Durham,
W75-09752 5B

Deoxygenation in Natural Streams,
W75-09767 5B

Sewage Utilization in Agriculture,
W75-09788 5D

Wastewater Treatment Facilities Construction Grants for the Lower Raritan River Basin and for the South Shore of Raritan Bay (Final Environmental Impact Statement).
W75-09817 5D

WATER QUALITY CONTROL
Research Needs for Water Resources Control in California.
W75-09587 5G

Water Quality Analysis System with Multicircuit Single Shell Heat Exchanger,
W75-09642 5G

Solar Still with Replaceable Solar Absorbing Liner and Weight Controlled Feed Inlet,
W75-09643 3A

**WATER QUALITY CONTROL**

Portable Water Supply System,
W75-09658 5D

Reverse Osmosis Apparatus,
W75-09661 3A

Liquid Treatment Apparatus,
W75-09666 5D

Reservoir Optimization for Water Quality Control,
W75-09773 5G

Gypsum Can Improve Your Water Also,
W75-09787 5G

Water Strategy--Statement of Policy for Implementing Certain Requirements of the 1972 Federal Water Pollution Control Act Amendments.
W75-09841 5G

**WATER QUALITY STANDARDS**

Wastewater Survey, Chanute AFB, Illinois.
W75-09397 5D

Sewage Disposal and Water Supply Alternatives on the Basis of Water Quality and Economic Criteria,
W75-09774 5B

**WATER REQUIREMENTS**

Plant Water Requirements as Related to Trickle Irrigation,
W75-09475 3F

Water Use with Drip Irrigation,
W75-09478 3F

**WATER RESOURCES**

Minnesota's Water Resources: A Primer,
W75-09516 6B

U.S. Engineering Information Services and the Role of the Water Resources Scientific Information Center,
W75-09585 10D

Research Needs for Water Resources Control in California.
W75-09587 5G

Information Exchange on Water Resources Computer Programs,
W75-09591 7C

Surface Water Resources of St. Johns River, Florida,
W75-09604 2A

Atlas of River Basins of the United States.
W75-09616 7C

Water Laws in Moslem Countries,
W75-09625 6E

Index 1945-1966, Land and Water.
W75-09635 10C

Water for Agriculture, Annotated Bibliography, Author and Subject Index.
W75-09636 10C

Great Lakes Basin Framework Study: Appendix 3--Geology and Ground Water,
W75-09714 2F

Bibliography of U.S. Geological Survey Water-Resources Reports for Utah,
W75-09718 2A

**WATER RESOURCES DEVELOPMENT**

Evaluating Effects of Water Resource Developments on Wildlife Habitat,
W75-09790 6G

**WATER RESOURCES PROBLEMS**

Minnesota's Water Resources: A Primer,
W75-09516 6B

**WATER RESOURCES SCIENTIFIC INFORMATION CENTER**

U.S. Engineering Information Services and the Role of the Water Resources Scientific Information Center,
W75-09585 10D

**WATER REUSE**

Closing Up a Fine Grade Paper Machine System,
W75-09353 3E

Domestic Wash Water Reclamation for Refuse as Commode Water Supply Using a Filtration-Reverse Osmosis Separation Technique,
W75-09403 5D

An Evaluation of Water Reuse for Municipal Supply,
W75-09408 5D

Sewage Utilization in Agriculture,
W75-09788 5D

**WATER RIGHTS**

Water Laws in Moslem Countries,
W75-09625 6E

**WATER SHORTAGE**

High Milk Production Under Unfavourable Natural Conditions,
W75-09797 3F

**WATER STORAGE**

Upper Mulberry River Watershed, Barrow, Gwinnett, Hall, and Jackson Counties, Georgia (Final Environmental Impact Statement).
W75-09822 8A

**WATER SUPPLY**

Economics and Finance of Nevada Public Water Systems,
W75-09375 6B

The Optimum Distribution of Urban Water Supplies in Puerto Rico,
W75-09377 4A

Implementation of Water Supply and Wastewater Programs in the Washington, D.C. Metropolitan Area.
W75-09392 5D

Domestic Wash Water Reclamation for Refuse as Commode Water Supply Using a Filtration-Reverse Osmosis Separation Technique,
W75-09403 5D

An Evaluation of Water Reuse for Municipal Supply,
W75-09408 5D

State of Arizona, Environmental Services Needs Study for Greenlee County, 1970-1990.
W75-09584 5D

Public Water Supplies of North Carolina: Part 3. Mountains and Western Piedmont,
W75-09711 5F

Water-Resources Data for Skagway, Alaska,
W75-09729 7C

Sewage Disposal and Water Supply Alternatives on the Basis of Water Quality and Economic Criteria,
W75-09774 5B

Borough of Morrisville v. Delaware Ri Basin Comm'n. (Ruling on Motion to Dism Action by Communities Dependent Delaware River Basin Comm'n. Which Act Was Founded on a NEPA Complaint).
W75-09827

**WATER SUPPLY DEVELOPMENT**

Water for Energy Self-Sufficiency.
W75-09626

Water for Energy Self-Sufficiency, Execut Summary.
W75-09627

**WATER TEMPERATURE**

Effects of Logging on Water Temperature a Dissolved Oxygen in Spawning Beds,
W75-09685

Effect of Constant Temperature on Grov Rates of Pumpkinseed Sunfish (Lepomis G bosus),
W75-09701

Temperatures of Streams and Selected Res voirs in Pennsylvania,
W75-09713

**WATER TREATMENT**

Cleaning of Circulation Water and Efflu from Paper and Board Mills by Chemicophy cal Methods (Die Moeglichkeit der Reinigu von Kreislauf- und Restabwasser bei Papi und Kartonfabriken unter Beruecksichtigu chemisch-physikalischer Verfahren),
W75-09371

Implementation of Water Supply and Was water Programs in the Washington, D. Metropolitan Area.
W75-09392

Antimicrobial Agents for Water Conservation
W75-09637

**WATER UTILIZATION**

Economics and Finance of Nevada Publ Water Systems,
W75-09375

An Investigation of Factors Affecting the I tensity of Water Use in the Lajas Valley Irrig tion Project,
W75-09376

Trickle Irrigation Management for Cotton ar Cabbage,
W75-09480

Performance of Plants with Drip Irrigation,
W75-09509

Makeup Requirements for Cooling Ponds,
W75-09760

For Rainfed Areas-Improved Velvet Beans fc Increased Forage Production,
W75-09796

**WATER WELLS**

Groundwater Levels in Nebraska, 1974,
W75-09710

**WATER YIELD**

Availability of Ground Water in the Branch River Basin, Providence County, Rhode Island
W75-09721

**WATERSHED MANAGEMENT**

Forage Preferences of Trained Mule Deer or the Beaver Creek Watersheds,
W75-09793

North Fork Nolin River Watershed, Kentucky (Final Environmental Impact Statement).
W75-09814 8A

Upper Mulberry River Watershed, Barrow, Gwinnett, Hall, and Jackson Counties, Georgia (Final Environmental Impact Statement).
W75-09822 8A

AVE FORCES
Statistical Properties of Wave Force,
W75-09759 8B

AVES (WATER)
Wave Force Coefficients for Circular Piers,
W75-09593 8B

Computation of Wave Heights Due to Refraction and Friction,
W75-09606 8B

Wave Induced Pressures in Permeable Seabeds,
W75-09607 8B

Wind and Wave Relationships in U.K. Coastal Waters,
W75-09737 2L

Friction Factor Under Oscillatory Waves,
W75-09755 8B

Statistical Properties of Wave Force,
W75-09759 8B

EED CONTROL
Weed Control Under Drip Irrigation in Orchard and Vineyard Crops,
W75-09493 3F

ST SPRINGFIELD (MASS)
Map Showing Drainage Areas, West Springfield Quadrangle, Massachusetts-Connecticut,
W75-09705 7C

T AIR OXIDATION
Wet Air Oxidation of Chemical Sludges,
W75-09565 5D

T OXIDATION
Wet Oxidation Treatment of Waste Liquor or Sludge,
W75-09571 5D

T OXIDATION SYSTEM
Sludge Disposal at a Profit,
W75-09557 5D

T SYSTEMS
Economic Analysis of the Processing and Disposal of Refuse Sludges,
W75-09406 5D

Wet Systems for Residential Refuse Collection: A Case Study for Springfield, Massachusetts,
W75-09407 5D

TLANDS
Union Camp Corp. v. Seminole Forest Water Management District (Suit by Single Landowner to Require Formation of a Drainage District).
W75-09828 6E

TTING PATTERNS
Soil Moisture Distribution and Wetting Pattern from a Point Source,
W75-09462 2G

EAT
Mix Gypsum in Shallow Depths--In Saline Soils,
W75-09786 3C

WHITE PINE TREES
Drought Crack on Western White Pine in Northern Idaho,
W75-09388 2I

WHITE WATER
Waste Water Clarification by Flotation (Flotacios szennyviztisztitas),
W75-09356 5D

Paper Machine Circulation Systems -- Flows, Consistencies, Recovery, and Pollution (Les circuits de la machine a papier -- debits, concentrations, recuperations et pollutions),
W75-09357 3E

WHITE-WING DOVES
A Survey of the Nesting Habitats of the White-Winged Dove in Arizona,
W75-09794 6G

WILDLIFE HABITATS
Evaluating Effects of Water Resource Developments on Wildlife Habitat,
W75-09790 6G

A Survey of the Nesting Habitats of the White-Winged Dove in Arizona,
W75-09794 6G

WISCONSIN
Solid Waste Milling and Disposal on Land Without Cover, Volume I. Summary and Major Findings,
W75-09401 5E

Solid Waste Milling and Disposal on Land Without Cover. Volume II. Data Condensations,
W75-09402 5E

Filter-Pressing Wastewater Sludge.
W75-09420 5D

Evaluation of Environmental Impact of Landfills,
W75-09761 5C

WYOMING
Hydrologic Analysis of the Valley-Fill Aquifer, North Platte River Valley, Goshen County, Wyoming,
W75-09722 2F

YORK RIVER (VIRGINIA)
Uptake, Metabolism and Distribution of DDT in Organs of the Blue Crab, Callinectes Sapidus,
W75-09691 5C

ZEBRAFISH
Selenium Toxicity on the Early Life Stages of Zebrafish (Brachydanio rerio),
W75-09671 5C

ZINC
The Effects of Lapsed Time Since Feeding Upon the Toxicity of Zinc to Fish,
W75-09688 5C

Deposition of Zinc and Cadmium by Marine Bacteria in Estuarine Sediments,
W75-09692 5C

Effect of Zinc on Growth of the Minnow Phoxinus Phoxinus,
W75-09693 5C

ZINC CHELATE
Application of Fertilizer Through Drip Irrigation Systems in West Texas,
W75-09489 3F

ZINC NITRATE
Effect of Zinc on Growth of the Minnow Phoxinus Phoxinus,
W75-09693 5C

ZOOPLANKTON
DDT Residues in Euphausiids in the Upper Estuary of the Gulf of St. Lawrence,
W75-09690 5C

# AUTHOR INDEX


**BRAHAMS, A. D.**
Initial Bifurcation Process in Natural Channel Networks,
W75-09609 8B

**BROL, I. P.**
Flow-Associated Precipitation Reactions in Saline-Sodic Soils and Their Significance,
W75-09792 2G

Gypsum Can Improve Your Water Also,
W75-09787 5G

In Salt-Affected Soils Mulching Aids in Crop Growth,
W75-09798 3C

Mix Gypsum in Shallow Depths--In Saline Soils,
W75-09786 3C

**BUKERMANN, J.**
Process for the Recovery of Formaldehyde and Phenol Contained in Waste Waters,
W75-09573 5D

**BUKMAN, R. G.**
Differentiation Between Natural Hydrocarbons and Low Level Diesel Oil Contamination in Cooked Lobster Meat,
W75-09698 5A

**BURDISON, R. F.**
Organochlorine Residue Levels in Arctic Ringed Seals: Variation with Age and Sex,
W75-09702 5C

**BURELMAN, G. L.**
Federal Maritime Jurisdiction and State Marine Pollution Legislation: The Florida Act Not Preempted Per Se,
W75-09845 5G

**BURNSBRAK, W. F.**
Saline Intrusion into Seneca Lake, New York,
W75-09765 5B

**BUROUS, K. M.**
Determination of Lead in Potable Waters Using Delves Cup Atomic Absorption Spectrometer With Signal Integration,
W75-09366 5A

Simultaneous Determination of Seven Trace Metals in Potable Water Using a Vidicon Atomic Absorption Spectrometer,
W75-09363 5A

**BURY, F.**
Weed Control Under Drip Irrigation in Orchard and Vineyard Crops,
W75-09493 3F

**BURY, F. K.**
Reforestation with Saline Water in Abu Dhabi,
W75-09483 3C

Performance of Plants with Drip Irrigation,
W75-09509 3F

Water Use with Drip Irrigation,
W75-09478 3F

**BUSEN, W. B.**
Great Lakes Basin Framework Study: Appendix 3--Geology and Ground Water,
W75-09714 2F

**BUSTED, E. R.**
Optimum Lateral Placement for Subsurface Irrigation Systems,
W75-09460 3F

**AMEIN, M.**
Computation of Flow Through Masonboro Inlet, N.C.,
W75-09608 2L

**ANDERSEN, D. R.**
Water Quality Study of Nonpoint Source of Agricultural Runoff,
W75-09519 5B

**ARMSTRONG, F. A. J.**
Mercury in Seals, Terrestial Carnivores and Principal Food Items of the Inuit, from Holman, N.W.T.,
W75-09679 5A

**ARULANANDAN, K.**
Pore and Eroding Fluid Influences on Surface Erosion of Soil,
W75-09741 2J

**ASSAF, R.**
Soil Moisture Distribution and Depletion in an Apple Orchard Irrigated by Tricklers,
W75-09463 2G

**AUSTERN, B. M.**
Gas Chromatographic Determination of Selected Organic Compounds Added to Waste Water,
W75-09365 5A

**AZAN, K. M.**
Identification of Problem Areas in Water Pollution Control Plants,
W75-09564 5D

**BAKSHT, S. P.**
System for Thermal Desalting of Water,
W75-09653 3A

**BALDING, G. O.**
Water-Resources Data for Skagway, Alaska,
W75-09729 7C

**BANSAL, M. K.**
Deoxygenation in Natural Streams,
W75-09767 5B

**BARRETTO, H. T.**
Quaternary Sedimentation on the Amazon Continental Margin: A Model,
W75-09600 2L

**BARTON, J. R.**
Water Quality Effect of Diking a Shallow Arid-Region Lake,
W75-09577 5B

**BASCOM, S. E.**
Secondary Impacts of Transportation and Wastewater Investments: Review and Bibliography,
W75-09576 5C

**BATTEN, C. E.**
Domestic Wash Water Reclamation for Refuse as Commode Water Supply Using a Filtration-Reverse Osmosis Separation Technique,
W75-09403 5D

**BAUM, B.**
Development of Porous Polyvinyl Chloride Coated Tubulets for Seawater Desalination,
W75-09373 3A

**BAUMANN, D. D.**
An Evaluation of Water Reuse for Municipal Supply,
W75-09408 5D

**BAUMANN, E. R.**
Packed-Bed Reactors for Secondary Effluent BOD and Ammonia Removal,
W75-09379 5D

**BAYDA, J. G.**
Closing Up a Fine Grade Paper Machine System,
W75-09353 3E

**BEAL, A. R.**
Selenium Determination on Fish Tissue,
W75-09696 5A

**BEASLEY, R. P.**
Corrugated Plastic Drain Tubing Used as Underground Conduit,
W75-09611 8B

**BEHAN, M. J.**
Transpiration Rates of Conifers,
W75-09784 2D

**BELL, D. T.**
Ground-Water Level in the Flood Plain and Adjacent Uplands of the Sangamon River,
W75-09599 4B

**BENGTSSON, B. E.**
Effect of Zinc on Growth of the Minnow Phoxinus Phoxinus,
W75-09693 5C

**BENNEH, G.**
Water Requirements and Limitations Imposed on Agricultural Development in Northern Ghana,
W75-09800 3F

**BENNETT, H. C.**
Irrigating Apparatus,
W75-09641 3F

**BERGSTEDT, D. C.**
Energy Conservation and Recycling Program of the Metropolitan Sewer Board of the Twin Cities Area,
W75-09556 5D

**BERNARD, H.**
Alternative Methods for Sludge Management,
W75-09534 5D

**BEROV, M. B.**
Optimum Conditions for Chemical Purification of Effluents (Optimal'nye usloviya khimicheskoi ochistki stochnykh vod),
W75-09359 5D

**BERTELSEN, J. A.**
Computation of Wave Heights Due to Refraction and Friction,
W75-09606 8B

**BESEMER, S.**
Irrigation for Benches,
W75-09446 3F

**BESTER, D. H.**
Drip Irrigation on Citrus,
W75-09432 3F

**BEVENUE, A.**
Pesticides in Fish from a Hawaiian Canal,
W75-09806 5A

**BILLIB, H.**
Experiences with Drainage Materials and a Review of Available Specifications,
W75-09631 8G

BLACK, J. D. F.
Change in Root Distribution of Mature Pear Trees in Response to Trickle Irrigation,
W75-09497 3F

Trickle Irrigation on Young Peach Trees,
W75-09501 3F

Water Uptake by an Apple Tree with Various Proportions of the Root System Supplied with Water,
W75-09495 3F

BLACK, S. A.
Utilization of Digested Chemical Sewage Sludges on Agricultural Lands in Ontario,
W75-09544 3F

BLACKWELL, J.
Plant Water Requirements as Related to Trickle Irrigation,
W75-09475 3F

BLUEMLE, J. P.
Geology of Griggs and Steele Counties,
W75-09725 2J

BOCK, P.
Geographic Variation of the Statistical Parameters of Hydrometeorological Data of the United States,
W75-09605 2B

BOHN, G. W.
Cantaloupe Response to Drip Irrigation,
W75-09505 3F

BOLTON, R. E.
Wet Systems for Residential Refuse Collection: A Case Study for Springfield, Massachusetts,
W75-09407 5D

BONNET, C. W.
Ground-Water Data for Orange County and Vicinity, Texas and Louisiana, 1971-74,
W75-09727 7C

BOSELLY, S. E. III
Defense Meteorological Satellite Program (DMSP) User's Guide,
W75-09770 7B

BOYKO, B. I.
Identification of Problem Areas in Water Pollution Control Plants,
W75-09564 5D

BRADFORD, B. C.
Water Treatment Plant,
W75-09645 5D

BRADLEY, P. G.
Marine Oil Spills: A Problem in Environmental Management,
W75-09849 5G

BRADLEY, W. G.
Tritiated Water Turnover Rate in Rodents: Desert and Mountain,
W75-09801 2I

BRADSHAW, J. S.
Water Quality Effect of Diking a Shallow Arid-Region Lake,
W75-09577 5B

BRANSON, R.
Irrigation for Container Growing,
W75-09447 3F

BRANSON, R. L.
Drip Irrigation Experiment on Avocados,
W75-09499 3C

Drip Irrigation-Worldwide,
W75-09424 3F

Monitoring Soil Salinity and Leaf Nutrient Levels in a Young Avocado Orchard Under Drip Irrigation,
W75-09482 3F

Water Use by Drip and Sprinkle Irrigated Avocados Related to Plant Cover, Evaporation and Air Temperature,
W75-09479 3F

BRAVO, B.
Soil Moisture Distribution and Depletion in an Apple Orchard Irrigated by Tricklers,
W75-09463 2G

BREIDER, E. J.
High Purity Oxygen Aerobic Digestion Experiences at Speedway, Indiana,
W75-09538 5D

BRILL, B. M.
Oil Skimmer with Oscillatable Circular Loop,
W75-09568 5G

BRILL, E. L.
Oil Skimmer with Oscillatable Circular Loop,
W75-09568 5G

BRINSKO, G. A.
Sludge Disposal by Incineration at Alcosan,
W75-09551 5E

BROUGH, K. J.
Institutional Problems Associated with Sludge Disposal,
W75-09555 5E

BROWN, B. A.
Arizona's Remote Subdivisions: An Inventory,
W75-09583 6G

BROWN, C. B.
Effects of Deforestation on Slopes,
W75-09743 4C

BROWN, L. S.
Collection and Recovery System for Oil Spills,
W75-09660 5G

BROWNSTEIN, A. B.
Financial Incentives and Pollution Control: A Case Study,
W75-09574 5G

BUCKS, D. A.
Trickle Irrigation Management for Cotton and Cabbage,
W75-09480 3F

Trickle Irrigation Management for Grapes,
W75-09510 3F

BULL, C. J.
Behavior of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Sumithion (Fenitrothion), An Organophosphate Insecticide,
W75-09700 5C

BURGMANN, W. S.
Defense Meteorological Satellite Program (DMSP) User's Guide,
W75-09770 7B

BURKE, Z. L.
Process for Effluent Water Recovery,
W75-09648 5D

BURNHAM, B. L.
Effects of Saline Water from North D
Lakes on Survival of Fathead Mi
(Pimephales Promelas) Embryos and Sac
W75-09669

BUTLER, G. L.
Loss of Five Pesticides from Cultures of T
tyone Planktonic Algae,
W75-09808

CAFFREY, P.
Evaluation of Environmental Impact of
fills,
W75-09761

CAIRNEY, T.
A Case Study of Mine Water Quality Dete
tion, Mainsforth Colliery, County Durham
W75-09752

CAIRNS, J. JR.
The Effects of Lapsed Time Since Fe
Upon the Toxicity of Zinc to Fish,
W75-09688

CAPONERA, D. A.
Water Laws in Moslem Countries,
W75-09625

CAPRIO, J. M.
World Maps of Potential Evapotranspir
Plant Development, and Spring Greenin
Autumn Browning of Vegetation, Based o
Solar Thermal Unit Model,
W75-09771

CARBONNEL, J. P.
Chemical Transport by the Mekong River,
W75-09603

CARLSON, D. A.
Phosphate Removal in an Activated S
Facility,
W75-09412

CARPENTER, E. J.
Effects of PCB on Interspecific Competiti
Natural and Gnotobiotic Phytoplankton
munities in Continuous and Batch Cultures
W75-09680

CARRY, C. W.
Sludge Dewatering,
W75-09539

CARTEE, C. P.
A Case Study of Estuarine Pollution and I
Agency Interactions,
W75-09620

CASSEL, A. F.
Sludge Handling and Disposal at Blue Plain
W75-09553

CHEN, H. H.
Economics and Finance of Nevada P
Water Systems,
W75-09375

CHLUBEK, N.
Application of Filtration Through Semi-Pe
able Membranes for Treatment of Wastes,
W75-09730

CHORESH, Y.
Drip Irrigation in Citrus Orchards,
W75-09502

CLARK, J. F.
Device for Underwater Observation,
W75-09640

RKE, R. T.
athematical Models in Hydrology,
75-09624 2A

UGH, G. F. G.
ysical Characteristics of Mechanical Aera-
rs,
75-09782 5D

KROFT, B.
anges in Root Patterns of Peach Trees
der Trickle Irrigation,
75-09498 2I

EN, D. B.
tro Denver's Experience with Large Scale
robic Digestion of Waste Activated Sludge,
5-09537 5D

EN, J. M.
Chromatographic Determination of
ected Organic Compounds Added to Waste
ter,
5-09365 5A

, P. J.
ponse of Mature Citrus Trees on Deep
dy Soil to Drip Irrigation,
5-09514 3F

EY, R. L.
uence of Surface and Near-Surface Caliche
ribution on Infiltration Characteristics, Las
as, Nevada,
-09374 2J

ER, K. G.
ondary Impacts of Transportation and
tewater Investments: Review and Bibliog-
y,
-09576 5C

ER, P. F.
nt Developments in Sewage Treatment
d on Physico-Chemical Methods,
-09414 5D

ERO, P. I. A.
nvestigation of Factors Affecting the In-
cy of Water Use in the Lajas Valley Irriga-
Project,
09376 3F

LISSEN, J.
terceptors for Separating Oil from Water
avity,
09667 5G

TINO, R. M.
e Management in Allegheny County,
09548 5E

NOGL, O.
ative Procedures for Coordinated Urban
and Water Management: A Systems
sis,
9622 6A

R, D. J.
xplanation for the Growth Advantage of
rrigation,
9465 3F

M. A.
logic Analysis of the Valley-Fill Aquifer,
Platte River Valley, Goshen County,
ing,
9722 2F

ELIN, M.
re Oil and Gas Rights: A Comparative
9836 6E

D'ITRI, F. M.
The Qualitative and Quantitative Determination of Soluble and Insoluble Forms of Phosphorus in Sewage Treatment Plants,
W75-09618 5D

DAHIYA, I. S.
Flow-Associated Precipitation Reactions in Saline-Sodic Soils and Their Significance,
W75-09792 2G

DALL, B. V.
Economics and Finance of Nevada Public Water Systems,
W75-09375 6B

DAN, C.
Influence of Different Amounts of Irrigation--Water, Irrigation--Intervals and Fertilizers on the Yield and Quantity of Drip-Irrigated Musk- and Watermelons,
W75-09494 3F

The Irrigation of Olives by Drip and Other Irrigation Methods,
W75-09508 3F

DANIEL, C.
Evaluating Effects of Water Resource Developments on Wildlife Habitat,
W75-09790 6G

DARGAN, K. S.
Mix Gypsum in Shallow Depths--In Saline Soils,
W75-09786 3C

DARROW, D. C.
DDT Residues in Euphausiids in the Upper Estuary of the Gulf of St. Lawrence,
W75-09690 5C

DAULAY, H. S.
Hungry Drylands of Western Rajasthan Need a New Technology,
W75-09789 3F

DAVID, M.
Evaluation of Environmental Impact of Landfills,
W75-09761 5C

DAVIS, J. C.
Use of Sodium Pentachlorophenate and Dehydroabietic Acid as Reference Toxicants for Salmonid Bioassays,
W75-09683 5C

DAVIS, K. R.
Soil Salinity Distribution in Drip and Subsurface Irrigated Summer Squash,
W75-09481 3C

DAVIS, S.
Drip Irrigation Experiment on Avocados,
W75-09499 3C

Drip Irrigation: Surface and Subsurface Compared with Sprinkler and Furrow,
W75-09440 3F

Drip Irrigation-Worldwide,
W75-09424 3F

Dripper Flow Consistency,
W75-09468 3F

Monitoring Soil Salinity and Leaf Nutrient Levels in a Young Avocado Orchard Under Drip Irrigation,
W75-09482 3F

Water Use by Drip and Sprinkle Irrigated Avocados Related to Plant Cover, Evaporation and Air Temperature,
W75-09479 3F

DAVISON, A. W.
The Accumulation of Fluoride by Marine and Intertidal Animals,
W75-09697 5C

DEASON, T. R.
Loss of Five Pesticides from Cultures of Twentyone Planktonic Algae,
W75-09808 5A

DECKX, R.
Survey of Experience with Drainage Materials and Review of Available Specifications,
W75-09629 8G

DEJOHN, P. B.
Carbon from Lignite or Coal: Which is Better,
W75-09733 5D

DENNINGTON, V. N.
The Effects of Oils on Growth of Freshwater Phytoplankton,
W75-09678 5C

DESHMUKH, M. T.
Development and Scope of Drip and Subsurface Irrigation,
W75-09431 3C

Evaluation of Hydraulics of Flow Through Pipes of Varying Slopes, Lengths and Orifice Placements,
W75-09474 8B

DEWEY, K. F.
The Prediction of Lake Huron Lake-Effect Snowfall Systems,
W75-09748 2C

DHANKHAR, O. P.
In Salt-Affected Soils Mulching Aids in Crop Growth,
W75-09798 3C

DICK, R. I.
Attitudes in Sludge Treatment and Disposal,
W75-09731 5D

Thickening of Sludges,
W75-09535 5D

DICKERMAN, D. C.
Availability of Ground Water in the Branch River Basin, Providence County, Rhode Island,
W75-09721 2F

DICKINSON, L. G.
Defense Meteorological Satellite Program (DMSP) User's Guide,
W75-09770 7B

DIERICKX, W.
Survey of Experience with Drainage Materials and Review of Available Specifications,
W75-09629 8G

DOANE, T. R.
Comprehensive Survey of Magpie Creek, McClellan Air Force Base, California,
W75-09410 5D

DOBBS, R. A.
Gas Chromatographic Determination of Selected Organic Compounds Added to Waste Water,
W75-09365 5A

DOROSHENKO, V. A.
On the Discharge Coefficient of Nozzles for Single- and Two-Phase Fluids,
W75-09739 8B

DOTSON, G. K.
Growth of Barley Irrigated with Wastewater Sludge Containing Phosphate Precipitants,
W75-09543 5D

DRAPER, L.
Wind and Wave Relationships in U.K. Coastal Waters,
W75-09737 2L

DREYFUS, D. A.
Influence of the Energy Crisis Upon the Future of Environmental Policy,
W75-09847 6E

DRNEVICH, R. F.
High Purity Oxygen Aerobic Digestion Experiences at Speedway, Indiana,
W75-09538 5D

DUNGLAS, J.
Study of Experiences with Drainage Materials and a Review of Specifications Available in France,
W75-09630 8G

DUNKTE, L. D.
Biophysical Control of Water Loss,
W75-09523 3F

DUTCHER, L. C.
Geologic and Hydrologic Features of Indian Wells Valley, California,
W75-09717 2F

DUVEL, W. A. JR.
Removal of Wastewater Organics by Reverse Osmosis,
W75-09417 5D

DWORKIN, D.
An Evaluation of Water Reuse for Municipal Supply,
W75-09408 5D

DZURISIN, D.
Channel Responses to Artificial Stream Capture, Death Valley, California,
W75-09610 2J

EASTIN, J. D.
Biophysical Control of Water Loss,
W75-09523 3F

ECKERT, H. W.
Antimicrobial Agents for Water Conservation,
W75-09637 5F

EDMISTEN, J. A.
Agricultural Utilization of Digested Sludges from the City of Pensacola,
W75-09554 5E

EDWARDS, M. D.
The Implementation of a Hydrologic Data Processing System in Brazil,
W75-09726 7C

EGAR, D. L.
Rapid Temperature Reduction of Thermal Discharge,
W75-09757 5B

EILERS, R. G.
Control Schemes for the Activated-Sludge Process,
W75-09395 5D

ELLIS, M. J.
Groundwater Levels in Nebraska, 1974,
W75-09710 4B

EMERSON, F. H.
Tree and Crop Response to Drip Irrigation,
W75-09504 3F

ENGELHOFFER, K.
Waste Water Clarification by Flotation (Flotacios szennyviztisztitas),
W75-09356 5D

EPSTEIN, E.
Composting Sewage Sludge,
W75-09546 5D

ERDMANN, D. E.
Water analysis,
W75-09372 5A

ERIE, L. J.
Trickle Irrigation Management for Cotton and Cabbage,
W75-09480 3F

Trickle Irrigation Management for Grapes,
W75-09510 3F

ESOGBUE, A. O.
Integrative Procedures for Coordinated Urban Land and Water Management: A Systems Analysis,
W75-09622 6A

FARRELL, J. B.
Overview of Sludge Handling and Disposal,
W75-09533 5D

FARRELL, M. D.
Drip Irrigation in Landscaping and Soil Erosion Control,
W75-09429 4D

FASSELL, W. M.
Sludge Disposal at a Profit,
W75-09557 5D

FAST, A. W.
Hypolimnetic Oxygenation Using Liquid Oxygen,
W75-09589 5G

FAZULLIN, N. T.
The Karman and Reynolds Numbers and the Drag Coefficient in Ducts and Pipes,
W75-09596 8B

FERRAR, T. A.
Financial Incentives and Pollution Control: A Case Study,
W75-09574 5G

FIELD, R.
Countermeasures for Pollution from Overflows; the State of the Art,
W75-09580 5D

Urban Runoff Pollution Control--State-of-the-Art,
W75-09762 5D

FIERO, G. W. JR.
Influence of Surface and Near-Surface Caliche Distribution on Infiltration Characteristics, Las Vegas, Nevada,
W75-09374 2J

FILIP, D. S.
Evaluation of Sample Preparation Techniques for Algal Bioassays,
W75-09734 5A

FINGER, R. E.
Phosphate Removal in an Activated Sludge Facility,
W75-09412

FIRTH, J. M.
A Non-Linear Rainfall-Runoff Model, Providing for Variable Lag Time,
W75-09753

FISCHER, B.
Weed Control Under Drip Irrigation in Orchard and Vineyard Crops,
W75-09493

FISCHER, N. S.
Effects of PCB on Interspecific Competition in Natural and Gnotobiotic Phytoplankton Communities in Continuous and Batch Cultures,
W75-09680

FISETTE, G. R.
Modifications to the Executive Computer Program for Steady-State Simulation of Wastewater Treatment Facilities,
W75-09775

FISHMAN, M. J.
Water analysis,
W75-09372

FLIPPO, H. N. JR.
Temperatures of Streams and Selected Reservoirs in Pennsylvania,
W75-09713

FOMICHEY, M. S.
The Karman and Reynolds Numbers and Drag Coefficient in Ducts and Pipes,
W75-09596

FORD, H. W.
Clogging of Drip Systems from Metabolic Products of Iron and Sulfur Bacteria,
W75-09456

FOSTER-SMITH, R. L.
The Effect of Concentration of Suspension of Inert Material on the Assimilation of Algae by Three Bivalves,
W75-09695

FOX, J. L.
Effect of Power Plant Chlorination on Estuarine Productivity,
W75-09684

FRASER, G. O.
Drip Irrigations Inherent Requisite - Water Quality,
W75-09435

FREEBURG, R. S.
An Explanation for the Growth Advantage in Drip Irrigation,
W75-09465

FRENCH, O. F.
Trickle Irrigation Management for Cotton and Cabbage,
W75-09480

Trickle Irrigation Management for Grapes,
W75-09510

FRITH, G. J. T.
Effects of Nitrogen Fertilizer Applications on Part of a Root System,
W75-09496

ROST, R. C.
A Case Study of Mine Water Quality Deterioration, Mainsforth Colliery, County Durham,
W75-09752 5B

UHRIMAN, D. K.
Water Quality Effect of Diking a Shallow Arid-Region Lake,
W75-09577 5B

JJINAGA, T.
Detector of Trace Substance in Water,
W75-09655 5A

RUTA, T.
Irrigation for Benches,
W75-09446 3F

Irrigation for Container Growing,
W75-09447 3F

LLOWAY, D. E.
Arctic Barrier Formation,
W75-09644 8A

RCEAU, J.-J.
Biological Treatment of Spent Bisulfite Liquor Traitement biologique de la liqueur residuelle u bisulfite),
W75-09355 5D

RDNER, B. R.
omparison of Irrigation Methods, Rootstocks, nd Fertilizer Elements of Valencia Orange rees,
/75-09439 3F

RRETT, M. T. JR.
rying of Sludge for Marketing as Fertilizer,
/75-09542 5E

RZOLI, K. V.
ant Water Requirements as Related to Trickle rigation,
75-09475 3F

', D. W.
gh Purity Oxygen Aerobic Digestion Experiences at Speedway, Indiana,
75-09538 5D

LER, R.
verse Osmosis Apparatus,
75-09661 3A

RGE, J. J.
e Effects of Oils on Growth of Freshwater ytoplankton,
'5-09678 5C

ALDSON, C. M.
Constant Micro Source of Moisture as a mponent in a Gradient System for a High el Production,
5-09443 3F

RD, C. J.
p and Furrow Irrigation Studies on Sugar-e,
5-09476 3F

TS, M.
formance of Plants with Drip Irrigation,
5-09509 3F

ICH, J. W.
sure Filtration--Municipal Wastewater ds, Cedar Rapids, Iowa,
-09540 5D

AD, Y.
raulic and Mechanical Properties of Drip-
-09473 8C

GILLEY, J. R.
Optimum Lateral Placement for Subsurface Irrigation Systems,
W75-09460 3F

GITLIN, H. M.
Design Charts for Drip Irrigation Systems,
W75-09472 8C

GLENN, L. F.
A Laboratory Rainfall Simulator for Infiltration and Soil Detachment Studies,
W75-09746 2G

GOLDBERG, D.
Formation of Blockages in Drip Irrigation Systems: Their Prevention and Removal,
W75-09454 3F

GOLDBERG, S. D.
Disinfection of Soil Strips Through the Drip Irrigation System,
W75-09444 5G

Strip Cultivation of the Area Wetted by Drip Irrigation in the Arava Desert,
W75-09445 3C

GOLDMAN, C. R.
Effects of Kokanee Salmon (Oncorhynchus Nerka) Decomposition on the Ecology of a Subalpine Stream,
W75-09672 5C

GOODRIDGE, J. D.
Evaporation from Water Surfaces in California,
W75-09586 2D

GOPALAKRISHNAN, T. C.
Wave Force Coefficients for Circular Piers,
W75-09593 8B

GOUBRAN, F. G.
Effects of Localized Phosphate Treatments and Solution pH on the Growth and Function of Apple Roots,
W75-09488 3C

GRAEF, S. P.
Anaerobic Digester Operation at the Metropolitan Sanitary Districts of Greater Chicago,
W75-09536 5D

GRAHAM, H. J.
Phosphorus Removal in Seasonal Retention Lagoons by Batch Chemical Precipitation,
W75-09563 5D

GRAY, I. M.
Phosphorus Removal Study at the Sarnia WPCP,
W75-09562 5D

GREWAL, S. S.
Drip Vs. Furrow Irrigation Trials in Potato Under Subtropical Conditions,
W75-09513 3F

GRIGAL, D. F.
Forest Fire: Effect on Phosphorus Movement to Lakes,
W75-09364 5B

GROBBELAAR, H. L.
Fertilizer Applications with Drip Irrigation,
W75-09491 3F

GROSSI, P.
Researches and Applications on Drip Irrigation and Similar Methods in Italy,
W75-09430 3F

GRUNDY, R. D.
Influence of the Energy Crisis Upon the Future of Environmental Policy,
W75-09847 6E

GUARINO, C. F.
Ocean Disposal Experiences in Philadelphia,
W75-09550 5E

GUILDFORD, S.
DDT Residues in Euphausiids in the Upper Estuary of the Gulf of St. Lawrence,
W75-09690 5C

GUILLEMENT, F. B.
The Relation Between Drip Irrigation, Phytophthora Root Rot of Avocado, and Fungicides,
W75-09512 2I

GULIDOV, M. V.
The Effect of Different Oxygen Conditions During Incubation on the Survival and Some of the Developmental Characteristics of the 'Verkhova' (Leucaspius Delineatus) in the Embryonic Period,
W75-09670 5C

GUSTAFSON, C. D.
Drip Irrigation Experiment on Avocados,
W75-09499 3C

Drip Irrigation-Worldwide,
W75-09424 3F

Monitoring Soil Salinity and Leaf Nutrient Levels in a Young Avocado Orchard Under Drip Irrigation,
W75-09482 3F

Water Use by Drip and Sprinkle Irrigated Avocados Related to Plant Cover, Evaporation and Air Temperature,
W75-09479 3F

GUY, L. L. JR.
A Guide for State Certification of Wastewater Facilities Personnel,
W75-09389 5D

HADJITHEODOROU, C.
The Optimum Distribution of Urban Water Supplies in Puerto Rico,
W75-09377 4A

HAGE, K. D.
Averaging Errors in Monthly Evaporation Estimates,
W75-09590 2D

HAGEMAN, R.
Control of Water by Drip Irrigation for Alfalfa Seed Production,
W75-09450 3F

HAGEN, H.
Technological and Economic Effects of the Change of the Preliminary Purification Time on Sludge Treatment (Technologische und Oekonomische Auswirkungen der Veraenderung der Vorklaerzeit auf die Schlammbehandlung),
W75-09421 5D

HALACY, D.
Arizona and Tomorrow's Solar Powerplants,
W75-09804 3A

HALDERSON, J. L.
Recent Sanitary District History in Land Reclamation and Sludge Utilization,
W75-09547 5E

**HALL, B. J.**
Spring Cucumber Drip vs. Furrow Irrigation,
W75-09507 3F

Staked Tomato Drip Irrigation in California,
W75-09506 3F

**HALL, J. B. JR.**
Domestic Wash Water Reclamation for Refuse as Commode Water Supply Using a Filtration-Reverse Osmosis Separation Technique,
W75-09403 5D

**HALL, J. D.**
Effects of Logging on Water Temperature and Dissolved Oxygen in Spawning Beds,
W75-09685 5C

**HAM, R. K.**
Evaluation of Environmental Impact of Landfills,
W75-09761 5C

Solid Waste Milling and Disposal on Land Without Cover, Volume I. Summary and Major Findings,
W75-09401 5E

Solid Waste Milling and Disposal on Land Without Cover. Volume II. Data Condensations,
W75-09402 5E

**HAMERNICK, D. M.**
Arizona's Remote Subdivisions: An Inventory,
W75-09583 6G

**HANDMAN, E. H.**
Contour Map of the Bedrock Surface, Collinsville Quadrangle, Connecticut,
W75-09706 7C

**HANFORD, W. E.**
Portable Water Supply System,
W75-09658 5D

**HANSON, E. G.**
Vegetable Production and Water-Use Efficiency as Influenced by Drip, Sprinkler, Subsurface, and Furrow Irrigation Methods,
W75-09438 3F

**HARDY, M.**
Offshore Development and Marine Pollution,
W75-09842 5B

**HARP, J. F.**
An Optimal Water Quality Management Technique for Conjunctive Ground and Surface Water Use,
W75-09378 5G

**HARRISON, D. S.**
Drip Irrigation Design Criteria for Tree Crops in Florida and Other Humid Regions,
W75-09427 3F

**HAYS, H. M.**
An Optimal Water Quality Management Technique for Conjunctive Ground and Surface Water Use,
W75-09378 5G

**HEANEY, J. P.**
Storm Water Management Model: User's Manual, Version II,
W75-09579 5D

**HEENAN, W.**
The Optimum Distribution of Urban Water Supplies in Puerto Rico,
W75-09377 4A

**HELFGOTT, T.**
Removal of Wastewater Organics by Reverse Osmosis,
W75-09417 5D

**HILDEBRAND, K. H.**
System for Purifying and Disinfecting Waste Water,
W75-09659 5D

**HILER, E. A.**
Designing Trickle Irrigation Laterals for Uniformity,
W75-09471 3F

Simulation of Miscible Displacement in Soils Using the Method of Characteristics,
W75-09612 2G

**HILLEL, D.**
The Progress and Problems of Drip Irrigation in Israel,
W75-09425 3F

**HILTON, H. W.**
Chemical Treatment of Drip Irrigation Water,
W75-09457 3F

**HINESLY, T. D.**
Agricultural Benefits and Environmental Changes Resulting from the Use of Digested Sludge on Field Crops,
W75-09409 5D

**HINRICHS, R. L.**
Synthetic Resins and Activated Carbon for Wastewater Treatment,
W75-09390 5D

**HOARE, E. R.**
Plant Water Requirements as Related to Trickle Irrigation,
W75-09475 3F

**HOFFMAN, D. L.**
Use of Glycerophosphate for Fertilization Through Trickle Irrigation Systems,
W75-09492 5B

**HOFFMAN, G. J.**
Salinity Management for High Frequency Irrigation,
W75-09484 3C

Traveling Trickle System,
W75-09452 3F

**HOLLO, J.**
Process for the Reduction of the Biochemical Oxygen Demand of Sewage and for the Recovery of the Inherent Protein,
W75-09566 5D

**HOLMES, C. W.**
Deposition of Zinc and Cadmium by Marine Bacteria in Estuarine Sediments,
W75-09692 5C

**HOOS, R. A. W.**
Use of Sodium Pentachlorophenate and Dehydroabietic Acid as Reference Toxicants for Salmonid Bioassays,
W75-09683 5C

**HORNKE, R.**
Possibilities for Reducing 5-Day BOD-Consuming Materials in Steam Condensates from Spent Sulfite Liquor Evaporation (Moeglichkeiten der Reduktion der BSB(5)-verbrauchenden Stoffe in Brundenkondensaten aus Sulfitablaugeneindampfungen),
W75-09360 5D

**HOUSER, E. A.**
Water Quality Analysis System with Multicuit Single Shell Heat Exchanger,
W75-09642 5

**HOUTZ, R. E.**
Sediments and Structure of the Japan Sea,
W75-09756 2

**HOWELL, M. P.**
Secondary Impacts of Transportation ar Wastewater Investments: Review and Biblio raphy,
W75-09576 5

**HOWELL, T. A.**
Designing Trickle Irrigation Laterals f Uniformity,
W75-09471 3

**HUBER, M. J.**
Cantaloupe Response to Drip Irrigation,
W75-09505 3

**HUBER, W. C.**
Storm Water Management Model: User Manual, Version II,
W75-09579 5

**HUDGINS, R. R.**
Wet Air Oxidation of Chemical Sludges,
W75-09565 5

**HUMPREY, W.**
Weed Control Under Drip Irrigation in Orcha and Vineyard Crops,
W75-09493

**HUNGERFORD, R. D.**
Drought Crack on Western White Pine Northern Idaho,
W75-09388

**HUNSINGER, R. B.**
Phosphorus Removal in Seasonal Retenti Lagoons by Batch Chemical Precipitation,
W75-09563 5

**HUNTAMER, J.**
Performance of Plants with Drip Irrigation,
W75-09509

Water Use with Drip Irrigation,
W75-09478

**IRIBARNE, J. V.**
The Fragmentation and Electrification Freezing Drops,
W75-09598

**ISOBE, M.**
Investigations in Sugarcane Fertilization Drip Irrigation in Hawaii,
W75-09490

**ISRAELSEN, E. K.**
Regional Analyses of Runoff Characterist for Small Urban Watersheds,
W75-09621

**JACKSON, K. W.**
Simultaneous Determination of Seven Tra Metals in Potable Water Using a Vidic Atomic Absorption Spectrometer,
W75-09363

**JACKSON, N. M. JR.**
Public Water Supplies of North Carolina: P 3. Mountains and Western Piedmont,
W75-09711

JAFFEE, L. R.
The Public Trust Doctrine Is Alive and Kicking in New Jersey Tidalwaters: Neptune City v. Avon-ByiThe-Sea--A Case of Happy Atavism,
W75-09850 6E

JAIN, M. L.
Evaluation of Hydraulics of Flow Through Pipes of Varying Slopes, Lengths and Orifice Placements,
W75-09474 8B

ENNINGS, P.
Synthetic Resins and Activated Carbon for Wastewater Treatment,
W75-09390 5D

ENSEN, R. A.
U.S. Engineering Information Services and the Role of the Water Resources Scientific Information Center,
W75-09585 10D

ENSEN, R. E.
Desalination Process,
W75-09654 3A

OHNSON, E. L. V.
The Relation Between Drip Irrigation, Phytophthora Root Rot of Avocado, and Fungicides,
W75-09512 2I

OHNSON, F. L.
Ground-Water Level in the Flood Plain and Adjacent Uplands of the Sangamon River,
W75-09599 4B

OHNSON, H. D.
Tritiated Water Turnover Rate in Rodents: Desert and Mountain,
W75-09801 2I

OHNSON, J. D.
Drought in the Ghana Savannah: A Report to the U.S. Aid Mission to Ghana,
W75-09795 6G

OHNSON, P.
A Non-Linear Rainfall-Runoff Model, Providing for Variable Lag Time,
W75-09753 2A

OHNSTON, H. E.
Availability of Ground Water in the Branch River Basin, Providence County, Rhode Island,
W75-09721 2F

ONES, R. M.
Evaluation of a New Spawning Mat Material,
W75-09749 7B

ONES, W. C.
Irrigation for Benches,
W75-09446 3F

Irrigation for Container Growing,
W75-09447 3F

OSSON, I. G.
Computation of Wave Heights Due to Refraction and Friction,
W75-09606 8B

UN, A. S.
Drip Vs. Furrow Irrigation Trials in Potato under Subtropical Conditions,
W75-09513 3F

UE, J. M.
Economic Analysis of the Processing and Disposal of Refuse Sludges,
W75-09406 5D

KALMYKOV, V. G.
Tangential Stress Distribution in Turbulent Boundary Layers at an Adverse Pressure Gradient,
W75-09738 8B

KAMOWSKI, J. C.
Weather Satellite Picture Receiving Stations, APT Digital Scan Converter,
W75-09588 7B

KAMPHUIS, J. W.
Friction Factor Under Oscillatory Waves,
W75-09755 8B

KAPLAN, E.
Reservoir Optimization for Water Quality Control,
W75-09773 5G

KARL, D. M.
Adenosine Triphosphate Measurements in Soil and Marine Sediments,
W75-09764 5A

KARMELI, D.
Evaluation of a Trickle Irrigation System,
W75-09469 3F

Trickle Irrigation Design for Optimal Soil Wetting,
W75-09461 2G

KARR, F. A.
Wastewater Treatment System,
W75-09567 5D

KASIMZADE, E. A.
System for Thermal Desalting of Water,
W75-09653 3A

KATZER, J. R.
Catalytic Oxidation of Phenol in Aqueous Solution Over Copper Oxide,
W75-09772 5D

KEENER, M. J.
Environmental Geology of an Area in West-Central Alabama,
W75-09615 7C

KELLER, J.
Evaluation of a Trickle Irrigation System,
W75-09469 3F

Trickle Irrigation Design for Optimal Soil Wetting,
W75-09461 2G

KELLING, K. A.
Urban Lawn Infiltration Rates and Fertilizer Runoff Losses Under Simulated Rainfall,
W75-09592 5B

KENWORTHY, A. L.
Trickle Irrigation in Michigan Orchards,
W75-09466 3F

Trickle Irrigation in Michigan Orchards: Controlling Rate of Flow with Flow Regulating Valves and Microtubes,
W75-09467 8C

KEPINSKI, J.
Application of Filtration Through Semi-Permeable Membranes for Treatment of Wastes,
W75-09730 5D

KESNER, C.
Trickle Irrigation in Michigan Orchards: Controlling Rate of Flow with Flow Regulating Valves and Microtubes,
W75-09467 8C

KESNER, C. D.
Trickle Irrigation in Michigan Orchards,
W75-09466 3F

KHAN, M. A. Q.
Pick up and Metabolism of DDT, Dieldrin and Photodieldrin by a Freshwater Alga (Ankistrodesmus Amalloides) and a Microcrustacean (Daphnta Pulex),
W75-09805 5C

KHATKOVSKIY, YE. M.
A Specific Case of Wave Motion of a Liquid in Pipes,
W75-09740 8B

KHOSLA, B. K.
Mix Gypsum in Shallow Depths--In Saline Soils,
W75-09786 3C

KIM, B. R.
Synthetic Resins and Activated Carbon for Wastewater Treatment,
W75-09390 5D

KINBACHER, E. J.
Biophysical Control of Water Loss,
W75-09523 3F

KING, M. L.
Device for Distributing Irrigation Water,
W75-09662 3F

KIRCHNEROVA, J.
Use of Centrifuges for Purification of Effluents (Primenenie tsentrifug dlya ochistki stochnykh vod),
W75-09358 5D

KIRKHAM, M. B.
Growth of Barley Irrigated with Wastewater Sludge Containing Phosphate Precipitants,
W75-09543 5D

KOBAYASHI, N.
Pond Snail Eggs as an Indicatory Material for Water Pollution Bioassay: Preliminary Experiments, (In Japanese),
W75-09682 5C

KOLGAYEV, A. M.
The Effect of Basic Cuprous Carbonate on the State of the Liver in Juvenile Amur Autumn Chum (Oncorhynchus keta infrasp. autumnalis),
W75-09668 5C

KOLOMEYCHUK, R. J.
The Fragmentation and Electrification of Freezing Drops,
W75-09598 2C

KOMATSU, T.
Aquatic Insect Communities of the Tenryu River, Their Composition, Biotic Index and Seasonal Change, (In Japanese),
W75-09807 5C

KOPPENSTEINER, G.
Antimicrobial Agents for Water Conservation,
W75-09637 5F

KOS, P.
Economic Analysis of the Processing and Disposal of Refuse Sludges,
W75-09406 5D

KRONE, R. B.
Pore and Eroding Fluid Influences on Surface Erosion of Soil,
W75-09741 2J

**KRONFELD, J.**
Aspects of Trace Metal Contamination in the Coastal Rivers of Israel,
W75-09689 5B

**KRYSTAL, L.**
Hydraulic and Mechanical Properties of Drippers,
W75-09473 8C

**KUEHNE, R. A.**
Evaluation of Recovery in a Polluted Creek After Installation of New Sewage Treatment Procedures,
W75-09515 5B

**KUHNER, J.**
A Preliminary Assessment of Wet Systems for Residential Refuse Collection,
W75-09405 5D

Wet Systems for Residential Refuse Collection: A Case Study for Springfield, Massachusetts,
W75-09407 5D

**KUNSTNER, W.**
Possibilities for Reducing 5-Day BOD-Consuming Materials in Steam Condensates from Spent Sulfite Liquor Evaporation (Moeglichkeiten der Reduktion der BSB(5)-verbrauchenden Stoffe in Brundenkondensaten aus Sulfitablaugeneindampfungen),
W75-09360 5D

**LAAK, R.**
A Covered Domestic Lagoon System for Natural Ground Water Recharge Near Metropolitan Areas,
W75-09524 5D

**LAGER, J. A.**
Countermeasures for Pollution from Overflows; the State of the Art,
W75-09580 5D

Urban Runoff Pollution Control--State-of-the-Art,
W75-09762 5D

**LAGUROS, J. G.**
An Optimal Water Quality Management Technique for Conjunctive Ground and Surface Water Use,
W75-09378 5G

**LAHAM, Q. N.**
Selenium Toxicity on the Early Life Stages of Zebrafish (Brachydanio rerio),
W75-09671 5C

**LAHAV, N.**
Formation of Blockages in Drip Irrigation Systems: Their Prevention and Removal,
W75-09454 3F

**LAKIS, J.**
Development of Porous Polyvinyl Chloride Coated Tubulets for Seawater Desalination,
W75-09373 3A

**LAMAIRE, R.**
Evaluating Effects of Water Resource Developments on Wildlife Habitat,
W75-09790 6G

**LANDSBERG, H. E.**
Drought, A Recurrent Element of Climate,
W75-09799 2B

**LANGE, A.**
Performance of Plants with Drip Irrigation,
W75-09509 3F

Weed Control Under Drip Irrigation in Orchard and Vineyard Crops,
W75-09493 3F

**LAPRAY, B. A.**
Bibliography of U.S. Geological Survey Water-Resources Reports for Utah,
W75-09718 2A

**LAROCK, P. A.**
Adenosine Triphosphate Measurements in Soil and Marine Sediments,
W75-09764 5A

**LATTMAN, L. H.**
Influence of Surface and Near-Surface Caliche Distribution on Infiltration Characteristics, Las Vegas, Nevada,
W75-09374 2J

**LE HOUEROU, H. N.**
Deterioration of the Ecological Equilibrium in the Arid Zones of North Africa,
W75-09802 6G

**LEAF, A. L.**
Where are We in Forest Fertilization,
W75-09367 5D

**LEAVITT, G.**
Performance of Plants with Drip Irrigation,
W75-09509 3F

**LECHNER, J. F.**
Determination of Chloride in Water with a HgS/Hg2Cl2 Electrode,
W75-09361 5A

**LEONARD, R. B.**
Changes in Chemical Quality of Water, Cedar Bluff Irrigation District Area, West-Central Kansas,
W75-09719 5B

**LEVIN, I.**
Soil Moisture Distribution and Depletion in an Apple Orchard Irrigated by Tricklers,
W75-09463 2G

**LEWANDOWSKI, R.**
Process for Treating Waste Water,
W75-09656 5D

**LEWANDOWSKI, S. O. R. L.**
Process for Treating Waste Water,
W75-09656 5D

**LEWIS, R. E.**
Data from a 1,000-Foot (305-Metre) Core Hole in the Long Valley Caldera, Mono County, California,
W75-09728 7C

**LIN, B. W.**
Integrative Procedures for Coordinated Urban Land and Water Management: A Systems Analysis,
W75-09622 6A

**LINDQUIST, H.**
Liquid Treatment Apparatus,
W75-09666 5D

**LINDSEY, K. E.**
Application of Fertilizer Through Drip Irrigation Systems in West Texas,
W75-09489 3F

**LIPPERT, T. E.**
Evaluation and Demonstration of the Capillary Suction Sludge Dewatering Device,
W75-09399 5D

**LOBKO, V. V.**
Optimum Conditions for Chemical Purificat
of Effluents (Optimal'nye uslov
khimicheskoi ochistki stochnykh vod),
W75-09359

**LOGAN, D. T.**
Diversity of Marine Invertebrates in a Ther
Effluent,
W75-09809

**LOGANATHAN, P.**
Pore and Eroding Fluid Influences on Surf
Erosion of Soil,
W75-09741

**LOMBARD, P. B.**
Drip Irrigation Research in Oregon - A Prog
Report,
W75-09428

**LOMEN, D. O.**
Linearized Moisture Flow Solutions for Po
Line, and Strip Sources,
W75-09459

**LONDQUIST, C. J.**
Map Showing Drainage Areas, Lud
Quadrangle, Massachusetts,
W75-09707

Map Showing Drainage Areas, Mount T
Quadrangle, Massachusetts,
W75-09708

Map Showing Drainage Areas, West Spr
field Quadrangle, Massachusetts-Connecticu
W75-09705

**LOS, S. N.**
Biological Treatment of Spent Bisulfite Liq
(Traitement biologique de la liqueur residu
au bisulfite),
W75-09355

**LOTTER, D. C.**
Drip Irrigation on Citrus,
W75-09432

**LOURENS, F.**
Fertilizer Applications with Drip Irrigation,
W75-09491

**LOVETT, W. D.**
Activated Carbon Used to Control Odors,
W75-09777

**LOWE, D. R.**
Water Escape Structures in Coarse-Grai
Sediments,
W75-09768

**LUDWIG, W. J.**
Sediments and Structure of the Japan Sea,
W75-09756

**LYNAM, B. T.**
Recent Sanitary District History in Land Re
mation and Sludge Utilization,
W75-09547

**MACIOROWSKI, A. F.**
An Inexpensive Macroinvertebrate Bioas
Table for Use in Continuous-Flow Toxi
Tests,
W75-09676

**MACKAY, W. C.**
Effect of DDT on Discriminating Ability
Rainbow Trout (Salmo Gairdneri),
W75-09674

COMBER, R. T.
Study of the Surface Fluid Flow Characristics of the New York Bight and the evelopment of Research Data Display echniques,
75-09783 5B

GOON, M. L.
or Rainfed Areas-Improved Velvet Beans for creased Forage Production,
75-09796 3F

NES, I. S.
etermination of Lead in Potable Waters Using lves Cup Atomic Absorption Spectrometer th Signal Integration,
75-09366 5A

RS, R. L.
Study of the Surface Fluid Flow Characistics of the New York Bight and the velopment of Research Data Display chniques,
5-09783 5B

INSKY, I. Z.
tem for Thermal Desalting of Water,
5-09653 3A

RIDES, A. C.
ondary Impacts of Transportation and stewater Investments: Review and Bibliogny,
5-09576 5C

LORY, C. W.
ended Aeration Wastewater Treatment,
5-09776 5D

BECK, D. M.
harge Simulation Model,
-09518 2A

RINATO, H. A.
cts of Drip Irrigation on Soil-Water-Plant tionship,
-09500 2I

ONE, G. J.
emporary Research in Marine Affairs,
-09837 6B

H, F. A.
ction and Recovery System for Oil Spills,
09660 5G

I, A. W.
rol of Water by Drip Irrigation for Alfalfa Production,
09450 3F

rrigation Experiment on Avocados,
09499 3C

rrigation-Worldwide,
09424 3F

oring Soil Salinity and Leaf Nutrient s in a Young Avocado Orchard Under rrigation,
9482 3F

Use by Drip and Sprinkle Irrigated dos Related to Plant Cover, Evaporation r Temperature,
9479 3F

Use with Drip Irrigation,
9478 3F

, C. J.
iminary Assessment of Wet Systems for ntial Refuse Collection,
9405 5D

MARTIN, J.
Arizona and Tomorrow's Solar Powerplants,
W75-09804 3A

MARTIN, L. W.
Drip Irrigation Research in Oregon - A Progress Report,
W75-09428 3F

MASON, C. M.
Underwater Drilling Pollution Control Curtain,
W75-09639 5G

MASON, G. J.
Phosphate Removal in an Activated Sludge Facility,
W75-09412 5D

MASSIE, L. E.
Solar Still with Replaceable Solar Absorbing Liner and Weight Controlled Feed Inlet,
W75-09643 3A

MATHESON, W. E.
Australian Vineyard Uses Sewage Effluent with Trickle Irrigation,
W75-09486 3C

MATLIN, C.
Soil Moisture Sensing System,
W75-09651 2G

MATON, A.
Survey of Experience with Drainage Materials and Review of Available Specifications,
W75-09629 8G

MATTEI, P. F.
Sludge Management System for St. Louis,
W75-09558 5D

MAURER, D.
Diversity of Marine Invertebrates in a Thermal Effluent,
W75-09809 5C

MAYROSE, D. T.
Heat Treatment and Incineration,
W75-09541 5D

MCAVOY, R. L.
Automation in a Water Quality Laboratory Scheme,
W75-09723 5A

MCBRIDE, J. R.
Effects of Thiourea Treatment on Sexually Maturing and Gonadectomized Male Sockeye Salmon (Oncorhynchus Nerka),
W75-09699 5C

MCCOLL, J. G.
Forest Fire: Effect on Phosphorus Movement to Lakes,
W75-09364 5B

MCCOY, H. J.
Summary of Hydrologic Conditions in Collier County, Florida, 1973,
W75-09716 4B

MCCRAREN, J. P.
Evaluation of a New Spawning Mat Material,
W75-09749 7B

MCELHOE, B. A.
Chemical Treatment of Drip Irrigation Water,
W75-09457 3F

MCFARLANE, C. F.
Ocean Waste Disposal Practices in Metropolitan Areas of California,
W75-09391 3D

MCGHEE, T. J.
Upflow Filtration of Oxidation Pond Effluent,
W75-09522 5D

MCINERNEY, J. E.
Behavior of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Sumithion (Fenitrothion), An Organophosphate Insecticide,
W75-09700 5C

MCKAY, D. C.
The Fragmentation and Electrification of Freezing Drops,
W75-09598 2C

MCLERRAN, C. J.
Deposition of Zinc and Cadmium by Marine Bacteria in Estuarine Sediments,
W75-09692 5C

MCNICHOLL, P. C.
Effect of DDT on Discriminating Ability of Rainbow Trout (Salmo Gairdneri),
W75-09674 5C

MCPHERSON, H. J.
Sediment Yields from Intermediate-Sized Stream Basins in Southern Alberta,
W75-09750 2J

MEDINA, M. A.
Storm Water Management Model: User's Manual, Version II,
W75-09579 5D

MEHDIZADEH, P.
An Investigation on the Use of Drip Irrigation for the Establishment of Multi-Purpose Parks (Green Belts Around the Cities) in Iran,
W75-09503 3F

MEHRA, K. L.
For Rainfed Areas-Improved Velvet Beans for Increased Forage Production,
W75-09796 3F

MEIER, P. M.
Economic Analysis of the Processing and Disposal of Refuse Sludges,
W75-09406 5D

Modifications to the Executive Computer Program for Steady-State Simulation of Wastewater Treatment Facilities,
W75-09775 5D

A Preliminary Assessment of Wet Systems for Residential Refuse Collection,
W75-09405 5D

Wet Systems for Residential Refuse Collection: A Case Study for Springfield, Massachusetts,
W75-09407 5D

MEITH-AVCIN, N.
DDT and the Rugophilic Response of Settling Barnacles Balanus Improvisus,
W75-09686 5C

MELLENTHIN, W. M.
Drip Irrigation Research in Oregon - A Progress Report,
W75-09428 3F

MERRILL, S. C.
Traveling Trickle System,
W75-09452 3F

MERRILL, S. D.
Salinity Management for High Frequency Irrigation,
W75-09484 3C

MERRITT, G. J.

MERRITT, G. J.
The Reserve Mining Case: Promises, Promises,
W75-09838 5G

MERRITT, L. B.
Water Quality Effect of Diking a Shallow Arid-Region Lake,
W75-09577 5B

MEYBECK, M.
Chemical Transport by the Mekong River,
W75-09603 5B

MIDDLEBROOKS, E. J.
Evaluation of Sample Preparation Techniques for Algal Bioassays,
W75-09734 5A

MIDDLETON, J. E.
Tree and Crop Response to Drip Irrigation,
W75-09504 3F

MIELE, R. P.
Sludge Dewatering,
W75-09539 5D

MILLIMAN, J. D.
Quaternary Sedimentation on the Amazon Continental Margin: A Model,
W75-09600 2L

MINDLING, A. L.
Influence of Surface and Near-Surface Caliche Distribution on Infiltration Characteristics, Las Vegas, Nevada,
W75-09374 2J

MINEAR, R. A.
State-of-the-Art for the Inorganic Chemicals Industry: Commercial Explosives,
W75-09581 5B

MINORE, G.
Process for the Recovery of Formaldehyde and Phenol Contained in Waste Waters,
W75-09573 5D

MINTON, G. L.
Phosphate Removal in an Activated Sludge Facility,
W75-09412 5D

MISRA, M. K.
Corrugated Plastic Drain Tubing Used as Underground Conduit,
W75-09611 8B

MITCHELL, D. G.
Determination of Lead in Potable Waters Using Delves Cup Atomic Absorption Spectrometer with Signal Integration,
W75-09366 5A

Simultaneous Determination of Seven Trace Metals in Potable Water Using a Vidicon Atomic Absorption Spectrometer,
W75-09363 5A

MITCHELL, P. D.
Trickle Irrigation on Young Peach Trees,
W75-09501 3F

MITCHELL, P. O.
Change in Root Distribution of Mature Pear Trees in Response to Trickle Irrigation,
W75-09497 3F

MIURA, K.
Detector of Trace Substance in Water,
W75-09655 5A

MIYAMOTO, S.
For Improving Water Penetration into Some Arizona Soils-Sulfuric Acid,
W75-09623 3C

MOCK, T.
Irrigation for Benches,
W75-09446 3F

Irrigation for Container Growing,
W75-09447 3F

MOHAN, A.
Heat Transfer in Soil-Water-Ice Systems,
W75-09742 2C

MOHR, R. T.
Sludge Handling and Disposal at Blue Plains,
W75-09553 5D

MOLOF, A.
Wastewater Treatment Sequence,
W75-09569 5D

MORAN, R. E.
Effects of Metal-Mine Drainage on Water Quality in Selected Areas of Colorado, 1972-73,
W75-09712 5C

MORGELI, B.
Cleaning of Circulation Water and Effluent from Paper and Board Mills by Chemicophysical Methods (Die Moeglichkeit der Reinigung von Kreislauf- und Restabwasser bei Papier- und Kartonfabriken unter Beruecksichtigung chemisch-physikalischer Verfahren),
W75-09371 5D

MOSER, P. H.
Environmental Geology of an Area in West-Central Alabama,
W75-09615 7C

MOSHAGEN, H.
Wave Induced Pressures in Permeable Seabeds,
W75-09607 8B

MOYER, M. S.
Effect of Power Plant Chlorination on Estuarine Productivity,
W75-09684 5C

MOYLE, W. R. JR.
Geologic and Hydrologic Features of Indian Wells Valley, California,
W75-09717 2F

MRKVA, M.
Automatic U.V.-Control System for Relative Evaluation of Organic Water Pollution,
W75-09735 5A

MURAUCHI, S.
Sediments and Structure of the Japan Sea,
W75-09756 2J

MURRAY, N. O.
A Case Study of Estuarine Pollution and Local Agency Interactions,
W75-09620 5G

MYERS, J. M.
Drip Irrigation Design Criteria for Tree Crops in Florida and Other Humid Regions,
W75-09427 3F

NAKAVAMA, F. S.
Trickle Irrigation Management for Grapes,
W75-09510 3F

NARKIS, N.
Ferric Chlorine or Lime for Chemical Trea
ment,
W75-09380 5

NAVATO, A. R.
Recent African Rainfall Patterns,
W75-09766 2

NAVROT, J.
Aspects of Trace Metal Contamination in th
Coastal Rivers of Israel,
W75-09689 5

NEFF, D. J.
Forage Preferences of Trained Mule Deer
the Beaver Creek Watersheds,
W75-09793

NELSON, D. W.
A Laboratory Rainfall Simulator for Infiltrati
and Soil Detachment Studies,
W75-09746

NEUDORF, S.
Pick up and Metabolism of DDT, Dieldrin a
Photodieldrin by a Freshwater Al
(Ankistrodesmus Amalloides) and
Microcrustacean (Daphnta Pulex),
W75-09805

NEW, L.
Automatic Drip Irrigation for Greenhouse T
mato Production in West Texas,
W75-09448

NEW, L. L.
Application of Fertilizer Through Drip Irri
tion Systems in West Texas,
W75-09489

NEWCOMB, T. W.
Changes in Blood Chemistry of Juvenile Ste
head Trout, Salmo Gairdneri, Follow
Sublethal Exposure to Nitrogen Supersatu
tion,
W75-09694

NEWCOME, R. JR.
Formation Factors and Their Use in Estimat
Water Quality in Mississippi Aquifers,
W75-09703

NEWELL, R. E.
Recent African Rainfall Patterns,
W75-09766

NICHOLS, D. G.
Effects of Nitrogen Fertilizer Application
Part of a Root System,
W75-09496

NIIMI, A. J.
Selenium Toxicity on the Early Life Stage
Zebrafish (Brachydanio rerio),
W75-09671

NIXON, S. W.
Sediment Resuspension and Deposition in
ragansett Bay,
W75-09736

NOYOLA, F. T.
A Study on Different Application Proced
of Drip Irrigation in Tomato Cultivation,
W75-09511

O'KELLEY, J. C.
Loss of Five Pesticides from Cultures of T
tyone Planktonic Algae,
W75-09808

'MELIA, C. R.
The Role of Polyelectrolytes in Filtration Processes,
W75-09394 5D

DA, S.
Towards a New Regime for Ocean Development,
W75-09843 6E

FFER, R.
Ferric Chlorine or Lime for Chemical Treatment,
W75-09380 5D

LDHAM, R. R.
Floating Solids Return Device,
W75-09657 5D

SON, D. M.
The Effect of Sulfate and Manganese Dioxide on the Release of Phosphorus from Lake Menota Sediments,
W75-09619 5C

TER, J. D.
alinity Management for High Frequency Irgation,
775-09484 3C

alinity Sensor Control of Drip Irrigation Vater Application,
775-09477 3C

TO, H.
eed Control Under Drip Irrigation in Orchard d Vineyard Crops,
75-09493 3F

RBEEKE, A. P.
ffects of Thiourea Treatment on Sexually aturing and Gonadectomized Male Sockeye lmon (Oncorhynchus Nerka),
75-09699 5C

RHOLTZ, W. J.
polimnetic Oxygenation Using Liquid Oxen,
75-09589 5G

TT, C. A.
diment Resuspension and Deposition in Naransett Bay,
5-09736 2L

RAY, G. F.
drogeology of the Waterways-Winefred e Area, Alberta,
5-09769 2F

I, H.
Irrigation and Automation Tools in Effit Use of Water Policy,
5-09426 3F

ER, J. E.
Showing Drainage Areas, Marlborough drangle, Connecticut,
-09704 7C

S, A. C.
ielement Neutron Activation Analysis of h Water Using Ge(Li) Gamma Spectry,
-09362 5A

IS, M.
rentiation Between Natural Hydrocarbons Low Level Diesel Oil Contamination in ed Lobster Meat,
09698 5A

PATTERSON, J. W.
State-of-the-Art for the Inorganic Chemicals Industry: Commercial Explosives,
W75-09581 5B

PATTERSON, T. C.
Irrigation Return Flow as Influenced by Drip Irrigation,
W75-09435 5G

Vegetable Production and Water-Use Efficiency as Influenced by Drip, Sprinkler, Subsurface, and Furrow Irrigation Methods,
W75-09438 3F

PAULS, C. F.
Comprehensive Survey of Magpie Creek, McClellan Air Force Base, California,
W75-09410 5D

Survey of Wastewater Discharge, Campion AFS, Alaska,
W75-09413 5D

Survey of Wastewater Discharge--Elmendorf AFB, Alaska,
W75-09398 5B

Wastewater Treatment Facility Evaluation, Malmstrom AFB MT,
W75-09411 5E

PEDRICK, J. L. JR.
Contemporary Research in Marine Affairs,
W75-09837 6B

PELLEG, D.
Formation of Blockages in Drip Irrigation Systems: Their Prevention and Removal,
W75-09454 3F

PELTZ, W. A.
Storm Water Management Model: User's Manual, Version II,
W75-09579 5D

PERKINS, M. A.
Effects of Kokanee Salmon (Oncorhynchus Nerka) Decomposition on the Ecology of a Subalpine Stream,
W75-09672 5C

PESSAH, E.
Effect of Constant Temperature on Growth Rates of Pumpkinseed Sunfish (Lepomis Gibbosus),
W75-09701 5C

PETERKA, J. J.
Effects of Saline Water from North Dakota Lakes on Survival of Fathead Minnow (Pimephales Promelas) Embryos and Sac Fry,
W75-09669 5C

PETERSON, A. E.
Urban Lawn Infiltration Rates and Fertilizer Runoff Losses Under Simulated Rainfall,
W75-09592 5B

PHENE, C. J.
High-Frequency Porous Tube Irrigation for Water-Nutrient Management in Humid Regions,
W75-09449 3F

PIETSCH, M. F.
Australian Vineyard Uses Sewage Effluent with Trickle Irrigation,
W75-09486 3C

PINEAULT, G.
Biological Treatment of Spent Bisulfite Liquor (Traitement biologique de la liqueur residuelle au bisulfite),
W75-09355 5D

PIRA, E. S.
Chamber Method for Drip Irrigation System Design and Installation Procedure,
W75-09441 8C

PLUHOWSKI, E. J.
Dynamics of Turbidity Plumes in Lake Ontario,
W75-09709 2J

POHL, H. A.
Biological Assay of Fresh Waters by a New Method, Dielectrophoresis,
W75-09531 5A

POLLOCK, K.
Biological Assay of Fresh Waters by a New Method, Dielectrophoresis,
W75-09531 5A

POLTORAK, R. L.
Activated Carbon Used to Control Odors,
W75-09777 5D

POPOV, A. V.
The Karman and Reynolds Numbers and the Drag Coefficient in Ducts and Pipes,
W75-09596 8B

POTTHARST, J. E. JR.
Multi-Effect Flash Evaporator,
W75-09663 3A

POWLES, P. M.
Effect of Constant Temperature on Growth Rates of Pumpkinseed Sunfish (Lepomis Gibbosus),
W75-09701 5C

PRADT, L. A.
Wet Oxidation Treatment of Waste Liquor or Sludge,
W75-09571 5D

PRASAD, M. V. R.
Hungry Drylands of Western Rajasthan Need a New Technology,
W75-09789 3F

PROBERT, P. K.
The Bottom Fauna of China Clay Waste Deposits in Mevagissey Bay,
W75-09673 5C

PROEBSTING, E. L.
Tree and Crop Response to Drip Irrigation,
W75-09504 3F

PRUPPACHER, H. R.
A Wind Tunnel Investigation on Ice Multiplication by Freezing of Waterdrops Falling at Terminal Velocity in Air,
W75-09613 2C

PUGH, W. J.
Drip Irrigation: Surface and Subsurface Compared with Sprinkler and Furrow,
W75-09440 3F

Dripper Flow Consistency,
W75-09468 3F

QURESHI, Z.
Surface Water Resources of St. Johns River, Florida,
W75-09604 2A

RAATS, P. A. C.
Movement of Water and Salts Under High Frequency Irrigation,
W75-09458 3F

RABE, F. T.
Secondary Impacts of Transportation and Wastewater Investments: Review and Bibliography,
W75-09576 5C

RADICI, P.
Process for the Recovery of Formaldehyde and Phenol Contained in Waste Waters,
W75-09573 5D

RAJAGOPAL, R.
Sewage Disposal and Water Supply Alternatives on the Basis of Water Quality and Economic Criteria,
W75-09774 5B

RAMAN, H.
Wave Force Coefficients for Circular Piers,
W75-09593 8B

RAO, S. R.
Recycling a Solid Waste from a Paper Plant -- Separation of Wood Fiber from Clay by Differential Flocculation,
W75-09354 5D

RAVSCHKOLB, R. S.
Use of Glycerophosphate for Fertilization Through Trickle Irrigation Systems,
W75-09492 5B

RAWITZ, E.
The Progress and Problems of Drip Irrigation in Israel,
W75-09425 3F

RAWLINS, S. L.
Reverse Flushing Technique for Bi-Wall Drip Tubing,
W75-09455 8C

Salinity Management for High Frequency Irrigation,
W75-09484 3C

Traveling Trickle System,
W75-09452 3F

RAWLS, W. J.
Optimizing Long-Term Streamflow Forecasts,
W75-09594 4A

READ, A. L.
Australian Vineyard Uses Sewage Effluent with Trickle Irrigation,
W75-09486 3C

REBHUN, M.
Ferric Chlorine or Lime for Chemical Treatment,
W75-09380 5D

REDDEL, D. L.
Simulation of Miscible Displacement in Soils Using the Method of Characteristics,
W75-09612 2G

REED, D. W.
A Non-Linear Rainfall-Runoff Model, Providing for Variable Lag Time,
W75-09753 2A

REED, L. A.
Occurrence of Pesticide Residues in Four Streams Draining Land-Use Areas in Pennsylvania,
W75-09720 5B

REINERT, R. E.
Effect of Temperature on Accumulation of Methylmercuric Chloride and p,p' DDT by Rainbow Trout (Salmo Gairdneri),
W75-09681 5C

REINHARDT, J. J.
Solid Waste Milling and Disposal on Land Without Cover, Volume I. Summary and Major Findings,
W75-09401 5E

Solid Waste Milling and Disposal on Land Without Cover. Volume II. Data Condensations,
W75-09402 5E

REMSEN, C. C.
Effects of PCB on Interspecific Competition in Natural and Gnotobiotic Phytoplankton Communities in Continuous and Batch Cultures,
W75-09680 5C

RICHEY, S. E.
Effects of Kokanee Salmon (Oncorhynchus Nerka) Decomposition on the Ecology of a Subalpine Stream,
W75-09672 5C

RILEY, J. P.
Regional Analyses of Runoff Characteristics for Small Urban Watersheds,
W75-09621 2A

RIMKUS, R. R.
Recent Sanitary District History in Land Reclamation and Sludge Utilization,
W75-09547 5E

RINGLER, N. H.
Effects of Logging on Water Temperature and Dissolved Oxygen in Spawning Beds,
W75-09685 5C

ROBERTS, D.
Differential Uptake of Endosulfan by the Tissues of Mytilus Edulis,
W75-09810 5A

ROBERTS, K. J.
Alternative Methods of Disinfection: How Effective,
W75-09780 5D

ROBERTS, R.
Automatic Drip Irrigation for Greenhouse Tomato Production in West Texas,
W75-09448 3F

ROBERTS, S.
Tree and Crop Response to Drip Irrigation,
W75-09504 3F

ROBERTSON, D. C.
Optimizing Long-Term Streamflow Forecasts,
W75-09594 4A

RODENHUIS, G.
Information Exchange on Water Resources Computer Programs,
W75-09591 7C

RODNEY, D. R.
Comparison of Irrigation Methods, Rootstocks, and Fertilizer Elements of Valencia Orange Trees,
W75-09439 3F

ROHRER, D. M.
Reduction in Surfactants by Irradiation,
W75-09418 5D

ROLSTON, D. E.
Use of Glycerophosphate for Fertilizat
Through Trickle Irrigation Systems,
W75-09492

ROMKENS, M. J. M.
A Laboratory Rainfall Simulator for Infiltra
and Soil Detachment Studies,
W75-09746

ROSS, W. M.
Biophysical Control of Water Loss,
W75-09523

ROTH, C. B.
A Laboratory Rainfall Simulator for Infiltra
and Soil Detachment Studies,
W75-09746

ROTH, R. L.
Comparison of Irrigation Methods, Rootsto
and Fertilizer Elements of Valencia Or
Trees,
W75-09439

Soil Moisture Distribution and Wetting Pa
From a Point Source,
W75-09462

RUSHTON, K. R.
Numerical Analysis of Confined-Uncon
Aquifers,
W75-09751

RUSSIER-DELOLME, R.
A Comparative Study of the Tolerance of
Freshwater Planarians, Dugesia Tigrina
Polycelis Felina, To Low Oxygen Le
(Etude Comparative de la Tolerance
Basses Tensions D'Oxygene Chez
Planaires D'Eau Douce, Dugesia Tigrin
Polycelis Felina),
W75-09675

RUSSO, R. C.
Acute Toxicity of Nitrite to Rainbow
(Salmo Gairdneri),
W75-09687

SADANA, A. J.
Catalytic Oxidation of Phenol in Aqueous
tion Over Copper Oxide,
W75-09772

SALBU, B.
Multielement Neutron Activation Analys
Fresh Water Using Ge(Li) Gamma
trometry,
W75-09362

SAMEOTO, D. D.
DDT Residues in Euphausiids in the
Estuary of the Gulf of St. Lawrence,
W75-09690

SAMPAYO, F. F.
How to Get Low Ammonia Effluents,
W75-09778

SAYLOR, M. L.
Effect of Harvesting Methods on Product
Fingerling Fathead Minnows,
W75-09415

SCHADE, R. O.
The Use of Foggers in Drip Irrigation,
W75-09442

SCHERER, E.
Avoidance of Fenitrothion by Go
(Carassius Auratus),
W75-09677

HLAMP, R. J.
A Wind Tunnel Investigation on Ice Multiplication by Freezing of Waterdrops Falling at Terminal Velocity in Air,
W75-09613 2C

HMELLER, E.
ide Energy Conversion Device,
775-09650 8A

IUMM, S. A.
an-Induced Changes of Middle Mississippi iver,
775-09754 4A

WINDT, B. W.
ater Quality Analysis System with Multicirit Single Shell Heat Exchanger,
75-09642 5G

. S. M.
itiated Water Turnover Rate in Rodents: sert and Mountain,
75-09801 2I

ERKA, I.
termination of Chloride in Water with a S/Hg2Cl2 Electrode,
5-09361 5A

HANE, A. N.
ographic Variation of the Statistical Parame- of Hydrometeorological Data of the United tes,
5-09605 2B

II, M.
ckle Irrigation,
5-09437 3F

NON, E. E.
sphorus Removal Demonstration Studies at B. Trenton,
5-09416 5D

CHENKO, V. M.
imum Conditions for Chemical Purification Effluents (Optimal'nye usloviya nicheskoi ochistki stochnykh vod),
-09359 5D

MA, R. C.
sum Can Improve Your Water Also,
-09787 5G

RER, M. N.
Irrigation Research in Oregon - A Progress rt,
-09428 3F

H, H.
n Water Management Model: User's al, Version II,
09579 5D

ON, A. L.
parative Ecology of Western Streams,
09617 5G

ARD, H. C.
and Wave Relationships in U.K. Coastal s,
09737 2L

EY, L. W. JR.
ne Extraction of Chemically Conated Water,
9419 5D

E, G. B.
e Utilization in Agriculture,
9788 5D

SHERIDAN, P. F.
Uptake, Metabolism and Distribution of DDT in Organs of the Blue Crab, Callinectes Sapidus,
W75-09691 5C

SHERRIN, J. J.
International Law and Canadian Arctic Pollution Control,
W75-09846 5G

SHERSTYUK, A. N.
Tangential Stress Distribution in Turbulent Boundary Layers at an Adverse Pressure Gradient,
W75-09738 8B

SHEU, M. S.
Effects of Deforestation on Slopes,
W75-09743 4C

SHIH, G. B.
Regional Analyses of Runoff Characteristics for Small Urban Watersheds,
W75-09621 2A

SHIREMAN, J. V.
Experimental Introduction of the Australian Crayfish (Cherax Tenuimanus) into Louisiana,
W75-09560 8I

SHIROKOVA, N. N.
The Effect of Basic Cuprous Carbonate on the State of the Liver in Juvenile Amur Autumn Chum (Oncorhynchus keta infrasp. autumnalis),
W75-09668 5C

SHUL'GINA, T. V.
Tangential Stress Distribution in Turbulent Boundary Layers at an Adverse Pressure Gradient,
W75-09738 8B

SHULTZ, C. D.
Pesticides in Fish from a Hawaiian Canal,
W75-09806 5A

SILVESTON, P. L.
Wet Air Oxidation of Chemical Sludges,
W75-09565 5D

SIMONS, D. B.
Man-Induced Changes of Middle Mississippi River,
W75-09754 4A

SIMPSON, J. D.
Financial Incentives and Pollution Control: A Case Study,
W75-09574 5G

SINGH, A.
For Rainfed Areas-Improved Velvet Beans for Increased Forage Production,
W75-09796 3F

SINGH, H. P.
Hungry Drylands of Western Rajasthan Need a New Technology,
W75-09789 3F

SINGH, N. T.
Drip Vs. Furrow Irrigation Trials in Potato Under Subtropical Conditions,
W75-09513 3F

SINGH, R. P.
Hungry Drylands of Western Rajasthan Need a New Technology,
W75-09789 3F

SINGH, V. P.
A Laboratory Investigation of Surface Runoff,
W75-09744 2E

SKINDE, R. T.
Operating Results of Electrodialysis and Reverse Osmosis Municipal Desalting Plants,
W75-09732 5D

SKOVGAARD, O.
Computation of Wave Heights Due to Refraction and Friction,
W75-09606 8B

SKRIBA, M. C.
Evaluation and Demonstration of the Capillary Suction Sludge Dewatering Device,
W75-09399 5D

SMAJSTRLA, A. G.
Simulation of Miscible Displacement in Soils Using the Method of Characteristics,
W75-09612 2G

SMITH, A. A.
Information Exchange on Water Resources Computer Programs,
W75-09591 7C

SMITH, C. E.
Acute Toxicity of Nitrite to Rainbow Trout (Salmo Gairdneri),
W75-09687 5C

SMITH, F.
Water Treatment Apparatus,
W75-09646 5D

SMITH, J. R.
Branding Chinook, Coho and Sockeye Salmon Fry with Hot and Cold Metal Tools,
W75-09561 7B

SMITH, R.
Control Schemes for the Activated-Sludge Process,
W75-09395 5D

SMITH, T. G.
Mercury in Seals, Terrestial Carnivores and Principal Food Items of the Inuit, from Holman, N.W.T.,
W75-09679 5A

Organochlorine Residue Levels in Arctic Ringed Seals: Variation with Age and Sex,
W75-09702 5C

SMYRNOW, W.
Anti Pollution Waterway Device and Process,
W75-09665 5G

SNOEYINK, V. L.
Synthetic Resins and Activated Carbon for Wastewater Treatment,
W75-09390 5D

SONNICHSEN, J. C. JR.
Makeup Requirements for Cooling Ponds,
W75-09760 5G

SOONS, A. H. A.
Artificial Islands and Installations in International Law,
W75-09834 6E

SOUDELIER, M. A.
Fluid Sampling Device,
W75-09422 7B

SOWER, G. D.
The Microwave Emission Spectum from Sparking Water Drops,
W75-09614 2B

SPENCER, W. F.
Soil Salinity Distribution in Drip and Subsurface Irrigated Summer Squash,
W75-09481 3C

SPETH, J. G.
Environmental Critique (The 1972 Federal Water Pollution Control Act: Problems and Prospects After One Year),
W75-09844 5G

STAHL, J. F.
Sludge Dewatering,
W75-09539 5D

STANCZUK, D. T.
A Study of the Surface Fluid Flow Characteristics of the New York Bight and the Development of Research Data Display Techniques,
W75-09783 5B

STEADMAN, J. R.
Pollution of Irrigation Waters by Plant Pathogenic Organisms,
W75-09521 5B

STEINNES, E.
Multielement Neutron Activation Analysis of Fresh Water Using Ge(Li) Gamma Spectrometry,
W75-09362 5A

STEPKO, W. E.
Phosphorus Removal Demonstration Studies at C.F.B. Trenton,
W75-09416 5D

STERN, G.
Pasteurization of Liquid Digested Sludge,
W75-09552 5D

STEVENS, M. A.
Man-Induced Changes of Middle Mississippi River,
W75-09754 4A

STEVENSON, D. S.
Edaphic Micro-Tubular Continuous Flow Irrigation in Canada,
W75-09436 2G

STONE, L. J.
Effect of Temperature on Accumulation of Methylmercuric Chloride and p,p' DDT by Rainbow Trout (Salmo Gairdneri),
W75-09681 5C

STREITER, S.
Financial Incentives and Pollution Control: A Case Study,
W75-09574 5G

STREUTKER, A.
Moisture Profiles and Salinization of Soils Under Drip Irrigation in the Republic of South Africa,
W75-09464 3C

STROEHLEIN, J. L.
For Improving Water Penetration into Some Arizona Soils-Sulfuric Acid,
W75-09623 3C

STROHMAN, R.
Irrigation for Benches,
W75-09446 3F

Irrigation for Container Growing,
W75-09447 3F

STROHMAN, R. A.
Monitoring Soil Salinity and Leaf Nutrient Levels in a Young Avocado Orchard Under Drip Irrigation,
W75-09482 3F

Water Use by Drip and Sprinkle Irrigated Avocados Related to Plant Cover, Evaporation and Air Temperature,
W75-09479 3F

SULLIVAN, C. Y.
Biophysical Control of Water Loss,
W75-09523 3F

SUMMERHAYES, C. P.
Quaternary Sedimentation on the Amazon Continental Margin: A Model,
W75-09600 2L

SWEENEY, J. C.
Environmental Protection by Coastal States: The Paradigm from Marine Transport of Petroleum,
W75-09848 5G

SYMONS, D. T. A.
Huronian Glaciation and Polar Wander from the Gowganda Formation, Ontario,
W75-09763 2C

SZABO, L.
A Survey of Experiences with Drainage Materials and a Review of Available Specifications,
W75-09632 8G

SZEKRENYI, B.
A Survey of Experiences with Drainage Materials and a Review of Available Specifications,
W75-09632 8G

TAHNOON, S.
Afforestation with Saline Water in Abu Dhabi,
W75-09483 3C

TAIT, R. S.
Edaphic Micro-Tubular Continuous Flow Irrigation in Canada,
W75-09436 2G

TALLEY, W. J. JR.
Wastewater Concentrator with Slotted Distributor,
W75-09649 5D

TAMADDONI-JAHROMI, S.
An Investigation on the Use of Drip Irrigation for the Establishment of Multi-Purpose Parks (Green Belts Around the Cities) in Iran,
W75-09503 3F

TANAKA, M.
Recent African Rainfall Patterns,
W75-09766 2B

TANG, T. L.
Operating Results of Electrodialysis and Reverse Osmosis Municipal Desalting Plants,
W75-09732 5D

TAYLOR, B. K.
Effects of Localized Phosphate Treatments and Solution pH on the Growth and Function of Apple Roots,
W75-09488 3C

TEMPLE, R. S.
The Sahelian Drought - A Disaster for Livestock Populations,
W75-09785 3F

THOMAS, D.
Geographic Variation of the Statistical Par[illegible] ters of Hydrometeorological Data of the U[illegible] States,
W75-09605

THOMAS, E. V.
Recent Developments in Sewage Treat[illegible] Based on Physico-Chemical Methods,
W75-09414

THOMAS, J. F.
Survey of Wastewater Discharge, Can[illegible] AFS, Alaska,
W75-09413

Survey of Wastewater Discharge--Elmen[illegible] AFB, Alaska,
W75-09398

THOMAS, M. E. R.
The Sahelian Drought - A Disaster [illegible] Livestock Populations,
W75-09785

THOMAS, M. P.
Map Showing Drainage Areas, Marlbor[illegible] Quadrangle, Connecticut,
W75-09704

Map Showing Drainage Areas, West S[illegible] field Quadrangle, Massachusetts-Connecti[illegible]
W75-09705

THOMAS, R. G.
Goundwater Models,
W75-09582

THOMPSON, T. L.
Biological Control of Sphaerotilus Natan[illegible] Related Species in Waste Waters,
W75-09520

THURSTON, R. V.
Acute Toxicity of Nitrite to Rainbow [illegible] (Salmo Gairdneri),
W75-09687

TILL, M. R.
Response of Mature Citrus Trees on [illegible] Sandy Soil to Drip Irrigation,
W75-09514

TODOROVIC, P.
A Stochastic Model of N-Day Precipitatio[illegible]
W75-09747

TOMLINSON, L. M.
Numerical Analysis of Confined-Uncon[illegible] Aquifers,
W75-09751

TORUM, A.
Wave Induced Pressures in Perm[illegible] Seabeds,
W75-09607

TOTH, J.
Process for the Reduction of the Bioche[illegible] Oxygen Demand of Sewage and fo[illegible] Recovery of the Inherent Protein,
W75-09566

TOUHEY, R. J.
An Evaluation of the Hagerstown, Mar[illegible] Water Pollution Control Plant,
W75-09396

TOWNSEND, R. D.
Rapid Temperature Reduction of Th[illegible] Discharge,
W75-09757

...SEND, S.
...an Disposal Experiences in Philadelphia,
...-09550 5E

...SLEY, P. M.
...erial for Biological Degradation of Petrole-
...-09652 5D

...ORD, B. D.
...oving the Design of Practical Field
...age,
...09595 4A

...y of Experiences with Drainage Materials
...Review of Available Specifications,
...09634 8G

...OR, V. L.
...ss for Separating Low API Gravity Oil
...Water,
...09664 5G

...J.
...f Centrifuges for Purification of Effluents
...enenie tsentrifug dlya ochistki stochnykh
...9358 5D

...PER, A. P.
...conomics of Sludge Irrigation,
...9545 5D

...AR, J. F.
...rence of Pesticide Residues in Four
...s Draining Land-Use Areas in Pennsyl-
...9720 5B

...A.
...mnetic Oxygenation Using Liquid Ox-
...9589 5G

..., D. P. H.
...g of Drip Systems from Metabolic
...ts of Iron and Sulfur Bacteria,
...456 5B

...C.
...al Properties of Wave Force,
...759 8B

...CZUK, J.
...al Aerated Filters,
...572 5D

...RT, N. S.
...lanation for the Growth Advantage of
...gation,
...65 3F

...esults of a Field Survey of Drip Irriga-
...tems in the Republic of South Africa,
...33 3F

...l.
...ion of Soil Strips Through the Drip Ir-
...System,
...44 5G

...tivation of the Area Wetted by Drip Ir-
...n the Arava Desert,
...35 3C

...M. S.
...nposite Roughness of Ice Covered
...8 2C

VAJDIC, A. H.
Alternative Methods of Disinfection: How Effective,
W75-09780 5D

VAN BENEDEN, G.
BOD as a Pollution Indicator (La DBO como indicador de la polucion),
W75-09368 5A

VAN BENEDEN, P.
BOD as a Pollution Indicator (La DBO como indicador de la polucion),
W75-09368 5A

VAN DER SCHALIE, W. H.
The Effects of Lapsed Time Since Feeding Upon the Toxicity of Zinc to Fish,
W75-09688 5C

VAN SOMEREN, C. L.
Drainage Materials - Provisional Report of the Experience Gained in the Netherlands,
W75-09633 8G

VAZIRI, C. M.
Hydraulics of Single-Chamber vs. Dual-Chamber Tubing,
W75-09470 8C

VELDMAN, G. H.
Drip Irrigation on Citrus,
W75-09432 3F

VERMILLION, C. H.
Weather Satellite Picture Receiving Stations, APT Digital Scan Converter,
W75-09588 7B

VILARS, J.
Paper Machine Circulation Systems -- Flows, Consistencies, Recovery, and Pollution (Les circuits de la machine a papier -- debits, concentrations, recuperations et pollutions),
W75-09357 3E

VIRK, P. S.
Drag Reduction by Collapsed and Extended Polyelectrolytes,
W75-09601 8B

VOLCANI, R.
High Milk Production Under Unfavourable Natural Conditions,
W75-09797 3F

VUGTS, H. F.
Interaction Between the Daily Heat Balance and the Tidal Cycle,
W75-09602 5B

WALES, R.
Determination of Chloride in Water with a HgS/Hg2Cl2 Electrode,
W75-09361 5A

WALKER, J. D.
Sewage Treatment with Primary Sludge Removal from Final Clarifier,
W75-09570 5D

WALKER, J. M.
Trench Incorporation of Sewage Sludge,
W75-09549 5E

WALL, D. J.
Packed-Bed Reactors for Secondary Effluent BOD and Ammonia Removal,
W75-09379 5D

WALLER, R.
Extended Aeration Wastewater Treatment,
W75-09776 5D

WALLER, R. M.
Great Lakes Basin Framework Study: Appendix 3--Geology and Ground Water,
W75-09714 2F

WALTON, W. C.
Minnesota's Water Resources: A Primer,
W75-09516 6B

WARD, P. S.
Interest in Oxygen Process Growing,
W75-09781 5D

WARNTZ, W.
Stream Ordering and Contour Mapping,
W75-09745 4A

WARRICK, A. W.
Linearized Moisture Flow Solutions for Point, Line, and Strip Sources,
W75-09459 2G

WEARE, B. C.
Recent African Rainfall Patterns,
W75-09766 2B

WEHLE, V.
Antimicrobial Agents for Water Conservation,
W75-09637 5F

WENTZ, D. A.
Effects of Metal-Mine Drainage on Water Quality in Selected Areas of Colorado, 1972-73,
W75-09712 5C

WESSELING, J.
Drainage Materials - Provisional Report of the Experience Gained in the Netherlands,
W75-09633 8G

WEST, A. W.
An Evaluation of the Hagerstown, Maryland Water Pollution Control Plant,
W75-09396 5D

Sewage Treatment Plant Dependability with Special Reference to the Activated Sludge Process,
W75-09393 5D

WEST, D. W.
Water Uptake by an Apple Tree with Various Proportions of the Root System Supplied with Water,
W75-09495 3F

WESTLAKE, G. F.
The Effects of Lapsed Time Since Feeding Upon the Toxicity of Zinc to Fish,
W75-09688 5C

WHITE, D. E.
Geochemistry Applied to the Discovery, Evaluation, and Exploitation of Geothermal Energy Resources,
W75-09724 2K

WHITE, R. A.
Development of Porous Polyvinyl Chloride Coated Tubulets for Seawater Desalination,
W75-09373 3A

WIERENGA, P. J.
Irrigation Return Flow as Influenced by Drip Irrigation,
W75-09485 5G

WIGAL, D. D.
A Survey of the Nesting Habitats of the White-Winged Dove in Arizona,
W75-09794 6G

WILKE, O. C.
Mobile Drip Irrigation Systems,
W75-09453 3F

WILKINS, J. R.
Domestic Wash Water Reclamation for Refuse as Commode Water Supply Using a Filtration-Reverse Osmosis Separation Technique,
W75-09403 5D

WILLARDSON, L. S.
Cantaloupe Response to Drip Irrigation,
W75-09505 3F

Control of Water by Drip Irrigation for Alfalfa Seed Production,
W75-09450 3F

Salinity Sensor Control of Drip Irrigation Water Application,
W75-09477 3C

See Germination Response to Subsurface Irrigation Depth,
W75-09451 2I

WILLENS, A. F.
An Investigation into the Potential Uses of Trickle Irrigation for Desert Reclamation and Fodder Production in the Emirate of Abu Dhabi,
W75-09487 4A

WILLENS, G. A.
An Investigation into the Potential Uses of Trickle Irrigation for Desert Reclamation and Fodder Production in the Emirate of Abu Dhabi,
W75-09487 4A

WILLFORD, W. A.
Effect of Temperature on Accumulation of Methylmercuric Chloride and p,p' DDT by Rainbow Trout (Salmo Gairdneri),
W75-09681 5C

WILLIAMS, D. C. JR.
A Case Study of Estuarine Pollution and Local Agency Interactions,
W75-09620 5G

WILLOUGHBY, P.
Changes in Root Patterns of Peach Trees Under Trickle Irrigation,
W75-09498 2I

WILLSON, G. B.
Composting Sewage Sludge,
W75-09546 5D

WINDHAGER, R. H.
Treatment and Safe Disposal of Cationic Coating Colors,
W75-09352 5D

WINER, A. A.
Recycling a Solid Waste from a Paper Plant -- Separation of Wood Fiber from Clay by Differential Flocculation,
W75-09354 5D

WITTMUSS, H. D.
Disposal of Cattle Feedlot Runoff on Agricultural Land,
W75-09517 5D

WITTRUP, N. R.
Method and Apparatus for Aeration of Biodegradable Waste Material,
W75-09647 5D

WOLFF, P.
Use of Drip Irrigation in Germany,
W75-09434 3F

WOODBRIDGE, C. G.
Effect of Root Temperature and Humidity on the Distribution of Ca in Apple and Sunflower Seedlings,
W75-09351 2I

WOODBRIDGE, D. D.
Reduction in Surfactants by Irradiation,
W75-09418 5D

WOODDELL, J. H.
Floating Solids Return Device,
W75-09657 5D

WOOLHISER, D. A.
A Stochastic Model of N-Day Precipitation,
W75-09747 2B

WRIGHT, D. A.
The Accumulation of Fluoride by Marine and Intertidal Animals,
W75-09697 5C

WU, I. P.
Design Charts for Drip Irrigation Systems,
W75-09472 8C

WURSTER, C. F.
Effects of PCB on Interspecific Competition in Natural and Gnotobiotic Phytoplankton Communities in Continuous and Batch Cultures,
W75-09680 5C

WYBORN, C. H. E.
The Effects of Oils on Growth of Freshwater Phytoplankton,
W75-09678 5C

YAGEV, E.
Drip Irrigation in Citrus Orchards,
W75-09502 3F

YAMADA, K.
Special Power Generating Unit Using Cpmpressed Air Produced by Ocean Wave Together with Super-Heated Steam,
W75-09638 8C

YANG, J. T.
Extended Aeration Wastewater Treatment,
W75-09776 5D

YAUGER, W. L. JR
Pesticides in Fish from a Hawaiian Canal,
W75-09806 5A

YOUNG, J. C.
Packed-Bed Reactors for Secondary Effluent BOD and Ammonia Removal,
W75-09379 5D

YOUNG, K. C.
The Evolution of Drop Spectra Due to Condensation, Coalescence and Breakup,
W75-09597 2B

YOUNG, K. W.
High Purity Oxygen Aerobic Digestion Experiences at Speedway, Indiana,
W75-09538 5D

YOUSEF, M. K.
Tritiated Water Turnover Rate in Rodents: Desert and Mountain,
W75-09801 2I

ZAGYVAI, I.
Process for the Reduction of the Biochem
Oxygen Demand of Sewage and for
Recovery of the Inherent Protein,
W75-09566

ZANKER, K.
Hydraulic and Mechanical Properties of D
pers,
W75-09473

ZENTMYER, G. A.
The Relation Between Drip Irrigati
Phytophthora Root Rot of Avocado, and Fu
cides,
W75-09512

ZHIRNOVA, A. A.
The Effect of Basic Cuprous Carbonate on
State of the Liver in Juvenile Amur Autu
Chum (Oncorhynchus keta infrasp. aut
nalis),
W75-09668

ZIMMERMAN, J. T. F.
Interaction Between the Daily Heat Bala
and the Tidal Cycle,
W75-09602

ZUCKERMAN, M.
Wastewater Treatment Sequence,
W75-09569

ZUZEL, J. F.
Optimizing Long-Term Streamflow Forecast
W75-09594

# ORGANIZATIONAL INDEX


RICULTURAL PLANNING ASSOCIATES
., LONDON (ENGLAND).
n Investigation into the Potential Uses of rickle Irrigation for Desert Reclamation and odder Production in the Emirate of Abu habi,
75-09487 4A

RICULTURAL RESEARCH AND
CATION CENTER, LAKE ALFRED, FLA.
ogging of Drip Systems from Metabolic oducts of Iron and Sulfur Bacteria,
75-09456 5B

ICULTURAL RESEARCH AND
CATIONAL CENTER, BRADENTON, FLA.
Constant Micro Source of Moisture as a mponent in a Gradient System for a High vel Production,
75-09443 3F

ICULTURAL RESEARCH SERVICE,
TSVILLE, MD. BIOLOGICAL WASTE
AGEMENT LAB.
mposting Sewage Sludge,
5-09546 5D

nch Incorporation of Sewage Sludge,
5-09549 5E

CULTURAL RESEARCH SERVICE,
E, IDAHO. NORTHWEST WATERSHED
ARCH CENTER.
imizing Long-Term Streamflow Forecasts,
5-09594 4A

CULTURAL RESEARCH SERVICE,
LEY, CALIF.
trol of Water by Drip Irrigation for Alfalfa d Production,
5-09450 3F

Germination Response to Subsurface Irtion Depth,
-09451 2I

nity Sensor Control of Drip Irrigation er Application,
-09477 3C

aloupe Response to Drip Irrigation,
-09505 3F

CULTURAL RESEARCH SERVICE,
ENCE, S.C. COASTAL PLAINS SOIL AND
R CONSERVATION RESEARCH
ER.
-Frequency Porous Tube Irrigation for r-Nutrient Management in Humid Re-,
09449 3F

ULTURAL RESEARCH SERVICE,
ETTE, IND.
boratory Rainfall Simulator for Infiltration oil Detachment Studies,
09746 2G

ULTURAL RESEARCH SERVICE,
IX, ARIZ. WATER CONSERVATION

le Irrigation Management for Cotton and ge,
09480 3F

e Irrigation Management for Grapes,
09510 3F

**AGRICULTURAL RESEARCH SERVICE, RIVERSIDE, CALIF.**
Drip Irrigation: Surface and Subsurface Compared with Sprinkler and Furrow,
W75-09440 3F

Dripper Flow Consistency,
W75-09468 3F

Soil Salinity Distribution in Drip and Subsurface Irrigated Summer Squash,
W75-09481 3C

Salinity Management for High Frequency Irrigation,
W75-09484 3C

**AGRICULTURAL RESEARCH SERVICE, RIVERSIDE, CALIF. SALINITY LAB.**
Traveling Trickle System,
W75-09452 3F

Reverse Flushing Technique for Bi-Wall Drip Tubing,
W75-09455 8C

Movement of Water and Salts Under High Frequency Irrigation,
W75-09458 3F

**AGRIPLAS LIMITED (SOUTH AFRICA).**
Fertilizer Applications with Drip Irrigation,
W75-09491 3F

**AIR WEATHER SERVICE, SCOTT AFB, ILL.**
Defense Meteorological Satellite Program (DMSP) User's Guide,
W75-09770 7B

**AKADEMIYA NAUK SSR, MOSCOW. INST. OF EVOLUTIONARY MORPHOLOGY AND ANIMAL ECOLOGY.**
The Effect of Different Oxygen Conditions During Incubation on the Survival and Some of the Developmental Characteristics of the 'Verkhova' (Leucaspius Delineatus) in the Embryonic Period,
W75-09670 5C

**ALBERTA RESEARCH, EDMONTON.**
Hydrogeology of the Waterways-Winefred Lake Area, Alberta,
W75-09769 2F

**ALBERTA UNIV., EDMONTON. DEPT. OF GEOGRAPHY.**
Averaging Errors in Monthly Evaporation Estimates,
W75-09590 2D

Sediment Yields from Intermediate-Sized Stream Basins in Southern Alberta,
W75-09750 2J

**ALBERTA UNIV., EDMONTON. DEPT. OF ZOOLOGY.**
Effect of DDT on Discriminating Ability of Rainbow Trout (Salmo Gairdneri),
W75-09674 5C

**ALLEGHENY COUNTY DEPT. OF PUBLIC WORKS, PA.**
Sludge Management in Allegheny County,
W75-09548 5E

**ALLEGHENY COUNTY SANITARY AUTHORITY, PITTSBURGH, PA.**
Sludge Disposal by Incineration at Alcosan,
W75-09551 5E

**AMERICAN SOCIETY OF CIVIL ENGINEERS, WASHINGTON, D.C. WATER POLLUTION TASK FORCE.**
Implementation of Water Supply and Wastewater Programs in the Washington, D.C. Metropolitan Area.
W75-09392 5D

**ARIZONA GAME AND FISH DEPT., PHOENIX. RESEARCH DIV.**
Forage Preferences of Trained Mule Deer on the Beaver Creek Watersheds,
W75-09793 3F

A Survey of the Nesting Habitats of the White-Winged Dove in Arizona,
W75-09794 6G

**ARIZONA STATE FUEL AND ENERGY OFFICE, PHOENIX.**
Arizona and Tomorrow's Solar Powerplants,
W75-09804 3A

**ARIZONA STATE OFFICE OF ECONOMIC PLANNING AND DEVELOPMENT, PHOENIX. PLANNING DIV.**
Arizona's Remote Subdivisions: An Inventory,
W75-09583 6G

State of Arizona, Environmental Services Needs Study for Greenlee County, 1970-1990.
W75-09584 5D

**ARIZONA UNIV., TUCSON.**
Linearized Moisture Flow Solutions for Point, Line, and Strip Sources,
W75-09459 2G

**ARIZONA UNIV., TUCSON. DEPT. OF SOILS, WATER AND ENGINEERING.**
For Improving Water Penetration into Some Arizona Soils-Sulfuric Acid,
W75-09623 3C

**ARIZONA UNIV., TUCSON. INST. OF ATMOSPHERIC PHYSICS.**
The Evolution of Drop Spectra Due to Condensation, Coalescence and Breakup,
W75-09597 2B

**ARIZONA UNIV., TUCSON. OFFICE OF ARID LANDS STUDIES.**
Drought in the Ghana Savannah: A Report to the U.S. Aid Mission to Ghana,
W75-09795 6G

**ARIZONA UNIV., YUMA.**
Comparison of Irrigation Methods, Rootstocks, and Fertilizer Elements of Valencia Orange Trees,
W75-09439 3F

Soil Moisture Distribution and Wetting Pattern From a Point Source,
W75-09462 2G

**ARMY ENGINEER DISTRICT, FORT WORTH, TEX.**
Detailed Project Report for Local Flood Protection, Zacate Creek, Laredo, Texas (Final Environmental Impact Statement).
W75-09813 4A

**ARMY ENGINEER DISTRICT, LITTLE ROCK, ARK.**
Table Rock Lake, White River, Missouri (Final Environmental Impact Statement).
W75-09818 8C

ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
Crude Oil and Natural Gas Production and Other Mining Operations in Navigable Waters Along the Louisiana Coast (Final Environmental Impact Statement).
W75-09823 5G

ARMY ENGINEER DISTRICT, SEATTLE, WASH.
Ediz Hook Beach Erosion Control, Port Angeles, Washington (Final Environmental Impact Statement).
W75-09815 8A

ARMY ENGINEER DISTRICT, VICKSBURG, MISS.
Bushley Bayou, Louisana (Final Environmental Impact Statement).
W75-09819 8D

BAKER (MICHAEL), JR., INC., BEAVER, PA.
Removal of Wastewater Organics by Reverse Osmosis,
W75-09417 5D

BALL STATE UNIV., MUNCIE, IND. DEPT. OF NATURAL RESOURCES.
Urban Lawn Infiltration Rates and Fertilizer Runoff Losses Under Simulated Rainfall,
W75-09592 5B

BARBER-COLMAN CO., IRVINE, CALIF. RESOURCE RECOVERY SYSTEMS DIV.
Sludge Disposal at a Profit,
W75-09557 5D

BASELINE, INC., PENSACOLA, FLA.
Agricultural Utilization of Digested Sludges from the City of Pensacola,
W75-09554 5E

BATTELLE-PACIFIC NORTHWEST LABS., RICHLAND, WASH.
Evaluation of Municipal Sewage Treatment Alternatives.
W75-09404 5D

BEDFORD INST., DARTMOUTH (NOVA SCOTIA).
DDT Residues in Euphausiids in the Upper Estuary of the Gulf of St. Lawrence,
W75-09690 5C

Organochlorine Residue Levels in Arctic Ringed Seals: Variation with Age and Sex,
W75-09702 5C

BIRMINGHAM UNIV. (ENGLAND). DEPT. OF CIVIL ENGINEERING.
Numerical Analysis of Confined-Unconfined Aquifers,
W75-09751 2F

BRIGHAM YOUNG UNIV., PROVO, UTAH.
Water Quality Effect of Diking a Shallow Arid-Region Lake,
W75-09577 5B

BRITISH COLUMBIA DEPT. OF RECREATION AND CONSERVATION, VICTORIA. FISH AND WILDLIFE BRANCH.
Behavior of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Sumithion (Fenitrothion), An Organophosphate Insecticide,
W75-09700 5C

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF ECONOMICS.
Marine Oil Spills: A Problem in Environmental Management,
W75-09849 5G

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF MINERAL ENGINEERING.
Recycling a Solid Waste from a Paper Plant -- Separation of Wood Fiber from Clay by Differential Flocculation,
W75-09354 5D

BRITISH METEOROLOGICAL OFFICE, BRACKNESS (ENGLAND).
Wind and Wave Relationships in U.K. Coastal Waters,
W75-09737 2L

BUREAU OF LAND MANAGEMENT, WASHINGTON, D.C.
Proposed 1973 Outer Continental Shelf Oil and Gas General Lease-Sale, Offshore Mississippi, Alabama, and Florida, Volume 2, Potential Environmental Impacts, Etc. (Environmental Impact Statement).
W75-09820 5G

BUREAU OF RECLAMATION, WASHINGTON, D.C.
Initial Stage, Oahe Unit, Pick-Sloan Missouri Basin Program, South Dakota (Final Environmental Impact Statement).
W75-09812 8A

BUTLER UNIV., INDIANAPOLIS, IND. HOLCOMB RESEARCH INST.
An Evaluation of Water Reuse for Municipal Supply,
W75-09408 5D

CALGON CORP., PITTSBURGH, PA.
Activated Carbon Used to Control Odors,
W75-09777 5D

CALIFORNIA INST. OF TECH., PASADENA. DIV. OF GEOLOGICAL AND PLANETARY SCIENCES.
Channel Responses to Artificial Stream Capture, Death Valley, California,
W75-09610 2J

CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO.
Evaporation from Water Surfaces in California,
W75-09586 2D

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD, SACRAMENTO. DIV. OF PLANNING AND RESEARCH.
Research Needs for Water Resources Control in California.
W75-09587 5G

CALIFORNIA UNIV., BERKELEY. DEPT. OF SOILS AND PLANT NUTRITION.
Forest Fire: Effect on Phosphorus Movement to Lakes,
W75-09364 5B

CALIFORNIA UNIV., DAVIS.
Use of Glycerophosphate for Fertilization Through Trickle Irrigation Systems,
W75-09492 5B

CALIFORNIA UNIV., DAVIS. DEPT. OF CIVIL ENGINEERING.
Pore and Eroding Fluid Influences on Surface Erosion of Soil,
W75-09741 2J

CALIFORNIA UNIV., DAVIS. DIV. OF ENVIRONMENTAL STUDIES.
Effects of Kokanee Salmon (Oncorhynchus Nerka) Decomposition on the Ecology of a Subalpine Stream,
W75-09672 5C

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF METEOROLOGY.
A Wind Tunnel Investigation on Ice Multiplication by Freezing of Waterdrops Falling at Terminal Velocity in Air,
W75-09613

CALIFORNIA UNIV., PARLIER. SAN JOAQUIN VALLEY AGRICULTURAL RESEARCH AND EXTENSION CENTER.
Water Use with Drip Irrigation,
W75-09478

Performance of Plants with Drip Irrigation,
W75-09509

CALIFORNIA UNIV., RIVERSIDE.
Irrigation for Benches,
W75-09446

Irrigation for Container Growing,
W75-09447

Water Use by Drip and Sprinkle Irrigated Avocados Related to Plant Cover, Evaporation and Air Temperature,
W75-09479

Monitoring Soil Salinity and Leaf Nutrient Levels in a Young Avocado Orchard Under Drip Irrigation,
W75-09482

The Relation Between Drip Irrigation, Phytophthora Root Rot of Avocado, and Fungicides,
W75-09512

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL SCIENCE AND AGRICULTURAL ENGINEERING.
Proceedings of the Second International Drip Irrigation Congress.
W75-09423

CALIFORNIA UNIV., SAN DIEGO, LA JOLLA.
Drip Irrigation-Worldwide,
W75-09424

Drip Irrigation Experiment on Avocados,
W75-09499

Staked Tomato Drip Irrigation in California,
W75-09506

Spring Cucumber Drip vs. Furrow Irrigation,
W75-09507

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
Determination of Chloride in Water with a HgS/Hg2Cl2 Electrode,
W75-09361 5A

CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT, WEST PALM BEACH.
Geographic Variation of the Statistical Parameters of Hydrometeorological Data of the United States,
W75-09605 2B

CENTRAL ARID ZONE RESEARCH INST. JODHPUR (INDIA). DRY FARMING RESEARCH MAIN CENTRE.
Hungry Drylands of Western Rajasthan Need a New Technology,
W75-09789 3F

CENTRAL PUBLIC HEALTH ENGINEERING RESEARCH INST., NAGPUR (INDIA).
Sewage Utilization in Agriculture,
W75-09788 5D

NTRAL SOIL SALINITY RESEARCH INST., RNAL (INDIA).
lix Gypsum in Shallow Depths--In Saline oils,
75-09786 3C

ypsum Can Improve Your Water Also,
75-09787 5G

ow-Associated Precipitation Reactions in line-Sodic Soils and Their Significance,
75-09792 2G

Salt-Affected Soils Mulching Aids in Crop owth,
75-09798 3C

TRE NATIONAL D'ETUDES TECHNIQUES E RECHERCHES TECHNOLOGIQUES R L'AGRICULTURE, LES FORETS ET UIPMENT RURAL, ANTONY (FRANCE).
dy of Experiences with Drainage Materials d a Review of Specifications Available in nce,
5-09630 8G

INNATI, OHIO NATIONAL RONMENTAL RESEARCH CENTER.
teurization of Liquid Digested Sludge,
5-09552 5D

ST GUARD DISTRICT (8TH), NEW EANS, LA.
posed Maintenance Dredging of the Chan- from U.S. Coast Guard Santa Rosa Station prings to Navigable Watershed in Pensacola (Final Environmental Impact Statement).
5-09824 8A

T GUARD, WASHINGTON, D.C.
t Canada-United States Marine Pollution tingency Plan for Spills of Oil and Other tious Substances.
5-09835 5G

RADO STATE UNIV., FORT COLLINS.
ct of Harvesting Methods on Production of terling Fathead Minnows,
-09415 8I

-Induced Changes of Middle Mississippi r,
-09754 4A

MITTEE ON INTERIOR AND INSULAR RS (U.S. SENATE).
ence of the Energy Crisis Upon the Future nvironmental Policy,
-09847 6E

ECTICUT UNIV., STORRS. DEPT. OF ENGINEERING.
overed Domestic Lagoon System for Natu- round Water Recharge Near Metropolitan s,
09524 5D

OF ENGINEERS, HONOLULU, II. PACIFIC OCEAN DIV.
ention and Mitigation of Shore Damages, lui Harbor, Maui, Hawaii (Final Environ- al Impact Statement).
09825 8A

OF ENGINEERS, WALTHAM, MASS. NGLAND DIV.
enance of the Federal Navigation Project arboro River at Scarboro, Maine (Final onmental Impact Statement).
09811 8A

Charles River Dam, Boston, Mass (Final Environmental Impact Statement).
W75-09816 8D

Proposed Navigational Maintenance Dredging Project at Guilford Harbor, Guilford, Connecticut (Final Environmental Impact Statement).
W75-09821 8A

CURRAN ASSOCIATES, INC., NORTHAMPTON, MASS.
Economic Analysis of the Processing and Disposal of Refuse Sludges,
W75-09406 5D

Wet Systems for Residential Refuse Collection: A Case Study for Springfield, Massachusetts,
W75-09407 5D

Modifications to the Executive Computer Program for Steady-State Simulation of Wastewater Treatment Facilities,
W75-09775 5D

CURRAN ASSOCIATES, INC., NORTHHAMPTON, MASS.
A Preliminary Assessment of Wet Systems for Residential Refuse Collection,
W75-09405 5D

DAMES AND MOORE, WASHINGTON, D.C.
Heat Transfer in Soil-Water-Ice Systems,
W75-09742 2C

DANISH HYDRAULIC INST., COPENHAGEN. COMPUTATIONAL HYDRAULICS CENTER.
Information Exchange on Water Resources Computer Programs,
W75-09591 7C

DEBELL AND RICHARDSON, INC., ENFIELD, CONN.
Development of Porous Polyvinyl Chloride Coated Tubulets for Seawater Desalination,
W75-09373 3A

DELAWARE UNIV., LEWES. COLL. OF MARINE STUDIES.
Diversity of Marine Invertebrates in a Thermal Effluent,
W75-09809 5C

DELAWARE UNIV., NEWARK. CENTER FOR THE STUDY OF MARINE POLICY.
Contemporary Research in Marine Affairs,
W75-09837 6B

DELAWARE UNIV., NEWARK. DEPT. OF CHEMICAL ENGINEERING.
Catalytic Oxidation of Phenol in Aqueous Solution Over Copper Oxide,
W75-09772 5D

DELAWARE UNIV., NEWARK. DEPT. OF CIVIL ENGINEERING.
Thickening of Sludges,
W75-09535 5D

Attitudes in Sludge Treatment and Disposal,
W75-09731 5D

DEPARTMENT OF AGRICULTURE, SUMMERLAND (BRITISH COLUMBIA).
Edaphic Micro-Tubular Continuous Flow Irrigation in Canada,
W75-09436 2G

DEPARTMENT OF THE NAVY, WASHINGTON, D.C. (ASSIGNEE)
Desalination Process,
W75-09654 3A

DISTRICT OF COLUMBIA DEPT. OF ENVIRONMENTAL SERVICES, WASHINGTON.
Sludge Handling and Disposal at Blue Plains,
W75-09553 5D

DORR-OLIVER, INC., STAMFORD, CONN.
Heat Treatment and Incineration,
W75-09541 5D

DOSHISHA UNIV., KYOTO (JAPAN). BIOLOGICAL LAB.
Pond Snail Eggs as an Indicatory Material for Water Pollution Bioassay: Preliminary Experiments, (In Japanese),
W75-09682 5C

DUNN (JOHN) AGENCIES LTD., VANCOUVER (BRITISH COLUMBIA). (ASSIGNEE)
Material for Biological Degradation of Petroleum,
W75-09652 5D

EARTH SATELLITE CORP., WASHINGTON, D.C.
A Study of the Surface Fluid Flow Characteristics of the New York Bight and the Development of Research Data Display Techniques,
W75-09783 5B

ECOLE POLYTECHNIQUE, MONTREAL (QUEBEC).
A Stochastic Model of N-Day Precipitation,
W75-09747 2B

ENVIRONMENTAL HEALTH LAB., KELLY AFB, TEX.
Wastewater Survey, Chanute AFB, Illinois.
W75-09397 5D

Survey of Wastewater Discharge--Elmendorf AFB, Alaska,
W75-09398 5B

Survey of Wastewater Discharge, Campion AFS, Alaska,
W75-09413 5D

ENVIRONMENTAL HEALTH LAB., MCCLELLAN AFB, CALIF.
Comprehensive Survey of Magpie Creek, McClellan Air Force Base, California,
W75-09410 5D

Wastewater Treatment Facility Evaluation, Malmstrom AFB MT,
W75-09411 5E

ENVIRONMENTAL IMPACT CENTER, INC., NEWTON, MASS.
Secondary Impacts of Transportation and Wastewater Investments: Review and Bibliography,
W75-09576 5C

ENVIRONMENTAL PROTECTION AGENCY, EDISON, NEW JERSEY, STORM AND COMBINED SEWER SECTION.
Countermeasures for Pollution from Overflows; the State of the Art,
W75-09580 5D

ENVIRONMENTAL PROTECTION AGENCY, NEW YORK. REGION II.
Wastewater Treatment Facilities Construction Grants for the Lower Raritan River Basin and for the South Shore of Raritan Bay (Final Environmental Impact Statement).
W75-09817 5D

**ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.**
Water Strategy--Statement of Policy for Implementing Certain Requirements of the 1972 Federal Water Pollution Control Act Amendments.
W75-09841 5G

**ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. INDUSTRIAL POLLUTION CONTROL DIV.**
Projects in the Industrial Pollution Control Division - December 1974.
W75-09578 5D

**ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF WATER PROGRAM OPERATIONS.**
Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability, Supplement to Federal Guidelines for Design, Operation, and Maintenance of Waste Water Treatment Facilities.
W75-09559 8C

**ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. TECHNOLOGY TRANSFER STAFF.**
Flow Equalization.
W75-09381 5D

Nitrification and Denitrification Facilities, Wastewater Treatment.
W75-09382 5D

Wastewater Filtration, Design Considerations.
W75-09383 5D

Physical-Chemical Nitrogen Removal, Wastewater Treatment.
W75-09384 5D

Physical-Chemical Wastewater Treatment Plant Design.
W75-09385 5D

Upgrading Lagoons.
W75-09386 5D

Oxygen Activated Sludge Wastewater Treatment Systems, Design Criteria and Operating Experience.
W75-09387 5D

**ENVIRONMENTAL PROTECTION SERVICE, OTTAWA (ONTARIO).**
Phosphorus Removal Demonstration Studies at C.F.B. Trenton,
W75-09416 5D

**ENVIRONMENTAL QUALITY SYSTEMS, INC., ROCKVILLE, MD.**
Alternative Methods for Sludge Management,
W75-09534 5D

**ETUDES ET PROCEDES D'ASSAINISSEMENT PURATOR (FRANCE). (ASSIGNEE)**
Process for Treating Waste Water,
W75-09656 5D

**EXXON PRODUCTION RESEARCH CO., HOUSTON, TEX. (ASSIGNEE)**
Arctic Barrier Formation,
W75-09644 8A

**FISHERIES AND MARINE SERVICE, STE. ANNE DE BELLEVUE (QUEBEC). ARCTIC BIOLOGICAL STATION.**
Mercury in Seals, Terrestial Carnivores and Principal Food Items of the Inuit, from Holman, N.W.T.,
W75-09679 5A

**FISHERIES AND MARINE SERVICE, VANCOUVER (BRITISH COLUMBIA). VANCOUVER LAB.**
Effects of Thiourea Treatment on Sexually Maturing and Gonadectomized Male Sockeye Salmon (Oncorhynchus Nerka),
W75-09699 5C

**FISHERIES AND MARINE SERVICE, WEST VANCOUVER (BRITISH COLUMBIA). PACIFIC ENVIRONMENT INST.**
Use of Sodium Pentachlorophenate and Dehydroabietic Acid as Reference Toxicants for Salmonid Bioassays,
W75-09683 5C

**FISHERIES RESEARCH BOARD OF CANADA, HALIFAX (NOVA SCOTIA). HALIFAX LAB.**
Differentiation Between Natural Hydrocarbons and Low Level Diesel Oil Contamination in Cooked Lobster Meat,
W75-09698 5A

**FISHERIES RESEARCH BOARD OF CANADA, WINNIPEG (MANITOBA). FRESHWATER INST.**
Avoidance of Fenitrothion by Goldfish (Carassius Auratus),
W75-09677 5C

Selenium Determination on Fish Tissue,
W75-09696 5A

**FLORIDA INST. OF TECH., MELBOURNE. UNIV. CENTER FOR POLLUTION RESEARCH.**
Reduction in Surfactants by Irradiation,
W75-09418 5D

**FLORIDA STATE UNIV., TALLAHASSEE. DEPT. OF OCEANOGRAPHY.**
Adenosine Triphosphate Measurements in Soil and Marine Sediments,
W75-09764 5A

**FLORIDA UNIV., GAINESVILLE.**
Drip Irrigation Design Criteria for Tree Crops in Florida and Other Humid Regions,
W75-09427 3F

**FLORIDA UNIV., GAINESVILLE. DEPT. OF ENVIRONMENTAL ENGINEERING SCIENCES.**
Storm Water Management Model: User's Manual, Version II,
W75-09579 5D

Effect of Power Plant Chlorination on Estuarine Productivity,
W75-09684 5C

**FOOD AND AGRICULTURAL ORGANIZATION OF THE UNITED NATIONS, ROME (ITALY). ANIMAL PRODUCTION AND HEALTH DIV.**
The Sahelian Drought - A Disaster for Livestock Populations,
W75-09785 3F

**FOOD AND AGRICULTURAL ORGANIZATION OF THE UNITED NATIONS, ROME (ITALY). COMMITTEE ON AGRICULTURE.**
India Case Study on Improving Productivity in Low Rainfall Areas.
W75-09803 3F

**FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, ROME (ITALY). DOCUMENTATION CENTER.**
Index 1945-1966, Land and Water.
W75-09635 10C

Water for Agriculture, Annotated Bibliography, Author and Subject Index.
W75-09636 10C

**FOOD AND AGRICULTURE ORGANIZAT OF THE UNITED NATIONS, ROME (ITAL LAND AND WATER DEVELOPMENT DIV.**
Water Laws in Moslem Countries,
W75-09625

**FOOD AND AGRICULTURE ORGANIZAT OF THE UNITED NATIONS, ROME (ITAL WORKING PARTY ON WATER RESOURC AND IRRIGATION.**
Drainage Materials.
W75-09628

**FORDHAM UNIV., BRONX, N.Y. SCHOOL LAW.**
Environmental Protection by Coastal S
The Paradigm from Marine Transpo Petroleum,
W75-09848

**FOREST SERVICE (USDA), MOSCOW, ID INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION.**
Drought Crack on Western White Pi Northern Idaho,
W75-09388

**GEOLOGICAL SURVEY, ALBANY, N.Y.**
Great Lakes Basin Framework Study: A dix 3--Geology and Ground Water,
W75-09714

**GEOLOGICAL SURVEY, ANCHORAGE, ALASKA.**
Water-Resources Data for Skagway, Alask
W75-09729

**GEOLOGICAL SURVEY, BISMARCK, N.D.**
Water-Resources Investigations in the Union Coal Region, North Dakota, 1974-7
W75-09715

**GEOLOGICAL SURVEY, BOSTON, MASS.**
Map Showing Drainage Areas, West Sp field Quadrangle, Massachusetts-Connecti
W75-09705

Map Showing Drainage Areas, Lu Quadrangle, Massachusetts,
W75-09707

Map Showing Drainage Areas, Mount Quadrangle, Massachusetts,
W75-09708

**GEOLOGICAL SURVEY, CHEYENNE, WY**
Hydrologic Analysis of the Valley-Fill Aqu North Platte River Valley, Goshen Cou Wyoming,
W75-09722

**GEOLOGICAL SURVEY, CORPUS CHRIST TEX.**
Deposition of Zinc and Cadmium by Ma Bacteria in Estuarine Sediments,
W75-09692

**GEOLOGICAL SURVEY, DENVER, COLO.**
Water analysis,
W75-09372

Effects of Metal-Mine Drainage on W Quality in Selected Areas of Colorado, 1972
W75-09712

**GEOLOGICAL SURVEY, GRAND FORKS, N DAK.**
Geology of Griggs and Steele Counties,
W75-09725

EOLOGICAL SURVEY, HARRISBURG, PA.
Temperatures of Streams and Selected Reservoirs in Pennsylvania,
W75-09713 7C

Occurrence of Pesticide Residues in Four Streams Draining Land-Use Areas in Pennsylvania,
W75-09720 5B

OLOGICAL SURVEY, HARTFORD, CONN.
Map Showing Drainage Areas, Marlborough Quadrangle, Connecticut,
V75-09704 7C

Contour Map of the Bedrock Surface, Collinsville Quadrangle, Connecticut,
775-09706 7C

OLOGICAL SURVEY, HOUSTON, TEX.
round-Water Data for Orange County and icinity, Texas and Louisiana, 1971-74,
775-09727 7C

OLOGICAL SURVEY, JACKSON, MISS.
ormation Factors and Their Use in Estimating ater Quality in Mississippi Aquifers,
75-09703 7C

OLOGICAL SURVEY, LAWRENCE, KANS.
anges in Chemical Quality of Water, Cedar uff Irrigation District Area, West-Central ansas,
75-09719 5B

OLOGICAL SURVEY, LINCOLN, NEBR.
oundwater Levels in Nebraska, 1974,
75-09710 4B

LOGICAL SURVEY, MENLO PARK, IF.
ochemistry Applied to the Discovery, aluation, and Exploitation of Geothermal ergy Resources,
5-09724 2K

ta from a 1,000-Foot (305-Metre) Core Hole the Long Valley Caldera, Mono County, ifornia,
5-09728 7C

LOGICAL SURVEY OF ALABAMA, ERSITY. ENVIRONMENTAL DIV.
vironmental Geology of an Area in Westtral Alabama,
5-09615 7C

LOGICAL SURVEY, PROVIDENCE, R.I.
ilability of Ground Water in the Branch er Basin, Providence County, Rhode Island,
5-09721 2F

OGICAL SURVEY, RALEIGH, N.C.
ic Water Supplies of North Carolina: Part ountains and Western Piedmont,
-09711 5F

OGICAL SURVEY, RESTON, VA.
amics of Turbidity Plumes in Lake Ontario,
-09709 2J

ogic and Hydrologic Features of Indian s Valley, California,
09717 2F

Implementation of a Hydrologic Data essing System in Brazil,
09726 7C

GEOLOGICAL SURVEY, SALT LAKE CITY, UTAH.
Bibliography of U.S. Geological Survey Water-Resources Reports for Utah,
W75-09718 2A

GEOLOGICAL SURVEY, SALT LAKE CITY, UTAH. WATER RESOURCES DIV.
Automation in a Water Quality Laboratory Scheme,
W75-09723 5A

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.
Summary of Hydrologic Conditions in Collier County, Florida, 1973,
W75-09716 4B

GEORGIA INST. OF TECH., ATLANTA. SCHOOL OF INDUSTRIAL AND SYSTEMS ENGINEERING.
Integrative Procedures for Coordinated Urban Land and Water Management: A Systems Analysis,
W75-09622 6A

GREEN (HOWARD R.) CO., CEDAR RAPIDS, IOWA.
Pressure Filtration--Municipal Wastewater Solids, Cedar Rapids, Iowa,
W75-09540 5D

HANFORD ENGINEERING DEVELOPMENT LAB., RICHLAND, WASH.
Makeup Requirements for Cooling Ponds,
W75-09760 5G

HAWAII UNIV., HONOLULU.
Design Charts for Drip Irrigation Systems,
W75-09472 8C

HAWAII UNIV., HONOLULU. DEPT. OF AGRICULTURAL BIOCHEMISTRY.
Pesticides in Fish from a Hawaiian Canal,
W75-09806 5A

HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER.
Dynamic Programming Optimization: A Water Distribution System Design,
W75-09525 7C

Methodological Approaches in Hawaiian Fog Research,
W75-09526 2B

HAWAIIAN AGRONOMICS, INC., HONOLULU.
Hydraulics of Single-Chamber vs. Dual-Chamber Tubing,
W75-09470 8C

HAWAIIAN SUGAR PLANTERS ASSOCIATION EXPERIMENT STATION, HONOLULU.
Chemical Treatment of Drip Irrigation Water,
W75-09457 3F

Investigations in Sugarcane Fertilization by Drip Irrigation in Hawaii,
W75-09490 3F

HEBREW UNIV., JERUSALEM (ISRAEL).
Aspects of Trace Metal Contamination in the Coastal Rivers of Israel,
W75-09689 5B

High Milk Production Under Unfavourable Natural Conditions,
W75-09797 3F

HEBREW UNIV., REHOVOTH (ISRAEL).
The Progress and Problems of Drip Irrigation in Israel,
W75-09425 3F

Soil Moisture Distribution and Depletion in an Apple Orchard Irrigated by Tricklers,
W75-09463 2G

HEBREW UNIV., REHOVTH (ISRAEL).
Disinfection of Soil Strips Through the Drip Irrigation System,
W75-09444 5G

Strip Cultivation of the Area Wetted by Drip Irrigation in the Arava Desert,
W75-09445 3C

HENKEL AND CIE GMBH, DUESSELDORF (WEST GERMANY). (ASSIGNEE)
Antimicrobial Agents for Water Conservation,
W75-09637 5F

HILL BROTHERS CHEMICAL CO., INC., CITY OF INDUSTRY, CALIF. (ASSIGNEE)
Process for Effluent Water Recovery,
W75-09648 5D

HOBART AND WILLIAM SMITH COLLEGES, GENEVA, N.Y. EARTH AND SPACE SCIENCES PROGRAM.
A Saline Intrusion into Seneca Lake, New York,
W75-09765 5B

HOUMA VALVE SERVICE, INC., LA. (ASSIGNEE)
Fluid Sampling Device,
W75-09422 7B

HOUSTON SEWAGE AND SLUDGE DISPOSAL PLANT, TEX.
Drying of Sludge for Marketing as Fertilizer,
W75-09542 5E

ICI UNITED STATES, INC., WILMINGTON, DEL.
Carbon from Lignite or Coal: Which is Better,
W75-09733 5D

ILLINOIS INST. OF TECH., CHICAGO. DEPT. OF ENVIRONMENTAL ENGINEERING.
State-of-the-Art for the Inorganic Chemicals Industry: Commercial Explosives,
W75-09581 5B

ILLINOIS UNIV., CHICAGO. DEPT. OF BIOLOGICAL SCIENCES.
Pick up and Metabolism of DDT, Dieldrin and Photodieldrin by a Freshwater Alga (Ankistrodesmus Amalloides) and a Microcrustacean (Daphnta Pulex),
W75-09805 5C

ILLINOIS UNIV., URBANA.
Synthetic Resins and Activated Carbon for Wastewater Treatment,
W75-09390 5D

ILLINOIS UNIV., URBANA. DEPT. OF FORESTRY.
Ground-Water Level in the Flood Plain and Adjacent Uplands of the Sangamon River,
W75-09599 4B

INDIAN GRASSLAND AND FODDER RESEARCH INST., JHANSI.
For Rainfed Areas-Improved Velvet Beans for Increased Forage Production,
W75-09796 3F

INDIAN INST. OF TECH., MADRAS. DEPT. OF CHEMICAL ENGINEERING.
Drag Reduction by Collapsed and Extended Polyelectrolytes,
W75-09601 8B

INDIAN INST. OF TECH., MADRAS. HYDRAULIC ENGINEERING LAB.
Wave Force Coefficients for Circular Piers, W75-09593 8B

INSTITUTE FOR LAND AND WATER MANAGEMENT RESEARCH, WAGENINGEN (NETHERLANDS).
Drainage Materials - Provisional Report of the Experience Gained in the Netherlands, W75-09633 8G

INSTITUTE OF HYDROLOGY, WALLINGFORD (ENGLAND).
Mathematical Models in Hydrology, W75-09624 2A

INSTITUTT FOR ATOMENERGI, KJELLER (NORWAY).
Multielement Neutron Activation Analysis of Fresh Water Using Ge(Li) Gamma Spectrometry, W75-09362 5A

INTERSTATE ELECTRONICS CORP., ANAHEIM, CALIF.
Ocean Waste Disposal Practices in Metropolitan Areas of California, W75-09391 3D

IOWA INST. OF HYDRAULIC RESEARCH, IOWA CITY.
The Composite Roughness of Ice Covered Streams, W75-09758 2C

IOWA STATE UNIV., AMES. DEPT. OF CIVIL ENGINEERING.
Packed-Bed Reactors for Secondary Effluent BOD and Ammonia Removal, W75-09379 5D

ISRAEL CENTER OF WATER WORKS APPLIANCES, TEL-AVIV.
Hydraulic and Mechanical Properties of Drippers, W75-09473 8C

ISRAEL CENTER OF WATERWORKS APPLIANCES, TEL-AVIV.
Formation of Blockages in Drip Irrigation Systems: Their Prevention and Removal, W75-09454 3F

ITT INDUSTRIES, INC., NEW YORK. (ASSIGNEE)
Liquid Treatment Apparatus, W75-09666 5D

KASSEL UNIV. (WEST GERMANY).
Use of Drip Irrigation in Germany, W75-09434 3F

KENTUCKY WATER RESOURCES INST., LEXINGTON.
Evaluation of Recovery in a Polluted Creek After Installation of New Sewage Treatment Procedures, W75-09515 5B

KINNAIRD, HILL, DEROHAN AND YOUNG LTD., KENSINGTON AND NORWOOD (AUSTRALIA).
Australian Vineyard Uses Sewage Effluent with Trickle Irrigation, W75-09486 3C

KULUWAI IRRIGATION CORP., HALEIWA, HAWAII.
Drip Irrigation in Landscaping and Soil Erosion Control, W75-09429 4D

KURATORIUM FUER KULTURBAUWESEN, HANOVER (WEST GERMANY).
Experiences with Drainage Materials and a Review of Available Specifications, W75-09631 8G

LAKE HERMAN DEVELOPMENT ASSOCIATION, INC., MADISON, S. DAK.
Silt Removal from a Lake Bottom. W75-09575 5C

LAMONT-DOHERTY GEOLOGICAL OBSERVATORY, PALISADES, N.Y.
Sediments and Structure of the Japan Sea, W75-09756 2J

LOS ANGELES COUNTY SANITATION DISTRICTS, WHITTIER, CALIF.
Sludge Dewatering, W75-09539 5D

LOUISIANA STATE UNIV., BATON ROUGE. DEPT. OF GEOLOGY.
Water Escape Structures in Coarse-Grained Sediments, W75-09768 2J

LOUISVILLE UNIV., KY. SCHOOL OF LAW.
The Public Trust Doctrine Is Alive and Kicking in New Jersey Tidalwaters: Neptune City v. Avon-By-The-Sea--A Case of Happy Atavism, W75-09850 6E

LYON-1 UNIV., VILLEURBANNE (FRANCE). DEPARTEMENT DE BIOLOGIE ET ZOOLOGIE.
A Comparative Study of the Tolerance of Two Freshwater Planarians, Dugesia Tigrina and Polycelis Felina, To Low Oxygen Levels, (Etude Comparative de la Tolerance aux Basses Tensions D'Oxygene Chez Deux Planaires D'Eau Douce, Dugesia Tigrina et Polycelis Felina), W75-09675 5C

MACMILLAN BLOEDEL LTD., NEW WESTMINSTER (BRITISH COLUMBIA).
Closing Up a Fine Grade Paper Machine System, W75-09353 3E

MARYLAND UNIV., COLLEGE PARK. GRADUATE PROGRAM IN METEOROLOGY.
Drought, A Recurrent Element of Climate, W75-09799 2B

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF METEOROLOGY.
Recent African Rainfall Patterns, W75-09766 2B

MASSACHUSETTS UNIV., AMHERST.
Chamber Method for Drip Irrigation System Design and Installation Procedure, W75-09441 8C

MERCK AND CO., PITTSBURGH, PA.
Treatment and Safe Disposal of Cationic Coating Colors, W75-09352 5D

METROPOLITAN DENVER SEWAGE DISPOSAL DISTRICT NO. 1, COMMERCE CITY, COL.
Metro Denver's Experience with Large Scale Aerobic Digestion of Waste Activated Sludge, W75-09537 5D

METROPOLITAN SANITARY DISTRICT O GREATER CHICAGO, ILL.
Agricultural Benefits and Environm Changes Resulting from the Use of Dig Sludge on Field Crops, W75-09409

Anaerobic Digester Operation at Metropolitan Sanitary Districts of Gr Chicago, W75-09536

Recent Sanitary District History in Land R mation and Sludge Utilization, W75-09547

METROPOLITAN SEWER BOARD, ST. PA MINN.
Energy Conservation and Recycling Progra the Metropolitan Sewer Board of the Twi ties Area, W75-09556

MIAMI UNIV., FLA. SCHOOL OF LAW.
Federal Maritime Jurisdiction and State M Pollution Legislation: The Florida Act Preempted Per Se, W75-09845

MICHIGAN STATE UNIV., EAST LANSING. INST. OF WATER RESEARCH.
The Qualitative and Quantitative Determina of Soluble and Insoluble Forms of Phosph in Sewage Treatment Plants, W75-09618

MICHIGAN STATE UNIV., LANSING.
Trickle Irrigation in Michigan Orchards, W75-09466

Trickle Irrigation in Michigan Orchards: trolling Rate of Flow with Flow Regula Valves and Microtubes, W75-09467

MICHIGAN UNIV., ANN ARBOR.
Sewage Disposal and Water Supply Alte tives on the Basis of Water Quality Economic Criteria, W75-09774

MINISTRY OF AGRICULTURE, ABU DHABI (UNITED ARAB EMIRATES).
Afforestation with Saline Water in Abu Dha W75-09483

MINISTRY OF AGRICULTURE, BEISAN (ISRAEL).
Influence of Different Amounts of Irrigatio Water, Irrigation--Intervals and Fertilizers the Yield and Quantity of Drip-Irrigated Mu and Watermelons, W75-09494

Drip Irrigation in Citrus Orchards, W75-09502

The Irrigation of Olives by Drip and Other rigation Methods, W75-09508

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD, CAMBRIDGE (ENGLAND).
Survey of Experiences with Drainage Materi and Review of Available Specifications, W75-09634 8

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD, CAMBRIDGE (ENGLAND). FIELD DRAINAGE EXPERIMENT UNIT.
Improving the Design of Practical Fiel Drainage, W75-09595 4

NISTRY OF AGRICULTURE, SAFAD RAEL).
Drip Irrigation and Automation Tools in Efficient Use of Water Policy,
W75-09426 3F

NISTRY OF AGRICULTURE, TEL-AVIV RAEL). IRRIGATION AND SOIL FIELD RVICE.
rickle Irrigation,
W75-09437 3F

NNESOTA POLLUTION CONTROL ENCY, MINNEAPOLIS.
he Reserve Mining Case: Promises, Promises,
W75-09838 5G

NNESOTA UNIV., ST. PAUL.
ptimum Lateral Placement for Subsurface Irgation Systems,
W75-09460 3F

NNESOTA UNIV., ST. PAUL. WATER OURCES RESEARCH CENTER.
innesota's Water Resources: A Primer,
W75-09516 6B

SOURI DEPT. OF CONSERVATION, FFERSON CITY.
valuating Effects of Water Resource evelopments on Wildlife Habitat,
W75-09790 6G

SOURI UNIV., COLUMBIA. DEPT. OF ICULTURAL ENGINEERING.
rrugated Plastic Drain Tubing Used as Unrground Conduit,
W75-09611 8B

NTANA STATE UNIV., BOZEMAN. DEPT. ECTRICAL ENGINEERING.
gital Instrumentation and Telemetry for ater Resources Research,
W75-09529 7B

NTANA STATE UNIV., BOZEMAN. DEPT. LANT AND SOIL SCIENCE.
orld Maps of Potential Evapotranspiration, nt Development, and Spring Greening and tumn Browning of Vegetation, Based on the lar Thermal Unit Model,
W75-09771 2D

NTANA STATE UNIV., BOZEMAN. ERIES BIOASSAY LAB.
ute Toxicity of Nitrite to Rainbow Trout lmo Gairdneri),
W75-09687 5C

NTANA UNIV., MISSOULA. DEPT. OF ANY.
nspiration Rates of Conifers,
W75-09784 2D

NTANA UNIV., MISSOULA. DEPT. OF LOGY.
tribution and Dynamics of Aquatic Insects the Elk Creek Experimental Watershed, precht Forest, Montana,
W75-09528 5C

nparative Ecology of Western Streams,
W75-09617 5G

KOVSKII ENERGETICHSKII INSTITUT ). DEPT. OF STEAM AND GAS INES.
gential Stress Distribution in Turbulent ndary Layers at an Adverse Pressure dient,
W75-09738 8B

MUNICIPALITY OF METROPOLITAN SEATTLE, WASH.
Phosphate Removal in an Activated Sludge Facility,
W75-09412 5D

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, GREENBELT, MD. GODDARD SPACE FLIGHT CENTER.
Weather Satellite Picture Receiving Stations, APT Digital Scan Converter,
W75-09588 7B

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, LANGLEY STATION, VA. LANGLEY RESEARCH CENTER.
Domestic Wash Water Reclamation for Refuse as Commode Water Supply Using a Filtration-Reverse Osmosis Separation Technique,
W75-09403 5D

NATIONAL ENVIRONMENTAL RESEARCH CENTER, CINCINNATI, OHIO.
Control Schemes for the Activated-Sludge Process,
W75-09395 5D

Overview of Sludge Handling and Disposal,
W75-09533 5D

Growth of Barley Irrigated with Wastewater Sludge Containing Phosphate Precipitants,
W75-09543 5D

NATIONAL ENVIRONMENTAL RESEARCH CENTER, CINCINNATI, OHIO. ADVANCED WASTE TREATMENT RESEARCH LAB.
Gas Chromatographic Determination of Selected Organic Compounds Added to Waste Water,
W75-09365 5A

Urban Runoff Pollution Control--State-of-the-Art,
W75-09762 5D

NATIONAL FIELD INVESTIGATIONS CENTER-CINCINNATI, OHIO.
Sewage Treatment Plant Dependability with Special Reference to the Activated Sludge Process,
W75-09393 5D

An Evaluation of the Hagerstown, Maryland Water Pollution Control Plant,
W75-09396 5D

NATIONAL FISH HATCHERY, TISHOMINGO, OKLA. WARM WATER HATCHERY BIOLOGY CENTER.
Evaluation of a New Spawning Mat Material,
W75-09749 7B

NATIONAL MARINE FISHERIES SERVICE, ANN ARBOR, MICH. GREAT LAKES FISHERY LAB.
Effect of Temperature on Accumulation of Methylmercuric Chloride and p,p' DDT by Rainbow Trout (Salmo Gairdneri),
W75-09681 5C

NATIONAL MARINE FISHERIES SERVICE, SEATTLE, WASH.
Changes in Blood Chemistry of Juvenile Steelhead Trout, Salmo Gairdneri, Following Sublethal Exposure to Nitrogen Supersaturation,
W75-09694 5C

NATIONAL MARINE FISHERIES SERVICE, SEATTLE, WASH. NORTHWEST FISHERIES CENTER.
Branding Chinook, Coho and Sockeye Salmon Fry with Hot and Cold Metal Tools,
W75-09561 7B

NATURAL RESOURCES DEFENSE COUNCIL, WASHINGTON, D.C.
Environmental Critique (The 1972 Federal Water Pollution Control Act: Problems and Prospects After One Year),
W75-09844 5G

NEBRASKA NATURAL RESOURCES COMMISSION, LINCOLN. DATA BANK.
Deoxygenation in Natural Streams,
W75-09767 5B

NEBRASKA UNIV., LINCOLN. DEPT. OF AGRICULTURAL ENGINEERING.
Disposal of Cattle Feedlot Runoff on Agricultural Land,
W75-09517 5D

Recharge Simulation Model,
W75-09518 2A

NEBRASKA UNIV., LINCOLN. DEPT. OF AGRONOMY.
Biophysical Control of Water Loss,
W75-09523 3F

NEBRASKA UNIV., LINCOLN. DEPT. OF CIVIL ENGINEERING.
Water Quality Study of Nonpoint Source of Agricultural Runoff,
W75-09519 5B

Upflow Filtration of Oxidation Pond Effluent,
W75-09522 5D

NEBRASKA UNIV., LINCOLN. DEPT. OF GEOGRAPHY.
The Prediction of Lake Huron Lake-Effect Snowfall Systems,
W75-09748 2C

NEBRASKA UNIV., LINCOLN. DEPT. OF PLANT PATHOLOGY.
Pollution of Irrigation Waters by Plant Pathogenic Organisms,
W75-09521 5B

NEBRASKA UNIV., LINCOLN. SCHOOL OF LIFE SCIENCES.
Biological Control of Sphaerotilus Natans and Related Species in Waste Waters,
W75-09520 5D

NEVADA UNIV., RENO. DESERT RESEARCH INST.
Influence of Surface and Near-Surface Caliche Distribution on Infiltration Characteristics, Las Vegas, Nevada,
W75-09374 2J

Economics and Finance of Nevada Public Water Systems,
W75-09375 6B

Tritiated Water Turnover Rate in Rodents: Desert and Mountain,
W75-09801 2I

NEW MEXICO INST. OF MINING AND TECHNOLOGY, SOCORRO.
A Laboratory Investigation of Surface Runoff,
W75-09744 2E

**NEW MEXICO INST. OF MINING AND TECHNOLOGY, SOCORRO. DEPT. OF PHYSICS.**
The Microwave Emission Spectum from Sparking Water Drops,
W75-09614 2B

**NEW MEXICO STATE UNIV., UNIVERSITY PARK.**
Vegetable Production and Water-Use Efficiency as Influenced by Drip, Sprinkler, Subsurface, and Furrow Irrigation Methods,
W75-09438 3F

An Explanation for the Growth Advantage of Drip Irrigation,
W75-09465 3F

Irrigation Return Flow as Influenced by Drip Irrigation,
W75-09485 5G

**NEW SOUTH WALES UNIV., KENSINGTON (AUSTRALIA). SCHOOL OF GEOGRAPHY.**
Initial Bifurcation Process in Natural Channel Networks,
W75-09609 8B

**NEW YORK STATE DEPT. OF HEALTH, ALBANY. DIV. OF LABS. AND RESEARCH.**
Simultaneous Determination of Seven Trace Metals in Potable Water Using a Vidicon Atomic Absorption Spectrometer,
W75-09363 5A

Determination of Lead in Potable Waters Using Delves Cup Atomic Absorption Spectrometer with Signal Integration,
W75-09366 5A

**NEWCASTLE-UPON-TYNE UNIV. (ENGLAND). DEPT. OF ENGINEERING MATHEMATICS.**
A Non-Linear Rainfall-Runoff Model, Providing for Variable Lag Time,
W75-09753 2A

**NEWCASTLE-UPON-TYNE UNIV. (ENGLAND). DEPT. OF PLANT BIOLOGY.**
The Accumulation of Fluoride by Marine and Intertidal Animals,
W75-09697 5C

**NEWCASTLE-UPON-TYNE UNIV. (ENGLAND). DOVE MARINE LAB.**
The Effect of Concentration of Suspension and Inert Material on the Assimilation of Algae by Three Bivalves,
W75-09695 5C

**NORGES TEKNISKE HOEGSKOLE, TRONDHEIM. RIVER AND HARBOR LAB.**
Wave Induced Pressures in Permeable Seabeds,
W75-09607 8B

**NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF CIVIL ENGINEERING.**
Computation of Flow Through Masonboro Inlet, N.C.,
W75-09608 2L

Statistical Properties of Wave Force,
W75-09759 8B

**NORTH CAROLINA UNIV., CHAPEL HIL. DEPT. OF ENVIRONMENTAL SCIENCES AND ENGINEERING.**
The Role of Polyelectrolytes in Filtration Processes,
W75-09394 5D

**NORTH CAROLINA UNIV., MOREHEAD CITY. INST. OF MARINE SCIENCES.**
DDT and the Rugophilic Response of Settling Barnacles Balanus Improvisus,
W75-09686 5C

**NORTH DAKOTA STATE UNIV., FARGO. DEPT. OF ZOOLOGY.**
Effects of Saline Water from North Dakota Lakes on Survival of Fathead Minnow (Pimephales Promelas) Embryos and Sac Fry,
W75-09669 5C

**NORWICH (ENGLAND). (ASSIGNEE)**
Water Treatment Apparatus,
W75-09646 5D

**OCEAN SYSTEMS, INC., RESTON, VA. (ASSIGNEE)**
Collection and Recovery System for Oil Spills,
W75-09660 5G

**OFFICE OF WATER RESEARCH AND TECHNOLOGY, WASHINGTON, D.C. WATER RESOURCES SCIENTIFIC INFORMATION CENTER.**
U.S. Engineering Information Services and the Role of the Water Resources Scientific Information Center,
W75-09585 10D

**OKLAHOMA STATE UNIV., STILLWATER. DEPT. OF PHYSICS.**
Biological Assay of Fresh Waters by a New Method, Dielectrophoresis,
W75-09531 5A

**OKLAHOMA UNIV., NORMAN. SCHOOL OF CIVIL ENGINEERING AND ENVIRONMENTAL SCIENCES.**
An Optimal Water Quality Management Technique for Conjunctive Ground and Surface Water Use,
W75-09378 5G

**OLDHAM (ROBERT R.), INC., SIDNEY, OHIO. (ASSIGNEE)**
Floating Solids Return Device,
W75-09657 5D

**ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO.**
Utilization of Digested Chemical Sewage Sludges on Agricultural Lands in Ontario,
W75-09544 3F

Phosphorus Removal Study at the Sarnia WPCP,
W75-09562 5D

Phosphorus Removal in Seasonal Retention Lagoons by Batch Chemical Precipitation,
W75-09563 5D

Identification of Problem Areas in Water Pollution Control Plants,
W75-09564 5D

**OREGON STATE UNIV., CORVALLIS.**
Drip Irrigation Research in Oregon - A Progress Report,
W75-09428 3F

**OREGON STATE UNIV., CORVALLIS. DEPT. OF FISHERIES AND WILDLIFE.**
Effects of Logging on Water Temperature and Dissolved Oxygen in Spawning Beds,
W75-09685 5C

**OTAGO UNIV., PORTOBELLO (NEW ZEALAND). MARINE BIOLOGICAL STATI**
The Bottom Fauna of China Clay W Deposits in Mevagissey Bay,
W75-09673

**OTTAWA UNIV (ONTARIO). DEPT. OF BIOLOGY.**
Selenium Toxicity on the Early Life Stage Zebrafish (Brachydanio rerio),
W75-09671

**OTTAWA UNIV. (ONTARIO). DEPT. OF CIV ENGINEERING.**
Rapid Temperature Reduction of The Discharge,
W75-09757

**PARIS-6 UNIV. (FRANCE). LABORATOIRE GEOLOGIE DYNAMIQUE.**
Chemical Transport by the Mekong River,
W75-09603

**PENNSYLVANIA STATE UNIV., UNIVERSIT PARK. CENTER FOR THE STUDY OF ENVIRONMENTAL POLICY.**
Financial Incentives and Pollution Control Case Study,
W75-09574

**PENNSYLVANIA UNIV., PHILADELPHIA.**
Reservoir Optimization for Water Quality C trol,
W75-09773

**PERMA-RAIN IRRIGATION, INC., LINDSAY CALIF.**
The Use of Foggers in Drip Irrigation,
W75-09442

**PHILADELPHIA WATER DEPT., PA.**
Ocean Disposal Experiences in Philadelphia,
W75-09550

**PISA UNIV. (ITALY).**
Researches and Applications on Drip Irrigati and Similar Methods in Italy,
W75-09430

**POLYTECHNIC OF CENTRAL LONDON (ENGLAND). DEPT. OF LIFE SCIENCES.**
The Effects of Oils on Growth of Freshwat Phytoplankton,
W75-09678 5

**PUERTO RICO UNIV., MAYAGUEZ. DEPT. O AGRICULTURAL ECONOMICS.**
An Investigation of Factors Affecting the I tensity of Water Use in the Lajas Valley Irrig tion Project,
W75-09376 3

**PUERTO RICO UNIV., MAYAGUEZ. SCHOOL OF ENGINEERING.**
The Optimum Distribution of Urban Wate Supplies in Puerto Rico,
W75-09377 4A

**PUNJAB AGRICULTURAL UNIV., LUDHIANA (INDIA).**
Drip Vs. Furrow Irrigation Trials in Potato Under Subtropical Conditions,
W75-09513 3F

**PURDUE UNIV., LAFAYETTE, IND. DEPT. OF AGRICULTURAL ECONOMICS.**
Sectoral and Regional Economic Impact of Controlling Nonpoint Pollution in Forested Areas,
W75-09530 5B

**DUE UNIV., LAFAYETTE, IND. DEPT. OF RICULTURAL ENGINEERING.**
ovement of Pollutant Phosphorus In Unsatu-ted Soil,
75-09527 5B

**EN'S UNIV., BELFAST (NORTHERN LAND). DEPT. OF ZOOLOGY.**
fferential Uptake of Endosulfan by the Tis-es of Mytilus Edulis,
75-09810 5A

**EN'S UNIV., KINGSTON (ONTARIO). T. OF CIVIL ENGINEERING.**
ction Factor Under Oscillatory Waves,
75-09755 8B

**EN'S UNIV., KINGSTON (ONTARIO). T. OF ZOOLOGY.**
fect of Constant Temperature on Growth tes of Pumpkinseed Sunfish (Lepomis Gib-us),
5-09701 5C

**ARCH INST. OF FORESTS AND GELANDS, TEHRAN (IRAN).**
Investigation on the Use of Drip Irrigation the Establishment of Multi-Purpose Parks een Belts Around the Cities) in Iran,
5-09503 3F

**OLDS, SMITH AND HILLS, SONVILLE, FLA.**
face Water Resources of St. Johns River, rida,
5-09604 2A

rating Results of Electrodialysis and erse Osmosis Municipal Desalting Plants,
5-09732 5D

**E ISLAND UNIV., KINGSTON. UATE SCHOOL OF OCEANOGRAPHY.**
ment Resuspension and Deposition in Nar-nsett Bay,
-09736 2L

**E ISLAND UNIV., KINGSTON. LAW OF EA INST.**
ficial Islands and Installations in Interna-l Law,
-09834 6E

**STATION VOOR BOUWTECHNIEK, MERELBEKE GIUM).**
ey of Experience with Drainage Materials Review of Available Specifications,
09629 8G

**LOUIS METROPOLITAN SEWER ICT, MO.**
ge Management System for St. Louis,
09558 5D

**EGO COUNTY COMPREHENSIVE ING ORGANIZATION, CALIF.**
r, Sewerage and Flood Control Systems and Implementation Program 1973-74.
09400 6D

**ULO UNIV. (BRAZIL). ESCOLA OR DE AGRICULTURA LUIZ DE OZ.**
ts of Drip Irrigation on Soil-Water-Plant onship,
09500 2I

**IFIC IRRIGATION SYSTEMS, EL , CALIF.**
Irrigations Inherent Requisite - Water y,
9435 5D

**SHELL OIL CO., HOUSTON, TEX. (ASSIGNEE)**
Oil Interceptors for Separating Oil from Water by Gravity,
W75-09667 5G

**SHIBATA KAGAKU KIKAI KOGYO KABUSHIKI, TOKYO (JAPAN). (ASSIGNEE)**
Detector of Trace Substance in Water,
W75-09655 5A

**SOIL CONSERVATION SERVICE, WASHINGTON, D.C.**
Atlas of River Basins of the United States.
W75-09616 7C

North Fork Nolin River Watershed, Kentucky (Final Environmental Impact Statement).
W75-09814 8A

Upper Mulberry River Watershed, Barrow, Gwinnett, Hall, and Jackson Counties, Georgia (Final Environmental Impact Statement).
W75-09822 8A

**SOUTH AFRICA DEPT. OF AGRICULTURAL TECHNICAL SERVICES, PRETORIA.**
Some Results of a Field Survey of Drip Irrigation Systems in the Republic of South Africa,
W75-09433 3F

Moisture Profiles and Salinization of Soils Under Drip Irrigation in the Republic of South Africa,
W75-09464 3C

**SOUTH AUSTRALIA DEPT. OF AGRICULTURE, ADELAIDE.**
Response of Mature Citrus Trees on Deep Sandy Soil to Drip Irrigation,
W75-09514 3F

**SPRINGFIELD SANITARY DISTRICT, ILL.**
The Economics of Sludge Irrigation,
W75-09545 5D

**STATE UNIV. NEW YORK, SYRACUSE. COLL. OF ENVIRONMENTAL SCIENCE AND FORESTRY.**
Where are We in Forest Fertilization,
W75-09367 5D

**STATE UNIV. OF NEW YORK, STONY BROOK. MARINE BIOLOGY PROGRAM.**
Effects of PCB on Interspecific Competition in Natural and Gnotobiotic Phytoplankton Communities in Continuous and Batch Cultures,
W75-09680 5C

**SULZER BROS. LTD., WINTERTHUR (SWITZERLAND).**
Cleaning of Circulation Water and Effluent from Paper and Board Mills by Chemicophysical Methods (Die Moeglichkeit der Reinigung von Kreislauf- und Restabwasser bei Papier- und Kartonfabriken unter Beruecksichtigung chemisch-physikalischer Verfahren),
W75-09371 5D

**SUN OIL CO., DALLAS, TEX. (ASSIGNEE)**
Underwater Drilling Pollution Control Curtain,
W75-09639 5G

**SUZAKA HIGH SCHOOL (JAPAN).**
Aquatic Insect Communities of the Tenryu River, Their Composition, Biotic Index and Seasonal Change, (In Japanese),
W75-09807 5C

**SWECO, INC., LOS ANGELES, CALIF. (ASSIGNEE)**
Wastewater Concentrator with Slotted Distributor,
W75-09649 5D

**SYRACUSE UNIV. RESEARCH CORP., N.Y. LIFE SCIENCE DIV.**
Loss of Five Pesticides from Cultures of Twentyone Planktonic Algae,
W75-09808 5A

**TECHNICAL UNIV. OF DENMARK, LYNGBY. INST. OF HYDRODYNAMICS AND HYDRAULIC ENGINEERING.**
Computation of Wave Heights Due to Refraction and Friction,
W75-09606 8B

**TECHNION - ISRAEL INST. OF TECH., HAIFA.**
Evaluation of a Trickle Irrigation System,
W75-09469 3F

**TECHNION ISRAEL INST. OF TECH., HAIFA. ENVIRONMENTAL ENGINEERING LABS.**
Ferric Chlorine or Lime for Chemical Treatment,
W75-09380 5D

**TEESSIDE POLYTECHNIC, MIDDLESBROUGH (ENGLAND). DEPT. OF CIVIL AND STRUCTURAL ENGINEERING.**
A Case Study of Mine Water Quality Deterioration, Mainsforth Colliery, County Durham,
W75-09752 5B

**TEXAS A AND M UNIV., COLLEGE STATION.**
Designing Trickle Irrigation Laterals for Uniformity,
W75-09471 3F

**TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF AGRICULTURAL ENGINEERING.**
Simulation of Miscible Displacement in Soils Using the Method of Characteristics,
W75-09612 2G

**TEXAS A AND M UNIV., LUBBOCK.**
Automatic Drip Irrigation for Greenhouse Tomato Production in West Texas,
W75-09448 3F

**TEXAS A AND M UNIV., LUBBOCK. AGRICULTURAL RESEARCH AND EXTENSION CENTER.**
Mobile Drip Irrigation Systems,
W75-09453 3F

Application of Fertilizer Through Drip Irrigation Systems in West Texas,
W75-09489 3F

**TEXAS A AND M UNIV., WESLACO. AGRICULTURAL RESEARCH AND EXTENSION CENTER.**
Drip and Furrow Irrigation Studies on Sugarcane,
W75-09476 3F

**TIKHOOKEANSKII NAUCHNO-ISSLEDOVATELSKII INSTITUT RYBNOGO KHOZYAISTVA I OKEANOGRAFII, VLADIVOSTOK (USSR).**
The Effect of Basic Cuprous Carbonate on the State of the Liver in Juvenile Amur Autumn Chum (Oncorhynchus keta infrasp. autumnalis),
W75-09668 5C

**TOHOKU UNIV., SENDAI (JAPAN). SCHOOL OF INTERNATIONAL LAW.**
Towards a New Regime for Ocean Development,
W75-09843 6E

TORONTO UNIV. (ONTARIO). MCLENNAN LAB.
The Fragmentation and Electrification of Freezing Drops,
W75-09598 2C

UDAIPUR UNIV. (INDIA).
Development and Scope of Drip and Subsurface Irrigation,
W75-09431 3C

Evaluation of Hydraulics of Flow Through Pipes of Varying Slopes, Lengths and Orifice Placements,
W75-09474 8B

UMEA UNIV. (SWEDEN). DEPT. OF BIOLOGY.
Effect of Zinc on Growth of the Minnow Phoxinus Phoxinus,
W75-09693 5C

UNION CARBIDE CORP., SAN FRANCISCO, CALIF. AQUATIC ENVIRONMENTAL SCIENCES.
Hypolimnetic Oxygenation Using Liquid Oxygen,
W75-09589 5G

UNION CARBIDE CORP., TONAWANDA, N.Y. LINDE DIV.
High Purity Oxygen Aerobic Digestion Experiences at Speedway, Indiana,
W75-09538 5D

UNION OIL CO. OF CALIFORNIA, BREA. (ASSIGNEE)
Process for Separating Low API Gravity Oil from Water,
W75-09664 5G

UNITED KINGDOM ATOMIC ENERGY AUTHORITY, LONDON (ENGLAND). (ASSIGNEE)
Reverse Osmosis Apparatus,
W75-09661 3A

UNITED NATIONS SECRETARIAT. OFFICE OF LEGAL AFFAIRS.
Offshore Development and Marine Pollution,
W75-09842 5B

UNIVERSITY OF SOUTHERN MISSISSIPPI, HATTIESBURG. BUREAU OF BUSINESS RESEARCH.
A Case Study of Estuarine Pollution and Local Agency Interactions,
W75-09620 5G

UNIVERSITY OF SOUTHWESTERN LOUISIANA, LAFAYETTE.
Experimental Introduction of the Australian Crayfish (Cherax Tenuimanus) into Louisiana,
W75-09560 8I

UNIVERSITY OF WESTERN ONTARIO, LONDON. DEPT. OF GEOGRAPHY.
Stream Ordering and Contour Mapping,
W75-09745 4A

URALS POLYTECHNIC INST. SVERDLOVSK (USSR). HYDRAULICS DIV.
On the Discharge Coefficient of Nozzles for Single- and Two-Phase Fluids,
W75-09739 8B

UTAH STATE UNIV., LOGAN.
Trickle Irrigation Design for Optimal Soil Wetting,
W75-09461 2G

UTAH WATER RESEARCH LAB., LOGAN.
Regional Analyses of Runoff Characteristics for Small Urban Watersheds,
W75-09621 2A

Evaluation of Sample Preparation Techniques for Algal Bioassays,
W75-09734 5A

VAND (REN), INC., WEBSTER CITY, IOWA. (ASSIGNEE)
Method and Apparatus for Aeration of Biodegradable Waste Material,
W75-09647 5D

VICTORIA DEPT. OF AGRICULTURE (AUSTRALIA).
Changes in Root Patterns of Peach Trees Under Trickle Irrigation,
W75-09498 2I

VICTORIA DEPT. OF AGRICULTURE, FERNTREE GULLY (AUSTRALIA).
Water Uptake by an Apple Tree with Various Proportions of the Root System Supplied with Water,
W75-09495 3F

Effects of Nitrogen Fertilizer Applications to Part of a Root System,
W75-09496 3F

Change in Root Distribution of Mature Pear Trees in Response to Trickle Irrigation,
W75-09497 3F

Trickle Irrigation on Young Peach Trees,
W75-09501 3F

VICTORIA DEPT. OF AGRICULTURE, FERNTREE GULLY (AUSTRALIA). SCORESBY HORTICULTURAL RESEARCH STATION.
Effects of Localized Phosphate Treatments and Solution pH on the Growth and Function of Apple Roots,
W75-09488 3C

VIRGINIA INST. OF MARINE SCIENCE, GLOUCESTER POINT.
Uptake, Metabolism and Distribution of DDT in Organs of the Blue Crab, Callinectes Sapidus,
W75-09691 5C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF BIOLOGY.
The Effects of Lapsed Time Since Feeding Upon the Toxicity of Zinc to Fish,
W75-09688 5C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF BIOLOGY; AND VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. CENTER FOR ENVIRONMENTAL STUDIES.
An Inexpensive Macroinvertebrate Bioassay Table for Use in Continuous-Flow Toxicity Tests,
W75-09676 5A

VIZGAZDALKODASI TUDOMANYOS KUTATO INTEZET, BUDAPEST (HUNGARY).
A Survey of Experiences with Drainage Materials and a Review of Available Specifications,
W75-09632 8G

VRIJE UNIVERSITEIT, AMSTERDAM (NETHERLANDS). INST. OF EARTH SCIENCES.
Interaction Between the Daily Heat Balance and the Tidal Cycle,
W75-09602 5B

VYSKUMNY USTAV PAPIERU A CELULO PRAGUE (CZECHOSLOVAKIA).
Use of Centrifuges for Purification of Effl (Primenenie tsentrifug dlya ochistki stoch vod),
W75-09358

VYZKUMNY USTAV VODOHOSPODARSK OSTRAVA (CZECHOSLOVAKIA).
Automatic U.V.-Control System for Re Evaluation of Organic Water Pollution,
W75-09735

WASHINGTON STATE UNIV., PROSSER.
Tree and Crop Response to Drip Irrigation
W75-09504

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF HORTICULTURE.
Effect of Root Temperature and Humidi the Distribution of Ca in Apple and Sunf Seedlings,
W75-09351

WASHINGTON SUBURBAN SANITARY COMMISSION, HYATTSVILLE, MD.
Institutional Problems Associated with S Disposal,
W75-09555

WASHINGTON UNIV., SEATTLE. DEPT. O CIVIL ENGINEERING.
Effects of Deforestation on Slopes,
W75-09743

WATER POLLUTION CONTROL FEDERATION, WASHINGTON, D.C.
A Guide for State Certification of Waste Facilities Personnel,
W75-09389

WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
Recent Developments in Sewage Treat Based on Physico-Chemical Methods,
W75-09414

WATER RESOURCES COUNCIL, WASHINGTON, D.C.
Water for Energy Self-Sufficiency.
W75-09626

Water for Energy Self-Sufficiency, Exec Summary.
W75-09627

WATERLOO UNIV. (ONTARIO). DEPT. OF CHEMICAL ENGINEERING.
Wet Air Oxidation of Chemical Sludges,
W75-09565

WESTINGHOUSE ELECTRIC CORP., ABINGDON, VA. WIRE DIV.
Volume Extraction of Chemically C taminated Water,
W75-09419

WESTINGHOUSE RESEARCH LABS., PITTSBURGH, PA.
Evaluation and Demonstration of the Capil Suction Sludge Dewatering Device,
W75-09399

WINDSOR UNIV. (ONTARIO). DEPT. OF GEOLOGY.
Huronian Glaciation and Polar Wander fr the Gowganda Formation, Ontario,
W75-09763

WISCONSIN UNIV., MADISON.
Evaluation of Environmental Impact of La fills,
W75-09761

**CONSIN UNIV., MADISON. WATER MISTRY LAB.**
e Effect of Sulfate and Manganese Dioxide the Release of Phosphorus from Lake Mena Sediments,
5-09619 5C

**DS HOLE OCEANOGRAPHIC TUTION, MASS.**
ternary Sedimentation on the Amazon Contal Margin: A Model,
5-09600 2L

**LD WATER RESOURCES, INC., NEW . (ASSIGNEE)**
able Water Supply System,
-09658 5D

**DIELA ESTATES (SOUTH AFRICA).**
Irrigation on Citrus,
-09432 3F

# ACCESSION NUMBER INDEX


09351 2I
09352 5D
09353 3E
09354 5D
09355 5D
09356 5D
09357 3E
09358 5D
09359 5D
09360 5D
09361 5A
09362 5A
09363 5A
09364 5B
09365 5A
09366 5A
09367 5D
09368 5A
09369 5D
09370 5A
09371 5D
09372 5A
09373 3A
09374 2J
09375 6B
09376 3F
09377 4A
09378 5G
09379 5D
09380 5D
09381 5D
09382 5D
09383 5D
09384 5D
09385 5D
09386 5D
09387 5D
09388 2I
09389 5D
09390 5D
09391 3D
09392 5D
09393 5D
09394 5D
09395 5D
09396 5D
09397 5D
09398 5B
09399 5D
09400 6D
09401 5E
09402 5E
09403 5D
09404 5D
09405 5D
09406 5D
09407 5D
09408 5D
09409 5D
09410 5D
09411 5E
09412 5D
09413 5D
09414 5D
09415 8I
09416 5D
09417 5D
09418 5D
09419 5D
09420 5D
09421 7B
09423 3F
09424 3F
09425 3F
09426 3F
09427 3F
09428 3F

W75-09429 4D
W75-09430 3F
W75-09431 3C
W75-09432 3F
W75-09433 3F
W75-09434 3F
W75-09435 5D
W75-09436 2G
W75-09437 3F
W75-09438 3F
W75-09439 3F
W75-09440 3F
W75-09441 8C
W75-09442 3F
W75-09443 3F
W75-09444 5G
W75-09445 3C
W75-09446 3F
W75-09447 3F
W75-09448 3F
W75-09449 3F
W75-09450 3F
W75-09451 2I
W75-09452 3F
W75-09453 3F
W75-09454 3F
W75-09455 8C
W75-09456 5B
W75-09457 3F
W75-09458 3F
W75-09459 2G
W75-09460 3F
W75-09461 2G
W75-09462 2G
W75-09463 2G
W75-09464 3C
W75-09465 3F
W75-09466 3F
W75-09467 8C
W75-09468 3F
W75-09469 3F
W75-09470 8C
W75-09471 3F
W75-09472 8C
W75-09473 8C
W75-09474 8B
W75-09475 3F
W75-09476 3F
W75-09477 3C
W75-09478 3F
W75-09479 3F
W75-09480 3F
W75-09481 3C
W75-09482 3F
W75-09483 3C
W75-09484 3C
W75-09485 5G
W75-09486 3C
W75-09487 4A
W75-09488 3C
W75-09489 3F
W75-09490 3F
W75-09491 3F
W75-09492 5B
W75-09493 3F
W75-09494 3F
W75-09495 3F
W75-09496 3F
W75-09497 3F
W75-09498 2I
W75-09499 3C
W75-09500 2I
W75-09501 3F
W75-09502 3F
W75-09503 3F
W75-09504 3F
W75-09505 3F
W75-09506 3F

W75-09507 3F
W75-09508 3F
W75-09509 3F
W75-09510 3F
W75-09511 3F
W75-09512 2I
W75-09513 3F
W75-09514 3F
W75-09515 5B
W75-09516 6B
W75-09517 5D
W75-09518 2A
W75-09519 5B
W75-09520 5D
W75-09521 5B
W75-09522 5D
W75-09523 3F
W75-09524 5D
W75-09525 7C
W75-09526 2B
W75-09527 5B
W75-09528 5C
W75-09529 7B
W75-09530 5B
W75-09531 5A
W75-09532 5D
W75-09533 5D
W75-09534 5D
W75-09535 5D
W75-09536 5D
W75-09537 5D
W75-09538 5D
W75-09539 5D
W75-09540 5D
W75-09541 5D
W75-09542 5E
W75-09543 5D
W75-09544 3F
W75-09545 5D
W75-09546 5D
W75-09547 5E
W75-09548 5E
W75-09549 5E
W75-09550 5E
W75-09551 5E
W75-09552 5D
W75-09553 5D
W75-09554 5E
W75-09555 5E
W75-09556 5D
W75-09557 5D
W75-09558 5D
W75-09559 8C
W75-09560 8I
W75-09561 7B
W75-09562 5D
W75-09563 5D
W75-09564 5D
W75-09565 5D
W75-09566 5D
W75-09567 5D
W75-09568 5G
W75-09569 5D
W75-09570 5D
W75-09571 5D
W75-09572 5D
W75-09573 5D
W75-09574 5G
W75-09575 5C
W75-09576 5C
W75-09577 5B
W75-09578 5D
W75-09579 5D
W75-09580 5D
W75-09581 5B
W75-09582 2F
W75-09583 6G
W75-09584 5D

W75-09585 10D
W75-09586 2D
W75-09587 5G
W75-09588 7B
W75-09589 5G
W75-09590 2D
W75-09591 7C
W75-09592 5B
W75-09593 8B
W75-09594 4A
W75-09595 4A
W75-09596 8B
W75-09597 2B
W75-09598 2C
W75-09599 4B
W75-09600 2L
W75-09601 8B
W75-09602 5B
W75-09603 5B
W75-09604 2A
W75-09605 2B
W75-09606 8B
W75-09607 8B
W75-09608 2L
W75-09609 8B
W75-09610 2J
W75-09611 8B
W75-09612 2G
W75-09613 2C
W75-09614 2B
W75-09615 7C
W75-09616 7C
W75-09617 5G
W75-09618 5D
W75-09619 5C
W75-09620 5G
W75-09621 2A
W75-09622 6A
W75-09623 3C
W75-09624 2A
W75-09625 6E
W75-09626 6B
W75-09627 4C
W75-09628 8G
W75-09629 8G
W75-09630 8G
W75-09631 8G
W75-09632 8G
W75-09633 8G
W75-09634 8G
W75-09635 10C
W75-09636 10C
W75-09637 5F
W75-09638 8C
W75-09639 5G
W75-09640 7B
W75-09641 3F
W75-09642 5G
W75-09643 3A
W75-09644 8A
W75-09645 5D
W75-09646 5D
W75-09647 5D
W75-09648 5D
W75-09649 5D
W75-09650 8A
W75-09651 2G
W75-09652 5D
W75-09653 3A
W75-09654 3A
W75-09655 5A
W75-09656 5D
W75-09657 5D
W75-09658 5D
W75-09659 5D
W75-09660 5G
W75-09661 3A
W75-09662 3F

W75-09663

| | |
|---|---|
| W75-09663 | 3A |
| W75-09664 | 5G |
| W75-09665 | 5G |
| W75-09666 | 5D |
| W75-09667 | 5G |
| W75-09668 | 5C |
| W75-09669 | 5C |
| W75-09670 | 5C |
| W75-09671 | 5C |
| W75-09672 | 5C |
| W75-09673 | 5C |
| W75-09674 | 5C |
| W75-09675 | 5C |
| W75-09676 | 5A |
| W75-09677 | 5C |
| W75-09678 | 5C |
| W75-09679 | 5A |
| W75-09680 | 5C |
| W75-09681 | 5C |
| W75-09682 | 5C |
| W75-09683 | 5C |
| W75-09684 | 5C |
| W75-09685 | 5C |
| W75-09686 | 5C |
| W75-09687 | 5C |
| W75-09688 | 5C |
| W75-09689 | 5B |
| W75-09690 | 5C |
| W75-09691 | 5C |
| W75-09692 | 5C |
| W75-09693 | 5C |
| W75-09694 | 5C |
| W75-09695 | 5C |
| W75-09696 | 5A |
| W75-09697 | 5C |
| W75-09698 | 5A |
| W75-09699 | 5C |
| W75-09700 | 5C |
| W75-09701 | 5C |
| W75-09702 | 5C |
| W75-09703 | 7C |
| W75-09704 | 7C |
| W75-09705 | 7C |
| W75-09706 | 7C |
| W75-09707 | 7C |
| W75-09708 | 7C |
| W75-09709 | 2J |
| W75-09710 | 4B |
| W75-09711 | 5F |
| W75-09712 | 5C |
| W75-09713 | 7C |
| W75-09714 | 2F |
| W75-09715 | 5B |
| W75-09716 | 4B |
| W75-09717 | 2F |
| W75-09718 | 2A |
| W75-09719 | 5B |
| W75-09720 | 5B |
| W75-09721 | 2F |
| W75-09722 | 2F |
| W75-09723 | 5A |
| W75-09724 | 2K |
| W75-09725 | 2J |
| W75-09726 | 7C |
| W75-09727 | 7C |
| W75-09728 | 7C |
| W75-09729 | 7C |
| W75-09730 | 5D |
| W75-09731 | 5D |
| W75-09732 | 5D |
| W75-09733 | 5D |
| W75-09734 | 5A |
| W75-09735 | 5A |
| W75-09736 | 2L |
| W75-09737 | 2L |
| W75-09738 | 8B |
| W75-09739 | 8B |
| W75-09740 | 8B |
| W75-09741 | 2J |
| W75-09742 | 2C |
| W75-09743 | 4C |
| W75-09744 | 2E |
| W75-09745 | 4A |
| W75-09746 | 2G |
| W75-09747 | 2B |
| W75-09748 | 2C |
| W75-09749 | 7B |
| W75-09750 | 2J |
| W75-09751 | 2F |
| W75-09752 | 5B |
| W75-09753 | 2A |
| W75-09754 | 4A |
| W75-09755 | 8B |
| W75-09756 | 2J |
| W75-09757 | 5B |
| W75-09758 | 2C |
| W75-09759 | 8H |
| W75-09760 | 5G |
| W75-09761 | 5C |
| W75-09762 | 5D |
| W75-09763 | 2C |
| W75-09764 | 5A |
| W75-09765 | 5B |
| W75-09766 | 2B |
| W75-09767 | 5B |
| W75-09768 | 2J |
| W75-09769 | 2F |
| W75-09770 | 7B |
| W75-09771 | 2D |
| W75-09772 | 5D |
| W75-09773 | 5G |
| W75-09774 | 5B |
| W75-09775 | 5D |
| W75-09776 | 5D |
| W75-09777 | 5D |
| W75-09778 | 5D |
| W75-09779 | 5D |
| W75-09780 | 5D |
| W75-09781 | 5D |
| W75-09782 | 5D |
| W75-09783 | 5B |
| W75-09784 | 2D |
| W75-09785 | 3F |
| W75-09786 | 3C |
| W75-09787 | 5G |
| W75-09788 | 5D |
| W75-09789 | 3F |
| W75-09790 | 6G |
| W75-09791 | 6G |
| W75-09792 | 2G |
| W75-09793 | 3F |
| W75-09794 | 6G |
| W75-09795 | 6G |
| W75-09796 | 3F |
| W75-09797 | 3F |
| W75-09798 | 3C |
| W75-09799 | 2B |
| W75-09800 | 3F |
| W75-09801 | 2I |
| W75-09802 | 6G |
| W75-09803 | 3F |
| W75-09804 | 3A |
| W75-09805 | 5C |
| W75-09806 | 5A |
| W75-09807 | 5C |
| W75-09808 | 5A |
| W75-09809 | 5C |
| W75-09810 | 5A |
| W75-09811 | 8A |
| W75-09812 | 8A |
| W75-09813 | 4A |
| W75-09814 | 8A |
| W75-09815 | 8A |
| W75-09816 | 8D |
| W75-09817 | 5D |
| W75-09818 | 8C |
| W75-09819 | 8D |
| W75-09820 | 5G |
| W75-09821 | 8A |
| W75-09822 | 8A |
| W75-09823 | 5G |
| W75-09824 | 8A |
| W75-09825 | 8A |
| W75-09826 | 8A |
| W75-09827 | 6E |
| W75-09828 | 6E |
| W75-09829 | 6E |
| W75-09830 | 6E |
| W75-09831 | 6E |
| W75-09832 | 6E |
| W75-09833 | 6E |
| W75-09834 | 6E |
| W75-09835 | 5G |
| W75-09836 | 6E |
| W75-09837 | 6B |
| W75-09838 | 5G |
| W75-09839 | 6E |
| W75-09840 | 6E |
| W75-09841 | 5G |
| W75-09842 | 5B |
| W75-09843 | 6E |
| W75-09844 | 5G |
| W75-09845 | 5G |
| W75-09846 | 5G |
| W75-09847 | 6E |
| W75-09848 | 5G |
| W75-09849 | 5G |
| W75-09850 | 6E |

# ABSTRACT SOURCES

| SOURCE | ACCESSION NUMBER | TOTAL |
|---|---|---|
| A. CENTERS OF COMPETENCE | | |
| Colorado State University, Irrigation Return Flow Quality | W75-09423--09514 | 92 |
| Franklin Institute (FIRL), Municipal Wastewater Treatment Technology | W75-09379--09387<br>09389--09414<br>09416--09422<br>09532--09559<br>09562--09573<br>09730--09733<br>09773--09782 | 96 |
| Illinois State Water Survey, Hydrology | W75-09585--09616<br>09635--09636<br>09734--09748<br>09750--09771 | 71 |
| Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry | W75-09352--09372 | 21 |
| University of Arizona, Arid Land Water Resources | W75-09582--09584<br>09623--09634<br>09784--09804 | 36 |
| University of Florida, Eastern U. S. Water Law | W75-09811--09850 | 40 |
| B. STATE WATER RESOURCES RESEARCH INSTITUTES | W75-09374--09378<br>09515--09531<br>09617--09622<br>09772 | 29 |
| C. OTHER | | |
| BioSciences Information Service | W75-09351, 09388<br>09415<br>09560--09561<br>09749 | 6 |
| Effects of Pollutants on Aquatic Life (Katz) | W75-09668--09702<br>09805--09810 | 41 |
| Environmental Protection Agency | W75-09574--09581 | 8 |

## ABSTRACT SOURCES

| SOURCE | ACCESSION NUMBER | TOTAL |
|---|---|---|
| C. OTHER Continued | | |
| National Oceanic and Atmospheric Administration | W75-09783 | 1 |
| Ocean Engineering Information Service (Patents) | W75-09637--09667 | 31 |
| Office of Water Research and Technology | W75-09373 | 1 |
| U. S. Geological Survey | W75-09703--09729 | 27 |

☆ U. S. GOVERNMENT PRINTING OFFICE : 1975 O-LT - 210-951 (5)

# CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey and the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

**Supported by the Environmental Protection Agency in cooperation with WRSIC**

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

## Subject Fields

- NATURE OF WATER
- WATER CYCLE
- WATER SUPPLY AUGMENTATION AND CONSERVATION
- WATER QUANTITY MANAGEMENT AND CONTROL
- WATER QUALITY MANAGEMENT AND PROTECTION
- WATER RESOURCES PLANNING
- RESOURCES DATA
- ENGINEERING WORKS
- MANPOWER, GRANTS, AND FACILITIES
- SCIENTIFIC AND TECHNICAL INFORMATION

## INDEXES

- SUBJECT INDEX
- AUTHOR INDEX
- ORGANIZATIONAL INDEX
- ACCESSION NUMBER INDEX
- ABSTRACT SOURCES

U.S. MAIL

POSTAGE AND FEES PAID
U S DEPARTMENT OF COMMERCE
COM 211

AN EQUAL OPPORTUNITY EMPLOYER

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

OFFICIAL BUSINESS
PRINTED MATTER

6.33391
48

# SELECTED WATER RESOURCES ABSTRACTS

THE LIBRARY OF THE
NOV 1 0
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

VOLUME 8, NUMBER 20
OCTOBER 15, 1975

-09851 -- W75-10350
DEN: SWRABW

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

SELECTED WATER RESOURCES ABSTRACTS is available to Federal agencies, contractors, or grantees in water resources upon request to: Manager, Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior, Washington, D. C. 20240.

SELECTED WATER RESOURCES ABSTRACTS is also available on subscription from the National Technical Information Service. Annual subscription rates are: To the SWRA Journal, $75 ($95 foreign); to the Journal & Annual Index, $100 ($125 foreign); to the Annual Index only, $50 ($65 foreign). Certain documents abstracted in this journal can be purchased from the NTIS at prices indicated in the entry. Prepayment is required.

# SELECTED
# WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior

**VOLUME 8, NUMBER 20**
OCTOBER 15, 1975

W75-09851 -- W75-10350

cretary of the U. S. Department of the Interior has determined that the publication of this periodical is neces-
the transaction of the public business required by law of this Department. Use of funds for printing this pe-
l has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

# FOREWORD

**Selected Water Resources Abstracts,** a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

**Selected Water Resources Abstracts** is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

## CONTENTS

FOREWORD----------iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

**01** NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

**02** WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

**03** WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

**04** WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

**05** WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

**06** WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

**07** RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

**08** ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

**09** MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

**10** SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

# SELECTED WATER RESOURCES ABSTRACTS

## WATER CYCLE

### General

**DICTING EVAPOTRANSPIRATION FROM ICULTURAL WATERSHEDS UNDER DRY DITIONS,**
as State Univ., Manhattan. Dept. of Civil En-ering.
primary bibliographic entry see Field 2D.
09860

**ANALYSIS OF RUNOFF IN AN URBAN A (IN JAPANESE),**
primary bibliographic entry see Field 5D.
09916

**ROLOGIC IMPACT OF PLANNED UNIT ELOPMENTS,**
land Univ., College Park. Dept. of Civil En-ring.
rimary bibliographic entry see Field 4C.
09919

**METHOD FOR PREDICTING FLOOD ER RUNOFF OF THE RIVER STEYR (EIN FAHREN ZUR VORHERSAGE DER HWASSERABFLUESSE DER STEYR),**
rimary bibliographic entry see Field 4A.
09943

**TUDY OF BEACH GROUND-WATER ROLOGY AND CHEMISTRY,**
ana State Univ., Baton Rouge. Coastal Stu-st.
imary bibliographic entry see Field 2F.
0077

**DEL OF ONE-DIMENSIONAL PERCOLA- TO A WATER TABLE USING A COM- R SIMULATION LANGUAGE,**
on Univ., S.C. Dept. of Agricultural En-ng.
imary bibliographic entry see Field 2G.
0138

**OLOGIC RECONNAISSANCE OF THE WAH VALLEY DRAINAGE BASIN, MIL- AND BEAVER COUNTIES, UTAH,**
ical Survey, Salt Lake City, Utah.
mary bibliographic entry see Field 4B.
0167

### Precipitation

**EEDINGS OF THE WORLD DROLOGICAL ORGANIZA- NTERNATIONAL ASSOCIATION OF DROLOGY AND ATMOSPHERIC CS SCIENTIFIC CONFERENCE ON HER MODIFICATION.**
Meteorological Organization, Geneva rland).
nary bibliographic entry see Field 3B.
944

**METHOD OF FOG MODIFICATION BY ATION OF CONDENSATION NUCLEI,**
kii Nauchno-Issledovatelskii eteorologicheskii Institut, Kiev (USSR).
nary bibliographic entry see Field 3B.
946

**RAIN ENHANCEMENT - A REVIEW,**
Commonwealth Scientific and Industrial Research Organization, Epping (Australia). Div. of Cloud Physics.
For primary bibliographic entry see Field 3B.
W75-09950

**SALT DRIZZLES EXTRACTED FROM UNSATURATED AIR LAYERS BY SEEDING WITH HYGROSCOPIC NUCLEI,**
Universite de Bretagne-Occidentale, Brest (France).
For primary bibliographic entry see Field 3B.
W75-09952

**NUMERICAL SIMULATION OF CLOUD SEEDING EXPERIMENTS,**
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
H. D. Orville, F. J. Kopp, and K. G. Hubbard.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 81-99, 1974. 3 fig, 1 tab, 13 ref. NSF Grants GA-24647, GA-36910X.

Descriptors: *Cloud seeding, *Numerical analysis, *Weather modification, Clouds, Winds, Water vapor, Rain, Ice, Graupel, Hail, Precipitation(Atmospheric), *Model studies, Salts, *Simulation analysis.
Identifiers: Potential temperature, Cloud water, Salt seeding.

A two-dimensional time-dependent cloud model with 200-meter grid spacing covering an area 19.2 km square was used to simulate cloud seeding experiments. Atmospheric wind, potential temperature, water vapor, cloud liquid, rain, cloud ice, and graupel were the primary dependent variables. Extension of the model to deep convection was made by using a density-weighted stream function. The model was used to simulate a natural cloud, ice phase seeding of both light and heavy cases, salt, and combinations of seeding agents. It was found that the cases studied resulted in pessimistic conclusions which may be modified when more realistic conditions are included in the model. It was also concluded that cloud modeling may be used to help develop a more quantitative rationale for many cloud seeding experiments. (See also W75-09944) (Jones-ISWS)
W75-09955

**THEORETICAL RESEARCH INTO ARTIFICIAL STIMULATION OF PRECIPITATION FOR FIGHTING FOREST FIRES,**
Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr, Leningrad (USSR).
D. D. Stalevich, T. S. Uchevatkina, and N. S. Shishkin.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 89-94, 1974. 7 fig, 5 ref.

Descriptors: *Weather modification, *Artificial precipitation, *Forest fires, Cloud seeding, Model studies, Mathematical models, Rainfall, Cloud physics, Precipitation(Atmospheric), Silver iodide, Nucleation, Meteorology, Theoretical analysis.

Recently, the artificial stimulation of rain has become widely used in extinguishing forest fires in the Soviet Union. Convective clouds 2.0-2.5 km thick and more which are moving towards the fire are seeded. Two essential questions were theoretically solved: (1) the optimal expenditure of seeding agent to produce maximum precipitation, and (2) the distance at which the cloud should be seeded so that the precipitation falls directly onto the fire. Curves and nomograms were presented to show the optimum seeding rates and the best location for the seeding relative to the fire. (See also W75-09944) (Sims-ISWS)
W75-09956

**HAIL PROCESS INVESTIGATION AND HAIL SUPPRESSION ACTIVITIES IN THE U.S.S.R.,**
Gidrometeorologicheskii Institut, Leningrad (USSR). High-Altitude Geophysics Inst.
For primary bibliographic entry see Field 3B.
W75-09965

**NATURAL 'HAILCORES' AND THEIR ABILITIES TO ESTIMATE THE EFFICIENCY OF HAIL PREVENTION SYSTEMS,**
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
P. Admirat.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 197-206, 1974. 5 fig, 2 tab, 8 ref.

Descriptors: *Hail, *Storms, *Energy, Size, On-site investigations, On-site data collections, Weather modification, Cloud physics, Precipitation(Atmospheric), Meteorology.
Identifiers: *Hailcores, Hailpads, Hail collectors, *France.

Preliminary results were described for studies of natural hailstorms in France. These studies have been carried out since 1971 in the 'Languedoc' Project, whose experimental field is situated in the viticultural plain of Languedoc near Montpellier. Hailpads and refrigerated hail collection boxes were used. The study of the distribution of the numbers and diameters of hailstones falling from natural storms shows that certain relations exist between these two parameters, the most important of which are: (1) the simultaneous variation of the total number of hailstones and their maximum diameter from one point to another, and (2) the inverse relation between the number of hailstones and their diameter at one point. These relations characterize natural 'hailcores' which are real areas of hail accumulation at ground level where all the energy of the hailfall is concentrated. Hailcores are probably the result of a 'dumping' of the accumulation zone in the storm cloud. From the natural distribution of the numbers and the diameters of the hailstones, the future structure of hailcores modified by seeding can be calculated and the criteria which will enable measurement of the efficiency of the hail prevention systems can be established. When hailcores are destroyed, hail prevention techniques will be successful. (See also W75-09944) (Sims-ISWS)
W75-09966

**RESEARCH INTO HAIL-FORMING PROCESSES AND THE RESULTS OF ANTI-HAIL PROTECTION MEASURES IN MOLDAVIA,**
Central Aerological Observatory, Moscow (USSR).
I. I. Gaivoronsky, L. A. Dinevitch, and N. M. Zaitchenko.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 217-223, 1974. 5 fig, 1 tab.

Descriptors: *Weather modification, *Hail, *Rainfall, Cloud seeding, Climatology, Precipitation(Atmospheric), Storms, Atmospheric physics, Cloud physics, Meteorology, On-site investigations.

Identifiers: *Hail prevention, *USSR(Moldavia).

In Moldavia, a comprehensive investigation was conducted of the evolution, including the regeneration, of thunder- and hail-clouds both under natural conditions and when subjected to artificial modification. Moldavia is one of the areas of the Soviet Union in which intensive hail-forming processes take place fairly frequently. In an average year, 10% of the territory is affected by hail. An analysis was carried out of mean total precipitation during the warm half-years before protective measures were taken and during analogous periods after protection. This analysis showed that when large-scale anti-hail experiments were carried out, the amount of precipitation on the protected and control territories increased as compared with the long-term data series. Since 1965, there has been a marked reduction in the size of the hail-damaged area in the protected territory as compared with the pre-protected period, while in the control areas, during the same period the level of hail damage remained within its former limits. (See also W75-09944) (Sims-ISWS)
W75-09968

**SIMULATION OF THE NATURAL PROCESS OF HAIL FORMATION AND ITS TRANSFORMATION UNDER THE INFLUENCE OF ARTIFICIAL CRYSTALLIZATON,**
Gidrometeorologicheskii Institut, Leningrad (USSR).
L. G. Kachurin, N. D. Artemyeva, A. I. Kartsivadze, S. Stoyanov, and M. Tekle.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 231-237, 1974. 5 fig, 10 ref.

Descriptors: *Weather modification, *Hail, *Model studies, *Cloud physics, Mathematical models, Atmospheric physics, Cloud seeding, Supersaturation, Condensation, Temperature, Moisture, Crystals, Radar, Storms, Precipitation(Atmospheric), Meteorology.
Identifiers: *Hail suppression, USSR.

Calculations for convection were performed on the basis of the jet theory in a stratified atmosphere. The influence of latent heat accompanying phase changes (during condensation, crystallization, coagulation of different-phase particles) on the convection velocity as well as on the temperature gradient, vapor supersaturation, specific liquid-water content, and horizontal extent of cloud was taken into consideration in the principal equations for convection with regard to flow inertia. The whole system of equations for a hail cloud consisted of 19 differential nonlinear equations of first-order and 29 algebraic equations which were solved by electronic computers. The processes of hail formation and its suppression by inducing crystallization are extremely complex. Only complete calculations concerning the in-cloud processes taking into account thermodynamic irreversibility and regenerative coupling between internal processes in clouds and convection parameters give an idea of the process as a whole. Seeding cannot be successful without correct calculations. The intensity of the process of hail growth, both natural and artificially transformed, proves to be highly dependent on one or two main factors under certain conditions. In this sense, the cloud, with respect to the hail growth process, proves to be metastable. Comparatively small changes in the parameters (temperature, the profile of temperature or wind) may result in radical changes in the hail growth process, i.e., they can intensify or reduce it. (See also W75-09944) (Sims-ISWS)
W75-09970

**REVIEW OF RECENT WORK ON HAIL SUPPRESSION IN BULGARIA,**
Bulgarian Academy of Sciences, Sofia. Inst. of Geophysics.
For primary bibliographic entry see Field 3B.
W75-09971

**THE EXPERIMENTAL PROGRAM TO MODIFY HURRICANES,**
National Hurricane Research Lab., Coral Gables, Fla.
R. C. Gentry.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No 399, Geneva (Switzerland), p 245-254, 1974. 5 fig, 1 tab, 11 ref.

Descriptors: *Weather modification, *Hurricanes, *Winds, *Cloud seeding, Wind velocity, Rain, Surges, Atmospheric pressure, Tropical cyclones, Storms, Model studies, On-site investigations, Silver iodide, Nucleation, Cloud physics, Atmospheric physics, Meteorology.

Hurricane modification experiments have been conducted in the United States since 1961, and recent experiments have been by Project STORMFURY, an interdepartmental effort of the Departments of Commerce (NOAA) and Defense (Navy and Air Force). Hurricane Debbie was seeded five times within 8 hours on 18 August 1969 and again on 20 August 1969. The maximum winds measured and recorded by highly instrumented aircraft flying at 3600 m decreased 30% from 50 mps before the first seeding on 18 August to 35 mps 5 hours after the fifth seeding. The maximum winds, which had meanwhile returned to the original levels, decreased on 20 August from 51 mps before the first seeding to 43 mps within 6 hours after the fifth seeding or by about 15%. Calculations with hurricane models suggest that the proper area in which to enhance the heating in a storm is the area outside the radius of maximum vertical motion (the eyewall) which in a mature hurricane usually coincides with the belt of maximum winds. It was hypothesized that seeding in these areas will result in a new eyewall developing radially outward from the old one, a reduction in the maximum pressure gradient, a reduction in the maximum winds, and a reduction in the moving of the belt of maximum winds to a greater distance from the center. (See also W75-09944) (Sims-ISWS)
W75-09972

**DYNAMIC METHODS OF CONVECTIVE CLOUD MODIFICATION BY MEANS OF ARTIFICIAL VERTICAL JETS,**
Institut Prikladnoi Geofiziki, Moscow (USSR).
For primary bibliographic entry see Field 3B.
W75-09973

**ON THE POSSIBILITY OF THUNDERSTORM SUPPRESSION BY CHANGING THE NON-EQUILIBRIUM CRYSTALLIZATION POTENTIALS OF CLOUD WATER,**
Vysokogornyi Geofizicheskii Institut, Nalchik (USSR).
L. G. Kachurin, H. H. Medaliev, and N. I. Karmov.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No 399, Geneva (Switzerland), p 275-282, 1974. 4 fig, 8 ref.

Descriptors: *Thunderstorms, *Radiation, *Electromagnetic waves, *Radio waves, Radar, Atmosphere, Electricity, Lightning, Weather modification, Storms, Measurement, Electricity, Meteorology, Research equipment.
Identifiers: USSR.

An important condition for experiments on co
trolling the electrical activity of clouds is t
availablility of equipment for use not only during
storm but also at the pre-storm stage in convecti
cloud development. Some definite results ha
been obtained in this direction. A special install
tion that enables monitoring both storm and pr
storm stage in convective cloud developmer
Some definite results have been obtained in th
direction. A special installation that enables mo
toring both storm and pre-storm stages of a co
vective cloud was made in the High Mounta
Geophysical Institute. This equipment was used
the study of electromagnetic energy radiation fro
clouds. In addition, the measuring apparatus i
cludes an electrical fluxometer and a centimet
wave-band radar. During the final experiments,
ten-centimeter radar technique was used whi
enabled more accurate location of thunderstor
discharges. According to the nature of the radi
tion field, one may distinguish three stages in thu
derstorm development: pre-storm, storm, a
after-storm. These stages are distinguished
spectral distributions of radiation field intensity
terms of duration and frequency of pulse parc
radiation. Preliminary experiments on cumulonim
bus modification at the pre-storm stage show
that is possible to affect the degree of electrical a
tivity and thus the radiation field. However, it
probably easier to intensify the storm activity th
to reduce it. The experiments show that as t
storm processes develop under natural conditio
(or after artificial modification) the radiation fie
charcteristics vary noticebly. (See also W7
09944) (Sims-ISWS)
W75-09976

**SOME QUESTIONS OF THUNDERSTOR
LIGHTNING CONTROL,**
Ukrainskii Nauchno-Issledovatelsk
Gidrometeorologicheskii Institut, Kiev (USSR).
V. M. Muchnik, and V. A. Djachuk.
In: Proceedings of the World Meteorological O
ganization/International Association
Meteorology and Atmospheric Physics Scientif
Conference on Weather Modification, October
7, 1973, Tashkent (USSR). WMO No 399, Gene
(Switzerland), p 283-288, 1974. 6 fig, 1 tab, 10 ref.

Descriptors: *Weather modificatio
*Thunderstorms, *Lightning, Electrical corona
Atmosphere, Climatology, Electricity, Clou
physics, Atmospheric physics, Meteorology, Ele
tric fields.
Identifiers: Electric charges, Corona discharg
Lightning suppression.

The choice of a method of controlling thu
derstorm electricity is predetermined by the natu
of the processes involved in the formation of thu
derstorm. A clear picture of current theories o
these processes is a necessary prerequisite
selecting an appropriate method. All theories su
gested three possible bases of electrificatio
mechanisms; the ions of the atmosphere, contra
potentials, and the atmospheric electric fiel
Further examination of thunderstorm electricit
theories indicates that the mechanisms of ion ele
trification cannot produce the formation of ele
tric charges and fields such as are observed i
thunder clouds. If atmosphere pollution does co
tribute the thunderstorm activity, the influenc
cannot be great. Therefore, it is considered th
contact electrification mechanisms are not funda
mental in generating thunderstorm activity an
that modification efforts in this direction are n
justified. Because of the high conductivity
thunder clouds, the process of formation and div
sion of charges within them must be continuou
and must be of great intensity. The mechanis
which appears most likely to provide such a rapi
formation and division of charges is the collisio
of hailstones and ice pellets with liquid drops
the electric field of a cumulonimbus cloud. T
study the collective effect the corona discharg
from a system of dischargers was investigated
This method may play an important role in th

rocess of suppression of the thunderstorm ischarge development. (See also W75-09944) Sims-ISWS)
V75-09977

HE EFFECT OF CHAFF SEEDING ON IGHTNING AND ELECTRIC FIELDS OF HUNDERSTORMS,
ational Oceanic and Atmospheric Administra-on, Boulder, Colo. Atmospheric Physics and hemistry Lab.
or primary bibliographic entry see Field 3B.
V75-09978

HE POSSIBILITY OF USING CHARGED BUB-LES IN CLOUD MODIFICATION,
stitute of Experimental Meteorology, Obninsk SSR).
. A. Volkovitskii, and V. V. Smirnov.
: Proceedings of the World Meteorological Or-nization/International Association of eteorology and Atmospheric Physics Scientific onference on Weather Modification, October 1-1973, Tashkent (USSR). WMO No 399, Geneva witzerland), p 295-300, 1974. 5 fig, 12 ref.

escriptors: *Weather modification, *Cloud seed-g, *Bubbles, Laboratory investigations, rops(Fluids), Cloud physics, Atmospheric ysics, Precipitation(Atmospheric), Meteorolo-.
entifiers: *Charged bubbles, Electric charges.

e feasibility of cloud modification by charged uid bubbles was discussed in 1965. The problem the charged bubbles' interaction with a water rosol is characterized by so-called intermediate ynolds numbers (10-100). Thus, it is impossible obtain an adequate estimate of the collection ef-iency of cloud droplets by charged bubbles thout theoretical studies of the phenomenon er this range of Reynolds numbers. The aim of s investigation was to study the characteristics the charged bubbles' coagulation growth. On basis of experimental data on collection effi-ncy, tentative estimates of the droplets' wash-rate from stratiform clouds were obtained. The lection of cloud droplets by charged bubbles s studied by using two techniques: (1) obtaining a on the collection efficiency of monodispersed ud droplets by a charged sphere-collector by ulating the process in a small wind tunnel, and fog modification by charged bubbles in a cloud mber 3200 cu m in volume. It was estimated t when a cloud 1 cu km in volume with a liquid er content of 0.3 g/cu m is modified, the uired reagent amount is, according to the esti-es, bout 0.6 tons for bubbles and 3 tons for plets respectively, for a time of 30-35 min. (See W75-09944) (Sims-ISWS)
5-09979

THE POSSIBILITY OF GENERATING WNDRAFTS BY INTRODUCING A HIGH NCENTRATION OF COARSE AERSOL PAR-LES IN THE ATMOSPHERE,
okogornyi Geofizicheskii Institut, Nalchik SR).
primary bibliographic entry see Field 3B.
5-09980

E EML 1973 FLORIDA AREA CUMULUS EX-RIMENT,
ional Oceanic and Atmospheric Administra-, Coral Gables, Fla. Experimental Meteorolo-ab.
primary bibliographic entry see Field 3B.
5-09981

E ACQUISITION OF INFORMATION DUR-ATTEMPTS AT WEATHER MODIFICA-N,
Aviv Univ. (Israel). Dept. of Environmental nces.

For primary bibliographic entry see Field 7B.
W75-09986

CONVECTIVE CLOUD STUDY RESULTS APPLIED TO WEATHER MODIFICATION,
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
A. D. Djouraev, and V. A. Eltsov.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No 399, Geneva (Switzerland), p 373-384, 1974. 5 fig, 2 tab, 7 ref.

Descriptors: *Weather modification, *Clouds, *Climatology, *Hail, Movement, Convection, Cloud seeding, Radar, Winds, Correlation analysis, Meteorology.
Identifiers: *USSR, *Hail suppression, Cloud growth.

Radar observation of convective clouds and their modification with the aim of hail prevention have been carried out since 1969 in the northern part of Phergana Valley in Uzbekistan. Based on X-band radar observations and radiosonde data, certain cloud characteristics were obtained. Observational data for 1969-1972 were analyzed of hail-, shower- and non-precipitating clouds. This data satisfied the following conditions: (1) The distance between a cloud and the radar system did not exceed 30 km, because there would be a considerable error in the radar-echo height determined over longer distances due to the finite width of the radar beam directivity diagram. (2) The given cloud was not yet seeded with reagent. For hail-cloud modification, the reagent (AgI or PbI2) was injected by rockets into the zone 0-3 km from the right front of the cloud base because there were updrafts in this area. Simultaneously, the reagent was introduced by 'Elbrus-2' shells into the upper part of the cloud just before the increased reflectivity zone at isotherm levels -9 to -20C. Modification undertaken in the Phergana Valley resulted in a rather high efficiency of anti-hail protection with a consequent benefit to agricultural activities in the protected areas. (See also W75-09944) (Sims-ISWS)
W75-09988

ON THE THERMODYNAMIC CRITERIA FOR THE INTENSITY OF CONVECTIVE CLOUD DEVELOPMENT,
Bulgarian Hydrometeorological Service, Sofia.
K. Stantchev, P. Boev, and R. Petrov.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No 399, Geneva (Switzerland), p 385-394, 1974. 4 fig, 10 ref.

Descriptors: Rainfall, *Hail, *Convection, *Model studies, Clouds, Cloud physics, Winds, Moisture content, Cloud seeding, Weather modification, Meteorology, Thermodynamics.
Identifiers: *Bulgaria, Hail suppression.

Among the various mesoscale meterological processes, convection plays the most significant role, especially where this is related to the formation of cumuliform rain clouds. A study has recently been started, based on certain relationships observed in the convective process, to investigate the role of the energy of instability in the development of convection, or more specifically, to find a relation between the maximum intensity of precipitation from a convective cloud and the total energy of instability in the appropriate layers of the atmosphere. The relation found shows that the total energy of instability in the layer between 700 and 500 mb plays a fundamental role in the process within cumuliform shower clouds and consequently in the intensity of rain from such clouds. The influence of other factors on the intensity is comparatively small. (See also W75-09944) (Sims-ISWS)
W75-09989

A REVIEW OF METHODS TO EVALUATE PRECIPITATION MODIFICATION IN NORTH AMERICA,
Illinois State Water Survey, Urbana. Atmospheric Sciences Section.
For primary bibliographic entry see Field 3B.
W75-09990

ECONOMIC ASPECTS OF PRECIPITATION AUGMENTATION OVER THE GREAT LAKES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 6B.
W75-09992

RADAR CHARACTERISTICS OF CUMULONIMBUS CLOUDS DURING THEIR NATURAL DEVELOPMENT AND ARTIFICIAL SEEDING,
Akademiya Nauk Gruzinskoi SSR, Tiflis. Institut Geofiziki.
A. I. Kartsivadze, and T. G. Salukvadze.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR), WMO No 399, Geneva (Switzerland), p 465-472, 1974. 5 fig, 3 tab, 5 ref.

Descriptors: *Weather modification, *Hail, *Cloud seeding, *Evaluation, Statistics, Cloud physics, Radar, Atmospheric physics, Meteorology.
Identifiers: *Hail suppression, *USSR(Alazani Valley).

An attempt was made, based on several years' radar measurements, to make some physico-statistical evaluations of the results of seeding of hail-dangerous clouds in the Alazani Valley (the Georgian SSR) by using rockets with crystallizing reagents. Over a period of 7 months in 1972, 461 dangerous clouds were seeded over the protected area of 600,000 hectares in the Alazani Valley. Based on calculations, 105 hail cases had to be expected with practical reliability; in fact, there were only 10. Thus, the efficiency of seeding was expressed in the probable decrease of the number of hail cases by about 90%. Evaluations of this kind are performed every year and indicate the high degree of efficiency of seeding in the Alazani Valley. Physico-statistical analysis of the large amount of experimental material allows demonstration of the effect of seeding, expressed both in the change of the developmental dynamics of cumulonimbus clouds and in the decrease of the number of the hailfalls from these clouds. (See also W75-09944) (Sims-ISWS)
W75-09996

ON THE CHARACTERISTICS OF SINGLE-CELL SHOWERS,
Iowa State Univ., Ames.
H. C. Vaughan, and K. L. Rancourt.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR), WMO No 399, Geneva (Switzerland), p 473-482, 1974. 7 fig, 3 tab, 9 ref.

Descriptors: *Rainfall, *Weather modification, *On-site data collections, *Iowa, Radar, Rain gages, Thunderstorms, Rain, Distribution patterns, Precipitation(Atmospheric), Cloud physics, Raindrops, Rainfall intensity, Rainfall disposition, Meteorology, Air masses.
Identifiers: *Showers.

The rainfall pattern of Iowa during July and August consists of air-mass showers and thunderstorms. This investigation was initiated in an attempt to answer some questions regarding availability of precipitable water and the efficiency of precipitation in a convective cloud and to better understand the natural precipitation process. All measures were made at the Kelly Farm Radar Facility located 5.7 km west-northwest of Iowa State University in an area of gently rolling farm land. The facility consists of two SCR-584 search radars, one of which has been extensively modified and modernized to operate as a short-pulse, high-resolution, 3.2-cm unit. Located 8.9 km north-northwest of the facility is a 23.3-sq km test area with 16 raingages in a square matrix. To obtain the complete history of a single-cell shower by using a raingage network, it would be desirable to have a larger and finer-spaced grid of raingages; i.e., at least 400 sq km with 441 raingages. The instruments used in this grid should be large-orifice, high-resolution, recording gages. In addition, a high-resolution, short-pulse radar to supplement the raingage network, would be desirable. The presence of high-intensity rain shafts within a single cell can significantly bias the raingage data, depending on whether the shafts pass in close proximity to a recording point and whether the horizontal movement of the shower is rapid. From the data available, it seems that even very intense and fast-moving showers would have a comparatively uniform precipitation pattern if it were not for their forward motion. Also, the variation in rainfall intensity within a cell increases with increased cloud top. (See also W75-09944) (Sims-ISWS)
W75-09997

**PREPARATION AND PROPERTIES OF 'PURE' SILVER IODIDE AEROSOL,**
Centre National de la Rechereche Scientifigue, Bellevue (France). Laboratoire de Meteorologie Dynamigue.
For primary bibliographic entry see Field 3B.
W75-09998

**CLIMATE OF MINNESOTA - PART VII - AREAL DISTRIBUTION AND PROBABILITIES OF PRECIPITATION IN THE MINNEAPOLIS-ST. PAUL METROPOLITAN AREA,**
Minnesota Agricultural Experiment Station, St. Paul.
D. G. Baker, and E. L. Kuehnast.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 851, $3.25 in paper copy, $2.25 in microfiche. Technical Bulletin 293, 1973. 18 p, 25 fig, 14 tab, 12 ref. OWRT B-068-MINN(2). 14-31-0001-3901.

Descriptors: *Minnesota, Climates, Precipitation(Atmospheric), Precipitation gages, Precipitation intensity, Rainfall disposition, Probable maximum precipitation, Cities, Areal.
Identifiers: *Minneapolis-St. Paul Metropolitan Area(Minn).

A study was made of the daily precipitation at 25 stations within a 30-mile radius of the Minneapolis-St. Paul airport from May-September for the 5-year period 1964-1968. The frequency of daily rains of 0.01 inch or more indicated by a single gage was about 35% while in reality the frequency was closer to 65%. The number of gages required for a 'true' sample varies from about 45 in May and June to 60 in July. The area of a rain was generally least in July and greatest in June. The maximum daily rainfall recorded equalled 7.98 inches and the greatest total monthly rainfall was 11.85 inches. Precipitation was lower at the airport site. (See also W75-14763) (Walton-Minnesota)
W75-10009

**THEORETICAL PROBABILITIES OF PREDICTED OCCURRENCES AND AMOUNTS OF PRECIPITATION,**
Florida State Univ., Tallahassee. Dept. of Meteorology.
T. A. Gleeson.
Journal of Applied Meteorology, Vol 14, No 4, p 466-470, June 1975. 4 fig, 2 ref. NSF Grant GA-32535.

Descriptors: *Precipitation(Atmospheric), *Model studies, *Probability, Mathematical models, Equations, Statistics, Theoretical analysis, Dynamics, Atmospheric physics, Cloud physics, Meteorology.

In a statistical-dynamical study of the atmosphere, the dependent variables of the dynamic equations constitute the continuous coordinates of a phase space in which an ensemble of possible states develops with time, according to the equations. However, the prediction of precipitation requires upward, not downward, winds and saturated, not unsaturated, air. These dichotomous features introduce first-order discontinuities in the dynamics at the time of condensation. It was shown that these discontinuities do not prevent the continuous transformation of a model ensemble with time, so that theoretical probabilities of atmospheric states are still possible both before and after precipitation begins. By means of the probability calculus, a model was developed to predict a theoretical probability of precipitation occurrence. Examples were given to illustrate these methods. (Sims-ISWS)
W75-10050

**AN INVESTIGATION OF THE PREDICTIVE ABILITY OF SEVERAL EVAPORATION EQUATIONS,**
California Univ., Davis. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2D.
W75-10051

**AN EXPERIMENTAL STUDY OF THE DETECTION OF ICE NUCLEI ON MEMBRANE FILTERS AND OTHER SUBSTRATA,**
National Center for Atmospheric Research, Boulder, Colo.
G. Langer, and J. Rodgers.
Journal of Applied Meteorology, Vol 14, No 4, p 560-570, June 1975. 10 fig, 3 tab, 25 ref.

Descriptors: *Instrumentation, *Laboratory equipment, *Nucleation, Clouds, Filters, Membranes, Silver iodide, Ice, Supersaturation, Humidity, Condensation, Laboratory tests, Meteorology, On-site investigations, Air pollution, Pollutant identification.
Identifiers: *Ice nuclei.

An experimental study was made of a membrane filter technique for the detection of ice nuclei in which air of controlled humidity flows across the cooled membrane as opposed to the usual static thermal diffusion procedure. This is necessary to overcome water vapor losses to various sinks on the sample substrate; the procedure also makes it possible to observe the nucleation process directly by microscope. However, for very small nuclei such as AgI, even this flow system is not able to activate the nuclei. This is overcome by letting a puff of supersaturated air pass over the deposited aerosol, which should be on a water-repellant substrate, to promote vapor flow to the ice and condensation nuclei, rather than onto the substrate. At temperatures warmer than -12C, the puff procedure is not necessary since the water vapor pressure is sufficient to keep up with the vapor sinks. By following the above procedures, consistent results were obtained for AgI, kaolin, soil particles, and pollution aerosols in both laboratory and field applications in the -5 to -20C range. (Sims-ISWS)
W75-10052

**THE POSITION STABILITY OF LARGE WATER DROPS SUSPENDED IN A VERTICAL WIND TUNNEL,**
Auckland Univ. (New Zealand). Dept. of Physics.
M. C. Woodward, and C. D. Stow.
Journal of Applied Meteorology, Vol 14, No
571-577, June 1975. 10 fig, 1 tab, 9 ref.

Descriptors: *Drops(Fluids), *Stab
*Turbulence, Flow, Turbulent flow, Suspen
Cloud physics, Laboratory tests, Labora
equipment, Velocity, Shear, Meteorology.
Identifiers: *Wind tunnels, Vertical wind tunn

The behavior of water drops of diameter in ex
of 3 mm suspended in a vertical wind tunnel
described and the vertical-position stability q
titatively and qualitatively assessed. The cont
tion to vertical instability caused by measured
bulence was calculated but does not fully acc
for the degree of instability observed. It was
gested that an inherent instability arises from
airflow constraints required to maintain a dr
the working section of the tunnel. When a dr
retained by such constraints, the artificial co
tions under which experiments are performed
limit the applicability of results obtained in
wind tunnel to the atmosphere. (Sims-ISWS)
W75-10053

**EQUIVALENT BLACKBODY TEMPERAT OF THE TOP OF A SEVERE STORM,**
Lyndon B. Johnson Space Center. Nati
Aeronautics and Space Administration, Hou
Tex.
D. E. Pitts, W. K. Reeser, and M. A. Mendlow
Journal of Applied Meteorology, Vol 14, No
609-618, June 1975. 13 fig, 36 ref.

Descriptors: *Clouds, *Storms, *Tempera
*Remote sensing, Aerial photography, Ra
Thunderstorms, Radiation, Instrumentation, A
ysis, Spectrometers, Infrared radia
Meteorology, On-site data collections.
Identifiers: *Radiometers.

An experiment was undertaken to measure
equivalent blackbody temperature of cloud to
a severe storm. This was done to evaluate the
mon meteorological practice of determining c
top altitude by equating the equivalent black
temperature to the corresponding tempera
from a nearby radiosonde and to provide data
determining radiative heat transfer mechanism
the cloud top. Near Graham, Texas, infrared s
tra in the spectral range of 6.7 to 13.3 microns
collected 29 April 1970 from the top of a se
storm 12.4 to 14.0 km in altitude. Absolute alti
of the cloud tops was determined by AS-1
plotter analysis of stereo pairs of photogr
taken with an RC-8 camera. The equiva
blackbody temperature of the cloud top was d
mined by fitting the Planck radiation functio
the data. The radiometrically derived tempera
of the cloud top is -4 to +7 K warmer than th
vironmental temperature as determined
radiosonde data for any given storm top altit
Two temperature anomalies approximately 5
in diameter were found near opposite sides o
km wide and 13.8 km high cloud tower. Eac
these anomalies is 6 to 9 K warmer than the
rounding cloud equivalent blackbody tempera
of 209 K. It was proposed that the anomalies
served are dry air subsidence on the edge of a
draft that perturbs cloud particle spectra. Th
frared extinction coefficient due to the clou
decreased and thermal radiation from the int
of the warmer cloud is allowed to escape. (S
ISWS)
W75-10054

**EVALUATION OF AN ERTS-1 DATA COLL TION PLATFORM INSTALLED IN THE PINE TUNDRA, COLORADO,**
Colorado Univ., Boulder. Inst. of Arctic and
pine Research.
For primary bibliographic entry see Field 7B.
W75-10055

HE EFFECT OF REPEATED ACTIVATION ON EPOSITIONAL ICE NUCLEI,
hicago Univ., Ill. Cloud Physics Lab.
Spyers-Duran.
urnal of Applied Meteorology, Vol 14, No 4, p 8-629, June 1975. 1 tab, 2 ref. NSF Grant GI 373.

escriptors: *Nucleation, *Laboratory tests, ystals, Crystal growth, Ice, Filters, Meteorolo-, Cloud physics.
entifiers: *Ice nuclei, Activation, Membrane fil-rs.

e nuclei collected on Millipore filters were ocessed at -16.6C water saturation and resulting ystals were allowed to sublime. The filters were en reprocessed. Eighty-three percent of the ginal sites reactivated, 17% did not, but 12% of e new crystals were located on new sites. This ggests that if an ice crystal should evaporate in tural clouds, the remaining nucleus could be ctivated, and serve again to grow a new ice ystal by vapor deposition. (Sims-ISWS)
75-10056

MMARY OF OBSERVATIONS INDICATING NAMIC EFFECT ON SALT SEEDING IN ARM CUMULUS CLOUDS,
titute of Tropical Meteorology, Poona (India).
r primary bibliographic entry see Field 3B.
75-10057

## C. Snow, Ice, and Frost

OWFALL ENHANCEMENT,
tional Oceanic and Atmospheric Administra-n, Boulder, Colo. Atmospheric Physics and emistry Lab.
Weickmann.
Proceedings of the World Meteorological Or-ization/International Association of teorology and Atmospheric Physics Scientific nference on Weather Modification, October 1-973, Tashkent (USSR). WMO No. 399, Geneva itzerland), p 127-141, 1974. 16 fig, 2 tab, 27 ref.

criptors: *Weather modification, *Snowfall, tificial precipitation, *Cloud seeding, Cloud sics, Atmospheric physics, Precipita-(Atmospheric), Nucleation, Condensation, stals, Carbon dioxide, Meteorology.
ntifiers: *Snow enhancement, Seeding pat-s, Snow crystals.

insight into the interrelationship between eral parameters--some of them are microscale, e are mesoscale--in nature has brought the un-tanding of the snow process into sharper us. The most important mesoscale parameter is rate of condensation which determines the unt of moisture released for precipitation. The t important microphysical parameter is the centration of snow crystals furnished by na-. The concentration of snow crystals was vn to depend on two factors: (1) the concentra-of freezing nuclei and (2) the rate of upward of freezing nuclei. Precipitable water in a d appears in two forms: (1) as liquid water ed in the cloud and (2) as water released by the of updraft in the condensation process, that y the rate of cndensation. Snowfall enhance-t opportunities may present themselves ugh the microscale mechanism of snow forma-as well as through the mesoscale flux parame-of cloud systems. Convective stratocumulus ems, upslope stratocumulus systems, and onic shallow cloud systems were shown to potential for cloud seeding. Techniques of ing for snow enhancement were discussed, the merits of various seeding patterns were ribed. Some results of snow enhancement ects were reported. (See also W75-09944) s-ISWS)
-09959

SEEDING REQUIREMENTS FOR RAPID GLACIATION OR STIMULATION OF A MIXED PHASE CLOUD,
State Univ. of New York, Albany. Atmospheric Sciences Research Center.
For primary bibliographic entry see Field 3B.
W75-09963

THE PYRAMID PILOT CLOUD-SEEDING PROJECT,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 3B.
W75-09964

AN ICE NUCLEI CONCENTRATION BENCHMARK NETWORK,
National Oceanic and Atmospheric Administration, Boulder, Colo. Atmospheric Physics and Chemistry Lab.
For primary bibliographic entry see Field 7A.
W75-09999

ICE NUCLEI GENERATOR TECHNOLOGY,
Denver Research Inst., Colo.
For primary bibliographic entry see Field 3B.
W75-10001

AN EXPERIMENTAL STUDY OF THE DETECTION OF ICE NUCLEI ON MEMBRANE FILTERS AND OTHER SUBSTRATA,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 2B.
W75-10052

THE EFFECT OF REPEATED ACTIVATION ON DEPOSITIONAL ICE NUCLEI,
Chicago Univ., Ill. Cloud Physics Lab.
For primary bibliographic entry see Field 2B.
W75-10056

ENGINEERING UTILITY AND SEWAGE LINES IN PERMAFROST SOIL,
For primary bibliographic entry see Field 5D.
W75-10192

## 2D. Evaporation and Transpiration

EFFECTS OF IRRIGATION AND ROW SPACING ON EVAPOTRANSPIRATION AND MICROCLIMATE OF A SORGHUM FIELD,
Kansas State Univ., Manhattan Evapotranspiration Lab.
E. T. Kanemasu, and W. L. Powers.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 557, $4.25 in paper copy, $2.25 in microfiche. Kansas Water Resources Research Institute, Manhattan, Contribution No. 166, May 1975. 54 p, 7 tab, 16 fig, 4 ref. OWRT A-056-KAN(1). 14-31-0001-3816.

Descriptors: *Evaporation, *Transpiration, *Irrigation effects, *Evapotranspiration, Microclimatology, *Sorghum, *Kansas, *Model studies, Energy budget, Advection, Carbon dioxide, Wheat, Soybeans, Crop production, Furrow irrigation, Cover crops.
Identifiers: *Net carbon dioxide exchange, Manhattan(Kan).

An evapotranspiration model was tested over the 1973 growing season at Manhattan, Kansas. The model predicted daily evapotranspiration rates that were within 1 to 2 mm of lysimetric estimates. Evaporation accounted for 22% of the seasonal evapotranspiration. Energy balance over wide and narrow row sorghum indicated within row advection early in the growing season and large scale advection at near maturity. Advection was greater in the wide-row sorghum. Seasonal evapotranspiration rates were 54 and 52 cm for the narrow and wide row sorghum, respectively. Hourly net carbon dioxide exchange rates were determined for wheat, sorghum and soybean. Sorghum canopy had nearly twice the net carbon dioxide exchange of the wheat and soybean canopies.
W75-09853

PREDICTING EVAPOTRANSPIRATION FROM AGRICULTURAL WATERSHEDS UNDER DRY CONDITIONS,
Kansas State Univ., Manhattan. Dept. of Civil Engineering.
J. J. Zovne, and A. Nawaz.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 562, $4.25 in paper copy, $2.25 in microfiche. Kansas Water Resources Research Institute, Manhattan, Contribution No 164, May 1975. 66 p, 11 fig, 7 tab, 28 ref, 2 append. OWRT A-050-KAN(1). 14-31-0001-3516.

Descriptors: *Evapotranspiration, *Streamflow, *Agricultural watersheds, Runoff, Evaporation, Transpiration, Soil moisture, Hydrographs, *Kansas, *Simulation analysis, Rainfall, *Model studies, *Forecasting, Crop production, Distribution, Data collections, Dry seasons.
Identifiers: *Watershed models, Penman Combination equation, *Black Vermillion Watershed(Kan).

A new evapotranspiration (ET) function for the Kansas Water Budget model is developed and tested on the Black Vermillion watershed in Northeastern Kansas. The purpose of the new ET function is to improve the response of Kansas model to daily climatic changes and to the distribution and stage of growth of crops on an agricultural watershed. The new function uses the Penman Combination equation modified by three coefficients which account for, (1) the soil moisture availability, (2) the increased soil surface evaporation following rainfall, and (3) for the crop transpiration efficiency which varies with the crop and the stage of growth. The new function was programmed into the present Kansas model and both the present and the revised models were applied to the Black Vermillion for comparison purposes. Improvements were noted in daily and weekly responses of the revised model. In particular, the overall correlations of calculated to observed daily streamflows for the 1954 through 1967 study period were improved from 0.58 to 0.78 with the revised model. The significant improvement in streamflow simulation accuracy requires a modest increase in required input data and computer time. If planning efforts revolve around optimizing yields from agricultural watersheds, the extra costs would be warranted.
W75-09860

AN INVESTIGATION OF THE PREDICTIVE ABILITY OF SEVERAL EVAPORATION EQUATIONS,
California Univ., Davis. Dept. of Chemical Engineering.
F. W. Pierson, and A. P. Jackman.
Journal of Applied Meteorology, Vol 14, No 4, p 477-487, June 1975. 5 fig, 4 tab, 16 ref, 1 append.

Descriptors: *Evaporation, *Equations, *Forecasting, Atmosphere, Meteorological data, Drag, Velocity, Eddies, Momentum transfer, Friction, Momentum equation, Temperature, Water vapor, Wind velocity, Humidity, Profiles, Diffusivity.
Identifiers: *Flux-gradient equations, Log-law equations.

A number of integrated flux-gradient type evaporation equations were tested by using accurate evaporation and meteorological data. The estimated evaporation was compared with the measured evaporation. Most of the equations originally were derived by assuming that the ratio

of the eddy diffusivity of momentum to the eddy diffusivity of water vapor is constant. Since recent developments have shown that this ratio is a function of atmospheric stability, these equations were revised to admit variability of the ratio and were tested in the revised form. The momentum flux appeared in all evaporation equations tested. Results showed that the accuracy of the evaporation estimation was critically dependent on the accuracy of the momentum flux estimation by the velocity profile equation from which the evaporation equation was derived. In general, profile equations that produce momentum fluxes in good agreement with measured values produce accurate evaporation equations. Of the equations tested, an evaporation equation based on the Brooks wind velocity profile equation and a modified form of the Deacon and Swinbank evaporation equation were found to be the most accurate. A semi-empirical equation proposed by Pruitt was also found to give good results, but may require further calibration. (Roberts-ISWS)
W75-10051

**EVAPORATION DATA IN TEXAS--COMPILATION REPORT, JANUARY 1907-DECEMBER 1970,**
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 7C.
W75-10154

**EVALUATION OF RESERVOIR SITES IN NORTH CAROLINA--REGIONAL RELATIONS FOR ESTIMATING THE RESERVOIR CAPACITY NEEDED FOR A DEPENDABLE WATER SUPPLY,**
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 4A.
W75-10159

## 2E. Streamflow and Runoff

**FRICTION COEFFICIENTS FOR LAMINAR SHEET FLOW OVER ROUGH SURFACES,**
University of the West Indies, Kingston (Jamaica).
For primary bibliographic entry see Field 8B.
W75-10062

**SURFACE WATER DATA, REFERENCE INDEX, CANADA 1974.**
Water Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 7C.
W75-10064

**HISTORICAL STREAMFLOW SUMMARY, BRITISH COLUMBIA, TO 1973.**
Water Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 7C.
W75-10065

**HISTORICAL STREAMFLOW SUMMARY, ONTARIO, TO 1973.**
Water Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 7C.
W75-10066

**HISTORICAL STREAMFLOW SUMMARY, ALBERTA, TO 1973.**
Water Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 7C.
W75-10067

**HISTORICAL STREAMFLOW SUMMARY, YUKON AND NORTHWEST TERRITORIES, TO 1973.**
Water Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 7C.
W75-10068

**HISTORICAL STREAMFLOW SUMMARY, MANITOBA, TO 1973.**
Water Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 7C.
W75-10069

**HISTORICAL STREAMFLOW SUMMARY, SASKATCHEWAN, TO 1973.**
Water Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 7C.
W75-10070

**HISTORICAL STREAMFLOW SUMMARY, ATLANTIC PROVINCES, TO 1973.**
Water Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 7C.
W75-10071

**THE DISCHARGE OF SOUTH CAROLINA STREAMS AS IT RELATES TO LINK MAGNITUDE,**
South Carolina Univ., Columbia. Dept. of Geology.
D. E. Reynolds.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 885, $4.75 in paper copy, $2.25 in microfiche. M.S. Thesis, 1972. 59 p, 9 fig, 6 tab, 43 ref, 3 append. OWRT A-026-SC(6).

Descriptors: *Streamflow forcasting, *South Carolina, *Discharge(Water), *Regression analysis, *Flow characteristics, Coastal plains.
Identifiers: Link magnitude, Piedmont, First order streams.

Linear regression analyses have been used to evaluate link magnitude as a predictor of stream flow. These analyses were also used to investigate the effects of climate and geology on stream flow characteristics and to show differences in flow characteristics of Piedmont and Coastal Plain streams. An evaluation of the contribution of first order streams to total discharge was made at two different map scales.
W75-10134

**DISCHARGE MEASUREMENTS AT LOW-FLOW PARTIAL-RECORD STATIONS IN IOWA,.**
Geological Survey, Iowa City, Iowa.
For primary bibliographic entry see Field 7C.
W75-10144

**HYDROLOGIC DATA FOR URBAN STUDIES IN THE DALLAS, TEXAS METROPOLITAN AREA, 1973,**
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-10148

**HYDROLOGIC DATA FOR URBAN STUDIES IN THE AUSTIN, TEXAS METROPOLITAN AREA, 1973,**
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-10151

**A TECHNIQUE FOR ESTIMATING THE MAGNITUDE AND FREQUENCY OF FLOODS IN MAINE,**
Geological Survey, Augusta, Maine.
R. A. Morrill.
Open-file report 75-292, 1975. 44 p, 10 fig, 7 tab, 12 ref.

Descriptors: *Flood forecasting, *Flood frequency, *Flood discharge, *Maine, Analytical techniques, Flood peak, Water yield, Discharge(Water), Streamflow, Curves, Gaging stations, Regression analysis, Correlation analysis, Hydrologic data.
Identifiers: Nomographs.

Magnitude and frequency of annual f
discharges has been defined by a log-Pearson
III frequency analysis for 60 sites on M
streams where flood records cover at leas
years. A technique also is presented for estim
flood-frequency relations, up to the 100-
recurrence interval, for streams in Maine w
floodflow is virtually natural. The estim
technique requires determination of the siz
drainage area, main channel slope, and percen
of storage (lakes and ponds) in the basin. An e
ple is given to demonstrate a step-by
procedure for applying the technique. (Wood
USGS)
W75-10155

**EVALUATION OF RESERVOIR SITES NORTH CAROLINA--REGIONAL RELATI FOR ESTIMATING THE RESERVOIR CAP TY NEEDED FOR A DEPENDABLE WA SUPPLY,**
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 4A.
W75-10159

**ESTIMATING MEAN STREAMFLOW IN DUCHESNE RIVER BASIN, UTAH,**
Geological Survey, Salt Lake City, Utah.
R. W. Cruff.
Utah Department of Natural Resources, Salt
City, Technical Publication No 48, 1975. 18
fig, 1 plate, 4 tab, 1 ref.

Descriptors: *Streamflow forecasting, *Ave
flow, *Utah, Methodology, Discharge mea
ment, Monthly, Hydrographs, Correlation a
sis, Analytical techniques, Estimating.
Identifiers: *Duchesne River basin(U
Monthly streamflow measurements.

Monthly, annual, and long-term mean stream
were estimated for streams in the Duchesne
basin, Utah, by use of monthly measurem
Monthly measurements were made at 44 sit
the basin during the 1971 and 1972 water y
For those sites at which measurements coul
be made under certain conditions, mo
discharge was determined by the use of
hydrographs for nearby gaging-station site
comparison of long-term mean annual disch
determined by the monthly measurement me
versus that determined from gaging-st
records was as follows: Good at three sites (8
cent or less), fair-to-poor at one site (39 perc
and poor at one site (87 percent). At the three
that showed good comparisons, there was fl
every monthly visit and the sites were above
diversions. The site where comparison was fa
poor is affected by upstream diversion; at th
where the comparison was poor, the stream
dry at the time of many of the monthly v
(Woodard-USGS)
W75-10166

**COLORADO RIVER-FLOW MANAGEMEN**
Bureau of Reclamation, Denver Colo.
For primary bibliographic entry see Field 4A.
W75-10208

**TRANSIENT CONTROL IN LOWER SA MENTO RIVER,**
Bureau of Reclamation, Sacramento, Calif. A
cations Branch.
For primary bibliographic entry see Field 4A.
W75-10219

## 2F. Groundwater

**TATUS OF LAND SUBSIDENCE DUE TO GROUND-WATER WITHDRAWAL ALONG HE MISSISSIPPI GULF COAST,**
Mississippi State Univ., Mississippi State. Dept. of Geology and Geography.
). M. Keady, T. W. Lins, and E. E. Russell.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 558, 3.75 in paper copy, $2.25 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Completion Report, July 1975. 25 p, 5 fig, 6 ref. OWRT A-085-MISS(1).

Descriptors: *Land subsidence, Mississippi, Gulf of Mexico, Subsidence, *Withdrawal, Groundwater, *Compaction, Consolidation, Stress, Aquitards, Water level fluctuations, Aquifers.
Identifiers: *Mississippi Gulf Coast, Preconsolidation.

Land subsidence due to ground-water withdrawal along the Mississippi Gulf Coast has not occurred to the measurable extent that it has in New Orleans, La., Baton Rouge, La., and the Houston, Texas, area. A potential for subsidence exists, and future large-scale ground-water developments make the possibility of subsidence important. The quantity of water produced, as well as water-level declines, should be considered in estimating potential for subsidence. Using the average specific-unit compaction value measured in the Houston, Texas area, subsidence due to ground-water withdrawal along the Mississippi Gulf Coast is estimated to be a few inches at most. Decreases in elevation of bench marks of about four to five inches are common along the coast, but this subsidence is attributed to tectonic activity and other causes. An unknown factor is 'preconsolidation' in the aquitards by loading and unloading, particularly as a result of the fluctuations of sea level during the Pleistocene Epoch. Stresses on the aquitards produced by ground-water withdrawal would have to exceed prior loading stress before significant amounts of compaction and land subsidence could occur.
W75-09856

**QUIFER PARAMETERS BY A CHEMICAL RACER TECHNIQUE: NON LINEAR MIXING THE ROSWELL CONFINED AQUIFER,**
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
. LeFebre.
Available from the National Technical Information Service, as PB-243 563, $3.75 in paper copy, $2.25 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No. 056, June 1975, 33 p, 6 fig, 3 tab, 3 ref. B-038-NMEX OWRT (2).

Descriptors: *Aquifer characteristics, Aquifer systems, *Groundwater movement, Aquifers, Groundwater, Groundwater basins, Groundwater recharge, *Calcite, Gypsum, Carbon dioxide, Sodium chloride, *Mixing, Saturation, *New Mexico, Chemical analysis, *Tracers, Soil tests.
Identifiers: *Roswell(NMex), Groundwater basin, Confined limestone aquifer, Aquifer mixing, Chemical tracers.

Soil column tests and chemical analyses of water samples from the Roswell ground water basin indicate that water is saturated with calcite before entering the aquifer. It is postulated that calcite precipitation and dissolution occurring within the aquifer result from nonlinear mixing effects. Four such effects are developed and applied to the Roswell ground water basin. Mixing caused by leakage from the unconfined to the confined aquifer is clogging the confined aquifer with a white precipitate. (Hain-New Mexico State).
W75-09893

**FINITE ELEMENT MODELING OF FLOW THROUGH POROUS MEDIA,**
State Univ., of New York, Buffalo. Faculty of Engineering and Applied Sciences.
For primary bibliographic entry see Field 5B.
W75-09900

**GROUNDWATER POLLUTION: PROBLEMS AND SOLUTIONS.**
For primary bibliographic entry see Field 5B.
W75-10058

**EVALUATION OF GROUND WATER RESOURCES: LIVERMORE AND SUNOL VALLEYS,**
California State Dept. of Water Resources, Sacramento.
R. S. Ford, and E. E. Hills.
Bulletin No. 118-2, June 1974. 153 p, 32 fig, 22 tab, 2 append.

Descriptors: *Groundwater resources, *Hydrogeology, *California, *Water supply, *Water quality, *Geologic formations, Geologic units, Water levels, Land use, Groundwater basins, Aquifers, Subsurface waters, Water resources development, Groundwater movement, Natural recharge, Artificial recharge, Computer models, Transmissivity, Mathematical models, Streamflow, Precipitation(Atmospheric), Storage, Pumping.
Identifiers: *Livermore Valley(Calif), *Sunol Valley(Calif).

Livermore and Sunol Valleys are part of the rapidly urbanizing metropolitan region surrounding San Francisco Bay. These two valleys contain three basic resources: land, gravel, and water. In the late 1940s and during the 1950s, water demand exceeded supply and groundwater levels declined. This trend has been stopped by the availability of a new water supply to the area from the Del Valle Reservoir. The present studies of the area will develop a better understanding of the groundwater resources leading to development and testing of alternative plans for conjunctive use of surface, ground, and waste waters. The geology and hydrology of the area were reported in sufficient detail to permit planning for use of the groundwater. (Sanderson-ISWS)
W75-10063

**A STUDY OF BEACH GROUND-WATER HYDROLOGY AND CHEMISTRY,**
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
T. F. Dominick, B. Wilkins, H. H. Roberts, and C. L. Ho.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-773 552, $5.25 in paper copy, $2.25 in microfiche. Technical Report No 152, November 1973. 108 p, 40 fig, 8 tab, 4 append, 25 ref. NR 388 002, ONR N00014-69-A-0211-0003.

Descriptors: *Water table, *Beaches, *Fluctuations, *Hydrology, *Mathematical models, Groundwater, Tidal effects, Intertidal areas, Sea water, Tropical regions, Sand aquifers, Chemical properties, Computer programs.
Identifiers: Grand Cayman Island.

A simplified mathematical model for beach groundwater fluctuations driven by tidal oscillations was developed and tested. The interstitial beach groundwater chemistry across a carbonate beach profile over several tidal cycles is described. The model was developed from nonlinear partial differential equations governing transient, one-dimensional movement of groundwater through porous media. A finite-difference algorithm for a digital computer was developed to solve the equations. Beach homogeneity and nonlinear boundary conditions imposed by tidal fluctuations were assumed. Field measurements of water table fluctuations in Galleon Beach, Grand Cayman Island show that the mathematical model simulates this system within the limits of accuracy of experimental measurements. A method for in situ determination of the permeability-porosity ratio is proposed and demonstrated. Results from the study of the chemical environment showed that the carbonate beach may be divided into two zones: a freshwater zone containing high dissolved carbonates but very low salinity and a seawater-dominated intertidal zone containing salinity close to that of seawater and about half as much dissolved carbonates as the freshwater zone. The calculated values showed that the local surface seawater was constantly supersaturated with calcite, whereas the interstitial waters, especially in the intertidal zone, where considerably undersaturated. (Jones-Wisconsin)
W75-10077

**GROUND WATER,**
Geological Survey, Denver, Colo.
M. S. Bedinger.
Water Spectrum, Vol 6, No 1, p 19-26, Spring 1975. 5 fig, 5 photos.

Descriptors: *Groundwater resources, *Water resources development, *United States, Groundwater availability, Water management(Applied), Groundwater potential, Groundwater basins, Water yield, Water quality, Aquifer characteristics, Hydrogeology, Hydrology, Planning, Groundwater movement, Hydrologic cycle, Water balance, Thermal stress, Environmental effects, Water utilization.

This article describes the role of groundwater as an integral part of the overall water resources of the Nation, the relations between environmental stress and groundwater response, and methods of scientific groundwater management, and it illustrates the relation between groundwater and environmental stress by a few case histories. About 180 billion acre-feet of potable water lies within a few thousand feet of the American land surface. At the present time only about 20 percent of our withdrawals for uses other than hydropower generation comes from groundwater. The proper application of scientific principles in developing and managing our groundwater resources is essential. Stresses on an aquifer, both natural and man induced, can be classified as hydraulic, thermal, and chemical. The response to any given stress will be in accordance with the laws of conservation of energy and mass. The equation of continuity, inflow minus outflow = change in storage, is a means of stating the mass balance equation when considering the hydraulic stress and response in the system. Similar equations could be expressed regarding the thermal and chemical balance in the aquifer. (Woodard-USGS)
W75-10143

**CARBON-14 AGES OF WATER FROM THE ARKANSAS HOT SPRINGS,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W75-10145

**GROUND-WATER DISCHARGE FROM THE EDWARDS AND ASSOCIATED LIMESTONES, SAN ANTONIO AREA, TEXAS, 1974,**
Geological Survey, San Antonio, Tex.
R. A. Rappmund.
Edwards Underground Water District, San Antonio, Texas, Bulletin 34, July 1975. 8 p, 1 tab, 14 ref.

Descriptors: *Groundwater resources, *Pumping, *Water yield, *Water utilization, *Texas, Aquifer characteristics, Water wells, Withdrawal, Hydrologic data.
Identifiers: *San Antonio area(Tex), Edwards and associated limestones, Groundwater discharge.

The estimated total well and spring discharge from the Edwards and associated limestones in the San Antonio, Texas, area during 1974 was 847,500 acre-feet, which is the record high for the period 1934-74. The total discharge from wells and springs for 1974 was about 1% more than in 1973 and 53% more than the average for 1934-73. About 43% of the total discharge came from wells, and approximately two-thirds of the well discharge was from wells in Bexar County. Well discharge in 1974 was 17% more than in 1973, while springflow decreased by about 8%. (Woodard-USGS)
W75-10146

**GEOTHERMAL INVESTIGATIONS IN IDAHO: PART 3, AN EVALUATION OF THERMAL WATER IN THE WEISER AREA, IDAHO,**
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 4B.
W75-10147

**WATER DEVELOPMENT FOR IRRIGATION IN NORTHWESTERN KANSAS,**
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.
W75-10152

**GROUND-WATER HYDROLOGY OF GARNER VALLEY, SAN JACINTO MOUNTAINS, CALIFORNIA--A MATHEMATICAL ANALYSIS OF RECHARGE AND DISCHARGE,**
Geological Survey, Menlo Park, Calif.
T. J. Durbin.
Open-file report 75-305, June 1975. 40 p, 15 fig, 5 tab, 21 ref.

Descriptors: *Hydrogeology, *Discharge(Water), *Groundwater recharge, *Aquifer characteristics, Finite element analysis, *California, Water yield, Pumping, Hydrology, Water transfer, Groundwater resources, Mathematical studies, Phreatophytes, Reservoirs.
Identifiers: *Garner Valley(Calif).

Garner Valley is an intermontane alluvial basin in the San Jacinto Mountains, California. An alluvial aquifer with a surface area of 21 square miles underlies the valley floor. A finite-element mathematical representation of the aquifer was used to compute average annual recharge and discharge. The aquifer is in an equilibrium state and recharge from precipitation equals groundwater discharge to phreatophytes and to Lake Hemet, a reservoir in the northern part of the valley. The average annual recharge is about 2,200 acre-feet. The average annual discharge to the phreatophytes is about 1,150 acre-feet, the average annual dishcarge to Lake Hemet is about 1,000 acre-feet, and the average annual discharge via other minor avenues is about 50 acre-feet. Water developers in an adjacent drainage basin are considering the annual export of 400 to 900 acre-feet of groundwater from Garner Valley, which would result in an equal reduction of the natural groundwater discharge in the valley. (Woodard-USGS)
W75-10158

**THE CAPE COD WATER PROGRAM, A CURRENT ANALYSIS,**
Massachusetts State Geology Office, Boston.
For primary bibliographic entry see Field 4B.
W75-10283

## 2G. Water In Soils

**RESEARCH STATUS ON EFFECTS OF LAND APPLICATION OF ANIMAL WASTES,**
Kansas State Univ., Manhattan.
For primary bibliographic entry see Field 5B.
W75-10022

**A MODEL OF ONE-DIMENSIONAL PERCOLATION TO A WATER TABLE USING A COMPUTER SIMULATION LANGUAGE,**
Clemson Univ., S.C. Dept. of Agricultural Engineering.
T. G. King.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 889, $5.25 in paper copy, $2.25 in microfiche. M.S. Thesis, December 1972. 98 p, 4 tab, 20 fig, 71 ref, 3 append. OWRT A-023-SC(4).

Descriptors: Water table, *Percolation, *Computer models, Evapotranspiration, Root zone, Seepage, *Soil moisture, Model studies, Moisture content, Porgramming languages.

A computer model was developed that simulates the quantity and movement of moisture involved in the deep seepage process. The deep seepage process extends from the bottom of the root zone, in the unsaturated flow region, down to the phreatic surface. The model is written in the modeling language CSMP. In one submodel, termed the Root Zone Model, a water balance is used, with measured precipitation and temperature as inputs, to evaluate the processes of runoff, evapotranspiration, root zone storage, and deep seepage. The deep seepage that percolates below the root zone moves down towards the water table. This downward motion is modeled in a submodel called the Deep Seepage Model. The input to this model is the pattern of deep seepage derived from the Root Zone Model. A finite difference form of Darcy's equation is used to compute moisture movement through the profile, which is considered to exist as a series of discrete layers. The soil properties used for each layer are considered to be the average for the entire layer and are applied at the center of the layer. A method to deal with soil inhomogeneity was formulated based on the moisture retention of the soil. The performance of the model was appraised by comparison of the results to field data and published analyses of these data. Figures were presented comparing evapotranspiration, deep seepage and root zone storage with these data. Profiles through the deep seepage region were used to evaluate the redistribution model. Predicted movement of the water table was compared to recorded values.
W75-10138

**PROBLEMS WITH EFFLUENT SEEPAGE FIELDS,**
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-10274

## 2H. Lakes

**THE EFFECTS OF ARTIFICIAL DESTRATIFICATION ON THE WATER QUALITY AND MICROBIAL POPULATIONS OF HYRUM RESERVOIR,**
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5C.
W75-09897

**A MODEL FOR PREDICTING THE EFFECTS OF SEWAGE EFFLUENT ON WETLAND ECOSYSTEMS,**
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5B.
W75-09915

**ECONOMIC ASPECTS OF PRECIPITATION AUGMENTATION OVER THE GREAT LAKES,**
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 6B.
W75-09992

**THE GEOCHEMICAL AND BIOST GRAPHIC RECORD OF NATURAL AND LUTIONAL EUTROPHICATION OF NESOTA LAKES,**
Minnesota Univ., Minneapolis. Dept. of Bot
For primary bibliographic entry see Field 5C
W75-10010

**CHLORINATED HYDROCARBONS IN LAKE ONTARIO ECOSYSTEM, (IFYGL),**
Wisconsin Univ., Madison. Water Chemistr gram.
For primary bibliographic entry see Field 5A
W75-10018

**CHANGES IN THE SUBME MACROPHYTE COMMUNITIES OF WABAMUM AS A RESULT OF THE DISCHARGES,**
Alberta Univ., Edmonton. Dept. of Botany.
For primary bibliographic entry see Field 5C
W75-10074

**THE EUTROPHICATION OF LAKES IN OKANAGAN VALLEY, BRITISH COLUM**
Fisheries Research Board of Canada, Wi (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C
W75-10075

**FLUXES, RESIDENCE TIMES, AND SOU OF SOME ELEMENTS TO LAKE MICHIG**
Hope Coll., Holland, Mich. Dept. of Chemis
For primary bibliographic entry see Field 5C
W75-10090

**AN ECOSYSTEM MODEL FOR THE PEL ZONE OF LAKE WINGRA,**
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5C
W75-10092

**THE STRUCTURE AND PRODUCTIO PHYTOPLANKTON IN MIKOLAJSKIE LA**
Polish Academy of Sciences, Warsaw. De Hydrobiology.
For primary bibliographic entry see Field 5C
W75-10093

**EXPERIMENTALLY INCREASED FISH S IN THE POND TYPE LAKE WARNI PHYSICAL AND CHEMICAL CONDITIO LAKE WATER,**
Instytut Rybactwa Srodladowego, G (Poland). Lake Field Station.
For primary bibliographic entry see Field 5C
W75-10094

**PHOSPHORUS RUN-OFF FROM DRAINAGE BASIN TO MIKOLAJSKIE LA**
Polish Academy of Sciences, Warsaw. De Hydrobiology.
For primary bibliographic entry see Field 5C
W75-10095

**ACTIVITIES, CHARACTERISTICS, OPINIONS OF LAKEFRONT RESIDENTS SIMMEE RIVER BASIN, FLORIDA,**
Florida Univ., Gainesville. Inst. of Foo Agricultural Sciences.
For primary bibliographic entry see Field 6B
W75-10129

**EFFECTS OF FIRE ON THE PLANTS ANIMALS OF A FLORIDA WETLAND,**
California State Univ., Los Angeles. De Biology.
For primary bibliographic entry see Field 6G
W75-10181

FECT OF WIND WAVES AND WIND TIDES
I THE OPTIMUM CONTROL OF LARGE
KES,
izona Univ., Tucson. Bureau of Business
search.
r primary bibliographic entry see Field 4A.
75-10204

## . Water In Plants

FECTS OF INTRODUCED BULLFROGS,
NA CATESBEIANA, ON THE NATIVE
OGS OF THE SAN JOAQUIN VALLEY,
LIFORNIA,
ifornia Univ., Davis. Dept. of Animal Physiolo-

3. Moyle.
peia. Vol 1973, No 1, p 18-22, 1973.
ntifiers: *Bullfrogs, *California, Competition,
og habitats, Predation, Rana-aurora, Rana-
lii, Rana-catesbeiana, San-Joaquin(Calif).

catesbeiana was introduced into California,
ween 1914 and 1920 and has since spread
ughout the state. In the San Joaquin Valley it
become the dominant frog on the valley floor
has spread into the Sierra Valley Nevada
thills. It is most abundant in the warm low
vation pools of the foothill streams, in areas
vily altered by man, although at least 2 popula-
s are established above 1600 m elevation. Of
2 frog species native to this region, R. aurora is
er absent or very rare at the present time,
le R. boylii is found mostly in small permanent
thill streams higher than 200 m elevation, in
s not occupied by R. catesbeiana. The disap-
rance of R. aurora from the region and the con-
ing reduction in range of R. boylii are at-
uted to habitat alteration coupled with preda-
and competition from R. catesbeiana.--Copy-
t 1973, Biological Abstracts, Inc.
5-10114

## Erosion and Sedimentation

TATION RATES AND LIFE EXPECTAN-
S OF SMALL HEADWATER RESERVOIRS
MONTANA,
tana Univ., Missoula. School of Forestry.
. Marsh, and R. Konizeski.
ilable from the National Technical Informa-
Service, Springfield, Va 22161 as PB-243 560,
5 in paper copy, $2.25 in microfiche. Research
ort Number 65, Montana University Joint
er Resources Research Center, Bozeman,
ch 1975. 71 p, 27 fig, 7 tab, 64 ref. OWRT B-
MONT(1).

criptors: *Montana, *Silting, Headwaters,
, *Reservoir silting, *Reservoir sites,
limentation, *Water storage, Water supply,
ll watersheds, Alpine.
tifiers: *Headwater reservoirs, Reservoir life,
ll reservoirs, *Siltation rates, *Alpine reser-
s.

objective was to determine the sedimentation
and life expectancies of small headwater
rvoirs in Montana. Thirty-five reservoirs were
en to sample in detail. Life expectancies are
generally 'infinite' (500 to several hundred
sand years) for alpine reservoirs, (2) generally
tens to a few thousands of years for montane
rvoirs, (3) several hundred years for subdued-
tane reservoirs, (4) one hundred to 2,000
s, for piedmont-foothills reservoirs, and (5) a
tens to one thousand years for plains reser-
. Siting of a small headwater reservoir in an
e area is more desirable than in the other
' watersheds studied. The reservoir basin
ly should lie in impermeable rocks (to avoid
erranean water loss) which will provide only a
gible amount of sediment when subjected to
action of the future reservoir. The watershed should be well-mantled with vegetation, particularly in areas immediately above the reservoir. Gentle topography is preferable to steep topography (erosion potential is lower); northeast aspect is preferable to southwest (for delay in snowmelt or chance of better quantities of vegetative cover); high elevations and/or being out of a rain shadow is preferable to low elevations or areas lying in rain shadows (to be in a zone of adequate precipitation for water to store in the reservoir and for plant growth).
W75-09858

**ARTIFICIAL REEF,**
For primary bibliographic entry see Field 8A.
W75-09879

**THE GEOCHEMICAL AND BIOSTRATIGRAPHIC RECORD OF NATURAL AND POLLUTIONAL EUTROPHICATION OF MINNESOTA LAKES,**
Minnesota Univ., Minneapolis. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W75-10010

**RESEARCH NEEDS AS RELATED TO THE DEVELOPMENT OF SEDIMENT STANDARDS IN RIVERS,**
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W75-10013

**EFFECTS OF SEDIMENT CONTROL ON SEDIMENT TRANSPORT IN THE NORTHWEST BRANCH ANACOSTIA RIVER BASIN, MONTGOMERY COUNTY, MARYLAND,**
Geological Survey, College Park, Md.
T. H. Yorke.
Available from Sup Doc, Wash., D.C. 20402, $3.15 single journal copy; $18.90 yearly subscription rate. Journal of Research of the U.S. Geological Survey, Vol 3, No 4, p 487-494, July-August 1975. 4 fig, 3 tab, 11 ref.

Descriptors: *Sediment transport, *Sediment control, *Urbanization, *Maryland, Data collections, Projects, Construction, Engineering structures, Sediment yield, Correlation analysis, Land use, Rivers.
Identifiers: *Montgomery County(Md), *Anacostia River basin(Md).

Streamflow and sediment were monitored in an urbanizing drainage basin in southeastern Montgomery County, Md., from 1962 to 1972. During this period, urban construction areas averaged about 3 percent of the 21.1 sq mi basin. Urban land increased from 3.5 percent in 1959 to 20 percent in 1971. Virtually all the suspended sediment was transported during storms; three-fourths of it, during large storms. High sediment yields were observed in February, March, June, and August; and low yields generally from September through January. The decrease in sediment discharge in the latter half of the study period is attributed to a sediment-control program. Sediment discharge decreased 35 percent between 1967 and 1972, when effective control measures were installed on about half the construction sites. (Woodard-USGS)
W75-10141

**ESTIMATE OF SEDIMENT DISCHARGES, SANTA ANA RIVER AT SANTA ANA AND SANTA MARIA RIVER AT GUADALUPE, CALIFORNIA,**
Geological Survey, Menlo Park, Calif.
C. G. Kroll.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 412, $3.25 in paper copy, $2.25 in microfiche. Water-Resources Investigations 40-74, February 1975. 18 p, 5 fig, 9 tab, 4 ref.

Descriptors: *Sediment transport, *Sediment yield, *Sediment load, Rivers, California, Particle size, Bedload, Erosion, Beaches, Hydrologic data, Streamflow, Discharge(Water), Water temperature, Estimating.
Identifiers: *Santa Ana River(Calif), *Santa Maria River(Calif).

During the water years 1968-71 the mean daily suspended-sediment discharge of the Santa Ana River at Santa Ana, Calif., was 7,400 tons, and the mean daily coarse-sediment discharge was 3,400 tons. Extrapolated over the 31 water years (1941-71) of streamflow record, the mean daily values are 1,200 and 620 tons. In the Santa Maria River at Guadalupe, Calif., during the water years 1969-71, the mean daily suspended-sediment discharge was 8,700 tons and the mean daily coarse-sediment discharge was 5,500 tons. Extrapolated over the 31 water years (1941-71) of adjusted streamflow record, the mean daily values are 1,400 and 830 tons. The estimated long-term coarse-sediment discharge of the Santa Ana River is 620 tons per day or 190,000 cubic yards per year, and that of the Santa Maria River is 830 tons per day or 250,000 cubic yards per year. Only during flood-flow is any significant quantity of sediment transported. In the Santa Maria River an estimated 99 percent of all coarse sediment was transported in 1 percent (113 days) of the 31-year period. (Woodard-USGS)
W75-10162

**ARSENIC IN SEDIMENTS ON THE CONTINENTAL SHELF OF SOUTHEAST AUSTRALIA,**
Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
For primary bibliographic entry see Field 5B.
W75-10177

**THE PUBLIC TRUST DOCTRINE AND THE CALIFORNIA COASTLINE,**
San Diego State Univ., Calif.
For primary bibliographic entry see Field 6E.
W75-10305

## 2K. Chemical Processes

**AQUIFER PARAMETERS BY A CHEMICAL TRACER TECHNIQUE: NON LINEAR MIXING IN THE ROSWELL CONFINED AQUIFER,**
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
For primary bibliographic entry see Field 2F.
W75-09893

**CARBON-14 AGES OF WATER FROM THE ARKANSAS HOT SPRINGS,**
Geological Survey, Reston, Va.
F. J. Pearson, Jr., M. S. Bedinger, and B. F. Jones.
Reprinted from the Proceedings of the 8th International Conference on Radio Carbon Dating, Wellington, New Zealand, October 1972, p D19-D30. 2 fig, 3 tab, 9 ref.

Descriptors: *Carbon radioisotopes, *Radioactive dating, *Hot springs, *Arkansas, Hydrogeology, Water chemistry, Geochemistry, Carbonates, Silica, Groundwater movement.

The Arkansas Hot Springs are on the southern margin of the Ozark Mountains, Arkansas, and have surface temperatures from 55 to 62 deg C. The adjusted C-14 age of the Hot Springs waters is 4600 years, while ages of up to 9000 years are found in cold spring waters in the Bigfork Chert. Variations in permeability along, and length of flow paths may explain these age differences. Recharge is through the Bigfork Chert, which is principally chalcedony but also contains carbonate beds and lenses. The flow paths to the springs pass through the Arkansas Novaculite and they emerge from the Hot Springs Sandstone, both carbonate-

free formations. The silica content of all the Hot Spring waters is 41-42 mg/litre, which is equivalent to chalcedony saturation at 63 deg C. The Hot Springs themselves and cold spring and well waters from the Bigfork Chert are calcium bicarbonate waters. The Hot Springs contain less calcium and bicarbonate but could be derived from cold Bigfork waters by precipitation of CaCO3 accompanying heating. Delta C-13 values of carbonate species dissolved in all waters range from -13 to -15 parts per thousand; those of the Hot Springs corresponding to Bigfork water to the northeast of the Springs. No carbonate isotope exchange has occurred because of lack of carbonate minerals in the area of heating or relatively rapid flow through fractures in the area of heating. (Knapp-USGS)
W75-10145

**GEOTHERMAL INVESTIGATIONS IN IDAHO: PART 3, AN EVALUATION OF THERMAL WATER IN THE WEISER AREA, IDAHO,**
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 4B.
W75-10147

**CHEMICAL AND PHYSICAL CHARACTERISTICS OF WATER IN ESTURIES OF TEXAS, OCTOBER 1970-SEPTEMBER 1971,**
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-10153

**DISTRIBUTION OF NITROGEN AND PHOSPHOROUS IN THE CONSERVATION AREAS IN SOUTH FLORIDA FROM JULY 1972 TO JUNE 1973,**
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W75-10160

**HYDROLOGIC RECONNAISSANCE OF THE WAH WAH VALLEY DRAINAGE BASIN, MILLARD AND BEAVER COUNTIES, UTAH,**
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W75-10167

**THE NATIONAL STREAM QUALITY ACCOUNTING NETWORK (NASQAN)--SOME QUESTIONS AND ANSWERS,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5A.
W75-10168

**REPORT OF COMMITTEE ON SURVEY OF GROUND WATER SUPPLIES IN NEW ENGLAND.**
New England Water Works Association, Boston (Mass).
For primary bibliographic entry see Field 4B.
W75-10182

**SOME APPLICATIONS OF THERMAL INFRARED LINESCAN IN WATER RESOURCES STUDIES,**
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 5A.
W75-10188

**GLC DETERMINATION OF PPB LEVELS OF CITRATE BY CONVERSION TO BROMOFORM,**
Pfizer (Chas.) and Co., Inc., Groton, Conn.
For primary bibliographic entry see Field 5A.
W75-10191

## 2L. Estuaries

**STATUS OF LAND SUBSIDENCE DUE TO GROUND-WATER WITHDRAWAL ALONG THE MISSISSIPPI GULF COAST,**
Mississippi State Univ., Mississippi State. Dept. of Geology and Geography.
For primary bibliographic entry see Field 2F.
W75-09856

**WAVE QUENCHING DEVICE,**
Baker Hydro, Inc., Irvine, Calif. (assignee)
For primary bibliographic entry see Field 4A.
W75-09871

**ARTIFICIAL REEF,**
For primary bibliographic entry see Field 8A.
W75-09879

**THE FORGING OF THE UNION RECONSIDERED: A HISTORICAL REFUTATION OF STATE SOVEREIGNTY OVER SEABEDS,**
Columbia Univ., N.Y. School of Law.
For primary bibliographic entry see Field 6E.
W75-09888

**FINITE ELEMENT MODELING OF FLOW THROUGH POROUS MEDIA,**
State Univ., of New York, Buffalo. Faculty of Engineering and Applied Sciences.
For primary bibliographic entry see Field 5B.
W75-09900

**QUANTITATIVE ERROR ANALYSIS OF NUMERICAL METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS,**
Rutgers - the State Univ., New Brunswick, N.J. Dept. of Computer Science.
For primary bibliographic entry see Field 6G.
W75-10003

**BIOCHEMICAL AND NUTRITIONAL INTERACTIONS BETWEEN THE OYSTER (CRASSOSTERA VIRGINICA (GMELIN) AND ITS ENVIRONMENT,**
Maryland Univ., College Park. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W75-10011

**RESIDENTIAL CANALS ALONG THE GULF COAST,**
University of Southern Mississippi, Hattiesburg. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W75-10016

**THE RESPONSE OF GYMNODINIUM BREVE TO MUNICIPAL WASTE MATERIALS,**
University of South Florida, Tampa. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W75-10033

**HYDRODYNAMIC LEVELLING OF AN OFFSHORE TIDE GAUGE,**
Institute of Oceanographic Sciences, Taunton (England).
For primary bibliographic entry see Field 8B.
W75-10060

**FAUNA AND FLORA IN HYDRAULIC CLAM DREDGE COLLECTIONS FROM FLORIDA WEST AND SOUTHEAST COASTS,**
Florida Dept. of Natural Resources, St. Petersburg. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W75-10079

**IDENTITY AND REGULATION OF NUTR
LIMITING PHYTOPLANKTON IN THE
LOW ESTUARIES NEAR BEAUFORT, N.**
National Marine Fisheries Service, Beaufo
Atlantic Estuarine Fisheries Center.
For primary bibliographic entry see Field 5C
W75-10084

**FLUVIAL-ESTUARINE WATER RESO
OPTIMIZATION: MICROECOSYSTEM
LATION OF RIVER-ESTUARINE PR
TIVITY RELATIONSHIPS,**
D. C. Cooper.
Verhandlungen Internationale Vereinigun
nologie, Vol 18, p 236-249, 1972. 16 fig, 1
ref.

Descriptors: *Rivers, *Estuaries, *Ecosy
*Model studies, *Productivity, Texas,
water, Salinity, Biological comm
Nutrients, Dams, Energy budget, Water p
effects.
Identifiers: *Microecosystems, Ga
Bay(Texas), Trinity River(Texas).

This research was designed to predict the p
responses of Galveston Bay to freshwate
reduction which would increase freshwate
tion time, 15% of Houston Ship Channel e
entering continuously into the estuarine
waters, and simultaneous application o
stresses. Since these responses could not
vestigated directly, the effects of a sin
freshwater impoundment and simulated H
Ship Channel diversions into estuarine head
were investigated on a group of six conti
culture microecosystem simulations of Ga
Bay. The expected general responses of t
ecosystem to dam construction near the m
the Trinity River are increasing salinity, r
import and export of organic carbon, great
portion of nutrients bound in living form,
community metabolism from heterotrophy
autotrophy, reductions in both primary and
dary productivity, and reduction in the es
ecosystem's efficiency at converting in
energy into useful work and/or products.
taneous diversion of Houston Ship Chan
fluent to the headwaters of Galveston Bay
expected to be assimilated primarily in th
important nursery areas of the bay. Phytopl
and zooplankton species diversity through
estuary will be reduced; this effect will be m
tense in estuarine headwaters. (Jones-Wisco
W75-10099

**SEAGRASS ECOSYSTEMS. RECOMM
TIONS FOR RESEARCH PROGRAMS.**
Available from the National Technical In
tion Service, Springfield, Va 22161 as PB-2
$3.75 in paper copy, $2.25 in micr
Proceedings of the International Se
Workshop, October 22-26, 1973, Leide
Netherlands. 62 p.

Descriptors: *Marine plants, *
*Ecosystems, *Grasses, *Investigations, I
tional commissions, Information exchange
ferences.
Identifiers: *Seagrass, International Se
Workshop.

The International Seagrass Workshop wa
cerned about the lack of knowledge as to t
nificance of seagrass systems to coastal
ecology. Because of the worldwide shallow
distribution of seagrass ecosystems, their m
ment of marine species and fisheries, the
nerability to environmental perturbation, fi
ferent working groups proposed recommend
for research with background notes that to
constitute a framework for an interdiscip
program of study on these ecosystems. Re
ships between food and feeding habits are l
unknown but necessary for an understand
these communities. Although the impact of

atastrophies in oceans is intense, little is known bout cause and effect relationships or of practical neasures which would minimize them. Mechanisms by which seagrasses stabilize coastal ediments are not understood nor are the methods f recolonization or transplantation. Seagrass roductivity is among the highest in the world, but neasuring techniques are unavailable and the nechanisms that sustain the high productivity are nknown, nor is their global distribution. The effects of pollutants on these ecosystems are obcure. Recommendations for research areas and nethodology are discussed and the needs for interisciplinary and international cooperation. (See W75-10107 thru W75-10111) (Auen-Wisconsin)
W75-10106

RODUCTIVITY/PHYSIOLOGY WORKING ROUP,
exas Univ. at Austin. Dept. of Botany.
. McMillan, and C. P. McRoy.
: 'Seagrass Ecosystems. Recommendations for esearch Programs,' Proceedings of the Internaonal Seagrass Workshop, October 22-26, 1973, eiden, The Netherlands, p 5-12. 2 ref.

escriptors: *Marine plants, *Grasses, Ecosystems, *Measurement, *Productivity, race elements, Primary productivity, Biomass, ultures, Plant growth substances, Investigations, oasts, Oceans, Plant physiology, Benthic flora, utrients, Standing crops, Data collections, ooted aquatic plants, Sea water, Plant morpholoy, Climatic zones.
dentifiers: *Seagrass, International Seagrass Vorkshop.

he Physiology Working Group on seagrass roductivity discussed the problems of measuring e productivity of seagrass meadows and roposed guidelines and recommendations for reas of research. The complex ecology of primary roduction in a seagrass meadow includes the eagrasses, microepiphytic and macroepiphytic gae, benthic microalgae and macroalgae, and nytoplankton, but no single study has measured l these components of organic matter formation a seagrass meadow. The reported productivity or seagrass alone ranges between 10 and 20 g of arbon fixed/sq m/day, and with the addition of ther components of the ecosystem it would incate that seagrass meadows must be one of the ost productive systems on earth. The problem of imary production measurements in this cosystem are in obtaining good estimates on a reonal and global scale, and in the methodology for roductivity measurements on a physiological vel. Although the recommendations for producvity measurements do not include phytoplankn, nonetheless phytoplankton productivity ould be included in the total seagrass ecosystem easurements. Specific recommendations are ven for investigations of nutrients, trace metals, ant growth substances that may act as repellents grazers, environmental tolerance limits, orphology, laboratory culture, and species comsition in different geographic regions. (See also 75-10106) (Auen-Wisconsin)
75-10107

ECOMPOSITION WORKING GROUP,
arhus Univ. (Denmark). Lab. of Ecology.
Fenchel.
: 'Seagrass Ecosystems. Recommendations for esearch Programs,' Proceedings of the Internaonal Seagrass Workshop, October 22-26, 1973, eiden, The Netherlands, p 25-37. 3 fig, 3 ref.

escriptors: *Marine plants, *Detritus, *Grasses, Cycling nutrients, Shallow water, Decomposing ganic matter, Organic matter, Coasts, Nutrients, vestigations, Aquatic productivity, Nitrogen, osphorus, Sediments, Aquatic bacteria, ceans.
entifiers: *Seagrass, International Seagrass orkshop.

Studies of detrital decomposition in sediments must be undertaken before mechanisms and importance of nutrient regeneration in sustaining primary production in seagrass ecosystems can be assessed. Flux of nitrogen and phosphorus between sediment and plants should be studied and techniques developed for separation, identification, and determination of nitrogen forms. Nature of microflora involved in metabolism, overall rates of release during metabolite decomposition from materials entering the sediment, fate of released dissolved organic compounds and organo-inorganic complexes, and loss of refractile molecules to permanent sediment should be studied by radioactive labeling of seagrasses. Anaerobic decomposition rates in particulate detritus should be determined in situ. Dissolved organic matter should be studied in relation to specific decompositional processes, rate processes of progressive degradation of dissolved organic components, bacterial succession of physiological degradation, indirect functional interactions of organic compounds with metals, and loss mechanisms as dissolved organic matter is degraded. Rate of physically dissolved organic matter loss from generation and degradation sites must be evaluated. Symbiotic relationships of epiphytic bacteria to angiosperm secretion of dissolved organic matter should be evaluated. Decomposer food chains are discussed. (See also W75-10106) (Buchanan-Davidson--Wisconsin)
W75-10109

**CONSUMER ECOLOGY WORKING GROUP,**
Amakusa Marine Biological Lab., Tomioka (Japan).
T. Kikuchi, and J. M. Peres.
In: 'Seagrass Ecosystems. Recommendations for Research Programs,' Proceedings of the International Seagrass Workshop, October 22-26, 1973, Leiden, The Netherlands, p 41-45.

Descriptors: *Primary productivity, *Marine plants, *Energy transfer, *Grasses, Biological communities, Ecosystems, Shallow water, Habitats, Investigations, Food chains, Coasts, Balance of nature, Oceans.
Identifiers: *Seagrass, International Seagrass Workshop.

The task of the Consumer Ecology Working Group was to determine areas of research as to the fate of the total primary production of the faunal communities in seagrass systems and the potential pathways. The several research areas required are: (1) What taxa are to be studied, based on the requirements that functional units of taxa must be defined with special attention given to feeding methods, modes of life, and microhabitats of organisms. (2) The population dynamics of at least some dominant components of the ecosystem must be studied separately to evaluate the total population dynamics. (3) Analysis of the qualitative aspects of feeding, i.e., food preferences of communities and their modification by food availability or other conditions. (4) The amount of food consumed and assimilated should be based on physiological and autecological characteristics of consumers and evaluation of energy trophic levels via metabolites, secreted materials, carrion, and feces. (6) The non-energetic relationships among and also between trophic levels, e.g., shelter, competition, and toxic effects. A framework for research of these areas is given as well as investigative techniques. (See also W75-10106) (Auen-Wisconsin)
W75-10110

**OCEANOGRAPHY,**
Alaska Univ., College. Inst. of Marine Science.
D. C. Burrell.
In: 'Seagrass Ecosystems. Recommendations for Research Programs,' Proceedings of the International Seagrass Workshop, October 22-26, 1973, Leiden, The Netherlands, p 47-52.

Descriptors: *Marine plants, *Grasses, *Ecosystems, Investigations, Sedimentology, Shores, Environmental effects, Revegetation, Habitats, Nutrients, Latitudinal studies, Nutrient requirements, Coasts, Sediments, Oceans, Vegetation establishment, Trace elements, Pollutants, Shallow water, Water circulation, Plant physiology, Thermodynamic behavior, Physicochemical properties.
Identifiers: *Seagrass, International Seagrass Workshop.

The scope of investigations necessary to understand the ecology of seagrass is delineated. A major requirement is to understand why certain near-shore areas, especially territory adjacent to existing beds, do not support seagrass growth. The varying ability of specific geological environments to promote recolonization, and the rates at which this occurs, are particularly important for successful seagrass transplantation programs. There is a paucity of information for both the effects of severe storms or dredging operations on seagrasses and for their possible uses to decrease the impact of such events. Research areas on sedimentological conditions are described. The total cyclical behavior of the primary nutrients, nitrogen and phosphorus, should be studied. Special attention should be given to flux rates and the nature of intermediate nutrient species. The major and trace organic chemistry of various seagrass species should be characterized. Cycling of both physiologically and non-physiologically required trace metals should be studied and the effects of chemical pollutants investigated. The hydrodynamics associated with the colonization and maintenance of seagrass stands and the effect of seagrass beds on shallow water circulation patterns require investigation together with the environmental limits of seagrass meadows with respect to temperature, salinity, depth, etc. Recommendations are given for investigative approaches. (See also W75-10106) (Auen-Wisconsin)
W75-10111

**CHEMICAL AND PHYSICAL CHARACTERISTICS OF WATER IN ESTURIES OF TEXAS, OCTOBER 1970-SEPTEMBER 1971,**
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-10153

**NUMERICAL MODEL OF THE SALT-WEDGE REACH OF THE DUWAMISH RIVER ESTUARY, KING COUNTY, WASHINGTON,**
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 5B.
W75-10157

**DETERMINISTIC MODEL OF DYNAMIC EUTROPHIC ESTUARY,**
Air Products and Chemicals, Inc., Allentown, Pa.
For primary bibliographic entry see Field 5B.
W75-10215

**ESTIMATES OF OIL IN AQUATIC SEDIMENTS BY FLUORESCENCE SPECTROSCOPY,**
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 5A.
W75-10235

**THE INFRARED STUDIES OF SANTA BARBARA CHANNEL OIL SPILL,**
Cincinnati Univ., Ohio.
For primary bibliographic entry see Field 5A.
W75-10237

**EXTRACTION OF PETROLEUM HYDROCARBONS FROM OIL-CONTAMINATED SEDIMENTS,**
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5G.

W75-10241

**TRED AVON RIVER, TALBOT COUNTY, MARYLAND (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineering District, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W75-10295

**REGIONALISM AND THE LAW OF THE SEA: THE CASE OF SEMI-ENCLOSED SEAS,**
Rhode Island Univ., Kingston.
For primary bibliographic entry see Field 6E.
W75-10301

**THE PUBLIC TRUST DOCTRINE AND THE CALIFORNIA COASTLINE,**
San Diego State Univ., Calif.
For primary bibliographic entry see Field 6E.
W75-10305

**PAMLICO RIVER ESTUARY--PAST, PRESENT AND FUTURE,**
North Carolina State Univ., Raleigh. Dept. of Zoology.
J. E. Hobbie, and B. J. Copeland.
Water Resources Institute Research Special, February 1973. 4 p, 1 fig, 7 ref. OWRT B-020-NC(3).

Descriptors: *Estuaries, *Estuarine environment, *Marine fisheries, *Rivers, *Water resources, Aquatic environment, Environment, Estuarine fisheries, Bays, Inlets(Waterways), Intertidal areas, Saline water-freshwater interfaces, Sea water, *North Carolina, Fish, Water sports, Natural resources, Projects, Nutrients, Nitrogen, Dams.
Identifiers: *Coastal water, Coastal zone management, Dam effects, Environmental policy, Nonpoint sources(Pollution), *Pamlico River estuary(NC).

Researchers have studied the Pamlico River Estuary since 1966; the area is a biologically rich estuary that serves as a nursery ground for many kinds of fish and shellfish. Although considerable algae is present, the water is clean enough for water sports and recreation. As eastern North Carolina experiences increases in population, industry and agriculture, the authors fear that the area will drastically change and that a valuable resource will be lost. After presenting a detailed description of the marine environment, the article suggests several modes for preserving existing conditions. First, it is suggested that nutrient input should remain constant and that circulation and runoff patterns remain unchanged. Second, the authors recommend that increased nutrient loading of nitrogen should be prevented, and finally, that the effects of dams be carefully studied before any action is taken. The article concludes that the risks of possible changes must be weighed against the benefits of maintaining the area's present status. (Fernandez-Florida)
W75-10338

# 3. WATER SUPPLY AUGMENTATION AND CONSERVATION

## 3A. Saline Water Conversion

**DESALTING PLANTS INVENTORY, REPORT NO. 5,**
Hawaii Univ., Honolulu. Coll. of Business Administration.
N. A. El-Ramly, and C. F. Congdon.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 556, $4.75 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, March 1975. 80 p, 4 tab. 14-30-3286.

Descriptors: *Desalination plants, *Census, *Treatment facilities, *Distillation, *Membrane process, Freezing, Desalination processes, Water treatment, Waste water treatment, Water supply.
Identifiers: *Combined capacity(Desalting plants).

According to information received from desalting plant manufacturers, there are 1036 land-based desalting plants with capacities of at least 25,000 gallons-per-day in operation or being constructed throughout the world as of January 1, 1975. These plants are capable of producing about 526 million gallons of fresh water daily for cities and industries. Distillation processes are most widely used, accounting for about eighty-five percent of total capacity. The balance is almost entirely membrane processes with freezing accounting for less than one-tenth of one percent. During the three year period 1972-1974, since the previous Inventory Report was prepared, world-wide sales of desalting plants 25,000 gallons-per-day was reported as 408 plants with a combined capacity of 198 million gallons daily. Of these, 124 distillation plants with a combined capacity of 144 million gallons-per-day and 283 membrane plants with a combined capacity of 54 million gallons-per-day were reported. During the period only one freezing plant was reported. Plants retired from operation were deleted.
W75-09852

**MEANS FOR AND METHOD OF PURIFYING CONTAMINATED WATER,**
R. J. Campbell.
U S Patent No 3,885,399, 4 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 934, No 4, p 1379, May 27, 1975.

Descriptors: *Patents, *Water purification, Water quality control, Sea water, Brackish water, Flash freezing, *Desalinization, Crystallization, Separation techniques, Desalination apparatus, Waste water treatment.
Identifiers: *Freeze crystallization process.

An apparatus and method is described of purifying contaminated water by means of a two-step freeze crystallization process. The process avoids the problem of water freezing on the screen of the work column by reducing the temperature difference between the work water and the concentrate in the work column. The dilute concentrate from one stage is utilized as work water for the stage that contains concentrated concentrate. (Sinha-OEIS)
W75-09864

**REVERSE OSMOSIS SYSTEM WITH AUTOMATIC VALVE FOR MODULE OPERATION CONTROL,**
Desalination Systems, Inc., Escondido, Calif. (assignee)
D. T. Bray.
US Patent No 3,887,463, 5 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 935, No 1, p 293, June 3, 1975.

Descriptors: *Patents, *Reverse osmosis, *Semipermeable membranes, *Water quality control, Water storage, Water purification, Water treatment, Equipment, Valves, *Desalination.

The invention comprises a reverse osmosis system in which purified water from a semipermeable membrane-containing module is stored in a container under fluctuating, elevated pressure. Pressurized feed water flow into the module is shut off by an automatic valve when the pressure in the storage container rises above a first predetermined value, and flow is restored by the automatic valve when pressure is the storage container drops below a second and lower pressure caused by withdrawal of purified water for use. The restoration or turn-on pressure is a predetermined proportion of the feed water pressure and the shut-o pressure is related to or a proportion of the turn- pressure. The automatic valve has a body with first internal cavity; a central internal cavity of effective cross sectional area smaller than that of t first cavity; and a third internal cavity having opening leading to the central cavity of ar smaller than the central cavity. Movable seals sp the effective cross sectional areas of the first a central cavities. A third movable seal opens t third cavity to the central cavity. (Sinha-OEIS)
W75-09877

**WASTE-HEAT STEAM RUNS EVAPORATIV WATER PURIFIER.**
For primary bibliographic entry see Field 5D.
W75-10240

## 3B. Water Yield Improvement

**APPARATUS FOR CONTROLLING TH LEVEL OF SUBSURFACE WATER,**
Moretrench American Corp., Rockaway, N (assignee)
For primary bibliographic entry see Field 4B.
W75-09880

**PROCEEDINGS OF THE WORL METEOROLOGICAL ORGANIZA TION/INTERNATIONAL ASSOCIATION O METEOROLOGY AND ATMOSPHERI PHYSICS SCIENTIFIC CONFERENCE O WEATHER MODIFICATION.**
World Meteorological Organization, Genev (Switzerland).
Conference held October 1-7, 1973., Tashke (USSR). WMO No 399, Geneva (Switzerland 1974. 538 p.

Descriptors: *Conferences, *Weather modifica tion, *Hail, *Snow, *Rain, *Meteorology, *Fog Snowfall, Cloud seeding, Artificial precipitation Storms, Precipitation(Atmospheric), Clou physics, Hurricanes, Thunderstorms, On-site in vestigations, Simulation analysis, Analytica techniques, Statistical methods, Evaluation Clouds, Nucleation, Instrumentation.
Identifiers: Hail suppression, Fog dispersal.

Weather modification is an art. Proceedings as whole serve to show the dilemma facing practi tioners of weather modification, namely the nee to interfere with meteorological phenomens without having sufficient basic knowledge abou the processes involved. Broad subjects discusse were fog dispersal; rain enhancement; snow enhancement; hail suppression; modification o tropical storms and thunderstorms; technical an operational aspects of weather modification physical, statistical, and economic evaluations o weather modification; and ice nuclei technology (See W75-09945 thru W75-10002) (Humphreys ISWS)
W75-09944

**FOG DISPERSAL - PHYSICAL AND TECHNOLOGICAL ASPECTS,**
Etablissement d'Etudes et de Recherches Meteorologiques, Paris (France).
L. Facy.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No 399, Geneva (Switzerland), p 3-11, 1974.

Descriptors: *Fog, *Weather modification, *Methodology, Airports, Meteorology, Technology, Silver iodide, Drops(Fluids), Crystals, Ice, Nucleation, Supercooling, Condensation, Chemicals, Aerosols, Propane.

dentifiers: *Fog dissipation, *Visibility improvement, Vaporization, Warm fogs, Cold fogs, Ice ogs, Collection efficiency, Helicopters, Freezing uclei.

og dispersal techniques were reviewed. These chniques were summarized as follows: (1) In old supercooled water fogs, use may be made of e thermodynamically metastable water phase by troducing natural or artifical ice or freezing uclei. (2)In warm fogs, sufficient heat may be pplied with burners to vaporize the droplets and provide an increase in air temperature for eater stability inside the clear space of air obined. (3)In warm (or even cold) fogs, a sufficient nount of hygroscopic chemicals may be spersed in order to lower the vapor pressure er the saturated droplets to make use of aoult's law versus the remaining pure water oplets. (4)The collection efficiency of the oplets may be increased either by mechanical d/or electrical means or by surface behavior odification. (5)The clear dry air above may be xed with the fog layer, if thin enough, by using ns or helicopters. (6)Ice fogs are the most difult case. In principle, heat or filtration are eoretically the only ways of dissipating the ice ystals. But heat must be provided by dry or diative devices in order not to inject additional ter vapor. (See also W75-09944) (Sims-ISWS)
75-09945

**i A METHOD OF FOG MODIFICATION BY SSIVATION OF CONDENSATION NUCLEI,**
rainskii Nauchno-Issledovatelskii drometeorologicheskii Institut, Kiev (USSR).
A. Bakhanova, and A. V. Silayev.
Proceedings of the World Meteorological Organization/International Association of teorology and Atmospheric Physics Scientific nference on Weather Modification, October 1-1973, Tashkent (USSR). WMO No 399, Geneva vitzerland). p 13-17, 1974. 5 fig, 23 ref.

scriptors: *Fog, *Weather modification, ethodology, Nucleation, Condensation, oratory tests, Chemicals, Clouds, Adsorption, ohols, Ammonium compounds, Meteorology.
ntifiers: *Hygroscopic nuclei, Ammonium oride, Cetyl alcohol, Passivation.

e idea of artifical modification of the activity of cloud condensation nuclei with monolayers of ne surface-active agents (SAA) was developed viously. Some attempts have been made to ly the SAA to prevent fog formation but the ll number of these experiments and an amuity of their results do not permit any conclus about the efficiency of this method. The ef- of cetyl alcohol adsorption layers was studied the early stages of condensation growth of roscopic nuclei (ammonium chloride). The dification of the nucleus' surface by cetyl alol was carried out by the adsorption of its ecules from the gas phase. Nuclei growth was erved. The experiments showed that the initial e of condensation nuclei is of great importance the artificial reduction of their activity (the sod passivation). The laboratory and theoretical lts indicated that the method of passivation of condensation nuclei may be operationally ible in preventing fog formation. To apply this hod a reliable forecast of fog formation is ded. Another difficulty is to choose the cor- moment to introduce SAA vapor into the atphere. The quantity of SAA needed depends ly upon the air mass temperature; for exam- at 0C, 5.5 kg per cubic kilometer is needed; at the quantity needed is 10 kg; at 10C, 25 kg; and 0C, 160 kg. (See also W75-09944) (Sims-ISWS)
-09946

**IGN OF A MODERN THERMAL FOG DISATION SYSTEM FOR AIRPORTS,**
Force Cambridge Research Labs., Hanscom , Mass.
. Silverman, and A. I. Weinstein.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No 399, Geneva (Switzerland), p 19-28, 1974. 2 fig, 5 tab, 9 ref.

Descriptors: *Fog, *Weather modification, *Airports, Methodology, Design, Equipment, Technology, Heat, Fuels, Economics, Safety, Costs.
Identifiers: *Visibility improvement, *Warm fogs, Fog dissipation, Landing safety, Burners.

Cold fog accounts for only 5% of the total fog encountered on a worldwide basis, warm fog accounting for the other 95% of the cases. The direct application of heat from a well-engineered ground based system is the most practical and reliable technique for dissipating warm fog at airports where the volume of traffic justifies its installation. The U.S. Air Force has undertaken the development of a thermal fog dissipation system that is based on the application of modern meteorological and heat engineering technology. The design of this modern thermal fog dissipation system for airports was described. Operation of the thermal fog dispersal system will result in significant benefits in terms of improved operational effectiveness, improved cost effectiveness, improved operational safety, and net fuel economy. (See also W75-09944) (Sims-ISWS)
W75-09947

**PROBLEMS OF RADIATION FOG PREVENTION,**
Akademiya Nauk SSSR, Moscow. Institut Fizicheskoi Khimii.
B. V. Derjaguin, I. N. Grigorenko, V. A. Ershov, I. A. Zolotarev, and Yu. S. Kurgin.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No 399, Geneva (Switzerland), p 29-33, 1974.

Descriptors: *Fog, *Weather modification, *Methodology, Condensation, Nucleation, Mathematical studies, On-site investigations, Alcohols, Meteorology, Radiation.
Identifiers: *Passivation, Cetyl alcohol, USSR.

One possible method of affecting the formation of radiation fog consists of artificially reducing the condensation activity of nuclei by coating these with monolayers to reduce the vapor adsorption rate. In 1970-1971, experiments were carried out on a site located in the neighborhood of Barishevka, Kiev region. One group used as a chemical reagent a mixture of high-molecular alcohols of the Shebekinsk Chemical Combine, whose chemical composition included 95% of alcohols of C18-C22 fraction, whereas another group used cetyl alcohol. These experiments demonstrated the high efficiency of the passivation method involving the introduction of highly dispersed high-molecular alcohol into the atmosphere layer adjacent to the ground. In all cases thus treated, no formation of radiation fog was observed over the area having passivated condensation nuclei. (See also W75-09944) (Sims-ISWS)
W75-09948

**SOME DATA ABOUT THE MECHANISM OF THE ARTIFICIAL DISSIPATION OF SUPERCOOLED FOG,**
Central Aerological Observatory, Moscow (USSR).
L. I. Krasnovskaya, T. I. Shevaldina, and A. N. Hizhnjak.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tahkent (USSR). WMO No 399, Geneva (Switzerland, p 35-40, 1974. 4 fig, 8 ref.

Descriptors: *Fog, *Weather modification, *Aerosols, Laboratory tests, Nucleation, Propane, Temperature, Carbon dioxide.
Identifiers: *Cloud chamber studies, Fog dissipation, Freon.

Data have been published during the past 15 years concerning the possibility of using propane for the artificial dissipation of fog at temperatures considerably higher than the threshold temperatures at which cooling reagents and ice-forming aerosols are active. The values obtained in field experiments for the threshold temperature at which propane is effective suggest that the properties of the active nuclei formed by introducing agents of this type into fog are different from those of ice crystals. It therefore seemed useful to conduct laboratory investigations aimed at verifying this hypothesis. The experiments were conducted in a cooling chamber with a working volume of 16 cu m. Comparisons were made of the quantities of active nuclei formed per gram of reagent introduced with liquid carbon dioxide, propane, and Freon-12 in temperatures ranging from -10C to0C. Freon was chosen to represent reagents of the propane type; but it is much more convenient for experimental purposes because it is neither toxic not explosive. In the temperature range from -10C to -3C, there was practically no difference in the action time of the reagents tested; but above -3C there was a considerable difference. It can be assumed, therefore, that at such high temperatures, CO2 acts only as a cold source and that the active nuclei formed when it is introduced are ice crystals. (See also W75-09944) (Sims-ISWS)
W75-09949

**RAIN ENHANCEMENT - A REVIEW,**
Commonwealth Scientific and Industrial Research Organization, Epping (Australia). Div. of Cloud Physics.
J. Warner.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No 399, Geneva (Switzerland), p 43-50, 1974. 1 tab, 7 ref.

Descriptors: *Weather modification, *Cloud seeding, *Artificial precipitation, Cloud physics, Rain, Precipitation(Atmospheric), Nucleation, Rainfall, Chemistry of precipitation, Silver iodide, Meteorology, On-site investigations, *Reviews.

Rain enhancement experiments in Australia, India, Israel, and the United States were reviewed. The good and bad features of these experiments were discussed. It was concluded that the following are necessary conditions for an experiment that will produce widely accepted results: (1) good statistical design and analysis of the experiment; (2) long-term continuity; (3) uniformity in cloud characteristics throughout the term of the experiment, or at least means of separating them; (4) a preponderance of clouds expected to be susceptible to the seeding technique employed; (5) sufficient background knowledge of the microphysics and dynamics of clouds in the area to enable the experimenter to accept or reject the statistical result. (See also W75-09944) (Sims-ISWS)
W75-09950

**RESULTS OF SEEDING CUMULONIMBUS CLOUDS AIMED AT THE MODIFICATION OF PRECIPITATION IN THE STEPPE PART OF THE UKRAINE,**
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
F. Ya., Voit, E. E. Kornienko, I. A. Kurejko, A. I. Furman, and S. B. Husid.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmopsheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 51-54, 1974. 1 tab, 12 ref.

Descriptors: *Weather modification, *Cloud seeding, *Artificial precipitation, Cloud physics, Rainfall, Rain, Precipitation(Atmospheric), Silver iodide, Nucleation, Clouds, Meteorology.
Identifiers: *Cumulonimbus clouds, USSR(Ukraine).

Over a number of years, cumulus congestus clouds were seeded in the steppe part of the Ukraine in order to influence the amount of precipitation produced. As a result of randomized experiments during 1966-1968, it was found that seeding these clouds with dry ice resulted in a marked increase in precipitation from them, although the absolute increase in precipitation was not large. Seeding of cumulonimbus clouds began in 1972. Experiments were carried out over the experimental meteorological polygon of the Ukr-NIGMI (area 10,000 sq km). The cloud seeding was performed by means of an Australian-made generator of silver iodide installed in an IL-14 aircraft. Monitoring of the operation was by means of a network of raingages and a MRL-I radar of wavelength 3.2 cm. A cumulonimbus cloud or system of clouds was selected as an experimental unit. Aircraft took off on days when showers were forecast. A violently growing cloud or a group of closely spaced clouds with a small initial depth was chosen from the aircraft. Seeding took place at the cloud base, in the area of updraughts, and stopped when the cloud transformed into cumulonimbus and precipitation started. Positive results of seeding were indicated and the observed increase in precipitation was impressive. (See also W75-09944) (Sims-ISWS)
W75-09951

**SALT DRIZZLES EXTRACTED FROM UNSATURATED AIR LAYERS BY SEEDING WITH HYGROSCOPIC NUCLEI,**
Universite de Bretagne-Occidentale, Brest (France).
R. Serpolay, and M. Andro.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 55-61, 1974. 5 fig, 4 ref.

Descriptors: *Weather modification, *Artificial precipitation, *Drizzle, Atmopsheric physics, Fog, Salts, Nucleation, Sodium chloride, Precipitation(Atmospheric), Rainfall, Meteorology.
Identifiers: *Hygroscopic nuclei.

For studying the possibility of modifying fogs, an experimental ground-based device was proposed. It consists of a set of units, each of them being able to disperse suitably powdered hygroscopic material into the atmosphere. By thus dispersing a powder of NaCl, it has been possible to induce locally a drizzle in fog layers of depths between 40 and 60 m. The precipitation was observed very accurately at a distance less than 300 m leeward of the device, corresponding to a residence duration of about 4 minutes for the airborne particles. In order to increase the number of data resulting from field experiments, seedings were carried in uncloudy air layers whose relative humidity were between 100% and 75%, the latter value corresponding the the critical relative humidity for sodium chloride. All the seedings conducted in uncloudy conditions with relative humidity between 100% and 75% induced saline drizzles similar to those previously obtained by seeding the fog layers with the same ground-based device. In the case of drizzle droplets generated in moist air, it appears that the higher the relative humidity of the air in which the drizzle has been induced, the higher the percentage of the large-sized droplets. It appears that aerosols of hygroscopic particles are capable of inducing precipitation in clear as well as in cloudy conditions. (See also W75-09944) (Sims-ISWS)
W75-09952

**RAPID INDUCEMENT OF PRECIPITATION BY SEEDING STRATIFIED AIR LAYERS,**
Universite de Bretagne-Occidentale, Brest (France).
R. Serpolay, and M. Andro.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 63-67, 1974. 6 ref.

Descriptors: *Precipitation(Atmospheric), *Weather modification, *Cloud seeding, Meteorology, Artificial precipitation, Rainfall, Nucleation, Ice, Crystals, On-site investigations, Fog.
Identifiers: Hygroscopic seeding.

The medium-scale trials carried out at Brest-Guipavas Airport make use of the action of the hygroscopic particles on air layers where clouds are present or in which the humidity is close to saturation point. The results indicate that precipitation develops rapidly after seeding. With the speed of displacement of the air layers treated in this way, precipitation occurs at only a few hundred meters from the source of the nuclei. The size of the residual crystals which are left after evaporation of water from the precipitating saline droplets is, on the average, 4 to 10 times that of the nuclei used for seeding. In a series of experiments with super-cooled fogs seeded by using ice crystals produced in the spray of a refrigerating liquid, all the conditions seeming to prevail for a rapid formation of precipitation were listed. It was concluded that the following three conditions must be fulfilled: (1) temperature of the order of-4C or below; (2) high concentration of ice crystals equally competitive for the process of water vapor transfer and immediately available for this process on leaving the injecting device; (3) turbulent flow of the cloudy atmosphere, often occurring with a wind speed of at least 3 m/s or caused by eddies. The rapid growth of precipitation elements has often been attributed to the third condition only because it is observed regularly and systematically. (See also W75-09944) (Ochs-ISWS)
W75-09953

**ON THE EFFICIENT SIZE AND CONCENTRATION OF SPRAY DROPS FOR STIMULATING WARM CLOUDS,**
Japan Meteorological Agency, Tokyo. Aerological Observatory.
Y. Takahashi.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmopsheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 69-80, 1974. 5 fig, 9 ref.

Descriptors: *Precipitation(Atmospheric), *Weather modification, *Cloud seeding, Meteorology, Drizzle, Artificial precipitation, Rainfall, Nucleation, Drops(Fluids), Clouds.
Identifiers: Hygroscopic seeding.

Cloud droplets which have grown beyond a certain size by condensation in ascending air, and whose inertia of motion against the air have become significant will begin rapidly to grow to small drops or drizzle through mutual collisions due to turbulence, whether they are of equal size or not. Drizzle thus formed consists of drops of various sizes according to the number of collisions. Some grow to raindrops by capture of lots of cloud droplets before leaving the cloud. If the cloud is shallow and no signficant updraught exists, drizzle falls from the cloud. An equation for the probability of equal sized drops colliding in turbulence was presented and the radius at which cloud droplets may begin rapid growth by collision was found to be about 25 microns radius. The critical concentration of these drops was also determined to be at about 0.2 grams/per cu m. The time required to form drizzle was also discussed. Spray drops
enhancing precipitation in warm clouds sho
have a distribution of size close to or somew
larger than the critical size, say 25 microns
radius, and delivery of spray should preferably
where the mass concentration of big cl
droplets is approaching the critical value, say
or 0.25 grams per cu m. (See also W75-09
(Ochs-ISWS)
W75-09954

**NUMERICAL SIMULATION OF CLOUD SE
ING EXPERIMENTS,**
South Dakota School of Mines and Technolo
Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 2B.
W75-09955

**THEORETICAL RESEARCH INTO ARTI
CIAL STIMULATION OF PRECIPITATI
FOR FIGHTING FOREST FIRES,**
Gidrometeorologicheskii Nauchno-Issledova
skii Tsentr, Leningrad (USSR).
For primary bibliographic entry see Field 2B.
W75-09956

**FEASIBILITY OF MESO- AND SYNOPT
SCALE WEATHER MODIFICATION FR
CARBON PARTICLE SEEDING,**
Colorado State Univ., Fort Collins.
W. M. Gray, and W. M. Frank.
In: Proceedings of the World Meteorological
ganization/International Association
Meteorology and Atmospheric Physics Scient
Conference on Weather Modification, Octobe
7, 1973, Tashkent (USSR). WMO No. 399, Gen
(Switzerland), p 95-102, 1974. 2 fig, 2 tab, 13 ref

Descriptors: *Feasibility studies, *Weat
modification, *Artificial precipitati
*Atmospheric physics, Carbon, Heating, So
radiation, Convection, Evaporation, Effe
Boundary layers, Meteorology, Economics.
Identifiers: *Carbon black dust, Mesoscale
fects.

A new area of potential weather modificatio
mesoscale weather modification from solar ene
interception by small carbon particles--v
described. If a significant portion of the incom
solar energy over the oceans could be absorbed
the atmospheric boundary layer during
daylight hours, an artificial stimulation of cumu
convection would occur. This might be acco
plished by aerosol interception of solar radiati
It is envisaged that this mesoscale artificial h
source will be utilized to produce or intensify
mesoscale upward vertical motion field which v
stimulate extra cumulus convection. T
mesoscale heat source should produce or intens
the lower level mass and water vapor converge
fields. An enhancement of cumulus convecti
should follow. If tropospheric vertical wind she
are not too large, it is likely that this extra induc
cumulus convection will act as a 'feedba
mechanism to develop or intensity a mesosc
weather system or cloud cluster. This weat
system is likely to exist after the termination of t
extra solar heating. It may prove beneficial to e
ploy both the 'carbon dust' and the 'silver iodi
modification techniques. The carbon du
technique could be used to generate cumulus a
the 'silver iodide' technique at a later time
enhance the cumulus. (See also W75-09944) (Sim
ISWS)
W75-09957

**THE ROLE OF SOLID PRECIPITATION EL
MENTS IN NATURAL AND ARTIFICI
PRODUCTION OF RAIN IN ISRAEL,**
Hebrew Univ., Jerusalem (Israel). Dept. of A
mospheric Sciences.
A. Gagin, and I. Steinhorn.

: Proceedings of the World Meteorological Or-
nization/International Association of
eteorology and Atmospheric Physics Scientific
onference on Weather Modification, October 1-
1973, Tashkent (USSR). WMO No. 399, Geneva
witzerland), p 103-124, 1974. 5 fig, 2 tab, 23 ref.

escriptors: *Weather modification, *Artificial
ecipitation, *Cloud seeding, Cloud physics, At-
ospheric physics, Silver iodide, Nucleation,
ainfall, Precipitation(Atmospheric), Meteorolo-
, On-site investigations.
entifiers: *Israel.

e rain bearing, wintertime, subtropical cumuli
Israel are predominantly mixed clouds. Their
odel cloud-top temperature is -20C whereas
ud base temperatures are 9C, on the average.
nsequently, values of maximum liquid water
ntents in the upper parts of each of these clouds
re found to be normally in the range of 0.7-1.5
u m, depending on the size of the clouds. Ex-
sive measurements of icy crystal concentra-
ns in the vicinity of cloud tops indicate that
se concentrations correspond to the ice nuclei
ncentrations active at the same temperatures
d are thus clearly temperature dependent. The
ysical plausibility of the statistically significant,
sitive effects, that were obtained in both the
t and second Israeli cloud seeding experiments
s assessed. In the absence of an alternative rain-
ming process, normal ice crystal formation and
subsequent growth by accretion was shown to
capable of producing precipitation sized parti-
s in Cu clouds that have top temperatures
der than -12C (equivalent to a cloud 3.25 kg
p). The size and concentration of precipitation
ments in the various clouds are porportional to
depth of the clouds and their top temperature.
e computer values of the duration of precipita-
n and the time for its full development were in a
d agreement with the corresponding values ob-
ved by radar. Clouds, having top temperatures
rmer than -12C are unlikely to be affected by
ding with AgI particles having a threshold ac-
tion temperature of -5C. Cu clouds having top
peratures in the range of -12C to -20C seem to
mostly favorable to the type of seeding
cussed. (See also W75-09944) (Sims-ISWS)
5-09958

**OWFALL ENHANCEMENT,**
ional Oceanic and Atmospheric Administra-
, Boulder, Colo. Atmospheric Physics and
emistry Lab.
primary bibliographic entry see Field 2C.
5-09959

**E EXPERIMENTAL SEEDING OF FRONTAL
OUDS IN WINTER IN ORDER TO IN-
EASE PRECIPITATION,**
ainskii Nauchno-Issledovatelskii
rometeorologicheskii Institut, Kiev (USSR).
. Leskov.
Proceedings of the World Meteorological Or-
zation/International Association of
eorology and Atmospheric Physics Scientific
ference on Weather Modification, October 1-
973, Tashkent (USSR). WMO No. 399, Geneva
itzerland), p 143-147, 1974. 3 fig, 15 ref.

criptors: *Weather modification, *Artificial
ipitation, *Cloud seeding, Rainfall, Winter,
ipitation(Atmospheric), Nucleation, Clouds,
on dioxide, Cloud physics, Atmospheric
ics, Meteorology, On-site investigations.
tifiers: *Frontal clouds, USSR.

results obtained from seeding of frontal
ds in winter were discussed. Used as a re-
t, solid carbon dioxide was introduced from
irplane into layers suitable for seeding. Each
r's vertical thickness was not less than 250-300
hile the temperature did not exceed -4C. The
riment was performed so as to seed all the
ing cloud. The seeding line was fixed relative to the ground, so as to make the artificial precipitation occur within the experimental area. The results of 77 experiments were analyzed and can be divided into two kinds: (1) 61 events incorporating experiments with naturally precipitating frontal clouds; (2) 16 events where nonprecipitating frontal clouds of Sc, Ac, As types were seeded. The average relative increase in the experiments of the first group was 100%. Such a large increase in precipitation was attained because only a definite type of cloud with layers suitable for treatment was seeded. In the case of precipitating clouds, such layers were observed only in 42% of the events. Out of the 16 experiments of group 2, only in 8 events were the artificial precipitation areas obtained. The results show that treatment of frontal clouds by solid carbon dioxide causes a substantial transformation. It is characterized by a change of the phase state of drop and mixed layers, by an increase in crystal concentrations, and by raising of the temperature. This should cause dynamic disturbances, as well as a change in the precipitation amount. (See also W75-09944) (Sims-ISWS)
W75-09960

**GROUND-BASED CLOUD SEEDING EXPERIMENT AT DELHI DURING WINTER,**
Institute of Tropical Meteorology, Poona (India).
R. K. Kapoor, R. N. Chatterjee, K. K. Kanuga, S. K. Paul, and Bh. V. Murty.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 149-158, 1974. 1 fig, 5 tab, 12 ref.

Descriptors: *Weather modification, *Artificial precipitation, *Cloud seeding, Rainfall, Winter, Precipitation(Atmospheric), Nucleation, Silver iodide, Climatology, Meteorology, On-site investigations.
Identifiers: *Ground-based seeding, India.

A series of ground-based experiments, which relate to winter cloud seeding with silver iodide as a seeding agent, has been in progress at Delhi since 1968. The details of these experiments, which are to continue, and the results obtained so far were presented. The solution used for seeding, in the first 4 of the 5 seasons, was prepared by dissolving silver iodide in acetone with sodium iodide as solubilizer. It contained about 7% silver iodide by weight. The solution used in the fifth season contained ammonium iodide as solubilizer in place of sodium iodide. The period of experiment has been the four winter months, December to March. The seed-generator has been operated on each seeding day for about four hours during the hottest part of the day, i.e., between 1100 and 1600 IST. The rainfall in the target sector, on a seasonal scale, increased. However, the positive result obtained cannot be accepted as conclusive, unless the same trend continues to be shown by experiments in the next few seasons. (See also W75-09944) (Sims-ISWS)
W75-09961

**THE ARTIFICIAL MODIFICATION OF CLOUDS AND PRECIPITATION IN A MOUNTAINOUS REGION,**
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
P. V. Hobbs, and L. F. Radke.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 159-167, 1974. 3 fig, 1 tab, 9 ref. NSF Grant GI-31759, Dept. of Int. Contract 14-06-D-6999.

Descriptors: *Weather modification, *Artificial precipitation, *Cloud seeding, *Mountains, Nucleation, Atmosphere, Silver iodide, Carbon dioxide, Precipitation(Atmospheric), Model studies, Mathematical models, Atmospheric physics, Cloud physics, Meteorology, Theoretical analysis, On-site investigations, Washington.
Identifiers: Cascade project, Cascade Mountains(Wash).

In 1969 the Cloud Physics Group at the University of Washington commenced a program of research to investigate the dynamics and microstructure of winter storms over the Cascade Mountains. The program involves extensive measurements both on the ground and in the air, the development of a theoretical model to describe the airflow over the Cascades and the growth and fallout of precipitation, and investigations into the effects on the microstructure of the clouds and on precipitation at the ground of introducing artificial ice nuclei directly into clouds with particular emphasis on diverting snowfall from the western slopes of the Cascades to the drier eastern slopes. An outline was given of the theoretical basis of the project and the experimental techniques that are being used in the field studies. Emphasis was place on observations and measurements obtained when artificial seeding was carried out and on current conclusions concerning the effectiveness of this technique for modifying the distribution of snowfall across a mountain range. (See also W75-09944) (Sims-ISWS)
W75-09962

**SEEDING REQUIREMENTS FOR RAPID GLACIATION OR STIMULATION OF A MIXED PHASE CLOUD,**
State Univ. of New York, Albany. Atmospheric Sciences Research Center.
J. E. Jiusto.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 169-178, 1974. 4 fig, 4 tab, 13 ref.

Descriptors: *Weather modification, *Artificial precipitation, *Mathematical models, Model studies, Cloud physics, Atmospheric physics, Nucleation, Cloud seeding, Crystals, Ice, Supersaturation, Glaciation, Meteorology.

Frequently, there are not enough ice nuclei present for partial or complete glaciation of supercooled clouds. This is especially true of highly convective systems where the supply rate of water vapor can exceed the extraction rate by deposition onto available ice crystals. There is a critical concentration of ice crystals beyond which a cloud will glaciate. This concentration, which varies with cloud updraft strengh, temperature, and crystal size and type is important in the development of natural and seeded clouds. An equation was previously developed to estimate the number of nuclei necessary to rapidly glaciate a supercooled cloud. With more complete information on crystal growth rates now available, it is possible to refine these estimates for particular crystal types and for several pressure levels. The basic equation employed was that for supersaturation change with time in a mixed-phase cloud. Supersaturation in an all-water warm cloud has been expressed by several other investigators. This expression was extended to include the ice phase and to consider supersaturation with respect to ice. Some results of calculations using this equation were presented. Implications of these results as they relate to the concentrations of nuclei needed in cloud modification were listed. (See also W75-09944) (Sims-ISWS)
W75-09963

**THE PYRAMID PILOT CLOUD-SEEDING PROJECT,**
Nevada Univ., Reno. Desert Research Inst.
J. A. Warburton.

In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 179-186, 1974. 2 fig.

Descriptors: *Weather modification, *Cloud seeding, *Artificial precipitation, *Snowfall, Silver iodide, Nucleation, Precipitation(Atmospheric), Mountains, Radar, Water supply, Projects, Meteorology, Nevada.
Identifiers: Sierra Nevada, Pyramid Lake Pilot Cloud-Seeding Project, Reno(Nev.).

In early 1970, a serious water shortage and water rights problem emerged in western Nevada. The surface elevation of Pyramid Lake, an ancient desert lake, was observed to have fallen some 20 meters over a period of 60-70 years. Increased water usage, irrigation, and urban development had presumably contributed significantly to this drop in lake level. Concern for the preservation of the lake, site of an Indian reservation, on both environmental and economic grounds led to the commencement of the Pyramid Pilot Cloud-Seeding Project, a weather modification program designed to augment the inflow to the river system supplying water to the lake and the surrounding urban areas. The project area is being seeded with six ground-based AgI generators. A 3.2 cm lambda weather radar is being used for observations of the winter snowstorms. With the radar data in digital form, a great variety of analysis can be performed. The combination of rugged terrain and the need for the seeding material to flow over the Sierra crest line into the target area lying on the east down-slope side of the mountains provided a situation where it was important to measure the silver content of the precipitation falling in the project area. Observed concentrations of silver in the target precipitation are typically 4 to 10 times 'background.' (See also W75-09944) (Sims-ISWS)
W75-09964

**HAIL PROCESS INVESTIGATION AND HAIL SUPPRESSION ACTIVITIES IN THE U.S.S.R.,**
Gidrometeorologicheskii Institut, Leningrad (USSR). High-Altitude Geophysics Inst.
I. I. Burtsev, I. I. Gaivoronsky, and A. I. Kartsivadze.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 189-196, 1974. 1 tab.

Descriptors: *Weather modification, *Cloud seeding, *Model studies, *Hail, Storms, Cloud physics, Atmospheric physics, Mathematical models, Nucleation, Crystals, Precipitation(Atmospheric), Meteorology.
Identifiers: *USSR.

In the past decade much success has been gained in the studies on hail formation and hail precipitation processes. As a result of these studies the possibilities of influencing the hail forming process have been learned. These studies were reviewed with particular emphasis given to the model studies of hailstorms in the USSR and elsewhere. The operational techniques used in the hail suppression activity in the USSR were described, and the results of these activities were summarized. Analysis of the results of hail suppression over 5 years shows a decrease by a factor of 3-4 both in relation to control areas and in comparison with many years' data obtained before protection. On the other hand, crops over wide areas are still damaged by hail. Analysis of the experience obtained in hail suppression work shows that the most considerable damage occurs during years of intensive hail processes or when hail clouds were not seeded or were seeded insufficiently. Efficiency evaluation both in the USSR and in other countries requires further improvement and verification. Statistical methods and randomized experiments will result in more objectiveness as far as hail suppression evaluation is concerned. More and more attention is being given in the USSR, USA, France, Canada, and other countries to these problems. It would be more justifialbe to carry out investigations and operational work cooperatively on the basis of the results already obtained. (See also W75-09944) (Sims-ISWS)
W75-09965

**NATURAL 'HAILCORES' AND THEIR ABILITIES TO ESTIMATE THE EFFICIENCY OF HAIL PREVENTION SYSTEMS,**
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
For primary bibliographic entry see Field 2B.
W75-09966

**HAILSTORMS IN JAPAN,**
National Research Center for Disaster Prevention, Tokyo (Japan).
Y. Omoto.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 207-215, 1974. 9 fig, 1 tab, 11 ref.

Descriptors: *Hail, *Weather modification, *Climatology, Cloud physics, Storms, Cloud seeding, Precipitation(Atmospheric), Meteorology.
Identifiers: *Japan.

An essential part of a hail suppression research project is to obtain knowledge on the characteristics of hailstorms which occur in the area under consideration. In Japan, there had been relatively few studies on hail, especially before the mid-1960s. Between 1965 and 1969 the central and east-central portions of the main island, Honshu, suffered an unusually great amount of damage by hail. At about this time, the National Research Center for Disaster Prevention was planning to promote weather modification research in Japan, and the organization decided to choose hail suppression as object of the first field program. The main task of the project was the development of a suitable seeding rocket for use over land areas of Japan. Efforts to obtain basic meteorological knowledge on hailstorms had to be carried out simultaneously. Recent research results on various aspects of hailstorms in Japan were summarized. Considering the operational aspects of such a project and the climatology of hail-affected regions of Japan, operations using anti-aircraft guns or rockets from the ground seem unpractical in Japan. Seeding by rockets launched from aircraft or pyrotechnic devices dropped from aircraft seems to be a more practical approach. Methods of seeding from aircraft flying under the storm cloud base are inadequate in Japan because cloud bases are relatively low over the mountainous regions. Further studies on hailstorms are required in order to make a conclusive decision on the feasibility of an operational hail suppression program in Japan. (See also W75-09944) (Sims-ISWS)
W75-09967

**RESEARCH INTO HAIL-FORMING PROCESSES AND THE RESULTS OF ANTI-HAIL PROTECTION MEASURES IN MOLDAVIA,**
Central Aerological Observatory, Moscow (USSR).
For primary bibliographic entry see Field 2B.
W75-09968

**ON THE RESULTS OF PRACTICAL PROTECTION OF VALUABLE AGRICULTURAL CROPS FROM HAIL BY THE THRI (ZAKNIGMI) METHOD (THE RESULTS OF FIVE YEA WORK, 1969-1973),**
Zakavkazskii Nauchno-Issledovatel Gidrometeorologicheskii Institut, Tiflis (USSR
V. P. Lominadze, I. T. Bartishvili, and Sh. L. Gudushauri.
In: Proceedings of the World Meteorological ganization/International Association Meteorology and Atmospheric Physics Scient Conference on Weather Modification, Octobe 7, 1973, Tashkent (USSR). WMO No. 399, Gen (Switzerland), p 225-230, 1974. 2 tab, 29 ref.

Descriptors: *Weather modification, *H *Cloud seeding, Sodium chloride, Silver iod Methodology, Cloud physics, Agriculture, Cr Meteorology, On-site investigations.
Identifiers: *Hail suppression, USSR.

The Transcaucasian Hydrometeorolog Research Institute (THRI) developed and us method of active modification of hail proce which differs substantially in its principles f methods used by other investigators in the US The method is based on the simultaneous appl tion of hygroscopic and crystallizing reagents. crystallizing reagents are used in comparati small quantities, since the principal modifica effects are achieved by the seeding of hygrosc reagents into the warm part of the cloud. Sod chloride particles are injected by means of hail shells near the base of the cloud and at mean level of the zone of increased radar ref tivity as hygroscopic reagent, and silver iodid introduced into the supercooled part of the cl in the zone of maximum radar reflectivity crystallizing reagent. Results were presented measures taken to protect agricultural crops large areas from hail during 1969-1973. Specia tention was drawn to 1972 when, despite the ceptional intensity and duration of potential producing processes, protection was success In 1972, within the protected area, hail-damag crops over an area of only 91 ha was record while in the control area over 7979 ha suffe damage. It was determined that the hail-dam within the protected area was caused by a dela starting operations. The effect of the protec measured by the THRI method was demonstra by comparing the proportion of crops damage the protected and the control areas. Over the years, crops in the protected area were dama by hail to an extent amounting only to 2.4% those damaged in the control area. (See also W 09944) (Sims-ISWS)
W75-09969

**SIMULATION OF THE NATURAL PROC OF HAIL FORMATION AND ITS TRANSF MATION UNDER THE INFLUENCE OF TIFICIAL CRYSTALLIZATON,**
Gidrometeorologicheskii Institut, Lening (USSR).
For primary bibliographic entry see Field 2B.
W75-09970

**REVIEW OF RECENT WORK ON HAIL S PRESSION IN BULGARIA,**
Bulgarian Academy of Sciences, Sofia. Inst. Geophysics.
L. Krastanov, and K. Stantchev.
In: Proceedings of the World Meteorological ganization/International Association Meteorology and Atmospheric Physics Scient Conference on Weather Modification, Octobe 7, 1973, Tashkent (USSR). WMO No 399, Gen (Switzerland), p 239-241, 1974.

Descriptors: *Weather modification, *H *Cloud seeding, *Programs, Precip tion(Atmospheric), Projects, Methodology, Ar cial precipitation, Meteorology.
Identifiers: *Hail suppression, *Bulgaria.

Cooperational activities aimed at reducing eliminating hail were initiated in 1968. Bulga

cialists, assisted by Georgian collegues, pared a program and proposed an organiza- al structure to deal with hail suppression. Ex- mental seeding began at the end of the 1969 season and was over an area of 3000 sq km. In- igations had to be made concerning the part of convective cloud where the hail-forming cess is expected to occur, and the way that this be identified by radar. A relationship was ght between the thermodynamic factors of the sophere, the underlying surface and the ction of movement of the cloud. It was found for optimum results the part of the cloud to be ed is that where the temperature is about - This corresponds to a level where the tem- ture outside the cloud is -6.3C. At present in aria, four polygons having a total area of more 6000 sq km are protected; one of them is still e experimental phase and another is being or- zed for operation during the next season. The ee of success achieved in each polygon is dif- nt depending on wheather the Georgian ods were strictly applied, how thoroughly the peculiarities were studied, and how high the of training of the personnel had been. In two e polygons where well-trained specialists are ork, having a combined protected area of than 3000 sq km, damage by hail has eased about sixfold. A side effect of the hail ression projects is an apparent increase in the nt of precipitation by 8%. (See also W75- ) (Sims-ISWS)
09971

EXPERIMENTAL PROGRAM TO MODIFY RICANES,
nal Hurricane Research Lab., Coral Gables,

rimary bibliographic entry see Field 2B.
09972

AMIC METHODS OF CONVECTIVE JD MODIFICATION BY MEANS OF AR- IAL VERTICAL JETS,
ut Prikladnoi Geofiziki, Moscow (USSR).
Vulfson, and L. M. Levin.
roceedings of the World Meteorological Or- tion/International Association of rology and Atmospheric Physics Scientific rence on Weather Modification, October 1- 3, Tashkent (USSR). WMO No 399, Geneva erland), p 255-263, 1974. 4 fig, 2 tab, 23 ref.

iptors: *Weather modification, derstorms, *Convection, *Clouds, Cloud g, On-site investigations, Heat, Velocity, rology.
iers: Ascending jets, Descending jets,

and precipitation formation initiated by heat sources (intensive fires), have been ed throughout history. In certain parts of American and Equatorial Africa, rain was by deliberatly lighting fires in prairies and ah. The experiments conducted by Dessens atorial Africa and in France allowed him to te certain meteorological conditions when s in inducing artificial precipitation could be ed. In the Soviet Union, a modification of tallation for generating artificial ascending s proposed which used aircraft turbojet en- stead of burners, thus generating a vertical eated air with high initial velocity. An ex- ntal set of 10 engines was developed which generate power up to 500,000 kw. The e of the jet favored more rapid cloud ment and its 'connection' with a given The addition of a reagent might increase the cy. Since the 1930s and 1940s, a number of ts have tried to stem convective cloud ment by means of various reagents such as , sand, soot, etc. It was observed that when bstances were introduced at the top of a in a number of cases the cloud lowered, p into parts, or completely disappeared.

Results of texts of this method in the Soviet Union show that thunderclouds were destroyed in approximately 80% of cases; 70% in the case of frontal clouds. (See also W75-09944) (Sims-ISWS)
W75-09973

**RESULTS OF EXPERIMENTAL AND OPERATIONAL WORK ON COMBATING FOREST FIRES,**
Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr, Leningrad (USSR).
E. S. Artsybashev, P. A. Gubin, A. I, Sidorov, Ju. P. Sumin, and N. S. Shishkin.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No 399, Geneva (Switzerland), p 265-266, 1974. 4 ref.

Descriptors: *Weather modification, *Forest fires, *Cloud seeding, On-site investigations, Rainfall, Precipitation(Atmospheric), Artificial precipitation, Silver iodide, Nucleation, Meteorology.
Identifiers: USSR.

Studies of the possibility of rainfall redistribution in regions of forest fires were begun in 1968 at the Main Geophysical Observatory and the Forest Economy Institute of Leningrad. The extinguishing of forest fires by artificial precipitation is an example of practical application of weather transformation methods. Four air groups attempted to extinguish 280 forest fires in 1970-1972 by this new method. Seeding locations were chosen based on the speed and direction of movement of the clouds so that induced rainfall will occur over the fire some 10-15 minutes later. An ice-forming agent was introduced into the cloud with help of pyrotechnical cartridges of 26 mm caliber containing 16 g AgI or PbI2. Induced precipitation fell on 214 fires (77%), of which 121 fires (43%) were extinguished by it. Their total area was 177,000 hectares. Statistics on the areas of fires extinguished by induced precipitation compared with the areas where conventional firefighting methods were used permit the conclusion that extinguishing forest fires over an area of 120,000 hectares in 1970-1971 prevented their spreading and preserved the forest at the area of 220,000 hectares. Investigations are currently being pursued to improve this new method. (See also W75-09944) (Sims-ISWS)
W75-09974

**CONVECTIVE CLOUD MODIFICATION TO REDUCE THUNDERSTORM ACTIVITY,**
Central Aerological Observatory, Moscow (USSR).
I. I. Gaivoronsky, L. P. Zatsepina, and B. I. Zimin.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No 399, Geneva (Switzerland), p 267-274, 1974. 6 fig, 3 tab, 4 ref.

Descriptors: *Weather modification, *Thunderstorms, *Lightning, *Cloud seeding, Storms, Cloud physics, Precipitation(Atmospheric), Radar, Instrumentation, On-site investigations, Meteorology.
Identifiers: Lightning suppression, USSR(Moldavia).

In summer 1972 a randomized modification experiment on thunderstorms was begun in Moldavia. Thunderstorm clouds with tops from 9 to 12 km were seeded by means of antihail rockets. Between 9 and 12 kg of PbI2 was introduced into the cloud between isotherms -6 and -20C. To assess the seeding results, lightning frequencies in 6 seeded clouds (before and after seeding) and 5 control clouds were compared. The mean lightning frequency in control clouds was 3.8 and in seeded clouds before seeding was 4.0 discharges per minute. The lightning frequency was reduced in all cases after seeding. The average reduction was equal to a factor of 2.4-2.5 compared with the control clouds or the seeded clouds prior to seeding. On the same proving ground in Moldavia in 1972 the randomized modification experiment on convective clouds with the help of large antihail rockets carrying powders was begun. Experiments carried out earlier had confirmed the possibility of destroying convective clouds by including descending currents through roughly dispersed powders released into the upper region of a cloud from an aircraft. Results of these experiments confirmed the feasibility of the rocket method to regulate the evolution of convective clouds with a thickness equal to 4.7 km. (See also W75-09944) (Sims-ISWS)
W75-09975

**ON THE POSSIBILITY OF THUNDERSTORM SUPPRESSION BY CHANGING THE NON-EQUILIBRIUM CRYSTALLIZATION POTENTIALS OF CLOUD WATER,**
Vysokogornyi Geofizicheskii Institut, Nalchik (USSR).
For primary bibliographic entry see Field 2B.
W75-09976

**SOME QUESTIONS OF THUNDERSTORM LIGHTNING CONTROL,**
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 2B.
W75-09977

**THE EFFECT OF CHAFF SEEDING ON LIGHTNING AND ELECTRIC FIELDS OF THUNDERSTORMS,**
National Oceanic and Atmospheric Administration, Boulder, Colo. Atmospheric Physics and Chemistry Lab.
H. W. Kasemir.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973., Tashkent (USSR). WMO No 399, Geneva (Switzerland), p 289-294, 1974. 3 fig, 7 ref.

Descriptors: *Weather modification, *Thunderstorms, *Lightning, *Electrical coronas, Electricity, Cloud physics, Atmosphere, Atmospheric physics, Cloud seeding, On-site investigations, Meteorology, Electric fields.
Identifiers: *Lightning suppression, Chaff seeding, Corona discharge, Electric charge.

Corona discharge appears at the ends of a chaff fiber in an electric field of 30 kv/m or more. If a pound of chaff consisting of about 2 million fibers is released from an airplane in a thunderstorm field of about 60 kv/m, a corona current of about 1 microampere is generated at the ends of each fiber. The net current of the 2 million fibers adds up to about 2 ampere and the charge released into the cloud in 100 seconds would be of the order of 200 coulomb. The net current and the net charge are comparable to the values of an average thunderstorm and will tend to neutralize the thunderstorm field. The application of this concept to modifying lightning or thunderstorm fields has two main difficulties: (1) the distribution of chaff fibers in the high field areas of the cloud must be fast enough to be effective in a large cloud volume, and (2) the possibility that ions liberated by corona discharge are trapped by the cloud droplets in the immediate neighborhood of the individual chaff fiber. This could generate a concentrated space charge around the fiber, which may quench the corona discharge before a large amount of charge is released. To investigate these problems, field experiments have been planned. After preliminary tests in Flagstaff, Arizona, the first of these experiments was carried out in

Boulder, Colorado, in 1972. The results indicate that the decay of the electric field under a thunderstorm is accelerated by about a factor five by chaff seeding as compared with the natural decay of the field of a nonseeded storm. Instrument development, test procedures, data analysis, and the significance of this field decay experiment to lightning modification were discussed. (See also W75-09944) (Sims-ISWS)
W75-09978

**THE POSSIBILITY OF USING CHARGED BUBBLES IN CLOUD MODIFICATION,**
Institute of Experimental Meteorology, Obninsk (USSR).
For primary bibliographic entry see Field 2B.
W75-09979

**ON THE POSSIBILITY OF GENERATING DOWNDRAFTS BY INTRODUCING A HIGH CONCENTRATION OF COARSE AERSOL PARTICLES IN THE ATMOSPHERE,**
Vysokogornyi Geofizicheskii Institut, Nalchik (USSR).
V. G. Khorguani, and Kh. M. Kalov.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No 399, Geneva (Switzerland), p 301-308, 1974. 4 fig, 3 tab, 5 ref.

Descriptors: *Weather modification, *Aersolos, *Clouds, Laboratory tests, Laboratory equipment, Convection, Cloud seeding, Cloud physics, Atmospheric physics, Meteorology, Particle size, Particle shape.
Identifiers: Powder, *Downdrafts, Cloud destruction.

Experiments on the destruction of convective clouds by a system of coarse aerosol particles were conducted. An initial impulse of downdraft velocity is generated by releasing a high concentration system of coarse aerosol particles at the top of a developing convective cloud. The descent velocities increase with increasing mass and reach several meters per second which is 1.5-2 orders of magnitude greater than the descent velocity of an isolated particle of the same material. In unstable conditions, the down-draft will be propagated after having been given the initial impulse and this will result in convective cloud destruction. Theoretical calculations and analysis of a great number of experiments together with the results of the experiments prove the possibility of using this technique for destroying convective clouds. (See also W75-09944) (Sims-ISWS)
W75-09980

**THE EML 1973 FLORIDA AREA CUMULUS EXPERIMENT,**
National Oceanic and Atmospheric Administration, Coral Gables, Fla. Experimental Meteorology Lab.
R. I. Sax, J. Simpson, and W. L. Woodley.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No 399, Geneva (Switzerland), p 309-316, 1974. 1 fig, 1 tab, 5 ref.

Descriptors: *Weather modification, *Artificial precipitation, *Cloud seeding, Cloud physics, Clouds, Model studies, Rainfall, Radar, Precipitation(Atmospheric), Silver iodide, Nucleation, Convection, *Florida, Meteorology.
Identifiers: Tropical cumulus clouds.

The 1973 Florida Area Cumulus Experiment (FACE) of NOAA's Experimental Meteorology Laboratory (EML) is the latest in a ten-year series of statistically controlled experiments to evaluate the effects of dynamic seeding on tropical cumulus clouds. Dynamic seeding of super-cooled convective clouds is based on the hypothesis that massive seeding with artificial ice nuclei can, under specifiable and predefinable conditions, cause enhance cloud growth had lifetimes, leading to increased precipitation in some situations. The experiments began on isolated cumulus clouds and have been guided by a one-dimensional numerical simulation of precipitating cumulus towers. By 1969, it had been demonstrated that with 26 pairs of single-clouds, the radar-deduced total rainfall from the seeded cumuli was about a factor of three more than from the controls with a significance at the 5% level using several statistical tests. In 1970, EML progressed from single cloud experiments to cloud group seeding in a 10,000 sq km (later increased to 12,000 sq km) target area, to determine whether dynamic seeding could promote 'cumulus mergers' and possibly increase the net rainfall over a large area. Randomization in the area experiment was by day. Both 'floating' and total target rainfalls were evaluated with calibrated S-band radars. At the present time, the best estimate of the 'floating target' rainfall increase is comparable to that for single clouds, (i.e., a factor of three) but only at the 10% significance level. (See also W75-09944) (Sims-ISWS)
W75-09981

**TECHNICAL DEVICES FOR THE ARTIFICIAL MODIFICATION OF CLOUD AND FOG,**
Central Aerological Observatory, Moscow (USSR).
I. I. Gaivoronsky, Yu. A. Seregin, A. I. Sidorov, and S. A. Silin.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No 399, Geneva (Switzerland), p 319-324, 1974.

Descriptors: *Weather modification, *Equipment, *Cloud seeding, Artificial precipitation, Silver iodide, Carbon dioxide, Aerosols, Engineering, Precipitation(Atmospheric), Meteorology.
Identifiers: *USSR, Airborne equipment, Ground-based equipment, Pyrotechnic devices, Rockets.

Investigations showed that seeding from an airplane into the upper surface of the cloud with dry ice in dust form was less effective than seeding with particles of 0.3-0.5 cm. Two types of equipment for disseminating CO2 from aircraft were developed. One of these is based on the transformation of liquid CO2 into solid onboard the aircraft itself. A device was developed which converts solid CO2 from standard solid blocks into granules of between 0.2 and 1 cm, with a prevailing size of 0.3-0.6 cm and not more than 10% of dust. A list was made of the most effective pyrotechnic compounds for the volatilization of silver iodide and lead iodide. Suitable devices were designed for ensuring the steady and reliable burning of the pyrotechnics when fired at great heights from aircraft or from ground installations. A special aerosol container for dropping from aircraft, with a capacity of about 30 g of powder, was developed for seeding clouds with cuprous sulphide and other dusts. A rapidly developing aspect of the problem of weather modification is the stimulation of downdrafts in unstable air by the artificial generation of a downward movement by seeding the clouds with coarse-grained aerosol. A special remote-controlled installation was designed to ensure that, despite the high speed at which the aircraft is moving, the aerosol is released in a compact cloud and dispersed in the form of a trail. The series of ground-based and airborne devices for active intervention on clouds now render possible a wide range of experimental work. (See also W75-09944) (Sims-ISWS)
W75-09982

**ENGINEERING AND OPERATIONAL ASPEC OF WEATHER MODIFICATION,**
South Dakota School of Mines and Technolo Rapid City. Inst. of Atmospheric Sciences.
A. S. Dennis, and R. A. Schleusener.
In: Proceedings of the World Meteorological ganization/International Association Meteorology and Atmospheric Physics Scient Conference on Weather Modification, Octobe 7, 1973, Tashkent (USSR). WMO No 399, Gen (Switzerland), p 325-332, 1974. 2 tab.

Descriptors: *Weather modification, *Rainf *Hail, *South Dakota, Cloud seeding, Sil iodide, Nucleation, Precipitation(Atmospher Artifical precipitation, Projects, Meteorolo Agriculture.
Identifiers: *Seeding techniques, Hail supp sion.

Various seeding concepts and delivery techniq were reviewed as a back-ground to the So Dakota cloud seeding program which designed to increase rainfall and suppress h Because of the variety of crops grown in So Dakota and wide variations in crop and moisture conditions, it was decided that the gram should be under local control. Each of th county governments decides annually whether county will participate in the program during following year and also chooses the periods w seeding will be done. The decision that seed would be concentrated on convective clouds, curring either in isolation or in squall lines, le the choice of updraft seeding from airbo generators as the delivery technique. Aceto generators carrying a solution of silver iodide ammonium iodide in acetone were selected as basic seeding technique. The program started 1972 with a 4% solution by weight, but in 197 2% solution was used. In hail suppression si tions, the generators were supplemented by burning for as short as 30 seconds of flares c taining up to several hundred grams of sil iodide each. As this program was not randomiz some commonly used evaluation techniques not applicable. Although there were a l number of hail threats resulting in deploymen aircraft for seeding, hail damage to crops thro mid-August totaled approximately $10,000,0 about one-third of the long-term average. Des the lack of an accurate evaluation of the res obtained so far, the South Dakota program is garded favorably by approximately 75% of people in the state according to a survey in 1972. (See also W75-09944) (Sims-ISWS)
W75-09983

**ANTI-HAIL ROCKETS AND SHELLS,**
Gidrometeorologicheskii Institut, Lening (USSR). High-Altitude Geophysics Inst.
N. Sh. Bibilashvili, I. I. Gaivoronski, G. G. Godorage, A. I. Kartsivadze, and R. N. Stanko
In: Proceedings of the World Meteorological ganization/International Association Meteorology and Atmospheric Physics Scient Conference on Weather Modification, Octobe 7, 1973, Tashkent (USSR). WMO No 399, Gen (Switzerland), p 333-341, 1974. 5 fig, 2 tab, 5 ref

Descriptors: *Weather modification, *Cloud se ing, *Hail, *Equipment, Silver iodide, Sodi chloride, Aerosols, Agriculture, Meteorology.
Identifiers: *USSR, *Hail suppression, Rock Shells, Lead iodide, Pyrotechnical devices.

The first Soviet PGIM anti-hail rocket developed in 1958-1959. The head of the PG rocket contains a cartridge of a pyrotechnical c pound which is ignited by a remote-contro mechanism at any desired point in the rock trajectory and, in burning, emits AgI or P aerosols. With a view to increasing the height radius of action of the reagent vectors and quantities of reagent carried into the clouds, also to improve other aspects of hail control ope tions, the 'Oblako' anti-hail rocket was develo

61-1964. With the operational experience of GIM and 'Oblako' anti-hail rockets, a new ail unit, the 'Alazan,' was developed in 1968- Experimental work carried out in the ern Caucasus from 1961 to 1963 on the ication of hail-forming processes by the use tillery shells with crystallizing reagents d this to be an effective and economic d of protection from hail. The method, how- was unacceptable for security because the ion of ordinary artillery shells produces ragments which are dangerous if they fall on y inhabited areas. The problem, therefore, develop a special type of shell. Research 1962-1964 led to the development of the s-2' anti-hail shell. The body of the shell is t-iron and the base is spherical. The com- n of a highly explosive charge with thin n walls and a number of other new design s ensured that the shell would be shattered all, safe fragments. In order to increase the a 130-mm shell, the 'Elbrus-3,' was ed in 1966, retaining the essential charac- s of the 'Elbrus-2' shell. (See also W75- (Sims-ISWS)
984

R METHODS AND EQUIPMENT FOR UPRESSION,
eteorologicheskii Institut, Leningrad . High-Altitude Geophysics Inst.
bshaev, and A. I. Kartsivadze.
ceedings of the World Meteorological Or- on/International Association of ology and Atmospheric Physics Scientific nce on Weather Modification, October 1- Tashkent (USSR). WMO No 399, Geneva rland), p 343-351, 1974. 5 fig, 12 ref.

tors: *Weather modification, *Hail, seeding, *Radar, Equipment, Data collec- ata processing, Storms, Meteorology, En- g.
rs: *USSR, *Hail suppression, Dual- gth radar, Hail detection.

of action for cloud seeding is determined tage of its development, by the scale and re of the hail-forming process, and by the and speed of movement. A successful in- n depends on a rapid identification of lready containing hail and those poten- pable of producing it. It appears that for curacy in distinguishing between hail nd non hail clouds, measurements of three rs are adequate; these are the maximum flectivity, the temperature at the radar- er boundary level, and temperature at the the increased reflectivity zone. Employ- doppler equipment enables hail detection simple and effective way, bu using the mean square width of the doppler y spectrum. Considerably more useful in- is provided by a dual technique of hail . This technique is based on the different ve scattering properties of hydrometeors ent sizes. A high-potential, specialized hail suppression and storm warning was This is a dual-radar station 'Radiograd.' nna unit provides equal widths (1.5 and matching of the radiation patterns for e-bands with high accuracy. Further im- ts are still necessary in hail identification to increase efficiency and achieve automation in obtaining and presenting n. (See also W75-09944) (Sims-ISWS)
5

QUISITION OF INFORMATION DUR- EMPTS AT WEATHER MODIFICA-
Univ. (Israel). Dept. of Environmental

y bibliographic entry see Field 7B.
5

**PRELIMINARY RESULTS OF EXPERIMENTS USING SEEDING ROCKETS WITH COMBUSTIBLE SHELLS,**
National Research Center for Disaster Prevention, Tokyo (Japan).
Y. Ozawa, and Y. Omoto.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No 399, Geneva (Switzerland), p 363-371, 1974. 5 fig, 3 tab.

Descriptors: *Weather modification, *Cloud seeding, *Hail, *Equipment, Nucleation, Silver iodide, Artificial precipitation, Precipitation(Atmospheric), Meteorology, Engineering.
Identifiers: *Japan, *Rockets, Hail suppression, Pyrotechnic devices.

A 5-year hail suppression research project in Japan ended in 1972. A rocket system was used for seeding. It was shown that dispersion of artificial nuclei with high concentration into the appropriate part of hail producing clouds is the most effective method of hail suppression. Since it was not possible to use aircraft or antiaircraft guns for the experiment, a method using rockets launched from the ground was chosen. Disintegration of seeding rockets by using explosive compounds had been used for hail suppression experiments in all foreign projects known of at the time. However, it was recognized that such a system over public land would be extremely difficult in Japan. Consequently, a method was developed by which the rocket body would completely burn away in the air after seeding. After 2 years of development, the NRCDP-1 rocket was completed. The NRCDP-1 rocket exhibited generally satisfactory performance in regard to flight, dissipation, and seeding. However, it is desirable to carry out more seeding experiments with a larger number of rockets in order to obtain more data concerning seeding effects, especially in the case of convective clouds. For this purpose, however, some improvement of the rocket system is desirable. (See also W75-09944) (Sims-ISWS)
W75-09987

**CONVECTIVE CLOUD STUDY RESULTS APPLIED TO WEATHER MODIFICATION,**
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 2B.
W75-09988

**ON THE THERMODYNAMIC CRITERIA FOR THE INTENSITY OF CONVECTIVE CLOUD DEVELOPMENT,**
Bulgarian Hydrometeorological Service, Sofia.
For primary bibliographic entry see Field 2B.
W75-09989

**A REVIEW OF METHODS TO EVALUATE PRECIPITATION MODIFICATION IN NORTH AMERICA,**
Illinois State Water Survey, Urbana. Atmospheric Sciences Section.
S. A. Changnon, Jr.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No 399, Geneva (Switzerland), p 397-422, 1974. 4 fig, 7 tab, 20 ref. Dept. of Int. Contract 14-06-D-7197 NSF Grants GI-33371, GI-38317, GK-37859.

Descriptors: *Weather modification, *Evaluation, *Methodology, *North America, Cloud seeding, Projects, Rainfall, Snowfall, Hail, On-site data collections, Model studies, Stochastic processes, Statistical methods, Variability, Sampling, Meteorology, Reviews.
Identifiers: Randomization, Target-control methods, Cross-over methods, Continuous-historical methods.

The history of evaluation methods used in weather modification was reviesed. Selected examples of the natural variability of rain and hail were described and it was shown how variability complicated evaluation of rain and hail modification. Various evaluation methods were discussed that have been used in rainfall, snowfall, and hail modification projects. Means of collecting surface data to evaluate rain and hail experiments were evaluted and their limitations and values were indicated. It was concluded that the many North American projects, both commercial and government supported, of the least 25 years have provided a wealth of conflicting results attributable to a variety of causes, and have often employed inadequate and confusing evaluation methodologies. (See also W75-09944) (Sims-ISWS)
W75-09990

**METHODS OF ESTIMATING PHYSICAL AND ECONOMIC EFFECTIVENESS OF WEATHER MODIFICATION,**
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
M. V. Bujkov, and E. E. Kornienko.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 423-430, 1974. 3 tab, 2 ref.

Descriptors: *Weather modification, *Evaluation, *Artificial precipitation, *Hail, Cloud seeding, Economics, Benefits, Precipitation(Atmospheric), Model studies, Cloud physics, Nucleation, Meteorology.
Identifiers: *USSR, Hail suppression.

The numerical simulation of clouds may help control the results of weather modification experiments; but in order to exclude atmospheric turbulence, it is necessary to make calculations with the space increments equal to 0.1 cm and the time increments equal to 0.1 sec. Information about the physical processes in clouds may make easier the classification of natural situations, permit selection of more homogeneous samples, produce statistically significant results with smaller numbers of experimental units, and give qualitative evidence of the artificial changes of cloud state. Four long-duration experiments on precipitation augmentation were carried out in the USSR. The results of these experiments were re-evaluated with consideration given to the economic effectiveness of the experiments. The value of the additional crops produced because of the precipitation increase and the expenses to carry out the cloud seeding were considered. Calculations taken into account only one crop and the cloud seeding during two arbitrarily chosen vegetation periods. A formula was derived for the direct estimation of the profit and the profit rate and may be used for the optimal design of a cloud-seeding experiment. A review was made of the methods of evaluation applied in the antihail operations in the USSR. These methods do not take into account that after inspection of hail damage, farm workers may compensate for some of the damage by devoting additional work. A very dissappointing shortcoming of the methods reviewed was the complete lack of statistical evaluation of the results of antihail operations. (See also W75-09944) (Sims-ISWS)
W75-09991

**ECONOMIC ASPECTS OF PRECIPITATION AUGMENTATION OVER THE GREAT LAKES,**
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 6B.
W75-09992

**AN EVALUATION OF EXTENDED AREA EFFECTS FROM ATTEMPTS TO MODIFY LOCAL CLOUDS AND CLOUD SYSTEMS,**
Colorado State Univ., Fort Collins.
G. W. Brier, L. O. Grant, and P. W. Mielke, Jr.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 439-447, 1974. 6 fig, 12 ref. NSF Grant GI-31460.

Descriptors: *Weather modification, Effects, *Cloud seeding, *Artificial precipitation, Rainfall, Clouds, Precipitation(Atmospheric), Nucleation, Cloud physics, Statistical methods, Meteorology, *Evaluation.
Identifiers: *Extended area effects, Downwind effects.

Weather modification programs involving the release of seeding material for augmenting precipitation or for reducing storm damage are in progress in the United States and other countries. There is increasing evidence that the effects of some of these experiments or operations may extend over a considerably broader geographic area than that for which they are intended. Although the evidence is not conclusive, a number of questions have caused an increasing concern among both scientists and administrators. Initially, the concern about extended area effects was limited to speculations about the possibility of adverse 'rainshadow' effects in areas downwind of precipitation augmentation projects. However, preliminary analyses by several investigators suggested that positive rather than negative anomalies had occurred downwind of the intended target in a number of projects. Several processes, or mechanisms, may reasonably produce such effects. These include processes that primarily involve (1) atmospheric transport followed by microphysical effects, (2) dynamic effects, and (3) transport processes combined with dynamic effects. The research in progress at Colorado State University on the reality and processes of downwind effects from cloud seeding activities was described. Recent analyses indicate that increases in the target area were not at the expense of downwind precipitation. The likelihood that the precipitation in the extended area was enhanced as a result of the seeding is high, but not conclusive. (See also W75-09944) (Sims-ISWS)
W75-09993

**RAIN STIMULATION EXPERIMENTS: DESIGN AND EVALUATION,**
California Univ., Berkeley. Statistical Lab.
For primary bibliographic entry see Field 7C.
W75-09994

**ON PHYSICAL AND ECONOMIC EFFECTIVENESS OF HAIL-SUPPRESSION PROJECTS,**
Institute of Experimental Meteorology, Obninsk (USSR).
L. P. Poluektova, and V. V. Tsykunov.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR), WMO No 399, Geneva (Switzerland), p 459-464, 1974. 1 tab, 8 ref.

Descriptors: *Weather modification, *Hail, *Economics, *Evaluation, Cloud seeding, Statistical methods, Benefits, Precipitation(Atmospheric), Correlation analysis, Meteorology.
Identifiers: *USSR, *Target-control evaluation, Hail suppression.

While analyzing antihail activities, it is necessary to conceive all possible after-effects, both expected and accidental, to determine if they are due to weather modification or to some other factors, and to evaluate the accuracy of the estimates made. It is important to consider two effects: (1) the physical effect of hail-suppression efforts irrespective of the expenses made and crops protected, (2) the economic effect of hail-suppression projects when crops, progress in hail modification, and all the expenses are considered. Modification effect estimation from the reduction of the equivalent crop hail damage area is more objective than the absolute crop hail damage area; although these are not physical efficiency estimations because they indirectly depend on the protected object parameters, the total crop areas, and the crops used. To test the calculation accuracy of the relative economic efficiency by the target-control approach, a statistical experiment was staged. The target-control approach is characterized by a large estimation error in economic efficiency. Precise definition of suppressed hailfall parameters decreases the error approximately up to 25%. The accuracy might be even higher if the suppressed hailfalls could have been localized. (See also W75-09944) (Sims-ISWS)
W75-09995

**RADAR CHARACTERISTICS OF CUMULONIMBUS CLOUDS DURING THEIR NATURAL DEVELOPMENT AND ARTIFICIAL SEEDING,**
Akademiya Nauk Gruzinskoi SSR, Tiflis. Institut Geofiziki.
For primary bibliographic entry see Field 2B.
W75-09996

**ON THE CHARACTERISTICS OF SINGLE-CELL SHOWERS,**
Iowa State Univ., Ames.
For primary bibliographic entry see Field 2B.
W75-09997

**PREPARATION AND PROPERTIES OF 'PURE' SILVER IODIDE AEROSOL,**
Centre National de la Rechereche Scientifigue, Bellevue (France). Laboratoire de Meteorologie Dynamigue.
M. M. Poc, and M. Roulleau.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR), WMO No 399, Geneva (Switzerland), p 485-498, 1974. 9 fig, 5 ref.

Descriptors: *Silver iodide, *Aerosols, *Laboratory equipment, *Nucleation, Ice, Chemistry, Laboratory tests, Methodology, Equipment, Cloud seeding, Weather modification.
Identifiers: *Ice nuclei.

Although silver iodide has been used for many years in weather modification experiments, the basic mechanisms by which it acts as an ice nucleant are not well known. It appears clearly from literature that the nucleating ability of silver iodide is strongly dependent on the manner in which it is prepared. To understand the nucleation processes, superficial modifications of AgI crystals, such as presence of impurities, water absorption, reactions with surrounding atmosphere, etc., must be avoided. The best way to prepare pure silver iodide is to make iodine vapor react on a silver aerosol in an inert dry atmosphere and in darkness. Procedures and equipment were described for the preparation of a monodispersed aerosol of pure silver iodide which has the following properties: (1) particles per cu cm are 5,000,000, (2) average diameter is 20 angstroms, (3) threshold activity temperature as freezing nucleus is 2.5 times 10 to the 14th power active nuclei per gram AgI at -20C. These results for size distribution and freezing activity show reasonable agreement with Fletcher's theory. It is difficult to compare this work with other author's results because it is the first time that particles with such a small size were studied as ice nuclei. This pure silver iodide aerosol may be useful for further studies on the influence of various factors on nuclea tion mechanisms. (See also W75-09944) (Sims ISWS)
W75-09998

**AN ICE NUCLEI CONCENTRATIO BENCHMARK NETWORK,**
National Oceanic and Atmospheric Administra tion, Boulder, Colo. Atmospheric Physics an Chemistry Lab.
For primary bibliographic entry see Field 7A.
W75-09999

**REMOVAL OF PYROTECHNIC GENERATE TRACER PLACED BY AIRCRAFT IN A CON VECTIVE UPDRAFT,**
Michigan Univ., Ann Arbor.
A. N. Dingle.
In: Proceedings of the World Meteorological Or ganization/International Association o Meteorology and Atmospheric Physics Scientifi Conference on Weather Modification, October 1 7, 1973, Tashkent (USSR), WMO No 399, Genev (Switzerland), p 507-520, 1974. 8 fig, 5 ref.

Descriptors: *Tracers, *Convection *Thunderstorms, *Weather modification *Illinois, Cloud seeding, Nucleation, Aircraft Sampling, Distribution patterns, Rain water Storms, Precipitation(Atmospheric), Clou physics, Meteorology.
Identifiers: *Pyrotechnic devices, Indium, Ic nuclei.

A field experiment, based on the indium trace technique and the silver iodide seeding of convec tive systems by airborne pyrotechnic flares, wa conducted in central Illinois on 1 June 1970 an yielded a comprehensive pattern of indium depos tion. Study of the indium deposition pattern show that material placed nominally in a convective up draft above and ahead of a cold frontal zone ma be transported in considerable quantities into th region below and behind that zone. The obviou transport mechanism is found in the downdraft which are necessarily interspersed with the up drafts throughout the sub-cloud adiabatic layer. I was concluded that somewhat less than 17% of th silver iodide, generated and placed similarly fo convective cloud modification, penetrates intac to the cloud regions where it can nucleate the ic phase by contact with super cooled water droplets This fraction of seeding agent is most likely to fa in a size range averaging somewhat less than 0. micrometer in radius. It was therefore implied tha silver iodide seeding via convective updrafts ma be improved in efficiency by limiting the size o the silver iodide particles to the range from 0.05 t 0.1 micrometer as they are generated. (See als W75-09944) (Sims-ISWS)
W75-10000

**ICE NUCLEI GENERATOR TECHNOLOGY,**
Denver Research Inst., Colo.
N. Fukuta.
In: Proceedings of the World Meteorological Or ganization/International Association o Meteorology and Atmospheric Physics Scientifi Conference on Weather Modification, October 1 7, 1973, Tashkent (USSR), WMO No 399, Genev (Switzerland), p 521-529, 1974. 2 fig, 15 ref.

Descriptors: *Weather modification, *Cloud seed ing, *Nucleation, Crystals, Silver iodide, Carbo dioxide, Toxicity, Engineering, Cloud physics Clouds, Precipitation(Atmospheric), Atmospheri physics, Meteorology.
Identifiers: *Ice nuclei, Ice nuclei generators, Dr ice, Nucleants.

Discussed were problems related to the ice-nucle generation technique, their characteristics, an their usage within the reacting cloud system. Ther are two methods of particle generation, i.e., th

spersion and condensation methods. Experimen-
l and theoretical studies of ice-forming nuclei in-
cate that the optimum size for cloud seeding is
ound 0.1 micron in radius or slightly less. The
st method of submicron particle production is
at of condensation. The control of nucleant par-
le size is probably the most important problem
r seeding generator development. The nuclei
rticles generated are subject to deactivation.
agulation is also important during the process of
oke generation. Small ice crystals formed by
eding of coolants disappear when they ex-
rience temperatures higher than 0C. The ice
stal growth rate by diffusion, at a given time
er nucleation, shows two maxima with respect
temperature, at -6.5 and at -18C. For effective
eding, it is desirable for the cloud parcel to main-
n upward motion so that the ice crystal growth
ntinues. The results of seeding experiments are
oendent on the particular nuclei compound
d. An advantageous feature of a particular
cleant for one condition can often become a
wback for another. The best approach appears
develop several different kinds of nucleants,
h having advantageous features in its own area.
knowing the nucleants features in nucleation,
understanding their interactions in cloud
cesses, and by making use of computer model-
optimum use of the seeding material may be
ght. (See also W75-09944) (Sims-ISWS)
5-10001

OUD GLACIATION BY LIQUIFIED
PANE SPRAY,
d Regions Research and Engineering Lab.,
nover, N.H.
. Hicks, and G. Vali.
Proceedings of the World Meteorological Or-
ization/International Association of
eorology and Atmospheric Physics Scientific
ference on Weather Modification, October 1-
973, Tashkent (USSR), WMO No 399, Geneva
itzerland), p 531-538, 1974. 5 fig, 2 tab, 16 ref.
t. of Int. Contract 14-06-D-6801.

criptors: *Weather modification, *Propane,
ciation, Crystals, Ice, Cloud physics, Labora-
tests, On-site investigations, Nucleation,
d seeding, Fog, Clouds, Meteorology.
tifiers: *Liquefied propane.

oratory tests at various temperatures but with
tant cloud densities yielded ice crystal
uction efficiencies between 2 times 10 to the
power and 6 times 10 to the 11th power
als per gram of propane. The efficiency
eases rapidly above -2C but is still 10 to the
power crystals per gram within a few tenths
degree below 0C. The results of the field tests
the 0.5-mm solid stream nozzle showed more
bility, the nucleating efficiency varying
een 10 to the 11th power and 5 times 10 to the
power crystals per gram in apparent response
e combined effects of cloud density and wind
ity. Since these factors influence the rate of
supply of the seeded plume, this rate ap-
to be a limiting factor for the numbers of
als being produced. On the whole, the agree-
between laboratory and field tests was
actory so that the extension of the field
s, on the basis of the laboratory tests, to tem-
ures not covered in the field tests appears to
stified. The shapes of ice crystals produced
eir growth rates indicate that the vapor pres-
within the plume was frequently depressed
water saturation. These observations
r confirm the critical role of vapor supply in
nining the seeding effect both in terms of the
ers of crystals produced and the size reached
crystals over a given path of length. The ex-
ents described confirmed the possible utility
efied propane as a cloud-seeding agent. (See
75-09944) (Sims-ISWS)
0002

**SUMMARY OF OBSERVATIONS INDICATING DYNAMIC EFFECT ON SALT SEEDING IN WARM CUMULUS CLOUDS,**
Institute of Tropical Meteorology, Poona (India).
A. S. Ramachandra Murty, A. M. Selvam, and Bh. V. Ramana Murty.
Journal of Applied Meteorology, Vol 14, No 4, p 629-637, June 1975. 6 fig, 2 tab, 6 ref.

Descriptors: *Cloud seeding, *Weather modification, *Sodium chloride, *Clouds, Salts, On-site investigations, Cloud physics, Atmosphere, Precipitation(Atmospheric), Meteorology.
Identifiers: *Cloud dynamics, Cumulus clouds, Liquid water content.

Measurements of cloud liquid water content and temperature were made along with visual observations in 32 traverses carried out in six warm cumulus clouds subjected to salt seeding. The results showed (1) a rise, of 1-2C, in temperature; (2) an increase, sometimes exceeding 200%, in liquid water content; and (3) vertical growth, up to 60%, in seeded clouds which developed rain. The features could be due to the possible dynamic effect of salt seeding in warm clouds. (Sims-ISWS)
W75-10057

**WATER DEVELOPMENT FOR IRRIGATION IN NORTHWESTERN KANSAS,**
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.
W75-10152

**INITIAL STAGE, GARRISON DIVERSION UNIT, PICK-SLOAN MISSOURI BASIN PROGRAM, NORTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Bureau of Reclamation, Billings, Mont. Upper Missouri Region.
For primary bibliographic entry see Field 8A.
W75-10296

**CLAYTON LAKE, JACK FORK CREEK, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 8A.
W75-10297

**AUTHORIZED BONNEVILLE UNIT, CENTRAL UTAH PROJECT, UTAH APPENDIX A (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-10331

## 3C. Use Of Water Of Impaired Quality

**FAUNAL RESPONSE TO SPRAY IRRIGATION OF CHLORINATED SEWAGE EFFLUENT,**
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5D.
W75-09899

**MANAGEMENT PRACTICES AFFECTING QUALITY AND QUANTITY OF IRRIGATION RETURN FLOW,**
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 5G.
W75-10019

**WATER AND WATER PROBLEMS IN THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT AND SOME POSSIBLE SOLUTIONS,**
Southwest Florida Water Management District, Brooksville.
G. G. Parker.
Water Resources Bulletin, Vol 11, No 1, p 1-20, February 1975. 9 fig, 16 ref.

Descriptors: *Water management(Applied), *Planning, *Water supply, *Florida, Water quality control, Water distribution(Applied), Water utilization, Legislation.

It is estimated that by about 1984 water demand in the District will nearly equal the natural average annual replenishment of the supply and that, thereafter, unless means are developed to augment the in-District resources, water mining will be required on a grand scale. Sources of augmentation include: reduction of wastes; industrial recycling of previously-used water; use of municipal sewage effluents; desalination of brackish groundwater; aquifer recharge from all available, high-quality sources, particularly flood waters; and importation of excess water from such out-of-District sources as the lower courses of the Suwannee and Apalachicola Rivers. To achieve maximum beneficial uses of in-District sources, a regional water and sewer authority is needed that can develop and transmit water from all available sources to the various county and city systems on a wholesale basis. It is envisioned that such a supply system would tie together all production sources, much as the electrical generation and supply systems are currently organized into regional electric power hookups. At least two bills are currently before the Florida Legislature to achieve these goals. (Bell-Cornell)
W75-10207

**RECYCLE SLUDGE TO FEED FARMS,**
CH2M/Hill, Denver, Colo.
For primary bibliographic entry see Field 5D.
W75-10282

## 3D. Conservation In Domestic and Municipal Use

**METHODS TO FACILITATE MANAGERIAL EFFECTIVENESS IN MUNICIPAL WATER SYSTEMS,**
Mississippi State Univ., Mississippi State. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6B.
W75-09895

**AN ANALYSIS OF RUNOFF IN AN URBAN AREA (IN JAPANESE),**
For primary bibliographic entry see Field 5D.
W75-09916

**HYDROLOGIC IMPACT OF PLANNED UNIT DEVELOPMENTS,**
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W75-09919

**PROCEEDINGS OF WORKSHOP CONFERENCE ON IDENTIFICATION OF METROPOLITAN AREA WATER RESOURCES PROBLEMS AND ASSOCIATED RESEARCH NEEDS IN MINNESOTA.**
Minnesota Univ., St. Paul. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W75-10004

**CLIMATE OF MINNESOTA - PART VII - AREAL DISTRIBUTION AND PROBABILITIES OF PRECIPITATION IN THE MINNEAPOLIS-ST. PAUL METROPOLITAN AREA,**
Minnesota Agricultural Experiment Station, St. Paul.
For primary bibliographic entry see Field 2B.
W75-10009

HYDROLOGIC DATA FOR URBAN STUDIES IN THE DALLAS, TEXAS METROPOLITAN AREA, 1973,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-10148

TOTAL APPROACH FOR THE BOGOTA, COLUMBIA, WATER SUPPLY,
Empresa de Aqueducto y Alcantarillado, Bogota (Colombia).
J. Gonzalez, and M. S. Clark, III.
Journal of the American Water Works Association, Vol 67, No 6, p 327-331, June 1975. 5 fig, 3 ref.

Descriptors: *Water supply development, *Systems analysis, *Planning, Optimization, Simulation analysis, Linear programming, Dynamic programming, Computer programs, Irrigation, *Municipal water, Hydroelectric power, Decision making, Hydrology, Tunnels, Economics, Operations research, Screening, Alternative planning.
Identifiers: Cost minimization, Operating rules.

Water-related problems associated with rapid population growth in Bogota, Columbia have been the subject of a recent comprehensive engineering study. Summarizes are presented of the system-analysis portion of the study related to water resources development planning. The application of simulation, linear programming, and dynamic programming was instrumental in a multidisciplinary approach for selecting a minimum cost plan for municipal water supply, irrigation, and hydroelectric developments. Computer programs and systems analysis techniques were necessary in handling voluminous data and complex problems for six major activities: (1) development of monthly flow records; (2) analysis of daily flow records; (3) comparison of subsystems of diversion tunnels; (4) preliminary screening; (5) sensitivity analysis; and (6) simulation of alternative systems. For selected tunnel configurations, a minimum-cost solution and economical scale of development were obtained by dynamic programming. Linear programming was employed in preliminary screening and to examine the economic aspects of system operation and water-use allocation. Simulation related the studies of hydrology and tunnel-diversion subsystems. It identified maximum supply rates and searched for least-cost component capacities and operating rules. The general procedure for system operation was divided into four considerations: reservoir operation; irrigation; water supply; and power. Satisfactory solutions to real-world planning problems were found. (Bell-Cornell)
W75-10203

STATISTICAL ANALYSIS OF OPERATIONAL PERFORMANCE OF SOME PACKAGE PLANTS,
Department of Water Affairs, Pretoria (South Africa).
For primary bibliographic entry see Field 5D.
W75-10256

PLANNING AND OPERATION OF URBAN WATER QUALITY MANAGEMENT SYSTEMS,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5G.
W75-10262

SURFACE WATERS AND THE CIVIL LAW RULE,
Long and Aldridge, Atlanta, Ga.
For primary bibliographic entry see Field 6E.
W75-10304

SIERRA CLUB V. LYNN (ACTION FOR DECLARATORY AND INJUNCTIVE RELIEF WITH RESPECT TO DEVELOPMENT OF NEW HOUSING DEVELOPMENT).
For primary bibliographic entry see Field 6G.
W75-10309

## 3E. Conservation In Industry

ELECTROLYTIC DECOMPOSITION OF WATER,
Westinghouse Electric Corp., Pittsburgh, Pa. (assignee)
L. E. Brecher, and C. K. Wu.
US Patent No 3,888,750, 3 p, 10 fig, 12 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 935, No 2, p 721, June 10, 1975.

Descriptors: *Patents, *Electrolysis, Electrolytes, Ionization, Oxidation, *Chemical reactions, *Separation techniques, Hydrogen, Oxygen.
Identifiers: Water decomposition, Thermochemistry, Hydrogen production.

Electrolysis and catalytic thermochemistry are combined to decompose water. The object of the invention is to produce hydrogen for coal conversion into hydrocarbons and other purposes by decomposition of water at a minimum cost in energy. The electrolyte is H2S03 produced by supplying S02 and the water to be decomposed to the electrolyzer. The H2S03 is ionized and oxidized in the electrolyzer into S04= and H+ ions and electrons. Hydrogen is derived from the negative electrode of the electrolyzer. The S04= is combined with H+ to form H2S04. The H2S04 is removed from the electrolyzer to the thermochemical unit, concentrated and decomposed predominately into H2O, SO2 and O2. The SO2 is liquefied and thus separated from the O2 which is derived from the thermochemical apparatus. The liquid SO2 is vaporized and returned to the electrolyzer. (Sinha-OEIS)
W75-09881

REVIEW OF THE CANADIAN METAL FINISHING INDUSTRY: CONSUMPTION OF RAW MATERIALS AND OPTIONS FOR WATER POLLUTION CONTROL.
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5D.
W75-09926

POLLUTION ABATEMENT IN THE PHARMACEUTICAL INDUSTRY,
National Environmental Research Center, Edison, N.J. Industrial Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-09931

RECOVERING ORGANIC MATERIALS FROM WASTEWATER,
Rohm and Haas Co., Philadelphia, Pa.
For primary bibliographic entry see Field 5D.
W75-09932

MEMBRANE PROCESSING IN THE METAL FINISHING INDUSTRY,
Abcor, Inc., Cambridge, Mass. Walden Research Div.
For primary bibliographic entry see Field 5D.
W75-09936

ACTIVATED CARBON TREATMENT OF UNBLEACHED KRAFT EFFLUENT FOR REUSE,
Saint Regis Paper Co., Pensacola, Fla. Research and Development Center.
For primary bibliographic entry see Field 5D.
W75-10028

A THEORETICAL AND EMPIRICAL APPROACH TO FISHERIES ECONOMICS,
Victoria Univ. of Manchester (England). Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W75-10118

ARTIFICIAL REEFS FOR TEXAS.
Texas A and M Univ., College Station. Industrial Economics Research Div.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-10853, $3.75 in paper copy, $2.25 in microfiche. Sea Grant Program Report TAMU-SG-73-214 (IAC (72-73)-1225), March 1974. 39 p, 11 fig.

Descriptors: *Fisheries, *Reefs, *Texas, Fish management, Financing, Legal aspects, Commercial fishing, Sport fishing, Habitats, Sites, Materials, Costs, Gulf of Mexico, Buoys.
Identifiers: *Artificial salt water reefs.

There is a lack of natural or accidentally created reefs to satisfy the increasing demand for sport and commercial fishing in Texas thus the construction of artificial reefs is investigated. The function of an artificial reef is to provide shelter for fish and to allow marine organisms to attach themselves, thus providing food for fish and establishing a food chain. Reef material suitability should be judged on availability, costs, durability in salt water and environmental impact. Usage of rubber tires, concrete pipes and blocks, automobile bodies, ships and barges, offshore oil platforms and other materials is evaluated. Proposed utilization of World War II Liberty Ships as reef material is discussed. The determination of site location for man-made reefs must include many factors among them are: (1) avoidance of shipping fairways; (2) knowledge of existing bottom obstructions, depth, and seabed characteristics; and (3) availability of site to potential users. Total costs of a reef include materials, preparation, handling, sinking, marking and policing. Project financing is potentially available from state and national governmental agencies and from special interest groups, who often contribute materials, labor, and funds. Legal ramifications of submerged construction are discussed in terms of liability, public access, common law, navigation, conflicting uses, jurisdiction, and international law. (Becker-Wisconsin)
W75-10119

PRIMARY ECONOMIC IMPACT OF THE GULF INTRACOASTAL WATERWAY IN TEXAS,
Texas Engineering Experiment Station, College Station.
For primary bibliographic entry see Field 6B.
W75-10120

GEOGRAPHICAL ANALYSIS OF OIL SPILL POTENTIAL ASSOCIATED WITH ALASKAN OIL PRODUCTION AND TRANSPORTATION SYSTEMS,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5G.
W75-10121

THE COMPARISON OF THE ENVIRONMENTAL ASPECTS OF NUCLEAR AND FOSSIL FUELLED POWER STATIONS,
New South Wales Univ., Kensington (Australia). School of Nuclear Engineering.
For primary bibliographic entry see Field 8C.
W75-10349

## F. Conservation In Agriculture

**FECTS OF IRRIGATION AND ROW SPAC-G ON EVAPOTRANSPIRATION AND CROCLIMATE OF A SORGHUM FIELD,**
nsas State Univ., Manhattan Evapotranspira-n Lab.
primary bibliographic entry see Field 2D.
5-09853

**EDICTING EVAPOTRANSPIRATION FROM RICULTURAL WATERSHEDS UNDER DRY NDITIONS,**
nsas State Univ., Manhattan. Dept. of Civil En-ering.
primary bibliographic entry see Field 2D.
5-09860

**IGATION DEVICE,**
Gilead.
Patent No 3,887,138, 4 p, 6 fig, 6 ref; Official ette of the United States Patent Office, Vol No 1, p 196, June 3, 1975.

criptors: *Patents, *Irrigation, *Irrigation ation and maintenance, *Irrigation design, er utilization.
tifiers: *Trickle irrigation.

ickle or drip irrigation device comprises two ike elements inserted into one another. One of lements is helically grooved hose of conven-l design. The inner member is held tightly in outer element. Openings are provided in the element and an outflow or outflows at ed intervals are provided from the outer ele-. In other embodiments the inner member is grooved hose or both the inner and the outer ents are helically grooved. In all cases a heli-ath is formed between the outer and inner ele-s. An assembly of the inner and outer element ded with openings can be manufactured in ss lengths and can be used as a water conduit the water trickling from the outflow openings outer member. (Sinha-OEIS)
09872

**KLE IRRIGATION EMITTER,**
is Tool Works Ltd., Slough (England).
nee)
Pearce.
atent No 3,887,139, 3 p, 4 fig, 7 ref; Official te of the United States Patent Office, Vol No 1, p 196, June 3, 1975.

iptors: *Patents, *Irrigation, Irrigation tion and maintenance, Irrigation design, ment.
fiers: *Trickle irrigation.

invention concerns irrigation, particularly eed irrigation emitters of the kind in which is fed through a narrow passageway which its a marked frictional resistance to the flow and thereby reduced that flow to no han a trickle. The emitter for a trickle irriga-ystem is comprised of a housing defining a er which is closed except for inlet and outlet The chamber contains a substantial length diameter tubing which connects to only of rts. The tubing is arranged for most of its as a spiral coil, the radially inner end of is connected to the inlet port. The housing is ably formed in two parts which can bly fasten together. Each of the parts is a ece plastic moulding, and one of the parts is with a wall which partially defines a reser-r water in which the outlet port can remain uously submerged. (Sinha-OEIS)
9873

**T OF WATER TABLE DEPTH ON YIELD BBAGE, SQUASH AND TENDERGREEN,**
ltural Research Service, Raleigh, N.C.
R. E. Williamson, and T. N. Gray.
J Am Soc Hortic Sci. Vol 98, No 2, p 207-209, 1973.
Identifiers: Brassica-oleracea-var-capitata, Brassica-perviridis, *Cabbage, Cucurbita-pepo, Squash, Tendergreen, *Crop production, *Water table depth.

Cabbage, Brassica oleracea var. capitata L., squash Cucurbita pepo Alef. and tendergreen, Brassica perviridis Bailey, were grown at various water table depths in sheltered soil tanks on a fine sandy loam and a loam soil to evaluate the effects of high water table and soil type on growth and yield of these vegetable crops. Yields of the 3 species increased with water table depth to a depth of 76-102 cm. On both soil types the 15-cm water table depth caused considerable yield reduction and chlorosis for the 3 species. For maximum yields deeper water table depths were needed with loam than with sandy loam soil. Yield of cabbage was not significantly increased at water table depths greater than 30 cm in either soil. Squash yield was highest at water table depths of 61-76 cm in the fine sandy loam and 91-102 cm in the loam soil. Tendergreen yield was not significantly increased by water table depths greater than 61 cm in either soil.--Copyright 1973, Biological Abstracts, Inc.
W75-09918

**ON THE RESULTS OF PRACTICAL PROTECTION OF VALUABLE AGRICULTURAL CROPS FROM HAIL BY THE THRI (ZAKNIGMI) METHOD (THE RESULTS OF FIVE YEARS' WORK, 1969-1973),**
Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).
For primary bibliographic entry see Field 3B.
W75-09969

**IRRIGATION EFFICIENCIES IN PRODUCING CALORIES AND PROTEINS: AN ANNOTATED BIBLIOGRAPHY,**
California Univ., Los Angeles. School of Public Health.
E. L. Rada, and R. J. Berquist.
California Water Resources Center, Davis, Report No 31, February 1975. 65 p, 280 ref.

Descriptors: *Irrigation efficiency, *Bibliographies, *Crop production, *Agriculture, *Nutrient requirements, Proteins, Water distribution(Applied), California, Water utilization, Energy conversion.
Identifiers: *Food production, Calories.

This annotated bibliography concerns the use of distributed water for the production of food crops eventually converted to human inputs of calories (energy) and proteins (growth-energy). A thorough literature search of the 1960's to 1970s was made dealing with various aspects of the questions, i.e., when measured in calorie-protein terms which crops are the most nutritious and which are most efficiently produced relative to distributed water used. The literature was searched by keying on certain words, such as water use, calories, food production and so forth. Concentration was largely on references dealing with plant production and their relation to water usage. Entries dealing with nutrient-composition of foods came primarily from USDA publications. References on crop production focused primarily, though not exclusively, on California. In the water resource area, the California Department of Water Resources, the University of California-Davis Departments of Agriculture and Engineering and Water Sciences, and the Giannini Foundation of Agricultural Economics at UC-Berkeley yielded the majority of entries. References include reports and articles on water resource development, irrigation efficiency, and consumptive use of water. A cross-reference by numbers is provided according to subtopics under the headings of nutrition and energy, water resouces, and agricultural production. (Jones-Wisconsin)
W75-10076

**SPRINKLING CATTLE FOR RELIEF FROM HEAT STRESS,**
California Univ., Davis. Dept. of Agricultural Economics.
S. R. Morrison, R. L. Givens, and G. P. Lofgreen.
J Anim Sci, Vol 36, No 3, p 428-431, 1973. Illus.
Identifiers: *California, *Cattle, Feed, Heat stress(Cattle), Refrigeration, Sprinkling, *Imperial Valley(Calif).

Sprinkling cattle under shades during the summer in the Imperial Valley of California for 1 min every 30 min when the temperature was above 80F (27C) resulted in significantly higher feed consumption and rate of gain compared with cattle under shades and not sprinkled. Efficiency of feed conversion, although favoring the sprinkling treatment, was not significantly improved over that of uncooled cattle. Sprinkling was as effective as a refrigerated air conditioned barn at 75F (24C) in 1 trial and more effective during a 2nd trial. Sprinkling and refrigeration promoted greater comfort as indicated by lower respiratory rates and body temperatures in the afternoon. Both noncooled and cooled cattle consumed more feed and gained more weight with 40 ft2 (3.7 m2)/head of space than with 20 ft2 (1.86 m2).--Copyright 1973, Biological Abstracts, Inc.
W75-10082

**A STUDY OF THE EFFECTS OF WATER INSTITUTIONS ON PLANNING AND MANAGEMENT OF WATER RESOURCES IN UTAH,**
Utah State Univ., Logan. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W75-10130

**DEW DURATION IN CENTRAL IOWA,**
Iowa State Univ., Ames. Dept. of Agronomy.
R. H. Shaw.
Iowa State J Res. Vol 47, No 4, p 219-227, 1973, Illus.
Identifiers: *Dew duration, Grass, *Iowa, *Pathogens(Plants), Reproduction, Soybean, Wetness, Corn(Field), Relative humidity.

Dew provides periods of crop wetness for reproduction of many plant pathogens. Dew observations were made at Ames, Iowa, during the growing seasons of 1953 and 1954. On rainless nights dew was present 50% of the hours from 8 p.m.-6a.m. on soybeans and 41% on corn in 1953, and 63% of the time on soybeans in 1954. On rainless nights for the June-Aug. period, dew collected on 88% of the nights on grass, 85% on soybeans and 73% on corn in 1953 and on 88% and 86% of the nights on grass and soybeans, respectively, in 1954. Hours of relative humidity (in the field) above 85% caused 29%-64% of the variation in dew duration.--Copyright 1973, Biological Abstracts, Inc.
W75-10212

**AN UNUSUAL BROWN ROT OUTBREAK IN A FLORIDA CITRUS GROVE FOLLOWING SPRINKLER IRRIGATION WITH PHYTOPHTHORA-INFESTED WATER,**
Agricultural Research and Educational Center, Lake Alfred, Fla.
J. O. Whiteside, and T. W. Oswalt.
Plant Dis Rep. Vol 57, No 5, p 391-393, 1973.
Identifiers: *Brown rot, Citrus, *Florida, Infested, Irrigation, *Phytophthora-citrophthora, *Sprinkler irrigation.

A report is given of a serious and apparently unique outbreak of on-tree brown rot on 'Marsh' and 'Duncan' grapefruit following overhead sprinkler irrigation. A strain of Phytophthora citrophthora with exceptionally high fruit-infecting ability was responsible for the attack. This fun-

gus was not detected within the soil of the grove itself, but was traced to the water supply.--Copyright 1973, Biological Abstracts, Inc.
W75-10245

# 4. WATER QUANTITY MANAGEMENT AND CONTROL

## 4A. Control Of Water On The Surface

**PROJECT EVALUATION IN WATER RESOURCES: BUDGET CONSTRAINTS,**
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W75-09851

**SOCIOLOGICAL IMPACT OF A FLOOD CONTROL RESERVOIR, HOWARD, PENNSYLVANIA,**
Pennsylvania State Univ., Inst. for Research on Land and Water Resources. University Park.
For primary bibliographic entry see Field 6B.
W75-09854

**THE ECONOMIC IMPACT OF A SMALL RECREATION-ORIENTED RESERVOIR,**
University of Southern Mississippi, Hattiesburg. Bureau of Business Research.
For primary bibliographic entry see Field 6B.
W75-09857

**SILTATION RATES AND LIFE EXPECTANCIES OF SMALL HEADWATER RESERVOIRS IN MONTANA,**
Montana Univ., Missoula. School of Forestry.
For primary bibliographic entry see Field 2J.
W75-09858

**MECHANICAL MANAGEMENT OF AQUATIC VEGETATION: ANALYTICAL STUDIES OF UNIT OPERATIONS POTENTIALLY USEFUL IN THEIR PROCESSING,**
Wisconsin Univ., Madison. Dept. of Mechanical Engineering.
S. H. SY.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 593, $7.50 in paper copy, $2.25 in microfiche. Ph D Thesis, 1974. 216 p, 25 tab, 34 fig, 43 ref, 5 append. OWRT B-078-WIS(1). 14-31-0001-3947.

Descriptors: *Dewatering, *Separation techniques, *Harvesting, *Aquatic weed control, *Mulching, Mechanical equipment, Treatment, Feeds, *Wisconsin, Management.
Identifiers: Dane County(Wis).

Dewatering processes and solid-liquid separation methods applied to harvested aquatic vegetation as an aid to handling and/or utilizing it are described. An 'initiation pressure' was defined and was shown to be a useful quantitative parameter indicative of the ease of dewatering aquatic vegetation. Subsequent use of this parameter improved the validity of a moisture predicting function. For the case of constant pressure dewatering, two separate mechanisms were observed (1) a short 'initial rate' period and (2) a 'falling rate' period characterized by a slow decay in the rate of moisture expression. A second-order rate mechanism was derived to describe this latter period. Solids content in the expressed liquid remained relatively constant over the pressing period. A significant fraction of the solids in the expressed liquid could be recovered by gravity separation. The chemical composition and variations in composition of Eurasian watermilfoil were investigated. Peak crude protein content was only slightly lower than that of alfalfa. Calcium and xanthophyll contents were high and crude fiber low relative to forage crops. The composition appears to make Eurasian watermilfoil a possibility in low-fiber rations in addition to its present use as a soil additive. (Koegel-Wisconsin)
W75-09861

**WAVE QUENCHING DEVICE,**
Baker Hydro, Inc., Irvine, Calif. (assignee)
D. A. Stanwood.
US Patent No 3,886,602, 5 p, 8 fig, 7 ref; Official Gazette of the United States Patent Office, vol 935, No 1, p 19, June 3, 1975.

Descriptors: *Patents, *Floats, *Turbulence, Swimming, Swimming pools.
Identifiers: Wave damping, Float design.

A float to be strung on lines to mark the lanes for swimmers in a racing meet is molded in one piece from plastic and is comprised of wafer components preferably being discs and interconnecting barrier elements. The wafers are uniformly spaced along the axis of the float and normal to that axis. The barrier elements are normal to and extend between confronting faces of adjacent wafers. Four barrier elements comprise a set in the space between two adjacent wafers and they are in a relationship of quadrature. Longitudinally of the float the barrier elements are aligned in four sets paralleling the axis of the float. The wafers are thin in relation to the spacing between adjacent ones and their exposed edges are rounded. A bore extends through the float from end to end so that the floats may be strung end to end on a line to mark the boundary between adjacent racing lanes. Waves striking the rounded edges of the wafers are not significantly reflected back toward the swimmer by the edges of the wafers but instead slide off sideways and enter the space between adjacent wafers. The wafers direct the turbulent water entering the spaces between the wafers to impinge upon the faces of the barrier elements or baffles which resist the force of the turbulent water due to the freedom of the float to rotate on the line which supports it. Thus wave energy is absorbed and turbulence quelled. (Sinha-OEIS)
W75-09871

**DRAINAGE SYSTEM COOPERATES WITH NATURE,**
Woodland Development Corp., Houston, Tex.
J. A. Veltman.
Public Works, Vol 106, No 2, p 86-87, February, 1975. 1 fig.

Descriptors: *Drainage, *Storm runoff, *Planning, Aquifers, Groundwater, Project planning, *City planning, Water resources development, Flood control, Land management.
Identifiers: Woodlandt(Tex), Houston(Tex).

A natural drainage system is being developed to treat storm water runoff for a planned city called The Woodlands, near Houston, Texas. The existing natural drainage system, Panther Creek, will be used as fully as possible as the trunk line for the system. Where natural drainage is not efficient, due to lack of slope or topography, shallow swales lined with native vegetation will be constructed to handle the water flow. In addition, retention ponds and other flood control devices will be used. Pipes and concrete systems will be used only when urban activity causes storm flow to exceed the system's natural capacities. The proposed plan will result in a city with a population of 150,000 with park-like areas throughout. The system should be effective in dealing with a peak flow of storm water runoff, as compared to a conventional system of curbs, gutters, storm sewers, and concrete ditches. Protection of the water resources including two main aquifers (recharge capacity of 65 mgd) will be incorporated into the design. Penetration of several shallow clay layers will be prohibited, so that vertical groundwat movement will be impeded; residential buildin built over the aquifers will be without basemer to avoid puncturing these layers. The system i cludes the use of existing swales, ponds, lo spots, and streams to hold rainfall rather th widespread building of storm sewers. The syste will also discharge underground water tables, tr erosion sediment and diminish sudden runof which could cause flash flooding and relat damage. (Prague-FIRL)
W75-09942

**A METHOD FOR PREDICTING FLOO WATER RUNOFF OF THE RIVER STEYR (E VERFAHREN ZUR VORHERSAGE DE HOCHWASSERABFLUESSE DER STEYR),**
W. Kresser, and D. Gutknecht.
Oesterreichische Wasserwirtschaft, Vol 26, N 11/12, p 249-259, 1974. 11 fig, 3 tab, 7 ref.

Descriptors: *Flood forecasting, *Runoff, Mod studies, Monitoring, Data analysis, Precipi tion(Atomspheric), Flood control, Rivers.
Identifiers: *River Steyr(Germany), Predicti models.

A model for the prediction of flood water runoff the Steyr River, Austria, is presented. The meth is based on a precipitation runoff model usi precipitation monitoring data. This runoff mod consists of: a model for the determination of t runoff formation; another model for the det mination of the direct runoffs; and a third mod for calculating basic runoffs for the characteri tion of runoff occurring during the precipitati event. The prediction model gave satisfactory b no optimal results. The runoff formation model the weakest link of the prediction method. A rap decrease in the accuracy of the predictions w the extension of the prediction period was foun corresponding to a rapid reaction of the river to tense precipitation. (Takacs-FIRL)
W75-09943

**PROCEEDINGS OF PUBLIC WORKSHOP CO FERENCE ON WATER RESOURC PROBLEMS AND RESEARCH NEEDS IN CE TRAL MINNESOTA.**
Minnesota Univ., St. Paul. Water Resourc Research Center.
For primary bibliographic entry see Field 6B.
W75-10005

**PROCEEDINGS OF PUBLIC FORUM O WATER RESOURCES PROBLEMS AN RESEARCH NEEDS IN SOUTHWESTERN MI NESOTA.**
Minnesota Univ., St. Paul. Water Resourc Research Center.
For primary bibliographic entry see Field 6B.
W75-10006

**PROCEEDINGS OF PUBLIC FORUM O WATER RESOURCES PROBLEMS SOUTHEASTERN MINNESOTA.**
Minnesota Univ., St. Paul. Water Resourc Research Center.
For primary bibliographic entry see Field 6B.
W75-10007

**APPLICATIONS OF INTEGER AN QUADRATIC PROGRAMMING TO FLOO PLAIN LAND USE MANAGEMENT,**
Massachusetts Univ., Amherst. Dept. of Food a Resource Economics.
For primary bibliographic entry see Field 6F.
W75-10008

NAGEMENT PRACTICES AFFECTING
ALITY AND QUANTITY OF IRRIGATION
URN FLOW,
State Univ., Logan. Dept. of Agricultural
Irrigation Engineering.
primary bibliographic entry see Field 5G.
-10019

FACE WATER DATA, REFERENCE
EX, CANADA 1974.
er Survey of Canada, Ottawa (Ontario).
primary bibliographic entry see Field 7C.
-10064

ORICAL STREAMFLOW SUMMARY,
ISH COLUMBIA, TO 1973.
r Survey of Canada, Ottawa (Ontario).
rimary bibliographic entry see Field 7C.
10065

ORICAL STREAMFLOW SUMMARY, ON-
O, TO 1973.
r Survey of Canada, Ottawa (Ontario).
rimary bibliographic entry see Field 7C.
10066

ORICAL STREAMFLOW SUMMARY, AL-
A, TO 1973.
r Survey of Canada, Ottawa (Ontario).
rimary bibliographic entry see Field 7C.
10067

ORICAL STREAMFLOW SUMMARY,
N AND NORTHWEST TERRITORIES, TO

Survey of Canada, Ottawa (Ontario).
imary bibliographic entry see Field 7C.
0068

ORICAL STREAMFLOW SUMMARY,
TOBA, TO 1973.
Survey of Canada, Ottawa (Ontario).
imary bibliographic entry see Field 7C.
0069

RICAL STREAMFLOW SUMMARY,
ATCHEWAN, TO 1973.
Survey of Canada, Ottawa (Ontario).
mary bibliographic entry see Field 7C.
0070

RICAL STREAMFLOW SUMMARY, AT-
C PROVINCES, TO 1973.
Survey of Canada, Ottawa (Ontario).
mary bibliographic entry see Field 7C.
0071

NG A RIVER,
nia Univ., Berkeley. Coll. of Natural
ces.
nary bibliographic entry see Field 6B.
116

ENEFIT-COST RATIO IN RESOURCE
OPMENT PLANNING,
ic Research Service, Washington, D.C.
nary bibliographic entry see Field 6B.
117

RY ECONOMIC IMPACT OF THE GULF
COASTAL WATERWAY IN TEXAS,
Engineering Experiment Station, College

ary bibliographic entry see Field 6B.
20

**THE EFFECTS OF AUTHORIZATION FOR WATER IMPOUNDMENTS ON SHORELAND TRANSITION,**
North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6B.
W75-10126

**THE DISCHARGE OF SOUTH CAROLINA STREAMS AS IT RELATES TO LINK MAGNITUDE,**
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 2E.
W75-10134

**UTILIZATION OF AERIAL PHOTOGRAPHS FOR MEASURING LAND USE CHANGES IN WATERSHEDS,**
Clemson Univ., S.C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W75-10136

**A MODEL FOR EARTHQUAKES NEAR PALISADES RESERVOIR, SOUTHEAST IDAHO,**
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 8B.
W75-10139

**DISCHARGE MEASUREMENTS AT LOW-FLOW PARTIAL-RECORD STATIONS IN IOWA,.**
Geological Survey, Iowa City, Iowa.
For primary bibliographic entry see Field 7C.
W75-10144

**HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1973,**
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-10150

**A TECHNIQUE FOR ESTIMATING THE MAGNITUDE AND FREQUENCY OF FLOODS IN MAINE,**
Geological Survey, Augusta, Maine.
For primary bibliographic entry see Field 2E.
W75-10155

**EFFECTS OF LOWERING INTERIOR CANAL STAGES ON SALT-WATER INTRUSION INTO THE SHALLOW AQUIFER IN SOUTHEAST PALM BEACH COUNTY, FLORIDA,**
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4B.
W75-10156

**EVALUATION OF RESERVOIR SITES IN NORTH CAROLINA--REGIONAL RELATIONS FOR ESTIMATING THE RESERVOIR CAPACITY NEEDED FOR A DEPENDABLE WATER SUPPLY,**
Geological Survey, Raleigh, N.C.
F. E. Arteaga, and E. F. Hubbard.
Water-Resources Investigations 46-74, February 1975. 60 p, 16 fig, 1 plate, 4 tab, 13 ref.

Descriptors: *Reservoir design, *Reservoir evaporation, *North Caolina, Frequency analysis, Frequency curves, Estimating, Water storage.
Identifiers: *Draft-storage-frequency relations.

Draft-storage-frequency relations, which show the storage required for a reservoir to furnish a specified withdrawal or draft are regionalized for four zones in North Carolina using the mean annual flow of the streams as an index. The differences between the zones primarily reflect differences in the variability of streamflow. To assure the available draft will fall below 75% of the mean annual flow of a stream only once in 50 years on the average, a reservoir in the mountains would need a usable storage capacity of 45% of the mean annual runoff of the impounded stream. In comparison, reservoirs in parts of the Piedmont furnishing a draft of 75% of the mean annual flow must have usable storage equal to 60% of the mean annual runoff of the stream. In the inner Coastal Plain the storage required increases to 84% and in the outer Coastal Plain to about 110%. These increases in storage are indicative of the general increase in streamflow variability, both seasonally and between years, from west to east in the State. Net evaporative draft also varies from west to east. For instance, a reservoir impounding a Piedmont stream, and designed with a 5 percent chance of deficiency, will have a net evaporative draft about twice as large as a similar sized reservoir in the Coastal Plain. In the mountains, annual precipitation always exceeds evaporation because of the cooler temperatures and higher rates of precipitation. (Knapp-USGS)
W75-10159

**LOW-FLOW CHARACTERISTICS OF WISCONSIN STREAMS AT SEWAGE-TREATMENT PLANTS,**
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 5B.
W75-10163

**RESERVOIR RELEASE ROUTING MODEL FOR THE UPPER ARKANSAS RIVER BASIN OF COLORADO,**
Geological Survey, Denver, Colo.
R. R. Luckey, and R. K. Livingston.
Colorado Water Conservation Board, Denver, Water Resources Circular No 27, 1975. 44 p, 12 fig, 1 tab, 5 ref, 2 append.

Descriptors: *Reservoir releases, *Model studies, *Colorado, River basins, Methodology, Computer models, Input-output analysis, Water yield, Bank storage, Channel flow, Inflow, Discharge(Water), Correlation analysis, Reservoir operation.
Identifiers: *Arkansas River basin(Colo), Twin Lakes(Colo), Colorado Canal.

A model for routing reservoir releases has been developed that accounts for channel storage, bank storage, inadvertent diversions (additional diversions caused by increased river stage), and travel time. Channel storage in the reach is calculated each time step as a linear function of the inflow to the reach. Inadvertent diversion is a function of the size of the release in the reach and the initial flow in the reach. Bank storage is a function of the inflow to the reach, outflow from the reach, and aquifer parameters. Because bank storage and outflow are interdependent, repetitive calculations are made until the calculated rate of bank sotorage ceases to change significantly. The final outflow from a reach then becomes the inflow to the next reach. This model has been tested by routing reservoir releases from Twin Lakes to the Colorado Canal in the upper Arkansas River basin. During periods when conditions on the river are relatively stable, the model produces hydrographs that are in excellent agreement with the observed hydrographs. (Woodard-USGS)
W75-10165

**ESTIMATING MEAN STREAMFLOW IN THE DUCHESNE RIVER BASIN, UTAH,**
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 2E.
W75-10166

**EFFECT OF WIND WAVES AND WIND TIDES ON THE OPTIMUM CONTROL OF LARGE LAKES,**
Arizona Univ., Tucson. Bureau of Business Research.
W. Metler, I. Bogardi, and L. Duckstein.

Water Resources Research, Vol 11, No 3, p 397-404, June 1975. 6 fig, 2 tab, 17 equ, 12 ref.

Descriptors: *Lakes, *Wind tides, *Waves(Water), Effects, Reservoir releases, Shallow water, Methodology, Optimization, Dynamic programming, Shores, Water levels, Stochastic processes, Water storage, Markov processes, Economic justification, Control, Water policy, Damages, Decision making, Probability, Equations, Mathematical models, Systems analysis, Risks.
Identifiers: *Lake Balaton(Hungary), Water rise, Loss functions, Sensitivity analysis, Discounting, Loss minimization, Event-based model.

Wind waves and wind tides may cause severe damage along large lake or reservoir shores when the average water level is high. Shallow lakes, however, need to maintain a high storage level in order to minimize losses in tourism, navigation and ecology. The optimal release policy for a large and shallow lake subject to the double uncertainty of average monthly hydrologic input and instantaneous wind-induced water rise is calculated. The case of Lake Balaton in Hungary is used to illustrate the methodology. Loss functions are obtained for each lakeshore section; losses due to unfavorable (high or low) water level are given on a monthly basis, and dynamic losses due to waves and wind tides are calculated by using an event-based model. The physical model is defined with the associated events and transformation functions. Then economic loss functions are introduced and accumulated around the lake. A stochastic dynamic programming formulation yields an optimum release policy whose sensitivity to loss function and discount factor is examined. (Bell-Cornell)
W75-10204

**WATER AND WATER PROBLEMS IN THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT AND SOME POSSIBLE SOLUTIONS,**
Southwest Florida Water Management District, Brooksville.
For primary bibliographic entry see Field 3C.
W75-10207

**COLORADO RIVER-FLOW MANAGEMENT,**
Bureau of Reclamation, Denver Colo.
R. E. Glover, C. A. Nelson, and J. I. Sanders.
Journal of the Hydraulics Divisions, Proceedings of ASCE, Vol 100, No HY11, Paper No 10934, p 1519-1535, November 1974. 4 fig, 3 tab, 15 equ.

Descriptors: *Colorado River, *Streamflow, *Management, Hydraulics, *Dams, Storage, Water delivery, Conservation, Control, Operations, Diversion, Flow characteristics, Water supply, Digital computers, Downstream, Return flow, Powerplants, Gaging stations, Storms, Reach(Streams), Communication, Data transmission, Natural streams, Equations, Velocity, Effects, Estimating, Lakes.
Identifiers: *Transient flow, Prediction, Flow routing, Losses.

A method of computing transient flow changes in a flowing stream is described. The results of more than five years of experience in the use of this method for estimating flows at the gaging stations of the 147-mile Parker-Imperial reach of the Colorado River are summarized. An account is made of digital computer applications which enable tabulations of the expected flows at the gaging stations for each hour of the ensuing 24 hours to be made and transmitted to the Boulder City Office of the USBR in time to be available at the beginning of each work day. Tabulation covering 72 hours is prepared for weekend operations. Demonstrated is the usefulness for tightening control of the river for purposes of preventing the waste of water. (Bell-Cornell)
W75-10208

**TRANSIENT CONTROL IN LOWER SACRAMENTO RIVER,**
Bureau of Reclamation, Sacramento, Calif. Applications Branch.
F. J. Gientke.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol 100, No HY3, Paper No 10418, p 405-424, March 1974. 14 fig, 28 equ, 8 ref, 3 append.

Descriptors: *Open channel flow, *Unsteady flow, *Hydraulics, *Weirs, *Gates, Flood forecasting, Flood control, Projects, Operation, Management, Equations, Mathematical models, Systems analysis, *California.
Identifiers: *Sacramento River(Calif), Method of characteristics, Geometry.

The transient controlling gate and valve-stroking concept recently developed and verified by Streeter and Wylie at the University of Michigan is extended to the operation of the Sacramento weir gates during periods of high flows in the river. The weir is located several miles upstream from Sacramento and is the only one operated at high stages to maintain a 29.0-ft. maximum stage at the Sacramento 'I' Street gage. High inflow from the regulated American River between the weir and the gage often causes flow to reverse in a portion of the Sacramento River, but this complication is easily handled by the method of characteristics. Although the gate-stroking technique is extended to operation of the Sacramento weir, the same extension can be made to natural and artificial channels in which a control structure is located. The three sections analyzed are: (1) basic theory of unsteady flow and the development and application of the characteristic equations; (2) the geometry of the lower Sacramento River; and (3) transient control of the lower Sacramento River. The gate operation technique allows the determination of whether flood conditions now developing in the Sacramento or release schedules anticipated from upstream dams can be conveyed within the system without violating the project flood plain. Furthermore, extension of this type of scheme could permit the internal optimization of release schedules and weir operation such that the operation of the conveyance system is optimized. Included is an appendix with more detailed treatment on development of the unsteady and characteristic equations. (Bell-Cornell)
W75-10219

**DIGITAL PROGRAM FOR WATER NETWORK ANALYSIS,**
Water Research Association, Marlow(England). Economics Group.
For primary bibliographic entry see Field 7C.
W75-10220

**A SENSITIVITY ANALYSIS OF SIMULATED RIVER BASIN PLANNING FOR CAPITAL BUDGETING DECISIONS,**
Idaho State Univ., Pocatello. Coll. of Business.
For primary bibliographic entry see Field 6A.
W75-10223

**SHORTCUT METHODS TEST ALGICIDES,**
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5G.
W75-10234

**WATERWAY MONITORING SYSTEM.**
For primary bibliographic entry see Field 7A.
W75-10248

**FORECASTING WATERSHED POLLUTION USING A MODEL,**
Adaptronics, Inc., McLean, Va.
For primary bibliographic entry see Field 5A.
W75-10249

**WATER QUALITY ROUTING OF UNSTEAD RIVER FLOW BY FINITE ELEME METHOD,**
Osaka Univ, (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-10252

**PRESERVATION AND ENHANCEMENT THE AMERICAN FALLS AT NIAGARA.**
American Falls International Board, Buffalo, N.
For primary bibliographic entry see Field 6E.
W75-10290

**AUTHORIZED BONNEVILLE UNIT, CENTR UTAH PROJECT, UTAH (FINAL ENVIRO MENTAL IMPACT STATEMENT).**
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-10292

**TRED AVON RIVER, TALBOT COUNT MARYLAND (FINAL ENVIRONMENTAL I PACT STATEMENT).**
Army Engineering District, Baltimore, Md.
Available from the National Technical Inform tion Service, Springfield, Va 22161 as USDC, E MD-73-1122-F, $4.75 in paper copy, $2.25 microfiche. July 1973, 82 p, 6 tab, 6 map.

Descriptors: *Environmental effects, *Maryla *Dredging, *Channel improvement, *Estuari Transportation, Spoil banks, Navigation, Navi ble waters, Benthos, Channels, Strea Estuarine environment, Federal governme Governmental interrelations, Local governmen Economic impact.
Identifiers: *Environmental impact statemen *Talbot County(Md), Navigation obstructions.

This project entails the hydraulic dredging of proximately 2 miles of channels in the Tred Av River, consisting of two navigation channels feet deep and 150 feet wide and a turning basin feet deep and 250 feet wide. Approximat 333,000 cubic yards of material will be remov and deposited in any of five nearby disposal are The river is an estuarine stream draining ab 29,300 acres of primarily agricultural land on eastern shore of Maryland. The deepened chan will reduce navigation hazards to commercial v sels, thereby enhancing the economic devel ment of the region. Greater sport fishing may a be generated. Project dredging will disturb remove benthic organisms, temporarily increa turbidity in the river, and destroy wildlife habi at the disposal areas. Alternative considered w no action, various channel depths and widths, alternate spoil disposal methods and sites. sites chosen were considered to be the least val ble environmentally. The loss of productivity the area due to destruction of benthic organis and use of agricultural lands for disposal site expected to be minimal. Opposition to this proj centers around the destruction of oyster beds the use of wetlands as disposal sites. (Decke Florida)
W75-10295

**MINUTES OF THE 89TH MEETIN (ARKANSAS-RED-WHITE RIVER BASI INTER-AGENCY COMMITTEE).**
Arkansas-White-Red Basins Inter-Agency Co mittee, Wichita, Kans.
Held on October 25-25, 1974. 91 p, 2 fig, 11 pend.

Descriptors: *Watersheds(Basins), *River ba development, *Water resources developme *Flood protection, *Arkansas, Basins, Ri basins, Watershed management, Federal gove ment, Administrative agencies, Legislation, Flo control, Non-structural alternatives, Planni Water management(Applied), Weather modifi tion, Reservoirs, River basin commissio Rivers, Dams.

ers: *Environmental policy, *Arkansas-
ed basins.

letails the opening position of the meeting
ection twenty-two and seventy-three of the
esources Development Act of 1974 were
d. Further items considered were water
nents for electric power generation, as
vatershed and weather modification activi-
t B consists of the business session, and
entation of reports by the Exchange of
Information Committee, the Ad Hoc
ee on National Assessment, and the Ad-
ive Committee Report. Appendices in
ntain statements of those who made for-
entations and includes the texts of reports
d. General discussion related to the
n and conservation of water and related
urces, and projects involving flood pro-
rough the use of nonstructural alterna-
rnandez-Florida)
0

E WATERS AND THE CIVIL LAW

Aldridge, Atlanta, Ga.
ry bibliographic entry see Field 6E.
4

AND REGULATIONS, SOUTHWEST
MANAGEMENT DISTRICT
A).
t Florida Water Management District,
le.
ry bibliographic entry see Field 6E.
6

OF CENTRAL AND SOUTHERN
CONTROL DISTRICT, CHAPTER
TH COMMENTARY.
d Southern Florida Flood Control Dis-
Palm Beach.
y bibliographic entry see Field 6E.
7

IN PARK RECLAMATION PROJECT,
MA--NUECES RIVER PROJECT,

Subcomm. on Water and Power
--Comm. on Interior and Insular Af-
Senate, 93d Cong, 2d Sess, July 18,
3 map, 1 tab, 2 chart.

: *Reclamation, *Water supply,
pply development, *Texas, Canyons,
klahoma, Industrial water, Reservoirs,
propriation, Mountains, Parks, Mu-
er, Construction, Rivers.
Congressional hearings, Nueces

mittee on Water and Power Resources
testimony on S.3704 and S.3513, both
relate to reclamation projects. The
ld increase the level of appropriations
been authorized for the Mountain Park
project in southwestern Oklahoma.
pal and industrial water supply project
under construction. The latter would
he Secretary of the Interior to con-
rate, and maintain the Nueces River
outheastern Texas. The proposed pro-
s the Choke Canyon Dam and Reser-
the flows of the Nueces River could be
rimarily to provide municipal and in-
ter supplies to Corpus Christi and
ller communities. The total estimated
project would be about 64 million dol-
rdi-Florida)

**AUTHORIZED BONNEVILLE UNIT, CENTRAL UTAH PROJECT, UTAH APPENDIX A (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-10331

## 4B. Groundwater Management

**STATUS OF LAND SUBSIDENCE DUE TO GROUND-WATER WITHDRAWAL ALONG THE MISSISSIPPI GULF COAST,**
Mississippi State Univ., Mississippi State. Dept. of Geology and Geography.
For primary bibliographic entry see Field 2F.
W75-09856

**GEOTHERMAL BRINE ENERGY TO GENERATE POWER,**
Chevron Research Co., San Francisco, Calif. (assignee).
For primary bibliographic entry see Field 8C.
W75-09863

**DISPOSAL OF WASTE STREAMS CONTAINING ASBESTOS,**
Dow Chemical Co., Midland, Mich. (assignee)
For primary bibliographic entry see Field 5E.
W75-09876

**APPARATUS FOR CONTROLLING THE LEVEL OF SUBSURFACE WATER,**
Moretrench American Corp., Rockaway, N.J. (assignee)
E. J. Moore.
US Patent No 3,888,605, 3 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 935, No 2, p 676, June 10, 1975.

Descriptors: *Patents, *Subsurface waters, *Wells, *Water levels, *Groundwater movement, Equipment, Valves, Water utilization.

Systems for removing water from the ground include a series of well points sunk into the ground at spaced intervals and a pumping unit for drawing water out of the ground through the well points. The apparatus of this invention automatically adjusts the flow of water to the pump from each well point in accordance with the amount of air being drawn into the particular well point. At the same time, the apparatus maintains a reduced pressure in the well point, whereby the flow of water to the pump is re-established when the air drawn into the well point decreases. A float-actuated valve connects the pump and the well point and controls the flow of water to the pump in accordance with the flow rate of water drawn into the well point. An air passageway bypasses the valve to provide a reduced pressure condition in the pipe when the valve is closed. (Sinha-OEIS)
W75-09880

**AQUIFER PARAMETERS BY A CHEMICAL TRACER TECHNIQUE: NON LINEAR MIXING IN THE ROSWELL CONFINED AQUIFER,**
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
For primary bibliographic entry see Field 2F.
W75-09893

**UNDERGROUND LIQUID WASTE DISPOSAL.**
American Society of Civil Engineers, New York. Task Committee on Underground Liquid Waste Disposal.
For primary bibliographic entry see Field 5E.
W75-09938

**DRAINAGE SYSTEM COOPERATES WITH NATURE,**
Woodland Development Corp., Houston, Tex.
For primary bibliographic entry see Field 4A.
W75-09942

**PROCEEDINGS OF PUBLIC WORKSHOP CONFERENCE ON WATER RESOURCES PROBLEMS AND RESEARCH NEEDS IN CENTRAL MINNESOTA.**
Minnesota Univ., St. Paul. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W75-10005

**GROUND WATER POLLUTION PROBLEMS IN THE NORTHWESTERN UNITED STATES,**
Geraghty and Miller, Port Washington, N.Y.
For primary bibliographic entry see Field 5B.
W75-10023

**MEASURING EXTERNAL EFFECTS OF SOLID WASTE MANAGEMENT,**
Institute for Policy Analysis, La Jolla, Calif.
For primary bibliographic entry see Field 5B.
W75-10024

**GROUNDWATER POLLUTION: PROBLEMS AND SOLUTIONS.**
For primary bibliographic entry see Field 5B.
W75-10058

**EVALUATION OF GROUND WATER RESOURCES: LIVERMORE AND SUNOL VALLEYS,**
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2F.
W75-10063

**INJECTION-PIPE SYSTEM FOR ARTIFICIAL RECHARGE,**
Geological Survey, St. Paul, Minn.
H. O. Reeder.
Available from Sup Doc., D.C. 20402, $3.15 single journal copy; $18.90 yearly subscription rate. Journal of Research of the U.S. Geological Survey, Vol 3, No 4, p 501-503, July-August 1975. 2 fig, 4 ref.

Descriptors: *Artificial recharge, *Injection wells, *Groundwater recharge, Methodology, Pipes, Piping systems(Mechanical), Friction, Hydraulics.
Identifiers: *Injection-pipe system.

An injection-pipe system was designed to utilize pipe friction in the well to maintain positive pressure and to eliminate gas release and air entrainment in the injection water. The size of the injection pipe was selected on the basis of obtaining a unit friction head loss per equal-unit length of pipe for the desired injection rates. The injection rates are 70 gallons per minute through a 11/4-inch heavy duty pipe and 106 gal/min through a 1 1/2-inch heavy duty pipe. A diagram shows flow rates through other pipe sizes. (Woodard-USGS)
W75-10142

**GROUND WATER,**
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2F.
W75-10143

**GROUND-WATER DISCHARGE FROM THE EDWARDS AND ASSOCIATED LIMESTONES, SAN ANTONIO AREA, TEXAS, 1974,**
Geological Survey, San Antonio, Tex.
For primary bibliographic entry see Field 2F.
W75-10146

**GEOTHERMAL INVESTIGATIONS IN IDAHO: PART 3, AN EVALUATION OF THERMAL WATER IN THE WEISER AREA, IDAHO,**
Geological Survey, Boise, Idaho.
H. W. Young, and R. L. Whitehead.
Idaho Department of Water Resources, Boise, Water Information Bulletin No 30, May 1975. 35 p, 13 fig, 4 tab, 30 ref.

Descriptors: *Geothermal studies, *Idaho, *Thermal water, *Thermal properties, Water quality, Geophysics, Data collections, Water temperature, Thermal springs.
Identifiers: Geochemical thermometers, Chemical ratios, Weiser area(Idaho).

The Weiser area encompasses about 200 square miles in southwest Idaho and contains two thermal water areas: (1) the Crane Creek subarea, which is 12 miles east of Weiser, Idaho, and (2) the Weiser Hot Springs subarea, which is 5 miles northwest of Weiser. Volcanic and sedimentary rocks of Miocene to Pleistocene age have been faulted and folded to form the northwest-trending anticlines present in much of the area. Basalt of the Columbia River Group or underlying rocks are believed to constitute the reservoir for the hot water. Sampled thermal waters are of a sodium chloride sulfate or sodium sulfate type, having dissolved-solids concentrations that range from 225 to 1,140 mg per litre. Temperatures of sampled waters ranged from 13 to 92 deg C. Minimum aquifer temperatures calculated from chemical analysis of water, using geochemical thermometers, were 170 and 150 deg C in the Crane Creek and Weiser Hot Springs subareas, respectively. Estimated maximum temperatures ranged from 212 to 270 deg C and 200 to 242 deg C, respectively, in these subareas. The probable heat sources for both subareas are (1) young magmatic intrusive rocks underlying the basalt or (2) above-normal temperatures resulting from thinning of the earth's crust. (Woodard-USGS)
W75-10147

**WATER DEVELOPMENT FOR IRRIGATION IN NORTHWESTERN KANSAS,**
Geological Survey, Lawrence, Kans.
E. D. Jenkins, and M. E. Pabst.
Open-file report 4-75, 1975. 39 p, 23 fig, 6 plate, 3 tab, 34 ref.

Descriptors: *Irrigation wells, *Groundwater resources, *Kansas, Semiarid climates, Aquifer characteristics, Pumping, Water yield, Water quality, Chemical analysis, Water level fluctuations, Hydrologic data, Withdrawal, Groundwater recharge.

Northwestern Kansas, an area of 8,050 square miles, is a flat to gently rolling plain that is dissected by the Smoky Hill and Republican Rivers. Loessial soils underlying the plain are ideal for cultivation. The climate is semiarid with the mean annual precipitation ranging from 16 to 21 inches. Precipitation occurring mainly as thunderstorms during the 6-month growing season is four to five times less than the potential evaporation. Principal aquifers are the Dakota Formation, which yields a few gallons per minute of water to domestic and stock wells; the ogallala Formation, which commonly yields 500 to 1,200 gallons per minute to irrigation wells; and the alluvium, which locally yields as much as 1,500 gpm to irrigation wells. Irrigation from wells has developed principally since the early 1950's. Development has increased from about 100 wells irrigating 10,000 acres in 1950 to about 2,200 wells irrigating 3000,000 acres in 1972. The rate of withdrawal by irrigation, municipal, and industrial wells in 1972 was about 5000,000 acre-feet of water per year, of which about 99% was for irrigation. A comparison of water levels measured in 1950 and in 1973 indicates that declines greater than 10 feet are common in much of the area. Declines greater than 30 feet have ocurred near Goodland and Colby. (Woodard-USGS)
W75-10152

**EFFECTS OF LOWERING INTERIOR CANAL STAGES ON SALT-WATER INTRUSION INTO THE SHALLOW AQUIFER IN SOUTHEAST PALM BEACH COUNTY, FLORIDA,**
Geological Survey, Tallahassee, Fla.
L. F. Land.
Open-file report FL 75-74, 1975. 59 p, 19 fig, 8 ref.

Descriptors: *Water level fluctuations, *Canals, *Saline water intrusion, *Groundwater movement, *Florida, Model studies, Land development, Land management, Environmental effects, Water quality, Analytical techniques, Evaluation, Hydrologic data, Withdrawal, Aquifers, Construction.
Identifiers: *Lake Worth(Fla), Lowering canal stages.

Land in southeast Palm Beach County, Florida, is undergoing a large-scale change in use, from agricultural to residential. To accommodate residential use, a proposal was made to lower canal stages in the interior part of the area undergoing change. The two main tools used in the investigation were a digital model for aquifer evaluation and an analytical technique for predicting the movement of the salt-water front in response to a change of groundwater flow into the ocean. Test results show that lowering part of the interior canal water levels 3 feet does not affect the aquifer head or salt-water intrusion along the coastal area of Lake Worth. Lowering interior canal water levels by as much as 4 feet would result in some salt-water intrusion. (Woodard-USGS)
W75-10156

**GROUND-WATER HYDROLOGY OF GARNER VALLEY, SAN JACINTO MOUNTAINS, CALIFORNIA--A MATHEMATICAL ANALYSIS OF RECHARGE AND DISCHARGE,**
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2F.
W75-10158

**HYDROLOGIC EVALUATION OF THE HAYSTACK BUTTE AREA WITH EMPHASIS ON POSSIBLE DISCHARGE OF CLASS-I WASTES, EDWARDS AIR FORCE BASE, CALIFORNIA,**
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W75-10161

**HYDROLOGIC RECONNAISSANCE OF THE WAH WAH VALLEY DRAINAGE BASIN, MILLARD AND BEAVER COUNTIES, UTAH,**
Geological Survey, Salt Lake City, Utah.
J. C. Stephens.
Utah Department of Natural Resources, Salt Lake City, Technical Publication No 47, 1974. 53 p, 8 fig, 1 plate, 10 tab, 24 ref, append.

Descriptors: *Groundwater resources, *Surface-groundwater relationships, *Available water, *Water quality, *Utah, Drainage area, Hydrologic data, Hydrology, Precipitation(Atmospheric), Runoff, Streamflow, Aquifer characteristics, Water wells, Well data, Drillers logs, Chemical analysis.
Identifiers: *Wah Wah Valley(Utah).

The Wah Way Valley drainage basin includes about 600 square miles in Millard and Beaver Counties in southwestern Utah. Total runoff averages only about 7,800 acre-feet annually; all streams are ephemeral or intermittent; and surface storage is negligible. Evaporation and transpiration within the basin consume more than 97% of total annual precipitation. There is no surface outflow. Total annual recharge to the groundwater system is about 10,000 acre-feet. Estimates and measurements of discharge from the groundwater system total about 1,500 acre-feet. Recharge to and discharge from the groundwater system are assumed to be equal over a long period of time because there are no known changes of storage in the system. Thus, the difference between the totals for recharge and discharge represents surface outflow from the drainage basin. known groundwater sources in the basin fresh, very hard water. The highest concentra of dissolved solids (masimum 4,550 mg/litre found in groundwater from igneous rocks, an lowest (minimum 99 mg/litre) are found in from quartzite and carbonate rocks. (Wood USGS)
W75-10167

**ISOTOPE HYDROLOGY 1974--A REVIEW THE IAEA SYMPOSIUM ON ISOT TECHNIQUES IN GROUNDWA HYDROLOGY,**
Paris-6 Univ. (France). Laboratoire de Geo Dynamique.
For primary bibliographic entry see Field 5A.
W75-10172

**GROUND-WATER'S ROLE IN WATER QU TY MANAGEMENT,**
Pennsylvania Dept. of Environmental Resou Harrisburg. Bureau of Water Quality Ma ment.
For primary bibliographic entry see Field 5G.
W75-10180

**REPORT OF COMMITTEE ON SURVEY GROUND WATER SUPPLIES IN NEW GLAND.**
New England Water Works Association, B (Mass).
Journal of the New England Water Work sociation, Vol 89, No 1, p 44-53, March 1975.

Descriptors: *Groundwater, *Water su *Surveys, Municipal water, Wells, *New En Maintenance, Water treatment, Iron, Mangan
Identifiers: Gravel wells.

A survey was made of municipal groundwate plies in several New England states, in respo concern over the environmental impact of development and a consequent increase in tion problems. Gravel packed and gravel-w wells were examined. The question was po to whether such wells have deteriorate decreased in their capacity. Opinions wer tained on the costs and benefits of preve maintenance programs for water wells and p ing equipment. Discussed also was treatme groundwater for inhibiting iron and mang problems. Public water supplies in Massachu Vermont, Maine, Connecticut, and Hampshire were discussed. In general, wells held their quality and capacities for many longer than previously expected. Maintenanc treatment methods varied, depending upo population of an area and the demand for gr water supplies. (Prague-FIRL)
W75-10182

**DUMPS: A POTENTIAL THREAT TO GROUNDWATER SUPPLIES,**
Environmental Protection Agency, Washi D.C. Office of Solid Waste Management grams.
For primary bibliographic entry see Field 5B.
W75-10184

**SOME APPLICATIONS OF THERMAL IN RED LINESCAN IN WATER RESOURCES DIES,**
Water Research Association, Marlow (Engla
For primary bibliographic entry see Field 5A.
W75-10188

**SUBSURFACE ENVIRONMENT--PRIV PROPERTY OR PUBLIC DOMAIN,**
Virginia Polytechnic Inst. and State U Blacksburg. Water Resources Research Cent
W. R. Walker, and W. E. Cox.

l of the Hydraulics Division, Proceedings of Vol 100, No HY11, Paper No 10958, p 705, November 1974. 8 ref.

ıtors: Hydraulics, *Water supply, dwater, *Legislation, *Mining, ground structures, *Storage, *Waste l, *Injection wells, Energy, Excavation. ers: Airspace, Public administration, *Gas , Land titles.

reasing utility of subsurface space is result- reater interest in the nature of the controls ern use of this portion of the environment, g water supply, mineral extraction, un- nd storage, waste disposal, utility location, mmercial and industrial activities. Many of s of the subsurface environment are con- by the institution of property rights. The er has exclusive rights to certain minerals beneath his surface estate and somewhat nited rights with respect to other natural s, e.g., groundwater. In addition, property finitions often imply exclusive rights to an e depth, thereby technically excluding all others even where use by the surface s not feasible. However, there is limited t for a restriction of exclusive property a depth subject to actual use as has been he case of overlying airspace. Regarding tion of whether the subsurface environ- uld be private property or at least par- hin the public domain, there is no easy vailable as in most cases of public policy; ion will require more consideration in the ell-Cornell) 09

UCH 'RELIABILITY' IS 'ENOUGH', ry bibliographic entry see Field 5A. 54

PE COD WATER PROGRAM, A CUR- NALYSIS, isetts State Geology Office, Boston. ot. f the New England Water Works As- Vol 88, No 3, p 238-247, September, , 13 ref.

rs: *Groundwater, *Water quality, , Iron, Sewage disposal, Land treat- roundwater management, Hydrologic Massachusetts. : *Cape Cod(Mass), Ocean disposal.

on the chemical quality of ground and aters has been conducted on Cape Cod undwater aquifer of Barnstable County, setts. Five deep holes were drilled in ng the thicknesses of permeable layers ting high iron content in all deep water. s pumped from three deep well mud it was concluded that: all water pumped was fresh water, background chloride m; only one aquifer exists under Cape usable water occurs before a depth of elow M.S.I.; and Fe and Mn at greater potential problems. Recommendations ther study of the problem of ocean out- disposal as opposed to on land treat- its impact on groundwater quality. RL)

ND REGULATIONS, SOUTHWEST MANAGEMENT DISTRICT ). Florida Water Management District, . y bibliographic entry see Field 6E.

**RULES OF CENTRAL AND SOUTHERN FLOOD CONTROL DISTRICT, CHAPTER 16CA, WITH COMMENTARY.**
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 6E.
W75-10307

## 4C. Effects On Water Of Man's Non-Water Activities

**HYDROLOGIC IMPACT OF PLANNED UNIT DEVELOPMENTS,**
Maryland Univ., College Park. Dept. of Civil Engineering.
R. H. McCuen, and H. W. Piper.
Journal of the Urban Planning and Development Division, American Society of Civil Engineers, Vol 101, No UP1, p 93-102, May 1975. 5 fig, 4 tab, 11 ref.

Descriptors: *Storm runoff, *Urban hydrology, *Urban runoff, *Model studies, Runoff forecasting, Urbanization, Infiltration, Hydrographs, Evapotranspiration, Subsurface flow, Roofs.
Identifiers: Planned unit development, Linked-process hydrologic model, Rooftop detention.

The hydrologic impact of planned unit developments (PUD) is examined. A linked-process hydrologic model was formulated to estimate the hydrologic impact of various land-use configurations and examine the potential of various storm water management practices. Components are included to simulate the various hydrologic processes such as interception, infiltration, evapotranspiration, surface retention and detention, subsurface flow, rooftop storage and runo', overland flow on impervious surfaces, gutter flow and storm sewer system routing, which are involved in transforming rainfall to storm water runoff. Peak discharges from a planned unit development have been computed to be as much as three times those of a single family detached dwelling unit and five times those of undeveloped land use. This fact makes it imperative that storm water management alternatives for PUD be investigated. The linked-process hydrologic model employed in this study appears to be a valid means for estimating the hydrologic impact of PUD and the effect of various storm water management alternatives. The use of rooftop detention may reduce peak discharge by approximately 4%. However, parking lot detention appears to be a more practical detention alternative. (Orr-FIRL)
W75-09919

**UTILIZATION OF AERIAL PHOTOGRAPHS FOR MEASURING LAND USE CHANGES IN WATERSHEDS,**
Clemson Univ., S.C. Dept. of Civil Engineering.
D. B. Stafford, J. T. Ligon, and M. E. Nettles.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 887, $3.75 in paper copy, $2.25 in microfiche. Presented at International Symposium on Remote Sensing of Water Resources, June 11-14, 1973, Burlington, Ontario, Canada. 23 p, 4 fig, 3 tab. OWRT A-024-SC(3).

Descriptors: *Watershed(Basins), *Land use, *Aerial photography, Remote sensing, *South Carolina, Urbanization, Runoff, Land management, *Land classification.

Techniques are described for using existing aerial photographs to investigate land use changes in watersheds. A primary objective was to measure the physical characteristics of historical land use patterns that affect the hydrologic parameters of a watershed. Land use changes in two watersheds in western South Carolina were examined. One of the watersheds has experienced rapid urbanization in recent years and the other watershed has experienced significant changes in agricultural land use over the past 26 years. Existing aerial photographs taken at approximately five-year intervals were used to delineate, classify, code, and measure the areas of various land use classes in the two watersheds. The land use classes employed were those that had experienced significant changes and which had different runoff characteristics. The area occupied by each land use class was measured on photographic enlargements by using a planimeter. Significant changes in land use were observed in the two watersheds. The results obtained from the research program indicate that the use of existing aerial photographs to obtain data on the historical distribution of land use in watersheds represents a very satisfactory approach that could be employed more widely.
W75-10136

**HYDROLOGIC DATA FOR URBAN STUDIES IN THE DALLAS, TEXAS METROPOLITAN AREA, 1973,**
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-10148

**HYDROLOGIC DATA FOR URBAN STUDIES IN THE AUSTIN, TEXAS METROPOLITAN AREA, 1973,**
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-10151

**PROCEDURE FOR EVALUATING ENVIRONMENTAL IMPACT,**
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 6G.
W75-10164

**SCENIC RIVERS ASSOCIATION OF OKLAHOMA V. LYNN (SUIT SEEKING DECLARATORY JUDGMENT THAT HUD MUST MAKE AN ENVIRONMENTAL IMPACT STUDY PRIOR TO THEIR CONTEMPLATED ACTIONS).**
For primary bibliographic entry see Field 6E.
W75-10313

**SUTHERLAND V. HICKORY NUT CORP. (ACTION FOR DAMAGES CAUSED BY CONSTRUCTION OF ROADS BY ADJACENT PROPERTY OWNER WHICH ALTERED NATURAL DRAINAGE OF MOUNTAIN LAND).**
For primary bibliographic entry see Field 6E.
W75-10315

## 4D. Watershed Protection

**SILTATION RATES AND LIFE EXPECTANCIES OF SMALL HEADWATER RESERVOIRS IN MONTANA,**
Montana Univ., Missoula. School of Forestry.
For primary bibliographic entry see Field 2J.
W75-09858

**EFFECTS OF SEDIMENT CONTROL ON SEDIMENT TRANSPORT IN THE NORTHWEST BRANCH ANACOSTIA RIVER BASIN, MONTGOMERY COUNTY, MARYLAND,**
Geological Survey, College Park, Md.
For primary bibliographic entry see Field 2J.
W75-10141

**HYDROLOGIC DATA FOR NORTH CREEK, TRINITY RIVER BASIN, TEXAS, 1973,**
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-10149

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1973,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-10150

PRESERVATION AND ENHANCEMENT OF THE AMERICAN FALLS AT NIAGARA.
American Falls International Board, Buffalo, N.Y.
For primary bibliographic entry see Field 6E.
W75-10290

BIG HILL LAKE CREEK, KANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 8D.
W75-10293

TYBEE ISLAND GEORGIA, BEACH EROSION CONTROL PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Savannah, Ga.
Availble from the National Technical Infomration Service, Springfield, Va 22161 as USDC, EIS-GA-73-1792-F, $4.25 in paper copy, $2.25 in microfiche. November 13, 1973. 70 p, 5 tab, 2 map.

Descriptors: *Environmental effects, *Georgia, *Shore protection, *Groins(Structures), *Beach erosion, Breakwaters, Jetties, Riprap, Shores coastal structures, Coastal engineeing, Flow control, Erosion control, Beaches, Ocean waves, Waves(Water), Barrier islands, Seashores, Recreation, Tidal marshes, Ocean currents, Tides, Wind erosion, Dunes.
Identifiers: *Environmental impact statements, *Tybee Island(Ga), Coastal zone management, Beach restoration, Coastal waters.

This project involves the restoration and periodic nourishment of 13,200 feet of ocean beach and construction of a rubble stone terminal groin extending 800 feet seaward. Proposed for the future, if needed, is the placement of two additional rubble groins 760 feet and 670 feet, respectively, and a 1200-foot extension to the terminal groin. Tybee Island is a small barrier island located off the central coast of Georgia. It is comprised of sand dunes and tidal marshes and its beach serves as a major vacation center during the summer months. The island has been continuously subjected to severe erosion due to wave and wind action. The project will result in the restoration and maintenance of the scenic beach area, stabilization of the eroding shoreline, sport fishery habitat, and enhancement of the island community. The project will also temporarily reduce water quality and fish population, and will disrupt the benthid community during construction. Various combinations of groins were considered as were several alternate borrow sites. Involving no irretrievable commitment of resources, the project will enhance the long-term economic development of the region. There is no significant opposition to this proposal. (Deckert-Florida)
W75-10294

# 5. WATER QUALITY MANAGEMENT AND PROTECTION

## 5A. Identification Of Pollutants

METHOD AND APPARATUS FOR DETECTING THE PRESENCE OF AN OIL SLICK ON A WATER SURFACE,
A. R. Kriebel.
U S Patent No 3,885,418, 4 p, 8 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 934, No 4, p 1385, May 27, 1975.

Descriptors: *Patents, *Oil spills, Oil pollution, *Water pollution control, *Pollutant identification, Monitoring, Equipment, Pollution abatement.
Identifiers: Oil film detector.

The invention provides an in situ floating oil film detector which can continuously monitor a number of local critical areas including the effluent from waste water treatment plants, offshore drilling platforms, piers where oil is being transferred to or from tankers, and inlets to congested water facilities or industrial water intakes where a hazard from floating oil exists. The detector consists of a cylinder positioned within a hollow cylindrical enclosure or shroud, the cylinder being driven about its axis as a constant speed by a drive motor. The detector floats on the water in such a manner that the cylinder is partially submerged in the water surface and, in the absence of an oil slick on the water surface, imposes a known and low value of torque on the drive motor due to the drag on the cylinder by the water film between the cylinder and the shroud. When an oil slick appears on the water surface, the surface of the rotating cylinder becomes coated with oil and the torque on the drive motor is increased, increasing the current through the drive motor. This increase in drive motor current is utilized to trigger a control circuit that signals the presence of the oil. (Sinha-OEIS)
W75-09865

OIL DETECTOR,
E. L. Brill.
US Patent No 3,887,907, 5 p, 10 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 935, No 1, p 421, June 3, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, Water pollution control, Water quality control, *Sampling, Skimming, Monitoring, *Pollutant identification.
Identifiers: Hydrophobic collectors, Oil detection.

A method and apparatus for detecting the presence of oil floating on water is described. A liquid sample is continuously taken from the surface of the water at a substantially steady rate. A sample is collected of predetermined parameter, such as weight or volume, in a predetermined time as consitituting one cycle of the operation. Each sample is dumped at the end of each cycle. Using a skimmer which lifts a minimum of liquid from the surface of the water when no oil is present, but which lifts a much larger amount of liquid when oil is present, the invention provides a system wherein if the collected sample is substantially all water, the same is dumped at the end of each cycle without providing a signal. However, if the collected sample involves some volume of oil, the sample reaches a predetermined parameter in less than the usually predetermined time of dumping and therefore the collected sample is utilized to give a signal indicating the presence of oil. A flexible, hose-like elongated collector is utilized which has an attraction for the hydrophobic liquid resting upon the water to pick up the oil collected by an endless loop floating on the water. It is carried out of the water where a doctor blade scrapes the coated material from the collector hose. (Sinha-OEIS)
W75-09878

HUMAN RADIATION DOSE STUDIES. A SELECTED BIBLIOGRAPHY.
Technical Information Center (AEC), Oak Ridge, Tenn.
Available from the National Technical Information Service, Springfield, Va. 22161, as Rept No TID-3348, $5.45 in paper copy, $2.25 in microfiche. Rept No TID-3348, December 1974. 85 p.

Descriptors: *Bibliographies, *Radioactivity, Environment, *Environmental effects, *Radioactivity effects, Research and development, Biology, Human population, Public health, Abstracts, Publications.
Identifiers: *Dose studies.

This bibliography contains abstracts of technical reports and journal articles that ha peared in Nuclear Science Abstracts from J 1962 to June 1973. The scientific and tec journals in which some of the literature a are available in most science libraries thro the United States. The abstracts in this b raphy are arranged by NSA volume and a number. (Houser-ORNL)
W75-09890

TERRESTRIAL AND FRESHW RADIOECOLOGY, A SELECTED BIB RAPHY,
Washington State Univ., Pullman. Dept. of gy.
A. W. Klement, Jr., and V. Schultz.
Available from NTIS, Springfield, Va. 22 Rept. No. TID-3910 (suppl. 9), $5.45 in paper $2.25 in microfiche. Rept. No. TID-3910 (Su 1974. 125 p, 1356 ref.

Descriptors: *Bibliographies, Public *Abstracts, *Radioactivity, *Water pol *Thermal pollution, Ecology, Ecosy Brackish water, Tracers, Nuclear power Effluents.

This compilation is based on the same crit previous supplements and includes publi which have been noted since publication o plement 8. Volume 26 of Nuclear Scienc stracts was perused. References have be tained from a large number of sources. Man obtained from reviews and other publicati number of more general references have b cluded which are not basically on ecology b be related, and it is hoped of interest to ecol e.g., use of tracers in pesticide studies. An a was made to reference publications which w lated to field or laboratory studies of wild s of plants and animals with respect to radiat fects or metabolic studies involving radionu including parasites. Included are referenc studies of brackish water and brackish wa ganisms. Reports on thermal pollution and r concerning organisms at nuclear energy in tions are also included even though the par study did not involve research on radiation or cycling of radionuclides. With these excep if a reference is listed it contains material on ing radiation even though it is not obvious fr title. (See also W73-07962, W72-04452 and 09232). (Houser-Ornl)
W75-09891

RADIOACTIVITY FROM SRP OPERATIO A DOWNSTREAM SAVANNAH R SWAMP,
Du Pont de Nemours (E.I.) and Co., Aiken Savannah River Lab.
For primary bibliographic entry see Field 5B.
W75-09901

EFFECT OF ASULAM IN WILDLIFE SPE ACUTE TOXICITY TO BIRDS AND FISH,
May and Baker Ltd., Dagenham (England).
For primary bibliographic entry see Field 5C.
W75-09903

IMPORTANCE OF WATER PH IN ACCUM TION OF INORGANIC MERCURY IN FISH
Wisconsin Univ., Madison. Dept. of Entomol
S-C. Tsai, G. M. Boush, and F. Matsumvra.
Bulletin of Environmental Contamination Toxicology, Vol 13, No 2, p 188-193, Feb 1975. 2 fig, 1 tab, 17 ref.

Descriptors: *Mercury, *Bioassay, *Hydrog concentration, *Minnows, Heavy metals, La tory tests, Absorption, *Pollution identificati
Identifiers: *Bioaccumulation, *Tissue analy

factors that effect the translocation of mercu-
om water into forage fish on the lower level of
ood chain were investigated. Inorganic mercu-
nder high pH values was not as readily trans-
ed from water into fish as under low pH con-
ns in ambient water. This may be due to un-
tive forms of mercury formed under alkaline
itions. (Katz)
-09904

AND PCB LEVELS IN LAKE COEUR
ENE, IDAHO, OSPREY EGGS,
Univ., Moscow. Dept. of Biological
ices.
Johnson, W. E. Melquist, and G. J.
eder.
tin of Environmental Contamination and
ology, Vol 13, No 4, p 401-405, April 1975. 1
1 ref.

riptors: *Polychlorinated biphenyls, *Bird
*DDT, DDE, Birds, Reproduction,
icide residues, Environmental effects, DDD,
ning, Pesticides, Path of pollutants, *Idaho,
tant identification.
fiers: *Lake Coeur d'Alene(Idaho), *Osprey

y eggs collected from the Coeur d'Alene
shed were analyzed for DDT metabolites and
content and shell-thickness. DDE levels
d from 1.8 to 15 ppm with lesser amounts of
and DDT also detected. PCB, probably
or 1260, averaged only 1.2 ppm. Total DDT
es were highest in eggs from clutches which
ually failed. There was no significant dif-
e in shell thickness between sample eggs
clutches which failed and those from
es which fledged at least one young. (Katz)
9907

RINATED HYDROCARBONS IN THE
ONTARIO ECOSYSTEM, (IFYGL),
nsin Univ., Madison. Water Chemistry Pro-

Haile, G. D. Veith, G. F. Lee, and W. C.

ble from the National Technical Informa-
ervice, Springfield, Va. 22161, as PB-243
.75 in paper copy, $2.25 in microfiche. En-
ental Protection Agency, Report EPA-
5-022, June 1975. 28 p, 8 tab, 13 ref. EPA
6 R-800608.

ptors: *Lake Ontario, Great Lakes,
tem, *DDT, *Chlorinated hydrocarbon
les, *Dieldrin, *Polychlorinated biphenyls,
Aquatic life, Benthos, Lake sediments, En-
akes, Sediments, *Pollutant identification,
omatography.
ers: BHC, Heptachlor.

ntario fish, water, sediment, net plankton,
hora, and benthos were examined for DDT
pesticides, dieldrin, and PCBs. Endrin,
roup pesticides, and heptachlor were also
ed in some fish samples. Average concen-
ranged from 28 ng/l (t-DDT), 4.8 ng/l
a), and 55 ng/l (PCBs as Aroclor 1254
ent for water to 1.40 micro-g/g (t-DDT),
icro-g/g (dieldrin), and 5.15 micro-g/g
for whole fish. DDE levels were generally
to t-DDT values. PCB/t-DDT ratios
d 2.6 for all samples except for sediment
l benthos (5.3). (EPA)
018

MINATION OF MOLECULAR
GEN SULFIDE,
mental Protection Agency, Athens, Ga.
st Environmental Research Lab.
over.
e from the National Technical Informa-
vice, Springfield, Va. 22161, as PB-242
5 in paper copy, $2.25 in microfiche. En-
vironmental Protection Agency, Report EPA-660/4-75-001, April 1975. 39 p, 11 fig, 6 tab, 27 ref. EPA 1BA027.

Descriptors: *Pollutant identification, Chemical analysis, Hydrogen sulfide, Electrodes, Permselective membranes, *Electrochemistry, Electrolytes.
Identifiers: Dissolved gas, Molecular hydrogen sulfide, Sparging, Gas-sensing.

The gas sparging technique and a new gas-sensing electrode were evaluated for the determination of dissolved molecular hydrogen sulfide at environmentally significant concentrations in water. From the sparging experiments approximate coefficients were obtained for the distribution of hydrogen sulfide between nitrogen and distilled water, seawater, or municipal sewage effluent. In the latter medium the volatility of hydrogen sulfide was very much less than predicted from the pH-total sulfide relationship. The selectrode, consisting of various semipermeable membranes, buffered electrolyte filling solution, silver-silver sulfide crystal sensor, and lanthanum fluoride internal reference electrode, gave a generally Nerstian response to more than 0.1 mg/l of molecular hydrogen sulfide. At lower concentrations the response was typically several tenths of a volt per decade of concentration, but was not reproducible among different samples or electrodes. Various sources of the anomalous behavior were considered. The electrode is recommended for in situ measurements of molecular hydrogen sulfide at concentrations greater than 0.1 mg/l. More work is needed to make it useful at lower concentrations. (EPA)
W75-10025

**AQUEOUS ODOR THRESHOLDS OF ORGANIC POLLUTANTS IN INDUSTRIAL EFFLUENTS,**
Georgia Univ., Athens. Dept. of Food Science.
D. A. Lillard, and J. J. Powers.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 734, $3.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/4-75-002, May 1975. 20 p, 5 tab, 15 ref. EPA 1BA027, R-802980-01.

Descriptors: *Odor, Water analysis, Organic wastes, Statistical methods, *Pollutant identification, *Industrial wastes, Effluents, Organic compounds, Air pollution, Organoleptic properties.
Identifiers: Odor thresholds, Extreme value calculations, Triangle test.

Odor thresholds in water were determined of organic pollutants that have been identified in industrial effluents. Seven to fourteen judges were used to determine the odor threshold values of 13 compounds at room temperature and 60C. Odor threshold values for the compounds in ppm at room temperature are: acenaphthene, 0.08; 2-ethyl-l-hexanol, 1.28; butanol, 2.77; geosmin, 0.13 x 10-3; 2-methyl naphthalene, 0.01; l-methyl naphthalene, 0.02; diacetone alcohol, 44.1; dibenzofuran, 0.12; 2-benzothiazole, 0.08; 2-mercaptobenzothiazole, 1.76; 2-ethyl-4-methyl-1,3-dioxolane, 0.38; caprolactam, 59.7; d-camphor, 1.29. Extreme value calculations were made to predict a concentration below which a certain percentage of the population might still be able to detect the compound(s). The threshold values obtained at 60C in most cases do not differ or are higher than those determined at room temperature. (EPA)
W75-10026

**STUDIES TO DETERMINE METHODS FOR CULTURING THREE FRESHWATER ZOOPLANKTON SPECIES,**
Fish and Wildlife Service, Yankton, South Dakota, North Central Reservoir Investigations.
D. B. Martin, and J. F. Novotny.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 764, $3.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/3-75-010, May 1975. 33 p, 2 fig, 9 tab, 20 ref. EPA 1BA021, EPA-1AG-0152(D).

Descriptors: *Cladocera, *Copepods, Invertebrates, *Fish food organisms, *Zooplankton, *Cultures, Bioassay, Fresh water, Bioindicators, Standing crops, Harvesting.
Identifiers: *Bosmina longirostris, *Chydorus sphaericus, *Cyclops bicuspidatus thomasi, Test animals.

Studies to determine laboratory methods for culturing unispecific populations of Bosmina longirostris, Chydorus sphaericus and Cyclops bicuspidatus thomasi were carried out. These cultures are to provide a source of animals to be used as live food for fish and as bioassay test organisms. B. longirostris was not successfully cultured. High mortalities, apparently associated with the phenomenon of 'air-locking,' always occurred during handling in the laboratory. C. sphaericus was successfully maintained in relatively dense cultures (approximately 1,000 per liter) using a mixture of dried foods, less than 37 microns in size. One-fourth of the standing crop was harvested each week without apparently reducing the production in the culture. C. bicuspidatus thomasi could be grown using both dried food and live Paramecium multimicronucleatum as an energy source. However, the latter resulted in higher standing drops. Total standing crop as well as the proportion of each life stage in the population fluctuated greatly in the C. bicuspidatus thomasi cultures. Both C. bicuspidatus thomasi and C. sphaericus were grown at 15C, at a light:dark cycle of 12:12 hours, and in a synthetic medium of known chemical composition. C. sphaericus was recommended as being best suited for live fish food and as a bioassay test animal. (EPA)
W75-10027

**ASBESTOS IN DRINKING WATER,**
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
G. H. Kay.
Journal of the American Water Works Association, Vol 66, No 9, p 513-514, September, 1974. 4 tab.

Descriptors: *Public health, *Asbestos, *Analytical techniques, *Potable water, Water sources, Water supply, *Pollutant identification, Water pollution sources, Foreign research, Filtration, *Minnesota, *Canada.
Identifiers: *Asbestiform fibers, Ontario(Can), Duluth(Minn).

Samples from the water supplies of 22 cities in Ontario, Canada, were assessed for asbestiform fibers. Charts present the asbestos fiber count and estimated mass concentration by distribution-system water and an analysis of the asbestos fiber count. Asbestos is apparently present in all surface waters of inhabited areas of Ontario. After evaluations of known information, the Ontario Ministry of Health advised that at the levels of concentration and size distribution of fibers reported, there was no evidence of an effect on health by the ingestion of asbestos particles. The City of Duluth, Minnesota, also discovered asbestiform fibers in its drinking water. Duluth will probably have to provide treatment, such as filtration, of its drinking water. Research needs to continue on the health hazard that may or may not be present at various levels of asbestiform fibers in drinking water supplies. (Orr-FIRL)
W75-10030

**QUANTITATIVE LARGE-VOLUME SAMPLING TECHNIQUE,**
Environmental Protection Agency, West Kingston, R. I. Northeast Water Supply Research Lab.
M. A. Levin, J. R. Fischer, and V. J. Cabelli.
Applied Microbiology, Vol 28, No 3, p 515-517, September 1974. 2 fig, 2 tab, 8 ref.

Descriptors: *Analytical techniques, *Bacteria, *Filtration, *Water analysis, Equipment, Laboratory tests, *Pollutant identification, Filters, *Sampling.
Identifiers: High-volume sampling, Most probable number.

A filtration technique for high-volume sampling (HVS) in water is described that can be used in combination with the most probable number technique (MPN) for the quantitation of microorganisms present at low densities. The apparatus consists of a Balston type AA cartridge filter, 2.5 by 6.4 cm, with a type 90 filter holder. The filter is made of borosilicate glass microfibers bonded with epoxy resin. It is 98% efficient for 0.3 micromillimeter particles. The HVS technique was used to obtain the MPN estimates of Salmonella densities in samples of marine waters around New York City. The HVS technique can be used in any sampling situation as long as a selective-enrichment medium is available for use in combination with the MPN procedure. (Orr-FIRL)
W75-10031

**METHODS FOR THE DETERMINATION OF SPECIFIC ORGANIC POLLUTANTS IN WATER AND WASTE WATER,**
National Environmental Research Center, Cincinnati, Ohio. Methods Development and Quality Assurance Research Lab.
J. J. Lichtenberg.
IEEE Transactions on Nuclear Science, Vol NS-22, No 2, p 874-891, April 1975. 15 fig, 57 ref.

Descriptors: *Monitoring, *Analytical techniques, *Pollutant identification, *Gas chromatography, Spectroscopy, Chromatography, Pesticides, *Organic wastes, Methodology, Organic compounds.

Methods for sample collection and pretreatment and for isolation and determination of specific organic compounds are reviewed. Methods presented include those designed for the determination of organochlorine, organophosphorus, and organonitrogen pesticides, phenoxy acid herbicides, polychlorinated biphenyls, organic solvents and other selected organic compounds. Gas chromatography is the most widely applicable and popular method for detecting and measuring specific organic compounds in water, waste water, and other environmental media. Gas chromatography used with selective detectors is the most sensitive and selective method for qualitative and quantitative determination of organic compounds that is available. The absolute identification of compounds that can be only tentatively identified by other means is made possible by the recent development and application of the computer-controlled gas chromatograph-mass spectrometer. Examples of the application of infrared, ultraviolet, and fluorescent spectroscopy; liquid chromatography; and thin-layer chromatography for organic analyses are also discussed. (Orr-FIRL)
W75-10032

**A RATIONAL APPROACH FOR PREDICTING THE DISSOLVED OXYGEN PROFILE IN RECEIVING WATERS,**
Oklahoma State Univ., Stillwater. School of Civil Engineering.
K. M. Peil, and A. F. Gaudy, Jr.
Biotechnology and Bioengineering, Vol 17, p 69-84, 1975. 9 fig, 14 ref.

Descriptors: *Analytical techniques, *Dissolved oxygen, Waste disposal, Streams, Biochemical oxygen demand, Environmental effects, Waste water(Pollution), Biodegradation, Forecasting, *Pollutant identification, Water pollution sources.
Identifiers: Environmental bioengineering, Oxygen uptake curve, BOD curve, Reaeration.

A new method has been developed for predicting the dissolved oxygen profile in a stream receiving biodegradable wastes. Because the level of dissolved oxygen in a stream influences the health of the aquatic environment, the amount of organic materials removed from waste water should be carefully determined. Such an engineering prediction is among the most complex in the field of environmental bioengineering. For this method the BOD curve is obtained using an open jug technique. The accumulated O2 uptake curve is then used in numerical integration with physical reaeration data for the receiving stream in order to predict the DO profile in the stream. In this case, 10-liter open jar reactors were utilized to obtain the O2 uptake curves, and the receiving stream was a 670-liter simulated stream apparatus. A good prediction of the actual DO was obtained. The effect of the reaeration constant K2 (agitation effect) on the kinetics of O2 uptake was studied. Increased agitation caused some increase in the BOD curve, with most of the increase coming after the plateau area in the O2 uptake curve, or after the low point along the DO sag curve. (Prague-FIRL)
W75-10034

**PETROLEUM POLLUTANTS IN SURFACE AND GROUNDWATER AS INDICATED BY THE CARBON-14 ACTIVITY OF DISSOLVED ORGANIC CARBON,**
Geological Survey, Reston, Va.
E. C. Spiker, and M. Rubin.
Science, Vol 187, p 61-64, January 10, 1975. 1 tab, 23 ref.

Descriptors: *Oil pollution, *Carbon radioisotopes, *Municipal wastes, Industrial wastes, *Organic compounds, *Pollutant identification, Rivers, Groundwater, Surface water, Water pollution sources.
Identifiers: *Petroleum effluents, C-14, Dissolved organic carbon.

Dissolved organic carbon (DOC) consists of organic compounds such as humic and fulvic acids, herbicides, pesticides, synthetic detergents, phenols, and petroleum hydrocarbons. Once the organic matter decomposes, carbon compounds are altered. While carbon dioxide is recycled, the carbon-14 content of organic carbon is not significantly affected by the synthesis. For this reason, the 14C activity of dissolved organic carbon can be used to distinguish between the two classes of organic carbon--those from petrochemical effluents and those from municipal wastes and agricultural runoff. The industrial wastes are composed of fossil petroleum products which contain no 14C; modern domestic wastes and naturally decaying matter contain approximately the modern atmospheric carbon-14 content. Rivers polluted by petrochemical effluents showed varying amounts of depression of the DOC 14-C activity, which reflects concentrations of 14C-deficient fossil carbon of as much as 40 percent of the total DOC. Studies of six rivers in the eastern United States were consistent with a model; seasonal variations in runoff and stream discharge were considered. (Prague-FIRL)
W75-10035

**IDENTIFICATION OF CRUDE OIL LEAKS AT SEA (IDENTIFICAZIONE DELLA FONTE DI SPANDIMENTI DI PETROLIO GREZZO IN MARE),**
A. M. Ilardi.
La Rivista dei Combustibili, Vol 28, No 10, p 367-371, October 1974. 4 fig, 3 tab, 4 ref.

Descriptors: *Oil spills, Analytical technique, Waste disposal, *Pollutant identification, Nickel, Oil pollution, Water pollution sources.
Identifiers: Vanadium, Italy.

By ascertaining oil quality, the origin of accidental oil spills may be identified. The composition of crude oil is best analyzed when commonly carried oils are available for comparison. An example of steps taken to identify two crude oil spills in w is detailed. Gas chromatography of selected di late fractions from the oil recovered was used. keys used for identification were quantita determination of vanadium and nickel from di lation residues. (Prague-FIRL)
W75-10036

**DETERMINATION OF TRACE QUANTIT OF BORON IN SURFACE WATER BODIES A IN DRINKING WAT (SPURENBESTIMMUNG VON BOR OBERFLACHENGEWASSERN UND TRI WASSERN),**
V. G. Graffman, P. Kuzel, H. Nosler, and G. Nonnemacher.
Chemiker-Zeitung, Vol 98, No 10, p 499-504, 19 1 fig, 3 tab, 20 ref.

Descriptors: *Boron, *Water quality, *Sampl Potable water, Surface waters, Waste wa *Pollutant identification, *Trace elements.
Identifiers: *Rhine River(Germany).

The boron concentration was determined in ab 300 samples of surface water and in about samples of drinking water taken from places tributed throughout the Federal Republic of G many and West-Berlin. All 110 surface water s ples from the river Rhine and samples from m of the other rivers had a boron concentration up a maximum of 0.25 mg B/liter. Only very sm rivers which are known to transport a la amount of waste water showed a significa higher boron concentration. None of the 240 s ples of drinking water had a boron concentrat higher than 0.25 mg B/liter. The boron concen tions which were found in surface and drink water of the Federal Republic of Germany ar the lower range as compared to boron concen tions which have been determined in surf water, ground water and drinking water of ot European and non-European countries. (Prag FIRL)
W75-10041

**A NEW INFRARED INSTRUMENT FOR MO TORING OIL FILMS ON WATER,**
Wright and Wright, Inc., Newton Center, Mass.
D. E. Wright, and J. A. Wright.
Marine Technology Society Journal, Vol 9, No p 22-24, January 1975. 4 fig.

Descriptors: *Oil pollution, *Monitori *Instrumentation, Oil spills, Oceans, Coas Laboratory tests, On-site tests, *Pollutant ident cation, *Infrared radiation.
Identifiers: Oil films, Infrared reflection, Infra Oil Film Monitor.

A new infrared oil film monitor has be developed to detect oil slicks by remote metho The technique is based on the infrared reflectan properties of water surfaces at the three-micr spectral region where sharp changes in reflectan occur due to absorption bands. The reflectance water differs from the reflectance of an oil f with regard to a peak and valley shaped graph water spectral reflectance, absent with an oil fi Both laboratory and field tests have shown t this instrument can detect oil spills during weather and lighting conditions. Design chan have improved the Infrared Oil Film Monitor operate at heights of up to 30 feet above the wa level. Slicks which seemed to be oil but by che cal analysis were not were discriminated by Monitor in both laboratory and field studies. T instrument provides a simple oil/no oil alarm s requires no attendant or cleaning problems. T possible applications of this instrument inclu baseline studies of coastal oil slicks; monitoring petroleum loading/unloading docks for mi spills; detection of oil which might be released i the environment from waste water storage tan and monitoring for law enforcement purpos suspected oil dumping or seepage areas. (Prag FIRL)

10044

ATED TEMPERATURE TECHNIQUE ENUMERATION OF SALMONELLAE IN AGE,
al Public Health Engineering Research Inst., ur (India). Div. of Microbiology.
imary bibliographic entry see Field 5D.
0045

UTILIZATION OF TRACERS IN THE Y AND CONTROL OF WATER POLLU- (UTILIZACAO DE MARCADORES NO DO E CONTROLE DE POLUICAO DAS S),
imary bibliographic entry see Field 5B.
0046

UTOMATED METHOD FOR DETER- TION OF RESIDUAL METHANOL IN RIFIED EFFLUENTS,
Pollution Research Lab., Stevenage nd).
mary bibliographic entry see Field 5D.
0047

ARISON OF AUTOCLAVE AND LENE OXIDE-STERILIZED MEMBRANE RS USED IN WATER QUALITY STU-
Centre for Inland Waters, Burlington o).
itka, M. J. Jackson, and J. B. Bell.
l Microbiology, Vol 28, No 3, p 474-480, ber 1974. 2 fig, 5 tab, 8 ref.

tors: Water quality control, *Testing, ria, *Filters, Statistics, Standards, Sam- Analytical techniques, Toxicity, Filters, E. ollutant identification, *Water quality stan-

ers: *Membrane filters, Autoclaves, ty tests.

eptance of the membrane filter technique fficial method of evaluating water quality he microbiologist to decide which mem- lter to choose from a variety of commer- vailable filters, each with its own brand d characteristics. Membrane filters manu- l by Gelman, Millipore, and Sartorius were e and ethylene oxide-sterilized and field or their recovery of total coliforms, fecal s, fecal streptococci, and heterotrophs. studies were performed to determine the membranes had a toxic effect on chia coli growing at 35 and 44.5C. The data alyzed by using split-plot analysis of vari- l significance tests. Gelman membrane fil- nerally produced the highest bacterial Toxicity tests at 35C showed that Gelman lipore autoclaved membrane filters were ecover 92% of the test organisms. There xtremely poor recovery rate at 44.5C. Sar- embranes were found to have hydropho- s which reduced the actual filtering area. lipore and Sartorius membranes became and somewhat fragile after autoclaving. erences observed in the ability of the three f membrane filters to recover bacteria apparent that the brands can not be used geably and that there should be stan- methods for bacteriological testing of e filters. (Orr-FIRL)
48

URCES AND LEVELS OF MERCURY SEWAGE OF A UNIVERSITY CAMPUS,
Illinois Univ., Carbondale. Dept. of y and Biochemistry.
, G. L. Lundquist, R. G. Webster, R. A. P. C. Lindahl.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 4, p 397-400, April 1975. 1 tab, 9 ref.

Descriptors: *Mercury, *Sewage, *Monitoring, Analytical techniques, Waste water treatment, *Pollutant identification, Water pollution sources, Illinois.

While it has been assumed that mercury pollution originates from industrial sources, other data have indicated that purely domestic sources may also account for mercury levels in sewage. A University campus in Illinois was chosen for analysis of its sewerage. A three-month survey of the total level of mercury from the main outfall sewer of the central campus was made. From an average of 152 trials, a mercury level of 7.9 ppb greatly exceeded the Illinois Pollution Control Board sewer-discharge criterion. The high levels of mercury slugs originated primarily from laboratories which use mercury and its compounds. A program was then established which identified the mercury users on campus and informed these users of a system where the overall-university and individual-building sewer effluents would be monitored for mercury. A central laboratory was designated for reception and treatment of mercury-containing wastes. Following this program, the mean level of mercury was lowered to 0.83 ppb. Sewage solely from student housing contained mercury only slightly in excess of the established background level. Some slugs of mercury in the main-outfall sewer did not correlate directly to slugs from individual buildings; however, subtle sources of mercury occasionally discharged to sewers are as yet undetermined. (Prague-FIRL)
W75-10049

**AN EXPERIMENTAL STUDY OF THE DETECTION OF ICE NUCLEI ON MEMBRANE FILTERS AND OTHER SUBSTRATA,**
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 2B.
W75-10052

**WATER POLLUTION FROM NONPOINT SOURCES,**
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5C.
W75-10085

**A PORTABLE GAS CHROMATOGRAPHIC TECHNIQUE TO MEASURE DISSOLVED HYDROCARBONS IN SEA WATER,**
Nova Univ., Dania, Fla. Physical Oceanographic Lab.
J. P. Perras.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-786 583, $4.25 in paper copy, $2.25 in microfiche. Report No. CG-D-2-75, October 1973. 50 p, 14 fig, 4 tab, 3 ref. DOT-CG-21660-A-3 NEW.

Descriptors: *Analytical techniques, *Gas chromatography, *Oil pollution, Monitoring, Automation, Equipment, Measurement.
Identifiers: Hydrocarbons.

An apparatus and techniques that can be used to determine the presence of alkane hydrocarbons from C-3 to C-6 which are dissolved in an aquatic environment are described. The apparatus is a gas-stripping device which continuously removes hydrocarbon vapors from water and injects them into a gas chromatograph. The gas chromatograph separates and detects the components present in the stripped vapors. Usefulness of this apparatus would be limited in an application to determine the point at which an oil spill is completely removed from the water's surface, because this apparatus depends on the hydrocarbons being dissolved in the water. Once the hydrocarbons are dissolved, they follow the water mass, not the oil on the surface. There is no present knowledge to indicate the exact fate of these volatile hydrocarbons once they become dissolved in the water, but eventually both dilution and volatilization would occur. It would be feasible to install this type of apparatus on appropriate Coast Guard vessels so that surveillance and monitoring could be continuously maintained. In this manner, areas of low level but constant source can be detected even though there is no large, visible oil slick on the water surface. (Jones-Wisconsin)
W75-10096

**MEASUREMENTS OF ABSOLUTE SCALAR IRRADIANCE SPECTRA IN RHODE RIVER,**
Johns Hopkins Univ., Baltimore, Md. McCollum-Pratt Inst.
For primary bibliographic entry see Field 5C.
W75-10102

**USE OF ALGAE, ESPECIALLY DIATOMS, IN THE ASSESSMENT OF WATER QUALITY,**
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
R. Patrick.
In: 'Biological Methods for the Assessment of Water Quality,' 75th Annual Symposium, American Society for Testing and Materials, ASTM Special Technical Publication 528, 1973, p 76-95. 7 fig, 1 tab, 41 ref.

Descriptors: *Algae, *Diatoms, *Water quality, *Bioindicators, Biological communities, Pollutants, Pollutant identification, Eutrophication, Plant physiology, Plant morphology, Bioassay, Statistical methods.

Two approaches have been used in determining if algae can reliably indicate water quality. The first is to observe and analyze natural communities; by shifts in species composition and structure of the community, the effect of a pollutant can be estimated. Data for this type of study are accumulated from autoecology and synecology studies. A second approach is to study a single or a few species in cultures in the laboratory under known and carefully regulated conditions. These studies are valuable in determining the physiological and morphological changes in function rates and polymorphism due to the concentration of a chemical or physical factor. Results may be misleading in precisely estimating how a species will behave in streams, lakes, or estuaries, because the species under laboratory conditions may not be subjected to the combinations of stresses or stimulating factors which occur in nature. To continually monitor a water body to determine if anything is inimical to aquatic life, the best way is to use algal community assays. Algal cells integrate all stresses that might deleteriously affect growth and reproduction or, in a similar way, they integrate all stimulants that may be present. (Jones-Wisconsin)
W75-10112

**COLOR MEASUREMENT METHODS FOR SURFACE WATER RECEIVING COLORED WASTES,**
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
M. W. Corlew.
Available from the National Technical Information Service as PB-243 886, $4.25, $2.25 in microfiche. M.S. Thesis, May 1973. 57 p, 11 fig, 7 tab, 42 ref. OWRT A-029-SC(1).

Descriptors: Spectroscopy, *Photometry, *Color, Measurement, Textiles, Pulp wastes, *Methodology, Analytical techniques, Instrumentation, Turbidity, *Pollutant identification.
Identifiers: *Color measurement, Textile wastes, Colored waste waters.

A laboratory investigation of methods for measuring color in surface waters wity emphasis on

developing a routine standard method is reported. The method developed was tested on six river waters which contained colored wastes and on six waste samples diluted in the laboratory. The instrumental method agreed well with the opinions expressed by the panel of observers. Preparation methods for turbidity removal were tested and a standard procedure is suggested.
W75-10135

**CHEMICAL AND PHYSICAL CHARACTERISTICS OF WATER IN ESTURIES OF TEXAS, OCTOBER 1970-SEPTEMBER 1971,**
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-10153

**HYDROLOGIC RECONNAISSANCE OF THE WAH WAH VALLEY DRAINAGE BASIN, MILLARD AND BEAVER COUNTIES, UTAH,**
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W75-10167

**THE NATIONAL STREAM QUALITY ACCOUNTING NETWORK (NASQAN)--SOME QUESTIONS AND ANSWERS,**
Geological Survey, Reston, Va.
J. F. Ficke, and R. O. Hawkinson.
Circular 719, 1975. 23 p, 4 fig, 1 tab, 5 ref.

Descriptors: *Water quality, *Streams, *Network design, *Untied States, Data collections, Methodology, Chemical analysis, Water properties, Streamflow, Water yield.

Some of the frequently asked questions are answered concerning concepts used in establishing the National Stream Quality Accounting Network (NASQAN), its purposes, design, value, and future plans. NASQAN is a series of stations at which systematic and continuing measurements are made to determine the quality of the Nation's streams. Design of the network specifies measurement of a broad range of water-quality characteristics which were selected to meet many of the information requests of groups involved in planning and management on a national or regional scale. The primary objectives are (1) to account for the quantity and quality of water moving within and from the United States, (2) to depict areal variability, (3) to detect changes in stream quality, and (4) to lay the groundwork for future assessments of changes in stream quality. (Woodared-USGS)
W75-10168

**ISOTOPE HYDROLOGY 1974--A REVIEW OF THE IAEA SYMPOSIUM ON ISOTOPE TECHNIQUES IN GROUNDWATER HYDROLOGY,**
Paris-6 Univ. (France). Laboratoire de Geologie Dynamique.
J. C. Fontes, and P. Fritz.
International Journal of Applied Radiation and Isotopes, Vol 26, p 1-8, 1975. 1 fig.

Descriptors: *Radioisotopes, *Tracers, Flow, *Groundwater, Aquifers, Model studies, Hydrologic aspects, *Reviews, Pollutant identification.
Identifiers: Pollutant flow, Groundwater flow, *Isotope hydrology.

Highlights of the International Atomic Energy Agency Symposium on Isotope Techniques in Groundwater Hydrology are presented. Discussions dealt with environmental isotopes to be used in the studies of the infiltration process, the origin and flow of groundwater, and geothermal systems. Such methods are useful in predicting flow of pollutants discharged into the ground. Possibilities of using 39Ar and 85Kr as research tools are mentioned. The use of artificial radioactive tracers for studies of aquifer characteristics, and development of models for interpretation of tracer data are also discussed. (Prague-FIRL)
W75-10172

**ARSENIC IN SEDIMENTS ON THE CONTINENTAL SHELF OF SOUTHEAST AUSTRALIA,**
Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
For primary bibliographic entry see Field 5B.
W75-10177

**THE MAGNETIC FLOWMETER AND ITS USE IN WASTE WATER TECHNOLOGY (DER MAGNETISCHE DURCHFLUSSMESSER UND SEINE ANWENDUNG IN DER ABWASSERTECHNIK),**
D. Fieberg.
Gas-Wasser-Fach Wasser/Abwasser, Vol 115, No 10, p 463-467, October 1974. 8 fig, 5 ref.

Descriptors: Flow, *Measurement, *Waste water treatment, *Biological treatment, *Flow rates, Liquids, Equipment, Treatment facilities, Instrumentation, *Pollutant identification.
Identifiers: *Magnetic flowmeter.

The advantages and uses of magnetic flowmeters in waste water technology are described. Magnetic flowmeters cause no change in the flow cross-section, and the pressure drop generated by them equals that caused by a pipe of identical length. Magnetic flowmeters can be used reliably for the measurement of viscous liquids and liquids carrying solid materials. The readout is linear and is insensitive to voltage fluctuations up to plus or minus 15%. Magnetic flowmeters are designed for flow rates of up to 10 m/sec, with the lowest range between zero and 1 m/sec. Non-conducting deposits on the pipe walls that could falsify the readout may be removed by ultrason or electric shock. Deposits whose conductivity are the same as that of the medium flowing through do not interfere with the measurements. However, magnetic flowmeters should be used in completely full pipes as partial flow falsifies the readout. Magnetic flowmeters can be efficiently used for the control of the waste water and return sludge in biological waste water treatment plants. (Takacs-FIRL)
W75-10185

**A NEW DIRECT ULTRAVIOLET METHOD FOR THE ANALYSIS OF NITRATE IONS,**
J. C. Moore.
Effluent and Water Treatment Journal, Vol 15, No 1, p 17-20, January 1975. 11 fig.

Descriptors: *Nitrates, *Nitrification, *Ultraviolet radiation, Analytical techniques, Ions, Lakes, Waste treatment, Organic compounds, Toxicity, *Pollutant identification.
Identifiers: Brucine sulphate analysis, *Nitrate ions.

A method of direct ultraviolet analysis of nitrate nitrogen is compared with a conventional analysis method which uses brucine sulphate. The brucine sulphate method requires special precautions because of its toxicity, involves precise timing and temperature, and is not accurate in clean water situations because its minimum detectable concentration is 0.18 mg/liter for a one cm path length cell at 410 nm. The ultraviolet method is based on the nitrate absorbance maximum at 203 nm. At concentrations of nitrate ions up to 0.5 mg/liter, the two methods performed identically. However, while stream water from lakes produced excellent results by the direct UV method, the brucine sulphate method was not applicable due to lack of sensitivity. Results were also compared for analysis of influent and effluent of a water pollution control center. The plant utilized activated sludge and trickling filters, reduced organic content by 90%, and accomplished nitrification. Both methods produced similar data; accuracy of the UV method increased with decreasing organ content. Because the direct UV method requir very low organic material, the organic content ma be reduced substantially by preliminary precipit tion with barium hydroxide and zinc sulphate, in proving the applicability of this technique f water analysis. The main disadvantage of t direct UV method had previously been the lack an inexpensive single beam in instrumentation f use at lower wavelengths. Recently, howeve lower wavelengths and a narrower bandpass ha become available. (Prague-FIRL)
W75-10187

**SOME APPLICATIONS OF THERMAL INFRA RED LINESCAN IN WATER RESOURCES STU DIES,**
Water Research Association, Marlow (England).
N. R. Brereton, and R. A. Downing.
Water Services, Vol 79, No 949, p 91-96, Marc 1975. 3 fig, 1 tab, 5 ref.

Descriptors: Groundwater, *Analytic techniques, Discharge(Water), Survey *Groundwater resources, *Remote sensin *Pollutant identification, Regional analysis, Cost Infrared radiation.
Identifiers: *Thermal infra-red linescan, Groun water discharge, Pollutant discharge.

The remote sensing method of thermal infra-r linescan has been applied in several regional st dies concerned with the large scale developme of groundwater resources. These studies we conducted to detect the location of groundwat discharges from the Chalk aquifer into the sea a to assess whether groundwater abstraction from well field had any effect on vegetation or moistu content of the soil. Sewage outfalls with know temperatures and discharges were used as co trols. The method is unlikely to detect spri discharges smaller than 100 liters/s. Groundwat discharges to rivers can be detected if the temper ture difference between the surface water and t groundwater is sufficient to create a recognizab thermal anomaly or if groundwater discharge high enough to not be diluted by the surface wat too rapidly. While the thermal infra-red linesc method was not suitable for small or diffu groundwater flow, the method is most applicab for detection of temperature anomalies in large e panses of water which cannot be economical surveyed from the ground. In coastal surveys, th technique may also be useful for studying the mi ing of river and sea waters and for detecting poll tion. (Prague-FIRL)
W75-10188

**ENERGY EVALUATION AND ORGANIC CON POUND INDEX IN MUNICIPAL SEWAG WATER (IN JAPANESE),**
For primary bibliographic entry see Field 5D.
W75-10189

**GLC DETERMINATION OF PPB LEVELS C CITRATE BY CONVERSION T BROMOFORM,**
Pfizer (Chas.) and Co., Inc., Groton, Conn.
R. G. Bjork.
Analytical Biochemistry, Vol 63, p 80-86, 1975. fig, 3 tab, 9 ref.

Descriptors: *Gas chromatography, *Analytic techniques, Environmental effects, Sewage e fluents, Detergents, *Pollutant identification.
Identifiers: *Citrates, Citric acid, Bromoform.

Citrate has been proposed for use as a builder detergents. For this reason, its biodegradabili and potential ecologic impact were evaluate Citric acid may be determined at the parts per b lion level in sewage effluents as well as in natu water bodies by gas chromatography with an E detector, without prior sample preconcentratio The citrate is converted to bromoform through

entabromoacetone intermediate. The various reb's cycle acids, amino acids, NTA, and citrate elators were tested for possible interference. nly 3-oxopentanedioic acid, which is oichiometrically converted to bromoform, inter- red. The analytical method developed is useful measure citric acid concentration as low as 10 rts per billion. (Prague-FIRL)
75-10191

ATER POLLUTION MONITORING SYSTEM, N JAPANESE),
Ikuta.
nkyo Sozo, (Environment Creation), Vol 5, No p 25-30, January, 1975. 3 fig.

scriptors: *Monitoring, *Water pollution, utomation, Sampling, Analytical techniques, ercury, Phenols, Dissolved oxygen, Model stu- s, *Pollutant identification, Water quality.
ntifiers: *Tokyo(Japan), Telemeter system.

elemeter system to monitor the water quality in blic drainages around the Tokyo area is scribed. Automated continuous monitoring ults are reported to a central station from 20 tionary stations and three mobile units. Re- rted are water temperature, pH, turbidity, elec- conductivity, dissolved oxygen contents, oride ion, cyanide ion, chromium +6 ion, total rcury, phenol, total organic carbons, sulfur, oxidation reduction potential. Since the auto- ted analytical techniques for the first six ameters are well established, they are reported all stations. However the other measurements selected by individual monitoring stations ac- ding to the difficulties in automated operation. sampling and analysis at any station can be trolled from the central station. Seven addi- al stations are scheduled to be installed in 4, and approximately 60 stations intend to par- pate in the water pollution monitoring system the Tokyo area. (Katayama-FIRL)
5-10196

ALUATION OF PHOSPHORUS DYNAMICS A WATERSHED,
County Conservancy of the Brandywine, dds Ford, Pa. Environmental Programs.
primary bibliographic entry see Field 5B.
5-10217

E DETERMINATION OF BENZIDINE IN STEWATERS,
Angeles County Sanitation District, Whittier, f. San Jose Creek Water Quality Lab.
. Jenkins, and R. B. Baird.
etin of Environmental Contamination and icology, Vol 13, No 4, p 436-442, April 1975. 2 8 ref.

criptors: *Waste water treatment, *Analytical niques, *Pollutant identification, Gas chro- ography, Colorimetry, Chromatography, rination.
tifiers: Carcinogens, *Benzidine.

zidine (4,4'-diaminobiphenyl) has been in- ed on the Occupational Safety and Health Ad- stration's list of chemical carcinogens. Results observations are reported on the development alytical procedures for the determination of idine in the ppb range in waste waters such as sewage, secondary effluents, rivers, and in- rial wastes. Waste water samples from the Los eles County area were routinely spiked with vn amounts of benzidine/methanol standards. treated samples were then subjected to a sam- retreatment procedure followed by colorimet- GLC, or TLC analysis. Pretreatment involved tment to pH 11, extraction of the filtrate with yl ether, extraction of ether phase with 2N neutralization of acid phase with 10N NaOH, his stage colorimetric analysis could be per- ed), extraction of aqueous phase with diethyl ether, and concentration of ether phase, (at this stage the GLC and/or TLC analysis can be performed). The GLC analysis is sensitive and selective for benzidine and is preferred over the colorimetric or TLC analysis. The overall detection limit of the analysis is determined by the initial sample size and the volume of the final concentrate. The practical detection limit was in the range of 2-3 micrograms/liter. In unchlorinated waste waters, the experimental spike recoveries ranged between 70-95%. However, low recoveries were realized from chlorinated waste waters spiked with benzidine. The low recoveries are apparently due to the reaction of benzidine with hypochlorous acid to produce a chloramine type structure. The described analytical methods should be suitable for the determination of other carcinogenic anilines in waste waters. (Orr-FIRL)
W75-10232

ESTIMATES USING FLUORESCENCE SPECTROSCOPY OF THE PRESENT STATE OF PETROLEUM HYDROCARBON CONTAMINATION IN THE WATER COLUMN OF THE NORTHWEST ATLANTIC OCEAN,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
D. C. Gordon, Jr., P. D. Keizer, and J. Dale.
Marine Chemistry, Vol 2, p 251-261, 1974. 1 fig, 2 tab, 24 ref.

Descriptors: *Oil pollution, Canada, *Spectroscopy, Surface waters, *Atlantic Ocean, Data analysis, Sea water, Sampling, Fluorescence, Organic compounds, *Pollutant identification.
Identifiers: *Fluorescence spectroscopy.

Recent attention has been given to determining the magnitude and variability of petroleum hydrocarbon concentrations in and on seawater. Sampling was done from cruises in the water column of the northwest Atlantic Ocean between Nova Scotia and Bermuda, Canada. Fluorescence spectroscopy was used to estimate petroleum hydrocarbons concentrations. In surface water (0 to 3 mm) concentrations averaged 20.4 micrograms/liter; in water from 1 to 5 m they averaged 0.8 to 0.4 micrograms/liter. No significant concentrations were detected in deeper water. Variability indicated that distribution of oil in seawater is very patchy, particularly for surface waters. Due to adsorption problems seawater samples for hydrocarbon analysis cannot be collected by conventional sampling methods. The inner surfaces of the samplers must come in contact only with the water being sampled and must be rinsed with organic solvent after samples are removed. For this reason, previous work in the data analysis of seawater hydrocarbons should be re-examined. (Prague-FIRL)
W75-10233

SHORTCUT METHODS TEST ALGICIDES,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5G.
W75-10234

ESTIMATES OF OIL IN AQUATIC SEDIMENTS BY FLUORESCENCE SPECTROSCOPY,
Bedford Inst., Dartmouth (Nova Scotia).
B. R. Hargrave, and G. A. Phillips.
Environmental Pollution, Vol 8, No 3, p 193-215, April 1975. 12 fig, 3 tab, 34 ref.

Descriptors: *Analytical techniques, *Pollutant identification, *Oil wastes, Water pollution sources, Laboratory tests, Fluorescence, *Spectroscopy, Estimating, *Sediments, Canada.
Identifiers: *Fluorescence spectroscopy, Nova Scotia, Chedabucto Bay(NS), Bermuda.

Fluorescence spectroscopy has been used to identify petroleum that has been spilled into the water and has become deposited in the sediments. Application of the fluorescence method for estimating oil in water, sediments and organisms requires that fluorescence be related to a standard. Wavelengths for measurement are chosen by scanning excitation and emission spectra and identifying peaks. Total oil concentrations are not measured, only inferred, and the use of such calibrations assumes that all fluorescence in samples is attributable to the presence of fluorescing compounds equivalent to those in the petroleum standard. A procedure for extracting aromatic containing compounds from sediments was developed in the present study. Fluorescence contour diagrams were constructed and used to compare fluorescence patterns in n-hexane extracts of samples and standard oils. This procedure permits more accurate estimates of total oil concentrations to be made by ensuring that fluorescing compounds observed in sample extracts are derived from petroleum. Similarities in spectral contour diagrams showed the presence of petroleum residues in beach sand from Bermuda, inter-tidal sand and sedimenting material from an inlet near an oil refinery in Nova Scotia, and in sand from Chedabucto Bay contaminated by the ship, Arrow, stranding in 1970. Total oil concentrations ranged from 10-3000 micrograms/gram wet sediment. Fluorescence patterns in many sample extracts did not resemble any standard oil, indicating the presence of material which did not originate from fresh petroleum. (Orr-FIRL)
W75-10235

THE INFRARED STUDIES OF SANTA BARBARA CHANNEL OIL SPILL,
Cincinnati Univ., Ohio.
T. Tu-Ching.
Available from University Microfilms, Inc., Ann Arbor, Michigan, 48106, Order No. 74-26,406. Ph.D. Thesis, 1974. 136 p.

Descriptors: *Oil spills, *Oil wells, *California, *Pollutant identification, *Infrared radiation, Analytical techniques, Organic compounds, Water pollution effects, *Path of pollutants.
Identifiers: Internal reflection spectroscopy(IRS), Santa Barbara Channel(Calif).

A twelve-month study was carried out to evaluate the effects of a spill from an oil well in Santa Barbara Channel, in southern California, which occurred January 28, 1969. The study evaluated infrared analytical techniques for qualitative identification of different oils and establishment of background levels of hydrocarbon control of marine sediments; studied the movement and deposition of oil both from the spill and from natural seeps in the Santa Barbara Channel; investigated the effect of the size and nature of the sediment on the movement of oil; and correlated the oil movement with sediment formation and movement and natural current patterns. Internal reflection spectroscopy (IRS) was used to analyze 374 samples which had previously been studied by the IR transmission technique. Different mineral composition of sediments was found to complicate the quantitive determination of oil. Conflicting results were discovered in some cases on the composition of sediments by x-ray diffraction methods and by IRS spectra methods; theoretical analysis showed that phosphate was the major constituent of the sediments. In addition, the study of the surface active agent, considered as a pollutant, and its effect on the crystal nature of hydroxyapatite precipitates was presented. (Prague-FIRL)
W75-10237

POLLUTION LAB PAYS OFF--TWO WAYS.
For primary bibliographic entry see Field 5D.
W75-10243

APPLICATIONS OF TOXICITY TESTING TO SEWAGE-TREATMENT PROCESSES,
Trent River Authority (England).
For primary bibliographic entry see Field 5D.
W75-10244

**BIODEGRADATION OF LINEAR ALKYLATE SULFONATES IN RIVER MODEL (IN JAPANESE),**
Chiba Univ. (Japan). Research Inst. for Chemobiodynamics.
For primary bibliographic entry see Field 5B.
W75-10247

**WATERWAY MONITORING SYSTEM.**
For primary bibliographic entry see Field 7A.
W75-10248

**FORECASTING WATERSHED POLLUTION USING A MODEL,**
Adaptronics, Inc., McLean, Va.
A. N. Mucciardi.
Water and Sewage Works, Vol 121, No 8, p 58-59, August 1974. 2 fig, 8 ref.

Descriptors: *Model studies, Watersheds(Basins), Pollutants, Water pollution, Bacteriophage, Coliforms, *Forecasting, *Pollutant identification, *Path of pollutants.
Identifiers: *Adaptive Trainable Network, *Pollutant forecasting, Non-linear multivariate forecasting model.

A model for forecasting the pollutants in watersheds is explained that overcomes the difficulties experienced with conventional analytical models. The technology in Adaptive Trainable (Learning) Networks places no reliance on prior assumptions; the modeling can provide solutions from a very limited data base; and, the methodology provides accurate forecasts many times farther into the future than previously realized. The Adaptive Trainable Network modeling techniques were used to forecast the total bacteriophage concentration in the Potomac River as a function simply of environmental variables such as river flow rate, river staging, tide levels, precipitation, and average daily temperature. Four ALN forecasting models were constructed: 3-day forecast; 6-day forecast; 9-day forecast; and, 12-day forecast. The networks were able to make forecasts with an average accuracy of 95.2% throughout a 12-day forecasting period. The key to developing nonlinear multivariate forecasting models is the ability to train an adaptive learning network model. The ALN modeling procedure not only determines the proper linear and nonlinear structure of the model, but also the relevant or most discriminatory variables are identified. The subset of relevant variables is ranked with respect to discriminatory ability as a byproduct of the ALN training exercise. An explanation of how to develop the model as well as the description of the Potomac River exercise is given. (Orr-FIRL)
W75-10249

**ROUTINE SURVEILLANCE ALTERNATIVES FOR WATER QUALITY MANAGEMENT,**
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
R. C. Ward.
Journal Water Pollution Control Federation, Vol 46, No 12, p 2645-2652, December 1974. 18 ref.

Descriptors: *Pollutant identification, *Water quality, Management, *Monitoring, Automation, *Remote sensing, *Sampling, Spills, Pollutants, Measurement, Costs, Personnel.
Identifiers: *Automatic monitoring, *Grab sampling, Data needs, Cost-effectiveness.

Three techniques of routine surveillance for water quality management are reviewed: grab sampling, automatic monitoring, and remote sensing. While grab sampling has been the traditional method of water quality analysis, it has the limitations of being unable to detect rapidly changing water quality conditions, such as spills, and of being unable to identify the source of an extreme. There has also developed a need for data acquisition with a large spatial coverage. The answer in time coverage is automatic monitoring and in space coverage is remote sensing. For best sampling, all three techniques in combination are needed. Cost, personnel, and data needs are factors to be considered in augmenting a traditional grab sampling system with the other two techniques. Data needs are dependent upon the pollution control strategy used and the character of the stream, both natural and as affected by population and effluent discharges. The cost-effectiveness of each system as applied by Colorado State University for both detection of spills and routine monitoring of pollutants is discussed. Management programs must concentrate on planning for automatic monitoring and remote sensing relative to the needs and the goals of each individual agency. (Prague-FIRL)
W75-10250

**MONITORING THE QUALITY OF SURFACE WATER,**
Philips Gloeilampenfabrieken N.V., Eindhoven (Netherlands).
D. J. Kroon, and M. Q. Mengarelli.
Philips Technical Review, Vol 34, No 5/6, p 113-122, 1974. 7 fig.

Descriptors: *Pollutant identification, Design critera, *Surface water, *Monitoring, Water quality, Automation, Measurement, Eutrophication, Oil spills, Computers, Mathematical models.

The design of a system for monitoring the quality of surface water is described. Ideally a combination of manual and automatic measurements is optimal. Such a system should provide prompt information about a number of simple physical and chemical parameters, relating to oxygen balance and eutrophication, concentrations of malodorous components, mineral oils, oil slicks, phenols, certain trace metals, and organic micropollutants. Monitoring systems in an automatic network may measure only one or two parameters or may measure a large number of parameters. The first type is best situated at discharge sites and at the boundaries of a monitored area for which a mathematical model has been composed. A central computer can then be programmed with this model and immediately warn of unusual pollutants and a dangerous situation further downstream. For example, should an oil spill occur, an analysis of floating oil, oil in emulsified form, as well as oil in dissolved form should be measured. Knowledge of the composition of the spill, its sulphur content, and presence of any trace metals (such as vanadium) makes it possible to often establish the origin of such a discharge. In addition, a third type of monitoring station should check the accuracy of the data obtained in measuring water quality. A water monitoring station developed by Philips is detailed, which operates along the river Lambro, near Milan, Italy. (Prague-FIRL)
W75-10251

**HOW MUCH 'RELIABILITY' IS 'ENOUGH',**
A. G. Linowiecki, and J. D. Lydick.
Offshore, Vol 35, No 2, p 240, 242-244, 247, February, 1975. 4 fig, 1 tab.

Descriptors: *Pollutant identification, *Monitoring, *Costs, Water pollution control, Design criteria, Wells, Mathematical models, Systems, Oil pollution.
Identifiers: *Hydrocarbon pollution.

Costs and reliability of hydrocarbon pollution monitoring are discussed. Subsea well control and monitoring systems should help operators maximize hydrocarbon production with minimum total cost, consistent with safety and pollution control requirements. The methods detailed can be used for various types of equipment and systems and are useful in offshore and subsea applications which involve high costs of lost production and perhaps difficult maintenance. Mathematical relationships are shown for reliability of a pollution control system. The failure rate of a system may be determined by: design with appropriate str margins; design verification for the specific ap cation; and employment of proven procedur trained experienced personnel, and discipline organization. Control system costs are affected ability to control the well, ability to provide use and reliable information about well performan and operating conditions, pollution control ca bilities, safety capabilities, and availabili (Prague-FIRL)
W75-10254

**MONITORING: AN ENVIRONMENTAL STA ESTIMATION PROBLEM,**
California Univ., Davis. Dept. of Mechanical E gineering.
J. W. Brewer, and S. F. Moore.
Journal of Dynamic Systems, Measurement, a Control, Vol 96, No 3, p 363-365, September, 19 1 fig, 1 tab, 12 ref.

Descriptors: *Design criteria, *Model studi *Monitoring, *Water quality contr *Mathematical models, Environmental conditio Water quality standards, Performance, Regu tion, Reliability, *Pollutant identification.
Identifiers: *Monitoring system design.

A water quality monitoring system is needed society. These monitors serve as estimators whi minimizes the cost of taking measurements a which simultaneously meets constraints on acc racy. The development of a monitor theory w improve environmental technological syste design. Monitor synthesis can be divided into t subproblems. The design problem consists selecting the variables for measurement, selecti the measurement devices, and selecting the spat distribution of the devices. The manageme problem consists of choosing, on line, the type a sequencing of measurements. A simulated applic tion of filter theory to the management of a wat quality monitor is presented. It is shown that a s boptimal minimum cost monitor can be synthe ized by the proper sequencing of costly measur ments. However, optimum modeling continues be a problem of much theoretical interest whi requires more investigation. (Orr-FIRL)
W75-10255

**FECAL CONTAMINATION--THE WATE ANALYST'S RESPONSIBILITY PART II,**
Saint Paul Water Dept., Minn.
M. M. Galvani.
Water and Sewage Works, Vol 122, No 1, 68-7 January, 1975. 1 fig, 42 ref.

Descriptors: *Analytical techniques, *Laborato tests, *Streptococcus, Sewage bacteria, *Pollutai identification, Bioindicators, Water analysi Water pollution sources.
Identifiers: *Fecal contamination.

A simple procedure for the analysis of fec streptococci to determine their source has bee developed. The new media used greatly simplifi the speciation of streptococcus faecalis va liquefaciens. The procedure with the new medi requires less scientific training for accurate resul than the most probable number technique which currently the commonly used method. The medi can be easily checked to determine that the result are not from a mixed culture of streptococci. Th method of determination does not require highl specialized equipment. (Orr-FIRL)
W75-10258

**TV SYSTEM GIVES AUTOMATIC ALARM A WESS AS VISUAL MONITORING OF AIR AN WATER POLLUTION.**
Canadian Controls and Instrumentation, Vol 1 No 9, p 32, September, 1974.

Descriptors: *Monitoring, *Pollutant identifica tion, Automation, Effluents, Remote sensing Data collections, Liquids, Fish.

ntifiers: *Television systems.

elevision system to give visual monitoring of id effluents or stack emissions has been eloped by Siemens. The system also provides utomatic alarm of sudden changes. An image ecorded on a compact TV camera and is dis- ed on a monitor electronically broken down 3200 dots. Digitized data is sorted and com- d with new data, and any discrepancies signal sual and/or audible alarm. Three adjustable meters can be set to select the pollution condi- s at which an alarm is to be given. These are ating sensitivity, transient disturbance sup- sion, and sustained disturbance suppression. itoring takes place without interruption; ating sensitivity is high enough for a level of ation of 30% on a coherent surface, cor- onding to 0.1% of the television image to be cted. The system can be used for both air and r pollution monitoring. In liquid effluent itoring, the Telemat system an monitor the ee of cleanliness of the effluent or it can be with control fish tanks where an alarm occurs fish die and rise to the tank surface due to sensitivity to the quantity of the effluent. gue-FIRL)
-10263

**ITIFICATION METHOD IN ENVIRON- TAL SYSTEMS AND ITS APPLICATION VATER POLLUTION,**
o Univ. (Japan). Dept. of Applied Mathe- s and Physics.
eda, S. Miyamoto, and Y. Sawaragi.
national Journal of Systems Science, Vol 5, p 707-723, 1974. 5 fig, 10 ref.

riptors: *Mathematical models, *Water pollu- sources, Simulation analysis, *Pollutant fication, Rivers, Streams, Analytical iques, Equations, *Path of pollutants.
ifiers: Fredholm integral equation, Environ- l systems.

n-well posed problem is discussed which in the identification of a pollution source uted along a river from the observed data at undary on fixed points. The identification m for the convective stream, after some ormation, results in solving the Fredholm in- equation of the first kind which is non-well . The solution does not continuously depend the observed data. The the application of a rization method in numerical analysis, a sta- gorithm is obtained to identify the distribu- a pollution source. For the dispersive case, dentification problem is also considered; tion examples illustrate the applicability of ethod to environmental control systems either on the convective or on the dispersive mena. (Prague-FIRL)
0266

**RRUPTED-SWEEP VOLTAMMETRY FOR IDENTIFICATION OF CHLORINATED BIPHENYLS AND THALENES,**
na State Univ., Bozeman. Dept. of Chemis-

arwell, F. A. Beland, and R. D. Geer.
ical Chemistry, Vol 47, No 6, p 895-903, 975. 4 fig, 2 tab, 34 ref.

ptors: *Pollutant identification, *Analytical ques, *Instrumentation, *Polychlorinated yls, Water pollution sources, Pollutants, ent, *Volumetric analysis.
ers: *Polychlorinated naphthalenes, lorinated hydrocarbons.

e of interrupted-sweep voltammetry for the cation of polychlorinated hydrocarbons by eristic current-voltage patterns and inter- tential data was demonstrated. The inex- instrumentation developed for this identification is particularly advantageous in obtaining rapid and reproducible voltametric data when the chlorinated hydrocarbon reduction waves overlap.. The theoretical basis, design, operation, and 'fingerprinting' capability of the equipment are discussed. The several important features of the interrupted-sweep technique that make it especially effective in the fingerprint identification of chlorinated hydrocarbons include: automatic control of the applied waveform by the reduction behavior of the sample; high resolution peaks; and, the relatively low cost of the integrated circuit instrumentation. Characteristic voltammetric fingerprints and reduction potential data were obtained for 31 polychlorinated biphenyls and 37 polychlorinated naphthalenes. Only two of the compounds could not be positively identified using this technique. (Orr-FIRL)
W75-10268

**WATER MONITORING IS BIG BUSINESS.**
Water and Pollution Control, Vol 112, No 9, p 14, September, 1974.

Descriptors: *Monitoring, *Water analysis, *Water quality control, *Analytical techniques, *Canada, *Pollutant identification, Chemical analysis, Sampling, Water sampling.

Monitoring Canada's lakes and rivers in a multi-million dollar proposition. A national network of over 600 fixed sampling stations are operated to assess the state-of-health of lakes and rivers and to show trends in water quality. Samples taken which are considered representative of the entire water system are analyzed for about 90 parameters which are then used to evaluate water quality. Specific tests are conducted to describe important basic conditions such as dissolved oxygen content and pH, indicative of the general health of a particular body of water. Identification and monitoring of trace metals is performed to guard against toxic conditions and effects. Equipment such as the AutoAnalyzer and the atomic absorption spectrophotometer have greatly reduced the time required for an analysis of trace metals. The Canada Centre for Inland Water laboratory is responsible for operating a quality control program to ensure reliability of data and for developing new analytical procedures and techniques. The data from the past ten years of sampling are being interpreted for water quality reports for each province. After the report is finished for a province, bi-annual water quality reports will then be published to inform the public of improvements or setbacks in the aquatic environment. (Orr-FIRL)
W75-10269

**RESEARCH ON POLLUTION WITH POLYCHLORINATED BIPHENYLS AND POLYCHLORINATED TERPHENYLS IN SEWAGE PLANTS, (IN JAPANESE),**
For primary bibliographic entry see Field 5D.
W75-10271

**DEVELOPMENT PROGRESS WITH SALWICO POLLUTION MONITORING SYSTEM.**
Marine Week, Vol 2, No 5, p 26, January 31, 1975.

Descriptors: *Oil wastes, *Oil spills, *Water pollution control, *Monitoring, Analytical techniques, Pumps, Equipment, *Pollutant identification.
Identifiers: Oil density measurement.

An oil pollution monitor has been developed by a Swedish company in order to monitor all normal black and white oils without need for individual setting or calibration. This Salwico monitor, from Salen and Wicander AB, concentrates the oil before scanning it for discoloration and gas evaporation. A rated flow of sample water is fed through a filter band and moved at a constant velocity. The oil density per area unit of the band is thus a direct function of the oil content in the water. Discoloration of the filter band is measured by a photo cell directly after exposure to the sample water; two signals given are added together, giving a minimum spread between different oils. The equipment is built into one analyzer unit and one control indicator panel. The latter is mounted in a cargo control room while the analyzer contains the wet compartment with pumps and piping, and is either mounted in a small deck cabinet or in the pump casing bulkhead. As pollution control equipment, the monitoring system has now been tested and put into series production. (Prague-FIRL)
W75-10272

**ANALYZING ORGANICS IN DILUTE AQUEOUS SOLUTIONS,**
Oak Ridge National Lab., Tenn.
R. L. Jolley, S. Katz, J. E. Mrochek, W. W. Pitt, Jr., and W. T. Rainey.
Chemtech, p 312-318, May, 1975. 4 fig, 5 tab, 36 ref.

Descriptors: *Analytical techniques, *Organic compounds, *Domestic wastes, *Industrial wastes, *Pollutant identification, Chromatography, Ion exchange, Mass spectrometry, Gas chromatography, *Organic wastes, Aqueous solutions.
Identifiers: Ultraviolet spectrophotometry.

To evaluate the possible consequences of the discharge of organic compounds from domestic and industrial sewage treatment plants, an integrated, multicomponent analytical procedure for the quantitative determination of organic constituents in the microgram/liter range in complex aqueous solutions has been developed. The method utilizes high resolution chromatography for separation followed by sequential use for identification of ion exchange chromatography, UV spectrophotometry, gas chromatography, and mass spectrometry. The automated high resolution liquid chromatographs were initially developed Oak Ridge National Laboratory. They have been successfully used for separating and detecting over 100 UV absorbing constituents from sewage effluents. In this case, 36 compounds were identified in the primary effluent sample tested; over 70 constituents were partially characterized. Nine compounds were identified in one sample of secondary effluent. (Orr-FIRL)
W75-10350

## 5B. Sources Of Pollution

**REVIEW OF LITERATURE PERTINENT TO THE AQUEOUS CONVERSION OF RADIONUCLIDES TO INSOLUBLE SILICATES WITH SELECTED REFERENCES AND BIBLIOGRAPHY (REVISED),**
Atlantic Richfield Hanford Co., Richland, Wash.
For primary bibliographic entry see Field 5D.
W75-09892

**MICROBIOLOGY AND WATER QUALITY IN A TRIBUTARY OF CAYUGA LAKE,**
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5C.
W75-09896

**FINITE ELEMENT MODELING OF FLOW THROUGH POROUS MEDIA,**
State Univ., of New York, Buffalo. Faculty of Engineering and Applied Sciences.
R. T. Cheng.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 750, $4.75 in paper copy, $2.25 in microfiche. Dept. of Civil Engineering, Water Resources and Environmental Engineering Research Rept. No. 75-2, March 1975. 87 p, 6 append. OWRT C-4026 (no.9006) (4).

Descriptors: *Aquifers, *Dispersion, *Computer models, Simulation analysis, *Sea water intrusion, Path of pollutants, Interfaces, Groundwater, Porous media, Flow, Computer programs, *Finite element analysis.
Identifiers: Finite element models.

Findings of an investigation into the application of the finite element method to certain ground water flow problems are presented followed by reproductions of five articles from the published literature originating from the study and an appendix containing a computer subroutine package for solving the convective-dispersion material balance equation using quadratic isoparametric finite elements. The published articles deal with the development of the basic theory for the finite element method as applied to ground water flow as well as basic schemes for application of the method. The results of this development are applied to the problem of sea water encroachment in coastal aquifers, brine movement through causeways, and dispersion of pollutants in ground water flows. The intrinsic generality of the finite element method for solution of the convective-dispersion equation allows the computer program to be applicable to a large class of problems. Only a set of new data which describe the region of interest, discretization, initial and boundary conditions are required to initiate the computations on a fresh problem. The included subroutine package was found to be the most efficient scheme for handling a class of initial-boundary value problems containing both a phreatic surface and a density stratified interface.
W75-09900

**RADIOACTIVITY FROM SRP OPERATIONS IN A DOWNSTREAM SAVANNAH RIVER SWAMP,**
Du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Lab.
W. L. Marter.
Available from NTIS, Springfield, Va. 22161 as Rept. No. DP-1370, $5.45 in paper copy, $2.25 in microfiche. Rept. No. Dp-1370, September 1974. 51 p, 16 fig, 15 tab, 3 ref, 3 append.

Descriptors: *Radioactivity, *Swamps, Costal marshes, Deposition(Sediments), Cesium, Cobalt, Strontium, Nuclear reactors, Nuclear wastes, Clays, Flooding, Water pollution, Fish, Regulation, *South Carolina.
Identifiers: *Savannah River(SC).

Approximately 25 curies of cesium 137, less than 1 curie of cobalt 60, and trace amounts of strontium 90 were deposited in about two square miles of swamp bordering the Savannah River and adjacent to the southeast Savannah River Plant boundary. Most of the radioactivity was released to on-site streams in the 1960's from reactor area irradiated fuel storage basins. During the period of release, annual average cesium 137 concentration in onsite streams never exceeded 3.0% of the concentration guide of 0.00002 Micro Ci/ml, and concentrations in the Savannah River never exceeded 1% of the guide. Most of the radioactivity in the offsite swamp is associated with kaolin clay particles deposited in the swamp during river flooding which occurred about 23% of the time each year. Gamma exposure rates in the affected area of the off-site swamp range from 30 to 590 mR/year above background. The swamp is uninhabited, and the most likely incremental radiation dose (above background) to hunters and fishermen who spend from a few hours to several hundred hours in the swamp would range from less than 1 mR to a few tens of mR per year. No restrictions on use of the swamp are considered warranted nor are remedial actions needed. (Houser-ORNL)
W75-09901

**A MODEL FOR PREDICTING THE EFFECTS OF SEWAGE EFFLUENT ON WETLAND ECOSYSTEMS,**
Michigan Univ., Ann Arbor.
K. R. Dixon.
Available from University Microfilms, Inc., Ann Arbor, Michigan, 48106, Order No. 74-25,187. Ph.D. Thesis, 1974. 120 p.

Descriptors: *Marshes, *Ecosystems, *Mathematical models, *Sewage disposal, *Environmental effects, Computers, Simulation models, Nutrients, *Forecasting, Wetlands, Water pollution sources.

A mathematical model was formulated to forecast the effects of sewage waste water disposal on the ecosystem. The model consists of a set of ordinary, first-order non-linear differential equations which represent the mass balance of the biomass components of the system. The CSMP simulation language is used and operated on a digital computer. Sensitivity analyses for unit variables relating to waste water disposal such as water and nutrients were made. Sensitivity was defined as the percentage change in the unit variable due to a 50 percent change in a parameter during a one-year simulation. For example, of the variables, nutrients have a greater effect on litter decomposition than the amount of water covering the litter. Long-range stability of the model was determined. The model is useful for making decisions about the feasibility of using a particular wetland ecosystem for waste water disposal. Forecasts for an individual marsh ecosystem are possible when data are actually collected from the marsh study area. In this manner, parameters related to added water and nutrients can be varied to give the projected simulation. (Prague-FIRL)
W75-09915

**A GENERAL LINEAR APPROACH TO STREAM WATER QUALITY MODELING,**
IBM Federal Systems Div., Gaithersburg, Md.
M. Arbabi, and J. Elzinga.
Water Resources Research, Vol 11, No 2, p 191-196, April 1975. 1 fig, 3 tab, 14 ref.

Descriptors: *Water quality, *Dissolved oxygen, *Mathematical models, Oxygen sag, *Linear programming, *Costs, Streams, Analytical techniques, Water quality control, *Path of pollutants, Model studies.
Identifiers: Pollutant discharge.

Techniques are presented for formulating stream water quality models which attempt to meet dissolved oxygen standards while optimizing some function of individual pollution abatement costs. New properties of the oxygen sag equation allow the constraint set of such mathematical programs to be described to a high degree of accuracy by linear inequalities. With the exception of upper and lower bounds on pollutant discharges, three linear constraints at most are required per reach. With simple constraint elimination techniques, the size of mathematical programs is reduced, making analysis of large-scale stream quality models feasible. For cases where the cost functions are linear or piece-wise linear convex, the analyst may utilize linear programming and its ancillary methods of duality implications, sensitivity analysis, parameterization, chance constraint, and decomposition. For cases where cost functions are not linear or in which variables are discrete, the problem solution may be easier with the presence of linear constraints. (Prague-FIRL)
W75-09917

**RESEARCH NEEDS AS RELATED TO THE DEVELOPMENT OF SEDIMENT STANDARDS IN RIVERS,**
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W75-10013

**RESIDENTIAL CANALS ALONG THE GU COAST,**
University of Southern Mississippi, Hattiesbu Dept. of Geology.
O. L. Paulson, Jr., and G. F. Pessoney.
Available from the National Technical Infor tion Service, Springfield, Va. 22161, as PB- 779, $3.75 in paper copy, $2.25 in microfiche. M sissippi Water Resources Research Institute, M sissippi State, Completion Report, July 1975. 4 17 fig, 8 tab, 13 ref. OWRT A-088-MISS(1).

Descriptors: Water pollution sources, Bays, P of pollutants, *Canals, Ecology, Water polluti Gulf of Mexico, *Mississippi, Dissolved oxyg Temperature, Salinity, Conductivity, Hydro ion concentration, Coliforms, Tides, Dy Biochemical oxygen demand.
Identifiers: *St. Louis Bay(Miss), Canal syste Flushing rates.

A study of a residential canal system on the M sissippi Gulf Coast and adjacent natural wa bodies was conducted to determine the relati ship in flushing characteristics between man-m and natural systems. The comparison was ba on measurements of temperature, salinity, c ductivity, coliform, pH, transparency, biolog oxidation demand, dissolved oxygen, bathymet tides, water velocity, and Rhodamine dye conc trations. The results indicate that coliforms crease with increasing distance of stations fr the receiving water body, St. Louis Bay, and solved oxygen decreases in a similar mann Biological oxidation demand was low at all tions; showing no differences between natural man-made systems. The canal system studied v shallower than adjacent water bodies and wa velocities in the canal system are a function tidal amplitude while velocities in the river are fected by both tides and runoff. The other param ters measured show little or no differen between natural and man-made systems. reflect overall seasonal changes. Flushing ra between the residential canal systems and an jacent natural system are equivalent on the ba of decline in dye concentrations measured ove five day period.
W75-10016

**MANAGEMENT PRACTICES AFFECTI QUALITY AND QUANTITY OF IRRIGATI RETURN FLOW,**
Utah State Univ., Logan. Dept. of Agricultu and Irrigation Engineering.
For primary bibliographic entry see Field 5G.
W75-10019

**RESEARCH STATUS ON EFFECTS OF LA APPLICATION OF ANIMAL WASTES,**
Kansas State Univ., Manhattan.
W. L. Powers, G. W. Wallingford, and L. S. Murphy.
Available from the National Technical Inform tion Service, Springfield, Va. 22161, as PB-2 472, $4.75 in paper copy, $2.25 in microfiche. E vironmental Protection Agency, Report EP 660/2-75-010, May 1975. 96 p, 5 fig, 13 tab, 233 r EPA 1 BB039, R-803021-01-1.

Descriptors: *Farm wastes, *Soil disposal fiel Pollution, Runoff, *Water pollution sources, *S contamination, Soil properties, Land manag ment, *Path of pollutants.

The primary purpose was to review the literatu and analyze research needs on the effects of la application of animal waste. An additional purpo was to assemble published information on applic tion guidelines for animal waste. Included are formation on the characteristics of waste, effec of waste on soil and water near application site application rates, application techniques, a research needs. The six main topics are: (1), C mate, waste, and soil classification; (2), was composition; (3), effect of waste on the enviro

4) application rates based on waste con-
s; (5) application techniques; and (6)
h needs. The climate, waste, and soil clas-
n systems were developed to allow com-
of the effects of animal waste applications
in various parts of the country. The com-
of the waste in each climate was tabulated
ues compared. Comparisons between cli-
gions were not possible because of the
riability within regions. Because of this
ty no average composition for a given
a given climatic region was possible. The
f the waste on the environment was mea-
terms of the possible final disposition of
te constituents. These constituents could
ate in the soil, move to the groundwater,
ne soil surface, or be taken up by plants.
s were made to assemble application
es from the various parts of the country.

22

D WATER POLLUTION PROBLEMS IN
RTHWESTERN UNITED STATES,
and Miller, Port Washington, N.Y.
r Leeden, L. A. Cerrillo, and D. W.

from the National Technical Informa-
vice, Springfield, Va. 22161, as PB-242
25 in paper copy, $2.25 in microfiche. En-
tal Protection Agency, Report EPA-3-75-
1975. 361 p, 60 fig, 48 tab, 3 append. EPA
Element 1BA024, 68-03-0298.

rs: *Groundwater, Mine wastes, Salini-
tanks, *Water pollution sources, Water
Evaluation, Water resources, Waste
Wells, Pacific Northwest U.S., Hard-
er), Iron, Manganese, Fluorides,
Montana, Wyoming, *Waste disposal
nderground waste disposal.

tion of ground-water pollution problems
carried out in six states in the northwest:
Idaho, Montana, Oregon, Washington
ning. With the exception of radioactive
posal, few cases of ground-water pollu-
been investigated in detail. There is a
baseline water-quality data and syste-
luation of overall ground-water condi-
ecially in urbran zones, in areas of
exploration and development, and at lo-
mining and industrial activity. The most
natural ground-water quality problems,
high salinity, are excessive hardness,
ganese, and fluoride. Principal sources
used ground-water quality problems in
imate order of severity are: discharge of
om septic tanks and sewage treatment
igation return flow, dryland farming,
oil wells, shallow disposal wells, un-
ace impoundments, mine tailings and
age, municipal and industrial landfills,
ctive waste disposal. Other sources that
be of less importance but still must be
include: spills and leaks, application of
nd pesticides, feedlots, and salt-water
Scalf-EPA)

NG EXTERNAL EFFECTS OF SOLID
ANAGEMENT,
r Policy Analysis, La Jolla, Calif.
nsee, R. Ramathan, W. Ramm, and D.

rom the National Technical Informa-
e, Springfield, Va. 22161, as PB-243
in paper copy, $2.25 in microfiche. En-
l Protection Agency, Report EPA-
0, March 1975. 438 p, 28 fig, 34 tab, 7
DB314, R/T 02 AAE 06, Grant No R-

: *Environmental effects, Property
andfills, Solid wastes, Economics,
t, Water pollution control, Waste
lifornia.

Identifiers: *Solid waste management, *Environmental impact, Los Angeles County(Calif).

This study analyzes the environmental impact of using sanitary landfills for disposing of solid waste. The relevant economic theory concerned with the measurement and valuation of external effects is developed and previous empirical impacts of various activities are reviewed. Both the theoretical and empirical evidence suggests that the costs and benefits of external effects are extremely difficult to measure directly but under certain circumstances property value studies can be used to obtain indirect estimates. A survey of the technology of sanitary landfills suggests that a properly designed fill will cause very little air and water pollution, but may impose visual and noise pollution on nearby residents. These hypotheses are tested with data on property surrounding four sanitary landfills in los Angeles County. A model of the determinants of residential property values is formulated and estimated. The model includes variables which describe the characteristics of the property and variables which describe the relationship of the property to the fill. Statistical estimates of the parameters of the model indicate that proximity to and view of a sanitary landfill do not significantly reduce the market or assessed value of surrounding property. (EPA)
W75-10024

**THE RESPONSE OF GYMNODINIUM BREVE TO MUNICIPAL WASTE MATERIALS,**
University of South Florida, Tampa. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W75-10033

**A RATIONAL APPROACH FOR PREDICTING THE DISSOLVED OXYGEN PROFILE IN RECEIVING WATERS,**
Oklahoma State Univ., Stillwater. School of Civil Engineering.
For primary bibliographic entry see Field 5A.
W75-10034

**PETROLEUM POLLUTANTS IN SURFACE AND GROUNDWATER AS INDICATED BY THE CARBON-14 ACTIVITY OF DISSOLVED ORGANIC CARBON,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5A.
W75-10035

**IDENTIFICATION OF CRUDE OIL LEAKS AT SEA (IDENTIFICAZIONE DELLA FONTE DI SPANDIMENTI DI PETROLIO GREZZO IN MARE),**
For primary bibliographic entry see Field 5A.
W75-10036

**GROUNDWATER POLLUTION BY WASTE DISCHARGE (LA POLLUTION DES EAUX SOUTERRAINES PAR LES DECHARGES),**
M. Barres.
Techniques et Sciences Municipales, Vol 69, No 6, p 365-371, 1974. 2 fig, 3 tab, 22 ref.

Descriptors: *Groundwater, *Aquifers, *Landfills, Flow rates, Waste disposal, *Water pollution sources.
Identifiers: Waste discharge, Leachout, Sanitary landfills.

The problem of groundwater contamination due to infiltration and leachout from waste dumps and sanitary landfills is discussed, and guidelines for the selection of landfill sites are presented. Waste dumps and sanitary landfills may present a hazard of groundwater contamination by inorganic and organic materials, but very little hazard of biological contamination. Sanitary landfills should be established in areas protected from inundation and with a low groundwater table level, or where an aquifer has good self-purification possibility. Therefore, porous aquifers are generally more suitable than karstic and fissurized rockbed. If the self-purifying capacity of an aquifer is limited, the waste disposal site should be made impervious by applying a layer of clay or plastic film. Also, sites with low groundwater flow rates are preferable. (Takacs-FIRL)
W75-10042

**THE UTILIZATION OF TRACERS IN THE STUDY AND CONTROL OF WATER POLLUTION (UTILIZACAO DE MARCADORES NO ESTUDO E CONTROLE DE POLUICAO DAS AGUAS),**
J. Bau.
Laboratorio Nacional de Engenharia Civil, Memoria 446, Lisbon, 1974, p 5-15. 22 ref.

Descriptors: *Tracers, *Water pollution sources, Flow, Hydrologic aspects, Analytical techniques, Reviews, Water pollution control, *Path of pollutants, Dispersion, Pollutant identification.
Identifiers: Chemical tracers, Radioactive tracers, Fluorescent tracers, Pollutant dispersion.

Chemical, radioactive, and fluorescent tracers and their uses in general hydrological and water pollution studies are reviewed. Compounds of chromium, sodium, cobalt, indium, and tantalum are among the most frequently used chemical tracers. The most common radioactive tracers are 82Br, 130I, 192Ir, 182Ta, 51Cr, 198Au, and 110Ag. Fluorescent tracers, such as rhodamine-B, rhodamine-WT, and fluorescein, emit visible light due to the effect of UV irradiation. A literature review of studies and experiments using tracers is presented. Tracers are particularly suitable for the study of flow and dispersion processes in water, as well as the study of the dilution and general behavior of water pollutants. (Takacs-FIRL)
W75-10046

**GROUNDWATER POLLUTION: PROBLEMS AND SOLUTIONS.**
Water and Sewage Works, Reference Number 1975, p R125-R126, R130-R132, R134-R136, R138, R140, R142-R144, April 30, 1975. 3 fig, 3 tab, 51 ref.

Descriptors: *Water pollution, *Water pollution sources, *Louisiana, *Nevada, *New York, *Northeast U.S., Groundwater, Biochemical oxygen demand, Water quality, Industrial wastes, Bioindicators, Indicators, Chemicals, Recharge, Basins, Water wells, Infiltration, Rivers, Bacteria, Dissolved solids, *Path of pollutants.
Identifiers: Industrial indicators.

Included was a general definition of groundwater, its value to society and the imminent dangers it faces. The protection of this valuable resource is vital; hence, indicators of potential polluters were examined and possible methods for preserving the quality of subsurface water were presented. The material for this study was drawn from three geographical regions of the United States and includes specific looks at pertinent problems in Louisiana and Nevada as well as some interesting case histories from the northeast section of the country. Investigations were recommended to study the movement, fate, and effect of pollutants in subsurface waters including to the extent and nature of native microbial activity as well as microbe-pollutant interactions in subsurface regions receiving pollutants. The ultimate objective should be the development of information needed for defining the capacity of subsurface regions as pollutant receptors and, hence, for predicting the probable impact on groundwater of activities entailing the release of pollutants into the earth's crust. (Humphreys-ISWS)
W75-10058

MEASUREMENT OF SMALL DISCHARGES THROUGH V-NOTCH WEIRS,
Leupold and Stevens, Inc., Beaverton, Oreg.
For primary bibliographic entry see Field 8B.
W75-10059

LABORATORY SIMULATION OF SWINE MANURE LAGOONS,
Clemson Univ., S.C. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W75-10137

NUMERICAL MODEL OF THE SALT-WEDGE REACH OF THE DUWAMISH RIVER ESTUARY, KING COUNTY, WASHINGTON,
Geological Survey, Tacoma, Wash.
E. A. Prych, W. L. Haushild, and J. D. Stoner.
Open-file report 75-13, 1975. 93 p, 29 fig, 13 tab, 53 ref, 2 append.

Descriptors: *Path of pollutants, *Estuaries, *Washington, *Model studies, Numerical analysis, Saline water intrusion, Sewage effluents, Water temperature, Dissolved oxygen, Biochemical oxygen demand, Phytoplankton, Tracking techniques, Tidal effects, Water pollution sources, Salinity, Chlorophyll.
Identifiers: *Duwamish River estuary(Wash).

A numerical model (calibrated and verified with observed data) of a salt-wedge estuary was used to calculate the distributions of salinity, temperature, chlorophyll a concentrations, biochemical oxygen demand, and dissolved-oxygen concentrations in the Duwamish River estuary, King County, Wash. Dissolved-oxygen concentrations were predicted in the estuary when sewage-effluent discharge is increased to its proposed maximum of 223 cubic feet per second. The computed monthly average dissolved-oxygen concentrations in the estuary decreased by a maximum of 2 mg/litre when compared with computations for the summer of 1971, when the effluent discharge averaged 37 cubic feet per second. The increase in effluent discharge is not expected to cause large changes in phytoplankton concentrations in the estuary. (Woodard-USGS)
W75-10157

DISTRIBUTION OF NITROGEN AND PHOSPHOROUS IN THE CONSERVATION AREAS IN SOUTH FLORIDA FROM JULY 1972 TO JUNE 1973,
Geological Survey, Tallahassee, Fla.
B. G. Waller.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-A012347, $3.25 in paper copy, $2.25 in microfiche.
Water-Resources Investigations 5-75, May 1975. 33 p, 11 fig, 8 tab, 6 ref.

Descriptors: *Path of pollutants, *Nitrogen, *Phosphates, *Florida, National parks, Nutrients, Water quality, Chemical analysis, Precipitation(Atmospheric), Surface drainage, Mass transfer, Sampling.
Identifiers: *Everglades National Park(Fla), Conservation areas.

The term 'Everglades basin' as used in this report extends from Lake Okeechobee in the north, southward through Everglades National Park. It is bordered on the west by the Big Cypress Swamp and on the east by agricultural lands and rapidly expanding urban areas. Within the Everglades basin are three water conservation areas utilized for water storage and recreational use. From July 1972 to June 1973, 78% (5,200 metric tons) of the total nitrogen and 90% (207 metric tons) of the total phosphorus entering the conservation areas was contributed by bulk precipitation (rainfall and dry fallout). Controlled and noncontrolled surface-water discharge contributed the remainer: 22% (1,460 metric tons) of total nitrogen and 10% (22.4 metric tons) of total phosphorus. Of the water lost, 53% was by seepage and 47% by surface-water discharge. About 5,000 metric tons of total nitrogen and nearly 220 metric tons of total phosphorus were apparently retained within the conservation areas. This retention constitutes 74% of the total nitrogen and 96% of the total phosphorus that entered the conservation areas from July 1972 to June 1973. (Woodard-USGS)
W75-10160

HYDROLOGIC EVALUATION OF THE HAYSTACK BUTTE AREA WITH EMPHASIS ON POSSIBLE DISCHARGE OF CLASS-I WASTES, EDWARDS AIR FORCE BASE, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. L. Huges.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 387, $3.75 in paper copy, $2.25 in microfiche.
Water-Resources Investigations 7-75, April 1975. 34 p, 4 fig, 4 tab, 11 ref, append.

Descriptors: *Waste disposal, *Liquid wastes, *Solid wastes, *Underground waste disposal, *Water quality control, *California, Injection wells, Fuels, Waste storage, Groundwater movement, Hydrogeology, Arid lands, Hydraulic conductivity, Path of pollutants, Sampling, Hydrologic data, Chemical analysis, Test wells.
Identifiers: *Rocket propellant wastes, *Edwards Air Force Base, Class-I wastes.

Edwards Air Force Base (EAFB), Calif., is northeast of Lancaster in the Mojave Desert. The primary function of EAFB is experimental flight and rocket testing. The Haystack Butte area is used primarily for the testing of rocket propellants. Waste products of the testing are solid and liquid rocket propellants and contaminated soils and metals. In the past these wastes have been containerized, placed in abandoned mine shafts, burned, exploded, or removed from EAFB by civilian contract for disposal in other areas. This report appraises the climatic, geologic, and hydrologic conditions for possible discharge of Class-I wastes, and evaluates the effects of previous disposal of solid and liquid wastes into abandoned mine shafts. Class-I waste disposal sites are those at which complete protection is provided for all time for the quality of ground and surface waters from waste dposited therin and against hazard to public health and wildlife resources. Although usable groundwater does not exist in the area investigated, the groundwater affected by the discharge of Class-I wastes could at some future time affect potentially usable groundwater outside the study area. (Woodard-USGS)
W75-10161

LOW-FLOW CHARACTERISTICS OF WISCONSIN STREAMS AT SEWAGE-TREATMENT PLANTS,
Geological Survey, Madison, Wis.
W. A. Gebert, and B. K. Holmstrom.
Water Resources Investigations 45-74, December 1974. 101 p, 2 fig, 32 tab, 34 ref.

Descriptors: *Low flow, *Wisconsin, Waste dilution, Waste water disposal, Water pollution, Base flow, Streamflow, Treatment facilities.

Low-flow characteristics of Wisconsin streams at 415 sewage-treatment plants are presented. The low-flow characteristics are the annual minimum 7-day mean flow that occurs on the average of once in 2 years and the annual minimum 7-day mean flow that occurs on the average of once in 10 years. The low-flow characteristics were determined by correlating base-flow measurements at the sewage-treatment plants to the concurrent daily mean flow at continuous-record gaging stations in the area. The accuracy determined by the standard error of estimate for the 10-year low flow ranged from 18 percent at continuous-record gaging stations to 70 percent when only three flow measurements were available. (K USGS)
W75-10163

ISOTOPE HYDROLOGY 1974--A REVIE THE IAEA SYMPOSIUM ON ISO TECHNIQUES IN GROUNDW HYDROLOGY,
Paris-6 Univ. (France). Laboratoire de Ge Dynamique.
For primary bibliographic entry see Field 5A
W75-10172

ARSENIC IN SEDIMENTS ON THE CONT TAL SHELF OF SOUTHEAST AUSTRALI
Bureau of Mineral Resources, Geolog Geophysics, Canberra (Australia).
P. J. Davies.
Search, Vol 5, No 8, p 394-396, August 1974 2 tab.

Descriptors: *Arsenic compounds, *Sedime tribution, *Municipal wastes, *Industrial w Sediments, Sedimentology, Sediment-water faces, Agricultural runoff, Agricultural chem Water pollution sources, Effluents, *Aus *Continental shelf, Pollutant identification.

Arsenic was discovered in the shelf sedime southeast Australia as a result of a reconnais geological survey conducted during 1972. T senic contents in the shelf sediments were two orders of magnitude higher than tho ported for average shale, sandstone, limestone. The maximum arsenic concentr occur offshore from areas of major urban a dustrial development, and not offshore agricultural areas. Support for the suggestio the arsenic is deposited as the result of urba lution comes from another study showing t creasing concentrations of arsenic in the K River due to pollution by detergents us household washing. Arsenic is enriched in th face sediments of the continental she southeast Australia, particularly between Kembla and Newcastle, where concentratio 50-100 ppm are common. The arsenic m derived from the natural erosion of rock, or urban and industrial effluents. The complex arsenic with colloidal manganese comp results in its deposition in the quieter areas middle to outer shelf. A series of sediment drilled in the areas of high arsenic concentr could be analysed to determine whether the arsenic values are due to modern urban/indu effluents, or related to natural concentr mechanisms coupled with non-sediment (Orr-FIRL)
W75-10177

GROUND-WATER'S ROLE IN WATER QU TY MANAGEMENT,
Pennsylvania Dept. of Environmental Resou Harrisburg. Bureau of Water Quality Ma ment.
For primary bibliographic entry see Field 5G.
W75-10180

DUMPS: A POTENTIAL THREAT TO GROUNDWATER SUPPLIES,
Environmental Protection Agency, Washin D.C. Office of Solid Waste Management grams.
B. Weddle, and G. Garland.
Nation's Cities, Vol 12, No 10, p 21-25, 42, tober 1974.

Descriptors: *Sanitary fill, *Landfills, *W disposal, *Groundwater, Wells, Waste du Leachates, Costs, Surface water, Drain Planning, *Water pollution sources.
Identifiers: Land disposal.

ry landfill criteria have been reexamined by ffice of Solid Waste Management Programs. l damage cases show that groundwater rces are threatened by pollutants leaching dumps. Two examples were a dump in Conut which caused the wells of about 50 subon homes to be contaminated, and a more s case in Delaware in 1972 where a dump in ndoned sand and gravel pit allowed an unund plume of leachate to envelop one well f a water company serving 80,000 people. ial measures in both cases were costly. The l definition of sanitary landfill includes apon of daily cover, no burning, waste not directly into groundwater, and no visible on of surface water. However, the problem hates entering unseen into groundwater is ex. Leachate forms when water percolating h solid waste flushes out compounds and products of decomposition. Site charac- s for determining safe sanitary landfill depon evaluation of: depth from the bottom of to the maximum height of groundwater; on and flow rate of groundwater; present ture groundwater demands; analysis of ung soils and geology including texture, bility, structure, and stratigraphy; topogelated to surface drainage; and net infiltraommunities should plan for disposal capacit least five years into the future. Existing ould be monitored to avoid costly cleanup es. (Prague-FIRL)
184

R POLLUTION MONITORING SYSTEM, PANESE),
nary bibliographic entry see Field 5A.
196

MIC LEACHING STUDIES ON PULP- BARK RESIDUES,
Columbia Univ., Vancouver. Dept. of Civil ering.
nary bibliographic entry see Field 5D.
214

MINISTIC MODEL OF DYNAMIC PHIC ESTUARY,
lucts and Chemicals, Inc., Allentown, Pa.
chofield, and R. G. Krutchkoff.
of the Environmental Engineering Divioceedings of ASCE, Vol 100, No EE4, o 10735, p 979-996, August 1974. 3 fig, 40 ef.

ors: *Environmental engineering, es, *Mathematical models, Eutrophica- *Stochastic processes, Diffusion, ems, Water pollution, Optimization, Nu- analysis, Equations, Systems analysis, udies.
rs: *Deterministic models, Generality, alance, Physical conditions, Biological nts, Chemical components.

ly, a stochastic model of a dynamic, onenal eutrophic estuary was developed; it wn that this model could be formulated deterministic counterpart with the addi- single new parameter. Herein, the determodel upon which the stochastic model d is developed and explained. The deriva- of sufficient generality to permit any f components and any reasonable system tion to be handled. All system parameditions, and forcing function could be s functions of time (not just tidal phase), and if necessary, other factors. ations have been made in: the difequations which are solved; the initial ndary conditions used; the manner in e physical conditions of cross-sectional ht intensities, freshwater flow rate, land enthal demand, and water temperature, d turbidity are handled; the number of components considered; and the use of time and position variable parameters and conditions. This deterministic model is more general and realistic than any previous estuary model. Its solution is twice as fast as that for the much simpler BOD-OD model. Recommended are use of the model by operating and design personnel and further verification of both the deterministic and stochastic models. (Bell-Cornell)
W75-10215

**EVALUATION OF PHOSPHORUS DYNAMICS IN A WATERSHED,**
Tri-County Conservancy of the Brandywine, Chadds Ford, Pa. Environmental Programs.
T. H. Cahill, P. Imperato, and F. H. Verhoff.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 100, No EE2, Paper No 10445, p 439-458, April 1974. 7 fig, 6 tab, 4 equ, 29 ref.

Descriptors: *Watersheds(Basins), *Water quality, *Environmental engineering, *Phosphorus, *Storm runoff, *Streams, Nutrients, River systems, Equations, Experiments, Measurement, *Path of pollutants, Water pollution sources.
Identifiers: *Mass balance.

Phosphorus dynamics in a small river system have been measured to determine phosphorus transport mechanisms and correlation with hydrodynamic phenomena. Variation of chemical forms with flow conditions are related to point and diffuse sources and general equations are derived. Mass balances are developed and diurnal changes are described. Investigation into the phosphate dynamics of the Brandywine River during the summer of 1972 indicates that phosphate transport occurs by two different mechanisms depending upon the type of flow found in the river. For steady flow, phosphate concentrations exhibit the dilution effect. During unsteady stage flow, phosphate concentrations tend to increase with increasing water flow rate. (Bell-Cornell)
W75-10217

**ESTIMATES OF OIL IN AQUATIC SEDIMENTS BY FLUORESCENCE SPECTROSCOPY,**
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 5A.
W75-10235

**THE INFRARED STUDIES OF SANTA BARBARA CHANNEL OIL SPILL,**
Cincinnati Univ., Ohio.
For primary bibliographic entry see Field 5A.
W75-10237

**BIODEGRADATION OF LINEAR ALKYLATE SULFONATES IN RIVER MODEL (IN JAPANESE),**
Chiba Univ. (Japan). Research Inst. for Chemobiodynamics.
K. Fujiwara, T. Sugyama, K. Koike, and K. Oba.
Nippon Eisei gaku Zasshi, (Japanese Journal of Hygiene), Vol 29, No 6, p 552-557, February 1975. 6 fig, 4 tab, 14 ref.

Descriptors: *Biodegradation, *Model studies, *Organic compounds, *Linear alkylate sulfonates, Rivers, Surfactants, Detergents, Water pollution sources, *Path of pollutants, *Pollutant identification.
Identifiers: Methylene blue, Ultraviolet spectrophotometry.

A river model for measuring the biodegradability of organic materials has been developed which simulates the natural aquatic environments. By using this model, the biodegradability of linear alkylate sulfonates (LAS) was determined by using methylene blue and UV spectrophotometry to detect the presence of LAS. LAS which was added to produce a concentration of 10 ppm was shown to be removed almost completely in twenty days from the water fractions and bottom sludge layers by determination with methylene blue. The UV spectrophotometry revealed a residue of about 40% in water fractions and about 25% in the bottom sludge layers even after the 20 day period. The discrepancy of these biodegradabilities might be due to the difference between the principles of the determination methods. The rate of biodegradation of LAS compounds containing alkyl chains in the range from C10 to C14 was fastest in compounds containing the C14 chains and slowest in the compounds containing C10 chains. LAS compounds having phenyl radicals near the terminal part of the alkyl chains could be decomposed easily. However, when the phenyl radicals were bound to the inner part of the chains it was more difficult to attack them. (Orr-FIRL)
W75-10247

**FORECASTING WATERSHED POLLUTION USING A MODEL,**
Adaptronics, Inc., McLean, Va.
For primary bibliographic entry see Field 5A.
W75-10249

**WATER QUALITY ROUTING OF UNSTEADY RIVER FLOW BY FINITE ELEMENT METHOD,**
Osaka Univ, (Japan). Dept. of Civil Engineering.
K. Muraoka, and K. Nakatsuji.
Osaka Daigako Kogako Hokoku (Technology Reports of the Osaka University), Vol 24, No 1191-1129, p 827-845, October, 1974. 9 fig, 10 ref.

Descriptors: *Discharge(Water), *Mathematical models, *River flow, *Unsteady flow, Flood routing, Hydraulics, Simulation analysis, Fourier analysis, Finite element analysis, Water quality, *Path of pollutants.
Identifiers: *Water quality routing, Diffusion-convection equation, Galerkin method.

For the optimal management of waste discharge facilities, it is necessary to establish mathematical modeling of water quality routing of unsteady river flow. While flood routing and numerical analyses have been conducted, a large amount of error is introduced, particularly due to pseudo-dispersion caused by large space gradients of hydraulic quantities. In this case, the applicability of the Galerkin method is domonstrated. The method is based on finite element weighted residual methods and simulates a water quality problem using a diffusion-convection equation. Numerical errors are evaluated by means of an amplification factor as defined by Fourier analysis and are compared with those of several other finite difference methods. Computational efficiency of the Galerkin method is discussed, and application to a two-dimensional ideal model is considered. (Prague-FIRL)
W75-10252

**FECAL CONTAMINATION--THE WATER ANALYST'S RESPONSIBILITY PART II,**
Saint Paul Water Dept., Minn.
For primary bibliographic entry see Field 5A.
W75-10258

**IDENTIFICATION METHOD IN ENVIRONMENTAL SYSTEMS AND ITS APPLICATION TO WATER POLLUTION,**
Kyoto Univ. (Japan). Dept. of Applied Mathematics and Physics.
For primary bibliographic entry see Field 5A.
W75-10266

## 5C. Effects Of Pollution

**BENEFICIAL USES OF WASTE HEAT,**
International Atomic Energy Agency, Vienna (Austria).

For primary bibliographic entry see Field 5G.
W75-09889

HUMAN RADIATION DOSE STUDIES. A SELECTED BIBLIOGRAPHY.
Technical Information Center (AEC), Oak Ridge, Tenn.
For primary bibliographic entry see Field 5A.
W75-09890

TERRESTRIAL AND FRESHWATER RADIOECOLOGY, A SELECTED BIBLIOGRAPHY,
Washington State Univ., Pullman. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W75-09891

MICROBIOLOGY AND WATER QUALITY IN A TRIBUTARY OF CAYUGA LAKE,
Cornell Univ., Ithaca, N.Y.
M. Khare, C. Thomas, and N. Dondero.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 759, $9.25 in paper copy, $2.25 in microfiche. Cornell University Water Resources and Marine Sciences Center, Ithaca, N.Y. OWRT A-030-NY(1). 14-31-0001-3232, 3532, 4032, 5032.

Descriptors: *Water pollution control, *Water quality, Streams, *Wastes, *Feedlots, Effects, Cattle, Lakes, Watersheds(Basins), Sampling, Chemical wastes, Biochemical oxygen demand, Dissolved oxygen, Bacteria, Nitrogen, Phosphate, Coliforms, Surface waters, *Microbiology, *New York.
Identifiers: *Cayuga Lake(NY), *Taughannock Creek(NY).

The effects of a cattle feedlot as a source of water pollution on Taughannock Creek, a Tributary of Cayuga Lake, were studied in terms of several common chemical parameters and in terms of most probable numbers of coliforms, fecal coliforms, fecal streptococci, denitrifiers, nitrifiers, and total plate counts. Data were highly variable, but the feedlot clearly contributed to pollution of the stream, although concentrations did not indicate severe pollution conditions. The feedlot contributed significant amounts of nitrogen and phosphate to the stream system and potentially to Cayuga Lake. Additional nitrogen probably originated from soils and groundwater in the drainage basin. Coliform, fecal coliform, and fecal streptococcus levels were conspicuously high at the feedlot. Although the concentrations of fecal coliforms and fecal streptococci quickly subsided and were low at the mouth of Taughannock Creek, the constant presence of Salmonella supported their utility as indicators of sanitary quality of surface waters. Many of the bacteria were transients, entering the water at the feedlot and disappearing downstream.
W75-09896

THE EFFECTS OF ARTIFICIAL DESTRATIFICATION ON THE WATER QUALITY AND MICROBIAL POPULATIONS OF HYRUM RESERVOIR,
Utah Center for Water Resources Research, Logan.
D. D. Drury, D. B. Porcella, and R. A. Gearheart.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 722, $7.00 in paper copy, $2.25 in microfiche. Utah Water Research Laboratory, Publication No. PRJEWO11-1, 174 p, 66 fig, 9 tab, 5 append. OWRT A-020-UTAH(1). 14-31-0001-4045.

Descriptors: *Destratification, Aeration, Algae, Bacteria, Thermocline, *Nutrients, Carbon, Phosphorus, Nitrogen, Oxygen, Temperature, Flow, Residence time, Lakes, *Utah, Trout, Dissolved oxygen, Eutorphication, Distribution, Water pollution effects, Water quality, Microbiology.
Identifiers: *Hyrum Reservoir(Utah), *Algal-bacterial dynamics, Little Bear River(Utah), *Aphanizomenon, Microbial populations.

Hyrum Reservoir, Utah, was studied for one year and then for a year following the initiation of artificial destratification. The redistribution of dissolved oxygen to the lower depths of the reservoir significantly increased the amount of habitat suitable for trout. The annual Aphanizomenon bloom increased during that first year after initiating destratification. The nitrogen cycle and the vertical distribution of bacteria were altered as a result of the elimination of the thermocline. During destratification the total suspended solids were correlated with the total coliforms. The water quality of Hyrum Reservoir was highly affected by annual runoff, spring and fall overturns, and destratification; sediments, the increased Aphanizomenon bloom, higher eiplimnetic nutrient concentrations, more uniform microbial and nutrient distributions all resulted from these hydraulic factors working singly and in combination.
W75-09897

FAUNAL RESPONSE TO SPRAY IRRIGATION OF CHLORINATED SEWAGE EFFLUENT,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5D.
W75-09899

PHTHALATE ESTERS, HEARTRATE DEPRESSORS IN THE GOLDFISH,
Oak Ridge National Lab., Tenn.
P. Pfuderer, and A. A. Francis.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 3, p 275-279, March 1975. 2 tab, 13 ref.

Descriptors: Wastes, *Fish physiology, *Bioassay, *Inhibitors, Mode of action, Path of pollutants, Food chains, Reproduction, Growth rates, Public health, Water pollution effects.
Identifiers: *Phthalate esters, *Dibutyl phthalate, *Heartrate depressors, *Goldfish.

Phthalate esters, an additive in polyvinyl chloride manufacture, were isolated as heartrate depressors in goldfish. Three compounds were identified and the most active was dibutyl phthalate, probably because it was the most water soluble of the three. Heartrates returned to resting levels when the fish were put through two or more changes of fresh water. The phthalate esters probably affect the heartrate indirectly through the nervous systems. (Katz)
W75-09902

EFFECT OF ASULAM IN WILDLIFE SPECIES: ACUTE TOXICITY TO BIRDS AND FISH,
May and Baker Ltd., Dagenham (England).
B. Ingham, and M. A. Gallo.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 2, p 194-199, February 1975. 6 tab, 7 ref.

Descriptors: *Herbicides, *Bioassay, *Toxicity, *Rainbow trout, *Channel catfish, *Pesticides, Birds, Mallard duck, Sunfishes, Laboratory tests, DDT, Water pollution effects, Pollutant identification.
Identifiers: *Asulam, Partriges, Carassius auratus, Lepomis macrochirus, Pheasants.

The results of the acute toxicity experiments conducted to determine the hazard of asulam, a herbicide, to wildlife species are presented. Results of acute toxicity experiments indicate a low order of toxicity resulting from massive doses of asulam given by gavage, in the diet or in bath waters to rainbow trout, channel catfish, bluegill, mallard duck, pheasants and other test organisms, concluded that asulam presents a very low tial for hazard to wildlife in treated areas. (
W75-09903

IMPORTANCE OF WATER PH IN ACCU TION OF INORGANIC MERCURY IN FIS
Wisconsin Univ., Madison. Dept. of Entom
For primary bibliographic entry see Field 5A
W75-09904

EFFECTS OF PCB (AROCLOR 1254) AN DDT ON PRODUCTION AND SURVIVA DAPHNIA MAGNA STRAUSS,
Michigan State Univ., East Lansing. D Fisheries and Wildlife.
A. W. Maki, and H. E. Johnson.
Bulletin of Environmental Contaminatio Toxicology, Vol 13, No 4, p 412-416, April tab, 1 fig, 13 ref.

Descriptors: *Daphnia, *Toxicity, *Bioassay, *Reproduction, *Polychlo biphenyls, *Aroclor, Bioindicators, Envir tal effects, Toxicants, Chlorinated hydro pesticides, Laboratory tests, An techniques, Lethal limit, Inhibition.
Identifiers: *Daphnia magna, Additive LC50.

The combined and individual effects of DI Aroclor 1254 on the survival and reproduc Daphnia magna were examined in laborato icity tests. Daphnia magna was an indicator toxicity of both DDT and PCB as measu static toxicity tests. The 14-day LC50's we ppb and 24.0 ppb respectively with ef values for reproductive inhibition as low ppb for DDT and 10.0 ppb for Aroclor 125 toxicants were found to work together bu combined effect was slightly less than pre by simple additive toxicity. (Katz)
W75-09905

THE EFFECT OF METHYL MERCUR GILL METABOLISM AND BLOOD PAR TERS OF RAINBOW TROUT,
Michigan State Univ., East Lansing.
D. V. O'Conner, and P. O. Fromm.
Bulletin of Environmental Contaminatio Toxicology, Vol 13, No 4, p 406-411, April, tab, 15 ref.

Descriptors: *Mercury, *Bioassay, physiology, *Metabolism, *Electro *Oxygen, *Rainbow trout, Water pollutio fects, Laboratory tests, Metals.
Identifiers: Gills, Sublethal effects, Plasma.

Methyl mercury has been shown to accumul gill tissue up to several thousand times the found in the media. The effects of methyl m on the metabolism or physiological fu (plasma electrolyte regulation) of the gill we vestigated. Rainbow trout were used in the say and results indicate that up to 12 weeks sure to methyl mercuric chloride (10 m Hg/liter) does not affect the in vitro metaboli the gill or concentration of plasma electroly rainbow trout. The only deleterious effec hibited by fish was a significant increase matocrit after 12-weeks exposure. There is a to consider the effects of long-term exposu methyl mercury. (Katz)
W75-09906

DDT AND PCB LEVELS IN LAKE CO D'ALENE, IDAHO, OSPREY EGGS,
Idaho Univ., Moscow. Dept. of Biol Sciences.
For primary bibliographic entry see Field 5A.
W75-09907

OXAPHENE INHIBITION OF ATPASE AC-
IVITY IN CATFISH, ICTALURUS PUNC-
ATUS, TISSUES,
lississippi State Univ., Mississippi State. Dept. of
iochemistry.
. Desaiah, and R. B. Koch.
ulletin of Environmental Contamination and
oxicology, Vol 13, No 2, p 238-244, February
75. 3 tab, 12 ref.

escriptors: *Enzymes, *Inhibitors, Mode of ac-
on, *Inhibition, *Pesticides, *Channel catfish,
oxicants, Analytical techniques, Metabolism,
hlorinated Hydrocarbon pesticides.
entifiers: *ATPase, *Toxaphene, *Tissue analy-
s.

he inhibition pattern of toxaphene in different
ssues of the channel catfish was examined in
der to understand the mode of action of this
sticide used in the control of cotton pests. AT-
se activities of the brain, kidney and gill tissues
ere inhibited by toxaphene, with variations
tween tissues and within the same tissue. The
eatest inhibition occurred for oligomycin-insen-
ive Mg2+ ATPase in brain and gill tissues. The
fferential sensitivity of ATPases to toxaphene
uld be due to the fact that toxaphene is a mix-
re of 175 components and each may exert dif-
rent effects on the various ATPase activities.
atz)
75-09908

OXICITY OF DFP AND RELATED COM-
OUNDS TO SQUIDS IN RELATION TO
IOLINESTERASE INHIBITION AND DETOX-
YING ENZYME LEVELS,
nderbilt Univ., Nashville, Tenn. Dept. of Phar-
acology.
. D. Dettbarn, and F. C. G. Hoskin.
lletin of Environmental Contamination and
xicology, Vol 13, No 2, p 133-140, February
75. 2 tab, 17 ref.

scriptors: *Enzymes, *Inhibitors, *Toxicants,
aste disposal, *Bioassay, *Toxicity, *Animal
ysiology, Inhibition.
entifiers: *Acetylcholinesterase, *DFP, *Nerve-
, *Squids, *Cephalopods, Paraoxon.

e toxicity of DFP and some related
etylcholinesterase-inhibitors were determined
ng squids. DFP was much less toxic to squid
n to mammals, and less toxic to squids than
re 217AO, Paraoxon, or physostigmine. This is
obably due to the high level of DFPase in the
uid nervous system. From the nature of the
uid-nerve-type DFPase, it may be speculated
t the nerve gases Tabun Sarin and Soman
uld be somewhat more toxic to squids than was
P. (Katz)
5-09909

E GEOCHEMICAL AND BIOSTRATI-
APHIC RECORD OF NATURAL AND POL-
TIONAL EUTROPHICATION OF MIN-
SOTA LAKES,
nnesota Univ., Minneapolis. Dept. of Botany.
Gorham, and H. E. Wright, Jr.
ailable from the National Technical Informa-
n Service, Springfield, Va 22161 as PB-243 774,
5 in paper copy, $2.25 in microfiche. Water
ources Research Center, University of Min-
ota, St. Paul, July 1975. Completion report, 12
0 ref. OWRT B-081-MINN(1).

scriptors: *Ecology, *Pigments, *Diatoms,
adocera, Carotenoids, Chlorophyll, Erosion,
trophication, *Geochemistry, History, Lakes,
innesota, Sediments, Weathering, Pollution,
nnology, *Lake sediments, Water pollution ef-
ts, Detritus.
ntifiers: Paleoecology, Natural eutrophication.

ment analysis of profundal surface sediments
Minnesota lakes has demonstrated that sedi-
mentary organic matter derives mainly from detritus produced within the lakes. Only in the most oligotrophic and unproductive lakes are terrestriail inputs to sedimentary organic matter likely to be considerable. Rising concentrations of fossil pigments in sedimentary organic matter, which are easily and quickly measured, offer a clear stratigraphic indication of the onset of cultural eutrophication. The time of onset can then be determined by other techniques such as pollen analysis, radio-isotope dating, etc. A record has been obtained of the degree of leaching and of erosion in postglacial times at Kirchner Marsh, the site of intensive paleoecological studies by several investigators. Periods of low erosion are indicated by low concentrations of Na, K, and Mg in the lake sedimentsand correlate generally with periods of high lake productivity. Carbonates disappeared from the sediments about 5,000 year ago. Stratigraphic analyses of short cores of lake sediments show a distinct change in diatom flora, which can be correlated with known historic disturbances in the watershed or the lake, such as waste disposal, agricultural land clearance, and logging. When the nature and the magnitude of the changes can be identified by this technique, it will be possible to plan lake-restoration projects. (Waelti-Minnesota)
W75-10010

**BIOCHEMICAL AND NUTRITIONAL INTERACTIONS BETWEEN THE OYSTER (CRASSOSTERA VIRGINICA (GMELIN) AND ITS ENVIRONMENT,**
Maryland Univ., College Park. Dept. of Chemistry.
M. Keeney.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 775, $3.25 in paper copy, $2.25 in microfiche. Maryland Water Resources Research Center, College Park, Technical Report No 32, June 1975, 5 p. OWRT B-018-MD(1) 14-31-0001-4090.

Descriptors: *Oyster, *Enzymes, *Metabolism, *Heavy metals, *Cadmium, Nutrients, Biochemistry, *Adsorption, *Estuarine environment, Toxicity, *Lethal limit, Water pollution effects, Jelly fish, Phosphates.
Identifiers: Phosphoenolpyruvate carboxykinase, Diphosphoinositides, Phosphatases.

The purpose was to obtain information on the biochemical and nutritional interactions between estuarine organisms and their environment in order to understand the effects of heavy metal uptake on these animals. A Ph.D. thesis on enzyme activity of phosphoenolpyruvate carboxykinase in the cytoplasm of the oyster has been completed. This enzyme may be involved in glycogen synthesis in the oyster. A M.S. thesis on diphosphoinositides in oyster lipid has also been completed. A study of acute toxicity levels of cadmium in water has indicated that the toxic level is between 0.1 and 0.25 ppm for oysters as measured by shell growth under laboratory conditions. A paper on phosphatases in the jellyfish has been published. Both acid phosphatases and alkaline phosphatases show similarities to veotebrate enzymes.
W75-10011

**EFFECTS OF ORIGINAL VEGETATION ON RESERVOIR WATER QUALITY,**
Texas A and M Univ., College Station. Water Resources Inst.
J. Ball, C. Weldon, and B. Crocker.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 777, $5.75 in paper copy, $2.25 in microfiche. Technical Report No TR-64, April, 1975. 120 p, 54 fig, 16 tab, 2 append, 18 ref. OWRT A-025-TEX(1), 14-31-0001-3844, 14-31-0001-4044, 14-31-0001-5044.

Descriptors: *Nutrients, *Vegetation, *Leaching, Grasses, Trees, Reservoirs, Water quality, *Texas, *Nitrogen, *Phosphorus, *Land clearing, *Pre-impoundment, Reservoir sites, Water pollution effects.
Identifiers: *Reservoir water quality, Reservoir clearing policy, Palmetto Bend Project(Tex), Herbage.

Leaching studies were conducted on representative grasses, herbage and trees to determine the relative nutrient release rates of nitrogen and phosphorous. In addition, a limited field study was conducted as well as a vegetation inventory at a proposed Bureau of Reclamation reservoir, site near Edna, Texas. The results of the leaching study were presented as percent nutrients released from the various types of vegetation as a function of time. The total quantity and rate of nutrient release varied greatly depending upon the type of vegetation. An an example, grasses and herbage (1) release nutrients at a greater rate, (2) contain a greater quantity of nutrients per unit weight of vegetation and generally are more available in greater quantities based on weight per unit area than trees. This indicated that although trees are often the only vegetation removed from a reservoir site, the amount of nutrients available for release by the herbage and grasses will probably have a much more significant impact on reservoir water quality and should be considered in the reservoir clearing policy. Several recommendations were made including a methodology for predicting the effects of original vegetation on reservoir water quality for any specific project.
W75-10014

**CHLORINATED HYDROCARBONS IN THE LAKE ONTARIO ECOSYSTEM, (IFYGL),**
Wisconsin Univ., Madison. Water Chemistry Program.
For primary bibliographic entry see Field 5A.
W75-10018

**TEMPERATURE EFFECTS ON EGGS AND FRY OF PERCOID FISHES,**
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
L. L. Smith, Jr., and W. M. Koenst.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 746, $5.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/3-75-017, May 1975. 91 p, 9 fig, 16 tab, 33 ref, 2 append. EPA 1BA021, R-800704.

Descriptors: *Sauger, *Walleye, *Environmental effects, *Growth rates, *Fish eggs, *Fish larvae, Juvenile fishes, Growth stages, Water pollution effects, Cold resistance, Heat resistance, Water pollution effects, Thermal pollution, Lethal limit.
Identifiers: Temperature tolerance, Acclimation, Percoid fishes.

Temperature effects on the early life history stages of the walleye (Stizostedion vitreum vitreum (Mitchill) and sauger (Stizostedion canadense (Smith)) were examined. Walleye eggs and fry were exposed to six temperatures (6-21C) for effects on fertilization, incubation, and fry survival. Mature sauger were held and eggs were fertilized at four temperatures (9-18C). Both species were incubated at 6-21C. Sauger fry survival was also tested at 6-21C. Optimum fertilization temperatures were 6-12C for walleye and 9-15C for sauger. Optimum incubation temperatures were 12-15C for both walleye and sauger. A sharp drop or rise in temperature had no great effect on walleye fry and juvenile survival except when the upper lethal or lower lethal temperature was approached. Optimum temperature for juvenile walleye and sauger growth was 22C. Upper lethal temperatures for walleye juveniles were determined for acclimation temperatures at 2C intervals between 8-26C. The upper lethal temperature for walleye juveniles was 27.0-31.6C, depending on acclimation. The upper lethal temperature of sauger acclimated to 10-26C was 26.6-30.4C. There was little temperature difference (1-2C) between 100% survival and no survival. (EPA)

W75-10020

**TOXICITY OF SELECTED PESTICIDES TO THE BAY MUSSEL (MYTILUS EDULIS),**
Stanford Research Inst., Menlo Park, Calif.
D. H. W. Liu, and J. M. Lee.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 221, $5.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/3-75-016, May 1975. 102 p, 8 fig, 30 tab, 36 ref, 3 append. EPA Program Element 1BA022, 68-01-0190.

Descriptors: Water pollution effects, *Pesticide toxicity, *Mussels, Mollusks, Marine animals, *Insecticides, *Herbicides, 2,4-D, Growth stages, *Embryonic growth stage, *Larval growth stage.
Identifiers: Sevin, Treflan, Methoxychlor, Malathion.

The toxicity of the insecticides Sevin, methoxychlor, and malathion and of the herbicides Treflan and 2,4-D to the bay mussel (Mytilus edulis) was investigated. Toxic effects were measured in terms of survival of and byssus-thread attachment by adults, embryoshell development, and larval growth and metamorphosis. Growth was the most sensitive measure of toxicity. All the pesticides produced statistically significant ($p = 0.05$) reductions in larval shell length after 10 to 20 days of exposure. Relative to potency, methoxychlor was the most toxic, and 2,4-D was the least toxic. The 96-hour TL50 values for each pesticide, based on adult survival and attachment data, were estimated, as were the 48-hour EC50 values based on data from embryo bioassays. The effects on embryo development of delaying the time of fertilization and of using seawater larval culture media of various ages also were studied, and substrate preference by metamorphosing larvae was investigated. A critical evaluation of the experimental approach and procedures is presented. (EPA)
W75-10021

**STUDIES TO DETERMINE METHODS FOR CULTURING THREE FRESHWATER ZOOPLANKTON SPECIES,**
Fish and Wildlife Service, Yankton, South Dakota, North Central Reservoir Investigations.
For primary bibliographic entry see Field 5A.
W75-10027

**THE RESPONSE OF GYMNODINIUM BREVE TO MUNICIPAL WASTE MATERIALS,**
University of South Florida, Tampa. Dept. of Chemistry.
M. T. Doig, III, and D. F. Martin.
Mar Biol (Berl). Vol 24, No 3, p 223-228, 1974, Illus.

Descriptors: *Eutrophication, Nutrients, Effluents, *Sewage effluents, *Water pollution sources, Biocontrol, Wastes, *Fish diseases, *Municipal wastes, Microorganisms, *Dinoflagellates, *Gymnodynium, *Florida, Fishkills.
Identifiers: *Gymnodinium-breve, Orthophosphate.

The response of the unarmored dinoflagellate G. breve, which is the causative organism in catastrophic fish kills along the Florida Gulf Coast, to enrichment with selected inorganic nutrients, municipal waste materials and various detergent components has been determined. The biostimulatory effects of the various enrichments were determined by a modification of the Provisional Algal Assay Procedure of the Joint Industry/Government Task Force on Eutrophication. Inorganic nutrients (orthophosphate, nitrate and ammonia) were added individually and in combination, and the results were compared to equivalent enrichments with the effluent from a secondary sewage-treatment plant. The maximum cell population, N sub max, attained could be increased 3-fold by the sewage-treatment plant effluent or by the equivalent combination of inorganic nutrients; individually, however, the inorganic nutrients had no pronounced effect on maximum cell population, N sub max (except for a 30% increase produced by slight orthophosphate enrichment). The results of these studies indicate that, at concentrations of orthophosphate typical of Florida coastal waters (about 0.10 ppm), the growth-promoting potential (as reflected by N sub max) of the medium was a linear function of the ammonia-nitrogen concentration (0.01 to 0.11 ppm). The sewage-treatment plant effluent was presumably low in detergent phosphate, having been obtained from a treatment plant some 6 mo. after the enactment of a ban on phosphate-containing detergents. Additions of orthophosphate or detergent-phosphate to the treatment-plant effluent did not significantly increase the observed biostimulatory effect of the waste material.--Copyright 1974, Biological Abstracts, Inc.
W75-10033

**COMPARISON OF AUTOCLAVE AND ETHYLENE OXIDE-STERILIZED MEMBRANE FILTERS USED IN WATER QUALITY STUDIES,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W75-10048

**CRITICAL LEVELS OF PHOSPHORUS AND NITROGEN IN TEXAS IMPOUNDMENTS,**
Texas Univ., Dallas. Inst. for Environmental Studies.
G. F. Lee.
IES Occasional Publication No 2 (undated). 7 p.

Descriptors: *Standards, *Nutrients, *Eutrophication, *Arid climates, *Texas, Phosphorus, Nitrogen, Impoundments, Federal Water Pollution Control Act, Water pollution control, Management, Water quality, Subtropic.
Identifiers: *Critical nutrient levels, Warm-water lakes.

The approach necessary to establish critical nutrient loading criteria for Texas' impounded waters is discussed. Texas impoundments have a wide variety of water quality although are they rarely classified as oligotrophic. The question is: what is the aquatic plant nutrient load that causes significant water quality deterioration in warm-water lakes. In addition to affecting how the public perceives algal growth in Texas impoundments, turbidity due to erosional materials could have a pronounced effect on how a certain nutrient load affects algal growth. After review of available information on aquatic plant-nutrient response in lakes and impoundments throughtout the U.S., it is concluded there is insufficient information today to establish critical nutrient concentrations or loads for Texas impoundments. Because of the importance of criteria in developing water quality management plans, it is recommended no attempt be made to develop criteria at this time as these standards must be based on situations specifically applicable to Texas. Consideration must be given to the public's response to water quality, recreational and other uses as a function of algal and other aquatic plant growth, and the limnological and environmental chemical aspects of nutrient transport and cycling. (Jones-Wisconsin)
W75-10072

**PRELIMINARY RESULTS OF A STUDY CONCERNING THE EFFECTS OF THERMAL POLLUTION ON PHYTOPLANKTONIC PRIMARY PRODUCTION IN LAKE WABAMUN, ALBERTA,**
Alberta Univ., Edmonton. Dept. of Zoology.
L. Noton.
In: Proceedings, Symposium on the Lakes Western Canada, 1973, Water Resources Cen University of Alberta, Edmonton, p 304-312, 1 1 tab.

Descriptors: *Thermal pollution, *Phytoplankt *Primary productivity, Canada, Electric pow plants, Surface waters.
Identifiers: *Lake Wabamun(Alberta).

Production of phytoplankton was monitored thirteen months to determine productivity ra for Lake Wabamun, Alberta, as a whole and fects on these rates of warm water effluent fr two electric generating stations. Phytoplank were enumerated, chlorophyll-a determined, chemical analysis of the water made. Product rates at the surface of the warm water effluen Wabamun plant were significantly greater t surface rates at other stations. However, prod tivity at 0.5 m and 1.0 m was unaffected. Simila the surface rates for the Wabamun plant area general were higher than those of the open lake rates were not higher at depths of 0.5 m and 1.0 Winter production in the open area was greate the Wabamun station that at the central area at surface only. The Sundance power area in gene showed greater production at the surface than the open area during summer 1972. There were differences at the 0.5 m and 1.0 m depths. C Sundance station had lower rates than any of other Sundance stations when power plant was operating. Resumption of plant operations co cided with an increase in productivity at this tion to the level of the other Sundance statio (Jones-Wisconsin)
W75-10073

**CHANGES IN THE SUBMERG MACROPHYTE COMMUNITIES OF LA WABAMUM AS A RESULT OF THERM DISCHARGES,**
Alberta Univ., Edmonton. Dept. of Botany.
E. D. Allen, and P. R. Gorham.
In: Proceedings Symposium on the Lakes Western Canada, June 1973, Water Resour Centre, University of Alberta, Edmonton, p 3 324, 8 fig, 5 ref.

Descriptors: *Sumberged plants, *Aquatic wee *Thermal pollution, Canada, Chara, Powerplan Water temperature, Succession, Adaptation.
Identifiers: *Lake Wabamun(Alberta), Elod candensis, Myriophyllum, Potamogeton pe tinatus.

To define factors responsible for the large amou of submerged macrophytes in Lake Wabamun, survey of species was made. Elodea canaden had not been previously listed, is rare in Alber but was the dominant species present. It h replaced Myriophyllum and Chara between 196 1968. After the Sundance Power Plant beg operations in 1970, Elodea and Myriophyllu gradually decreased and Potamogeton pectinat increased in the discharge canal. In the dischar canal mouth, Myriophyllum died out in a year. September much of the Chara died, possibly d to reduced light and photosynthesis coupled wi isothermal heating and increased respiration; th is respiratory loss exceeded photosynthetic ga for a few days, opening a habitat for Elodea inv sion, which was followed by consolidation and e tensive spread in the direction of the prevaili pattern of the plume. Presumably a similar situ tion had occurred near the Wabamun power pla in 1967. In Kapasiwin Bay, fluctuations in wee growth were better correlated with water lev variations and hours of sunshine than with therm effluent from the Wabamun plant. Weed problem in Lake Wabamun appear to be a consequence the operation of two power plants rather tha production of increased quantities; the specie change aggravated the situation. (Buchana Davidson-Wisconsin)
W75-10074

E EUTROPHICATION OF LAKES IN THE
ANAGAN VALLEY, BRITISH COLUMBIA,
heries Research Board of Canada, Winnipeg
anitoba). Freshwater Inst.
Patalas.
Proceedings Symposium on the Lakes of
stern Canada, June 1973, Water Resources
itre, University of Alberta, Edmonton, p 336-
, 2 fig, 3 tab, 16 ref.

criptors: *Eutrophication, *Lakes, Canada,
e basins, Dissolved solids, Calcium, Conduc-
ty, Sodium, Potassium, Magnesium,
epods, Crustaceans, Daphnia, Plankton,
plankton, Secchi disks, Dissolved oxygen,
olmnion, Stratification, Oligotrophy,
otrophy, Nutrients, Phosphorus, Forecasting.
ntifiers: Lake Okanagan(British Columbia),
e Skaha(British Columbia), Lake
yoos(British Columbia), Lake Wood(British
umbia), Lake Kalamlka(British Columbia).

rophication was studied in 1969-71 in five lakes
the Okanagan Valley. Four basins were
ntified in Lake Okanagan. The total dissolved
ds, calcium, and electrical conductivity
reased from north to south. Macroelements in
s Okanagan, Skaha, and Osoyoos were not
stantially different, but Lakes Kalamalka and
od were twice higher in sodium, potassium,
magnesium and about 1.5 times in total dis-
ed solids. Four copepods and nine cladocerans
e found; four species, Cyclops bicuspidatus
nasi, Diaptomus ashlandi, Diaphanosoma
chtenbergianum, and Daphnia longiremis were
inant in all the lakes and Daphnia thorata was
mon in four lakes. The upper 50 m contained
of the total plankters in Lake Okanagan, and
e was little horizontal variation. Crustaceans
e less abundant in inshore waters. Settled net
kton volume varied. Compared to 1935 data,
e was little change in the zooplankton species,
hi disc visibility, and dissolved oxygen in the
olmnion, but net plankton values were greater.
es Okanagan and Kalamalka were oligotrophic
close to mesotrophic; Lake Wood moderately
ophic, and Lakes Skaha and Osoyoos mar-
y eutrophic. Changes during the past century
predictions for 1990 about the phosphorus
s are made. (Buchanan-Davidson--Wisconsin)
-10075

VEY OF LAKE REHABILITATION
HNIQUES AND EXPERIENCES,
onsin Dept. of Natural Resources, Madison.
Dunst, S. M. Born, P. D. Uttormark, S. A.
h, and S. A. Nichols.
lable from the National Technical Informa-
Service, Springfield, Va. 22161, as PB-236
$7.00 in paper copy, $2.25 in microfiche.
nical Bulletin No 75, 1974. 182 p, 2 fig, 18 tab,
otos, 819 ref, 1 append. R 802242.

riptors: *Water pollution treatment, *Lakes,
abilitation, *Technology, Eutrophication,
ews, Bibliographies, Management, Diversion,
e water treatment, Land use, Dredging,
ent removal, Harvesting, Biocontrol, Sedi-
control, Harvesting of algae, Drawdown,
sediments, Chemcontrol, Fish, Parasitism,
tic weed control.
ifiers: *Lake restoration, *State-of-the-art,
studies, Flushing.

national concern has stimulated considerable
rch on the nature and causes of the lake aging
ss, including the development of various
ol techniques. There is presently great need
compilation of information which thoroughly
ments the broad spectrum of lake restoration-
ted activities. Studies that are essential ad-
s to any nutrient limitation program include
says, nutrient budgets, hydraulic and
horus residence times, and nutrient
nge reactions. Present lake rehabilitation
ilities are substantial, although in need of ex-
e, well-documented testing, and future prospects for success in this realm of environmental management are very encouraging. This state-of-the-art review represents an attempt to delineate the accomplishments of lake restoration-related activities worldwide. Information was acquired through an extensive mail survey (about 8000 entries), cooperation of several international journals/newsletters, and a systematic literature search including foreign as well as domestic materials. The contents of this report consist of five major divisions: identification, description and present utility of the various techniques; compilation and description of individual past and/or ongoing restoration experiences (almost 600 accounts); project methodology; name and address of people providing pertinent information (over 300 respondents); and literature references (more than 800 documents). (Jones-Wisconsin)
W75-10078

**FAUNA AND FLORA IN HYDRAULIC CLAM DREDGE COLLECTIONS FROM FLORIDA WEST AND SOUTHEAST COASTS,**
Florida Dept. of Natural Resources, St. Petersburg. Marine Research Lab.
M. F. Godcharles, and W. C. Jaap.
Available from the National Technical Information Service, Springfield, Va. 22161, as COM-74 10276, $4.75 in paper copy, $2.25 in microfiche. Special Scientific Report No 40, December 1973. 89 p, 17 fig, 2 tab, 9 ref.

Descriptors: *Marine algae, *Marine animals, *Marine plants, *Varieties, *Florida, Coasts, Mollusks, Crustaceans, Habitats, Fish, Annelids, Clams, Ecological distribution, Sampling, Gulf of Mexico.
Identifiers: Echinoderms, Cnidarians, Atlantic coast, Dredge sampling.

Two exploratory programs to locate commercial clam populations off west and southeast Florida were carried on. An an adjunct to these endeavors was the analysis of associated fauna and flora collected by two gear types: a hydraulic Nantucket dredge operated from the R/V Hernan Cortez and a Maryland escalator soft-shell clam dredge, operated from the R/V Venus. The chief distinctions between these two gear types were that the Venus operated in shallower depths (0.9 to 4.6 m) and that its conveyor belt system provided continuous harvesting and was more selective for smaller clams because of smaller mesh size. In contrast, operating depth of the Nantucket dredge was 3.1 to 14.6 m. Florida east coast and shallow estuarine west coast areas were explored with the R/V Venus. A total of 453 taxa, primarily mollusks (64 gastropods, 95 bivalves,) crustaceans (111), fish (57), echinoderms (36), annelids (32), and cnidarians (30) were identified. Depth, water temperature, salinity, substrate type, and water clarity were recorded at each station. An effort was made to collect, identify and count all live specimens and these are listed by locality, depth, and numbers collected. (Jones-Wisconsin)
W75-10079

**PESTICIDES, POLYCHLORINATED BIPHENOLS AND HEAVY METALS IN UPPER FOOD CHAIN LEVELS, EVERGLADES NATIONAL PARK AND VICINITY,**
Everglades National Park, Homestead, Fla. Div. of Natural Science and Resource Management Studies.
J. C. Ogden, W. B. Robertson, G. E. Davis, and T. W. Schmidt.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-235 359, $3.75 in paper copy, $2.25 in microfiche. Ecological Report No DI-SFEP-74-16, March 1973. 28 p, 2 tab, 29 ref.

Descriptors: *Pesticides, *Polychlorinated biphenols, *Heavy metals, *Food chains, Florida, Insecticides, DDT, DDE, DDD, Dieldrin, Arsenic compounds, Mercury, Cadmium, Lead, Zinc, Copper, Aquatic animals, Chlorinated hydrocarbon pesticides, Baseline studies, Birds, Fish, Shellfish, Frogs, Toxicity, Pesticide residues.
Identifiers: *Everglades National Park(Fla), Alligators, Crocodiles, Eggs.

This investigation was designed to compile baseline information on the distribution of pollutants which are known to, or strongly suspected of, adversely affecting upper trophic level vertebrates and invertebrates present in south Florida environments. Ninety-five samples, including brain and breast tissue and eggs of various birds, alligator and crocodile eggs, fish and shellfish, and frogs were analyzed for residues of chlorinated insecticides (DDT, DDE, DDD, and Dieldrin), and for the persistent chlorinated industrial compounds polychlorinated biphenols. Each sample was also tested for residues of arsenic, mercury, cadmium, lead, zinc and copper. The resulting analyses provide a baseline for future analyses, and clues for particular poisons or particular species in need of more intensive study. These data revealed that DDT, DDE, DDD, Dieldrin, and PCBs appear to exist in concentrations well below amounts known to have either acute or chronic effects on local species. Less is known of the significance of the various metal concentrations reported here, although levels of mercury in freshwater vertebrates, and arsenic in marine species are great enough to deserve more intensive study. (Jones-Wisconsin)
W75-10080

**RECOVERY OF POLLUTED LAKES. A SWEDISH RESEARCH PROGRAM ON THE EFFECTS OF ADVANCED WASTE WATER TREATMENT AND SEWAGE DIVERSION,**
Uppsala Univ. (Sweden). Algal Assay Lab.
C. Forsberg, S-O. Ryding, and A. Claesson.
Water Research, Vol 9, No 1, p 51-59, 1975. 4 fig, 7 tab, 31 ref.

Descriptors: *Water pollution control, *Lakes, *Waste water treatment, *Sewage, *Diversion, Phosphorus, Eutrophication, Monitoring, Nutrients, Limiting factors, Chlorophyll, Suspended solids, Nitrogen, Bioassay, Europe, Investigations, Nutrient removal.
Identifiers: Lake restoration.

The National Swedish Environment Protection Board began a program in 1972 to analyze the effects of phosphorus removal at advanced wastewater treatment plants on 18 lakes and 15 treatment plants. The effects of diversion of sewage effluents from some lakes are also being investigated. Sewage treatment plant efficiency is continuously monitored by the new Minitest method and the nutrient loads from these plants as well as from other sources are calculated. Water quality is illustrated by the correlation between chlorophyll-a and suspended solids; the correlation coefficient was +0.88. The first sign of lake recovery was observed after an 85% reduction of the waste phosphorus load. Post-precipitation (Al-sulphate) decreased the yearly load from 2000 kg P to 300 kg, which gave a 50% reduction to the recipient water. Chlorophyll values also decreased. The role of nitrogen and phosphorus as algal growth limiting nutrients was studied by algal assay. Nitrogen limited Selenastrum capricornutum growth in two-thirds of the samples. In filtered lake water phosphorus was the growth limiting nutrient at total-P values below 0.05 mg/l. Above 0.1 mg P/1 nitrogen played the principal role. Between these values algal growth was primarily limited by P or N or chelating agents. (Jones-Wisconsin)
W75-10081

**NITRATE IN WATER, SOIL, PLANTS AND ANIMALS,**
Sunning House, Sunningdale (England).
A. H. Walters.
International Journal of Environmental Studies, Vol 5, No 2, p 105-115, 1973. 4 tab, 46 ref.

Descriptors: *Hazards, *Nitrates, *Water pollution, *Path of pollutants, *Soil contamination, Public health, Fertilizers, Nitrites, Potable water, Crops, Animal pathology, Nitrification.

World aspects of nitrate pollution in water and soils mainly due to excess application of artificial fertilizers are discussed. During the last 20 years it has been scientifically established in many countries that crops, including grass, do not contain excess amounts of nitrate provided they have been grown in naturally manured soils, or in soils which have received moderate and correctly controlled treatments with artificial fertilizers applied within suitable farming systems. It has also been clearly established that the widespread abuse of the use of artificial fertilizers can definitely introduce a health hazard in farm animals due to the uptake of nitrate into the fodder crops, as well as eutrophication and soil structure and fertility breakdown problems. The introduction of nitrate into foodstuffs and water can constitute a human health hazard. The connection between intake of nitrate and methaemoglobinaemia in Man and animals has been amply demonstrated, and work is now proceeding to establish a possible connection between nitrosamines and conditions such as cancer and spina bifida. To minimize such hazards it is suggested that much more effective standards on the use of artificial fertilizers is needed. (Jones-Wisconsin)
W75-10083

**IDENTITY AND REGULATION OF NUTRIENTS LIMITING PHYTOPLANKTON IN THE SHALLOW ESTUARIES NEAR BEAUFORT, N.C.,**
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
G. W. Thayer.
Oceologia (Berl), Vol 14, p 75-92, 1974. 7 fig, 4 tab, 37 ref.

Descriptors: *Nutrients, *Phytoplankton, *Productivity, *Limiting factors, *Estuaries, North Carolina, Nitrogen, Phosphorus, Photosynthesis, Bacteria, Decomposing organic matter, Carbon, Detritus.
Identifiers: *Beaufort(NC).

Enrichment experiments to test the hypothesis that nitrogen was the prime limiting nutrient and experiments to determine whether microbial competition for nitrogen and phosphorus might limit the availability of these nutrients to the phytoplankton are described. Inorganic nutrients limiting phytoplankton production in the shallow estuarine system near Beaufort, North Carolina were identified. Nitrogen was the primary limiting nutrient and was phosphorus limiting at times. Samples receiving a complete enrichment medium plus organic substrates poor or lacking in nitrogen and phosphorus showed no significant increase in relative photosynthesis over unenriched controls, even though there was a significant decrease in the nitrogen and phosphorus concentrations in the enriched samples. This suggested that microbial immobilization of nitrogen and phosphorus during decomposition of organic matter may limit nutrient availability to phytoplankton and in part account for the general paucity of inorganic nutrients present in this shallow system. The estimated amounts of carbon, nitrogen and phosphorus entering the estuarine system in the form of partially decayed Spartina alterniflora each year are given. Data suggested that an annual cycle in nutrient concentration in the estuarine system in part may result from shifts in the equilibrium between microbial immobilization and remineralization. (Jones-Wisconsin)
W75-10084

**WATER POLLUTION FROM NONPOINT SOURCES,**
Midwest Research Inst., Kansas City, Mo.
A. D. McElroy, S. Y. Chiu, J. W. Nebgen, A. Aleti, and A. E. Vandergrift
Water Research, Vol 9, No 7, p 675-681, 1975. 3 tab, 18 ref.

Descriptors: *Water pollution sources, *Pollutants, Erosion, Agriculture, Forest management, Mining, Construction, Nutrients, Pesticides, Organic wastes, Thermal pollution, Acid mine water, Grasslands, Sedimentation rates, Saline water, Radioactive wastes, Heavy metals, Farm wastes, Pathogenic bacteria.
Identifiers: *Nonpoint pollution sources.

The nature and extent of nonpoint pollution sources in the United States were assessed for four major industrial activities: agriculture, silviculture, mining, and construction. Nonpoint pollutants exert a significant influence on water quality in the United States. Based on land use data, more than 97% of the land area in the U.S. is a potential source of nonpoint pollution. Among the pollutants identified from agriculture, silverculture, mining, and construction, important pollutants are sediment, nutrients, pesticides, organic wastes, thermal discharges, acid mine drainage, salinity, radioactivity, microbial pollutants, and heavy metals. Agriculture, especially cropland, is responsible for the release of large quanties of sediment, nutrients, and pesticides. Because of the production of large quantities of organic wastes from livestock operations, these wastes can be potential sources of water quality degradation, if not handled properly. Silviculture is a source of sediment. Other pollutants originating from silvercultural operations include very limited quantities of nutrients, pesticides, and thermal discharges. Surface mining is a major source of erosion sediment. Acid mine drainage, salinity, and heavy metals are other important pollutants from mining. Sediment is a major pollutant from construction industry. (Jones-Wisconsin)
W75-10085

**COPPER (II)--NITRILOTRIACETATE COMPLEXES IN AQUEOUS SOLUTION,**
Waterloo Univ., Ontario. Dept. of Chemistry.
W. A. E. McBryde, and L. J. McCourt.
Journal Inorganic Nuclear Chemistry, Vol 33, No 12, p 4193-4197, 1973. 1 fig, 4 tab, 4 ref.

Descriptors: *Copper, *Copper compounds, *Nitrilotriacetic acid, *Chelation, Aqueous solutions, Hydrogen ion concentration, Measurement, Equations, Stability, Potassium compounds.
Identifiers: *Complexes, NTA.

Previous studies disagreed on the composition and stability of the complex formed by copper (II) and nitrilotriacetic acid. On repeating the experiments, copper was mainly present in the form of complexes in solutions containing an excess of nitrilotriacetic acid, even when the pH was less than 2. Under these circumstances, it is questionable whether pH titration measurements are capable of defining the equilibrium constant. The method of hydrogen ion balance previously used was shown to be unsuitable. The composition of stability constants of copper (II) complexes with nitrilotriacetic acid were studied in aqueous 0.1 molar potassium nitrate solution at 25C by means of a solid-state copper-ion sensitive electrode. Experimental data could be fitted to equations by assuming that a single species (ML) was formed, but could be better fitted with two formation constants applying to two species, ML and MHL (M equals copper, H3L equals nitrilotriacetic acid). MHL species appeared only at very low hydrogen ion concentrations. The average pK-alpha for the reaction was 1.25. The results indicated that the simple 1:1 complex was the predominant species, but at low pH it became protonated. Log beta ML was 13.21 and log beta MHL was 14.46-14.87, depending on the pK1 value used for nitrilotriacetic acid. (Buchanan-Davidson--Wisconsin)
W75-10086

**NORTH CAROLINA MARINE ALGAE. III. A COMMUNITY OF CERAMIALE (RHODOPHYTA) ON A GLASS SPONGE FRO 60 METERS,**
Duke Univ., Durham, N.C. Dept. of Botany.
C. W. Schneider.
Bulletin of Marine Science, Vol 24, No 4, p 109 1101, 1974. 3 fig, 17 ref. NSF GB-6868, GB-1754 GB-27725.

Descriptors: *North Carolina, *Marine alga *Biological communities, *Rhodophyta, Syste matics, Benthic flora, Continental shelf, Tropica regions.
Identifiers: Onslow Bay(NC), Gulf stream Ceramiales, Antithamnion cruciatum, Callitham nion byssoides, Heterosiphonia wurdemanni Branchioglossum prostratum, Membranopter subtropica.

Study of the benthic offshore flora on the con tinental shelf of Onslow Bay, North Carolina, i reported. The algal flora of this area is charac teristically tropical. This part of the shelf lies nex to the Gulf Stream system and a bathythermo graph cast at the dredge site indicated a botton temperature of 20.3C. One particular deep wate community of red algae in the order Ceramiale grew epizoically on a glass sponge. The only alga collected in either of two dredges were five mem bers of the Ceramiales (Rhodophyta) recorde from 60 m at the shelf break off North Carolina These include two taxa previously reported fro these shallow waters, Antithamnion cruciatum (C Agardh) Naegli v. radicans (J. Agardh) Collins an Hervey and Callithamnion byssoides Arnott i Hooker, one plant not previously reported fro this area. Heterosiphonia wurdemanni (Bailey e Harvey) Falkenberg v. laxa Borgesen, and tw new species, Branchioglossum prostratum sp. nov and Membranoptera subtropica sp. nov. This is th first report of the genus Branchioglossum from th Atlantic Ocean. (Jones-Wisconsin)
W75-10087

**A MODEL OF INORGANIC CARBON LIMITA TION IN NATURAL WATERS,**
Texas Univ., Dallas. Inst. for Environmental Studies.
D. W. James, and G. F. Lee.
Water, Air, and Soil Pollution, Vol 3, p 315-320, 1974. 1 fig, 1 tab, 7 ref. EPA 16010-EHR, TG 5P2 WP-184-04.

Descriptors: *Mathematical models, *Inorganic compounds, *Carbon, *Limiting factors, Carbon dioxide, Eutrophication, Algae, Hydrogen ion concentration, Alkalinity.

To understand the role of inorganic carbon in eutrophication, a mathematical model was constructed to determine if inorganic carbon limits planktonic algae productivity in a body of water. The model depends on the ability to account for changes in inorganic carbon species concentrations, especially aqueous carbon dioxide. The basis of the model is the application of the chain rule for partial derivatives, with the rate of pH change calculated as the product of the rate of carbon dioxide change and change in pH as carbon dioxide changes. Given data on gross productivity, algal-bacterial respiration rates, carbon dioxide gas transfer rates, temperature, alkalinity, initial pH, and epilimnion depth, the model calculates the theoretical magnitude of change of pH with change of temperature in the water body during the photosynthetic period. Based on sample calculations under various chemical, physical, and biological conditions, a change in pH to change of temperature ratio greater than 2.0 units was necessary for inorganic carbon limitation to occur. Results suggest that carbon limitation of total planktonic algal growth would be rare in most natural waters, but could occur in low alkalinity water which would influence the species of algae present. (Buchanan-Davidson--Wisconsin)
W75-10088

NT SEDIMENTARY HISTORY OF LAKE
ONA, WISCONSIN,
gical Survey, Tacoma, Wash.
Bortleson, and G. F. Lee.
, Air, and Soil Pollution, Vol 4, p 89-98,
fig, 1 tab, 29 ref. EPA 16010 EHR, 5-TO2-
0184.

ptors: *Lake sediments, *Stratigraphy,
ry, *Wisconsin, Cores, Pollen, Chemical
is, Phosphorus, Iron, Manganese, Alu-
, Potassium.
iers: *Lake Monona(Wis), Ambrosia,
on(Wis).

historical changes of Lake Monona
h interpretation of chemical profiles and
sia (ragweed) pollen of lake sediment cores
xamined. Results presented for chemical
es of each core are mean values of two or
plicate determinations. Duplicate pollen
were made from each processed sample. In
nsition zone (high to low ragweed) triplicate
were made. Chemical analyses from the
ort cores show pronounced changes in
al stratigraphy have occurred since white
oved into Madison and southern Wisconsin
gan modifying the area. Since the mid- to
0s, there has been an appreciable increase
e, Mn, Al, and K in the uppermost sedi-
Maximum concentrations of P were ob-
near the turn of the century and in the most
sediment layers. Data from the two cores
agree precisely but are within 5 to 10 yr of
her. Among the domestic changes taking
uring this period in Lake Monona basin
pid urbanization of Madison, rapid growth
s and suburban areas which contribute ef-
o the lake's tributaries, and emergence of
ergent era' as an additional source of P.
Wisconsin)
089

S, RESIDENCE TIMES, AND SOURCES
ME ELEMENTS TO LAKE MICHIGAN,
oll., Holland, Mich. Dept. of Chemistry.
lein.
Air, and Soil Pollution, Vol 4, No 1, p 3-8,
ab, 18 ref.

tors: *Chemical properties, *Lake
n, *Trace elements, Reviews, Cycles,
tation, Aerosols, Industrial wastes, Mu-
wastes, Copper, Mercury, Calcium, Mag-
Sodium, Chlorine, Aluminum, Bromine,
Iron, Potassium.
rs: Antimony, Selenium, Vanadium,
Arsenic, Chromium, Lanthanum, Silicon,
.

ichigan receives a considerable input of
ements from both natural and societal
and as a result the chemistry of the lake is
. Fluxes of 28 elements to Lake Michigan
ulated from literature data on sedimenta-
es and concentrations in sediments and
ake Michigan residence times are roughly
er than oceanic residence times. Despite
iplicity of sources, it is possible to con-
imple model for trace elements in the lake
only two source terms: soil and aerosol.
del assumes the industrial and municipal
e directly to the water has a negligible ef-
ake-side average sediment and water con-
n, although such discharges may have
ed localized effects. With soil and
he only sources, fourfold excesses are
of Cu, Hg, Sb, Se, and V and order of
e deficits for Ca, Mg, Na, and Cl, but ac-
with 50%) for the observed inputs of Ag,
r, Co, Cr, Fe, K, La, Mn, S, Si, Sc, Th,
Except for Al, Co, La, Si, and Th, deposi-
aerosol accounts for at least one-fifth of
nput. (Jones-Wisconsin)
90

**MICROBIAL DEGRADATION OF DDT,**
Cornell Univ., Ithaca, N.Y.
M. Alexander.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-781 903, $3.75 in paper copy, $2.25 in microfiche. ONR Report June 1974. 34 p, 9 fig, 7 tab, 29 ref. NR 306-067. N00014-67-A-0077-0027.

Descriptors: *Pesticides, *Microbial degradation, *Pesticide removal, *DDT, *Marine bacteria, Chlorine, Oceans, Fungi, Mode of action, Aromatic compounds.
Identifiers: Mucor alternans, Dechlorination.

Investigations with marine bacteria to determine their ability to convert DDT to water-soluble products are described. Mucor alternans converted DDT to water-soluble metabolites at a rate four times greater than the most active marine bacterium. Techniques were developed to isolate and purify these metabolites. These compounds are different from the previously described DDT metabolites, and they do not contain chlorine. If the absence of chlorine is confirmed, these compounds represent products of the most extensive microbial degradation of DDT yet reported. To model marine communities were added eighty different carbon sources in a total of 100 separate treatments, but in no case were water-soluble products of DDT metabolism detected. Microorganisms were found to be capable of converting diphenylmethane, an analog of DDT to 1,1,1',1'-tetraphenyldimethyl ether. Para-substituted aromatic compounds were toxic to some bacteria, even at low levels, but a few stimulated growth of individual bacteria. The relationship of chemical structure to biodegradability of DDT analogs was investigated. Para substitution of one of the two aromatic rings with chloro, nitro, hydroxyl, or amino groups significantly reduced the rate of biodegradability. The most resistant compounds were those with both rings containing these substituents. (Jones-Wisconsin)
W75-10091

**AN ECOSYSTEM MODEL FOR THE PELAGIC ZONE OF LAKE WINGRA,**
Wisconsin Univ., Madison.
A. J. A. MacCormick, O. L. Loucks, J. F. Koonce, J. F. Kitchell, and P. R. Weiler.
International Biological Program, EDFB-IBP 74-7 (Biology and Medicine UC-48), October 1974. 100 p, 9 fig, 23 tab, 12 ref. NSF AG-199, 40-193-69, AEC W-7405-eng-26.

Descriptors: *Lakes, *Model studies, Wisconsin, Biomass, Phytoplankton, Zooplankton, Benthos, Fish, Detritus, Sediments, Organic matter, Phosphorus, Ecosystems, Productivity, Computer programs.
Identifiers: *Pelagic zone, *Lake Wingra(Wis).

The status of an open-lake model for the pelagic zone of Lake Wingra, Wisconsin designed to simulate the transfer of biomass at a relatively aggregated level of resolution, is described. Although the resolution is intended to be gross, and the output cannot be expected to show the sharp variation of individual process sub-models, the pelagic zone model leans heavily on the lessons from the process sub-models. It is intended to address questions concerning general response characteristics rather than questions of detail. It is an attempt to represent a projection of the real ecosystem into the subspace defined by the variables. These variables are incorporated in the model, and a 'true' model would be an exact mathematical representation of the projection. However, the projection cannot be known. It was the intention to base the model on understanding gained from the detailed process studies of the different components, e.g., phytoplankton, zooplankton, benthos, etc. Because different process studies are at different stages of development, all the mathematical detail of the process models are not included in the general model. It is felt that the model works well and the results and insight it provides are good. (Jones-Wisconsin)
W75-10092

**THE STRUCTURE AND PRODUCTION OF PHYTOPLANKTON IN MIKOLAJSKIE LAKE,**
Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
I. Spodniewska.
Ekologia Polska, Vol 22, No 1, p 65-106, 1974. 10 fig, 14 tab, 74 ref.

Descriptors: *Biomass, *Productivity, *Phytoplankton, Eutrophication, Diatoms, Dinoflagellates, Biological communities, Trophic level, Nannoplankton, Deep-water habitats, Varieties, Algae, Distribution, Decomposing organic matter, Period of growth, Seasonal, Europe.
Identifiers: *Mikolajskie Lake(Poland), Holomictic lake.

In order to determine the direction and rates of changes in the trophic level of lakes, preliminary studies were conducted in the pelagic zone of Mikolajskie Lake in the Masurian Lakeland of Poland (eutrophic, holomictic, maximum depth 27.8 m). The seasonal variability of composition, biomass and production of phytoplankton in different years of the studies (1963-1970) was analyzed. In the phytoplankton development, two maxima were observed: that in spring--having relatively small biomass of algae (averaging about 6 mg/l) and distinct domination of diatoms in the plankton, and that in summer--with a much higher algal biomass (10-30 mg/l) and dominated by dinoflagellates. The mean phytoplankton production in spring and summer remained on a constant level (about 1.0 mg oxygen per day) despite the directional changes in the phytoplankton structure and distinct increase of algal biomass in summer during the last years of the studies. Simultaneously an increase of maximal values of phytoplankton production and an increase of decomposition of organic matter has been observed. Both the species composition and seasonal dynamics of phytoplankton development and the values of biomass and production of planktonic algae in this lake are typical for naturally eutrophic lakes, of average fertility and with a distinct periodicity of phytoplankton development. (Jones-Wisconsin)
W75-10093

**EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. I. PHYSICAL AND CHEMICAL CONDITIONS IN LAKE WATER,**
Instytut Rybactwa Srodladowego, Gizycko (Poland). Lake Field Station.
J. Zachwieja.
Ekologia Polska, Vol XXI, No 27, p 405-421, 1973. 6 fig, 2 tab, 38 ref.

Descriptors: *Fish stocking, *Physical properties, *Chemical properties, *Lakes, Ice cover, Temperature, Stratification, Oxygen, Winterkilling, Aquatic plants, Secchi disks, Conductivity.
Identifiers: *Lake Warniak(Poland).

Physical and chemical studies of Lake Warniak, Poland have been carried out in connection with studies of the effect of newly introduced fish species on the original fish stock. Duration of the ice cover ranged from 90 to 143 days (average 53 days). Maximum temperature of surface water was 32.4C and at 3 m, 24.2C. A distinct correlation was observed between the mean daily wind velocity, air temperature and water temperature. Periods of vertical thermal compensation coincided with drop of air temperature and greater wind velocity. The reverse accompanied the temporary stratification. Among Elodea canadensis stands temperature of water was 0.4-3.0C higher than in the weed-free places. Only during the winter periods were there oxygen losses causing a winterkill depending on meteorological conditions, thickness and structure of ice and snow cover, and

oxygen contents before freezing. The winterkill was very severe in 1969/1970. Lowest visibility was observed in July and August, and highest in autumn and winter. Seasonal and yearly variation of some physical and chemical elements was observed, especially of iron, alkalinity, carbon dioxide, calcium and conductivity. (Jones-Wisconsin)
W75-10094

**PHOSPHORUS RUN-OFF FROM THE DRAINAGE BASIN TO MIKOLAJSKIE LAKE,**
Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
T. Gorski, and J. I. Rybak.
Ekologia Polska, Vol 22, No 2, p 275-286, 1974. 1 fig, 3 tab, 67 ref.

Descriptors: *Measurement, *Runoff, *Watersheds(Basins), *Nutrients, Statistical methods, Europe.
Identifiers: *Mikolajskie Lake(Poland), Non-point nutrient sources.

The method for quantitatively estimating the runoff of substances from a drainage basin to water bodies and streams from scattered sources is presented. Using phosphorus as an example, literature data and data on the abundance of phosphorus in the drainage basin of Mikolajskie Lake allowed calculation of the amount of phosphorus runoff from various sources within one year. The calculation is based on following sources of substances (in this instance phosphorus) in-flowing from the drainage basin: surface and groundwater runoff, erosion (water erosion of soil drainage basin, shore erosion, wind erosion), litter fall, substances brought in by animals, substances brought in with precipitation, effect of tourism, and municipal sewage. The drainage basin of Mikolajskie Lake (surface 810 ha) was divided into four parts, each having different biological and geographical parameters. The forest and the towns were separated. The remaining surface of the drainage basin was divided into the area between town and forest, partly with buildings, and partly used for agricultural purposes, and the flat area which was almost entirely used for agriculture. Calculations show that the most significant source of phosphorus is municipal sewage (86.0% of total phosphorus), followed by surface runoff. Other sources are not important. (Jones-Wisconsin)
W75-10095

**FLUVIAL-ESTUARINE WATER RESOURCE OPTIMIZATION: MICROECOSYSTEM SIMULATION OF RIVER-ESTUARINE PRODUCTIVITY RELATIONSHIPS,**
For primary bibliographic entry see Field 2L.
W75-10099

**PHOSPHORUS KINETICS IN THE EUPHOTIC ZONE OF THE CHESAPEAKE BAY,**
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
J. L. Taft, and W. R. Taylor.
Available from the National Technical Information Service, Springfield, Va 22161 as COO-3279-08, $4.00 in paper copy, $2.25 in microfiche. Report COO-3279-08 (Undated). 16 p, 9 fig, 8 ref. AEC AT(11-1)3279.

Descriptors: *Phosphorus, *Kinetics, *Euphotic zone, *Chesapeake Bay, Phytoplankton, Growth rates, Cycling nutrients.

There are at least three phosphorus cycles in natural waters. One cycle, the kinetic steady state between phosphorus in phytoplankton and bacteria and dissolved P, is evaluated. The experimental design allowed measurement of the flux of biologically active phosphorus compounds in a living system at ambient nutrient concentrations and reaction rates. It was concluded that when soluble reactive phosphorus concentration is very low, rapid initial P-32 uptake is due to exchange across cell membranes, not to net uptake. The rate constants used for P flux are those for exchange across cell membranes. Michaelis-Menton kinetic experiments frequently evaluate uptake rate by filtration at a single time interval following tracer addition. This practice leads to overestimation of net uptake at low ambient concentrations because some P-32 incorporation is due to exchange. The fraction of uptake due to exchange may be appreciable, demonstrated by Chesapeake Bay data in June, 1973. Since phosphorus appears to limit phytoplankton growth during most of the year in Chesapeake Bay, the slow rate of P-32 uptake may approximate growth rate. It will underestimate growth rate according to the net rate of P uptake from organic molecules and polyphosphates. (Jones-Wisconsin)
W75-10101

**MEASUREMENTS OF ABSOLUTE SCALAR IRRADIANCE SPECTRA IN RHODE RIVER,**
Johns Hopkins Univ., Baltimore, Md. McCollum-Pratt Inst.
W. E. Esaias, W. H. Biggley, and H. H. Seliger.
Available from the National Technical Information Service, Springfield, Va 22161 as COO-3278-24, $4.00 in paper copy, $2.25 in microfiche. COO-3278-24 (Undated). 31 p, 9 fig, 23 ref. AEC AT(11-1)3278.

Descriptors: *Solar radiation, *Measurement, *Spectrometers, *Attenuation, Estuaries, Chesapeake Bay, Phytoplankton, Light intensity, Analytical techniques, Absorption, Wavelengths.
Identifiers: *Rhode River(Md), Scalar irradiance spectra, Turbid waters.

To date there have been no direct measurements of underwater photon scalar irradiance spectra in turbid waters. An attempt to make these measurements by coupling a spherical diffusing collector to an underwater scanning spectrometer is reported. The design and calibration of the instrument and preliminary results obtained in the Rhode River, a subestuary of Chesapeake Bay, are described. The high attenuation in the blue is readily apparent and the attenuation near 680 nm and into the far red. The sharp peak at 700 nm is the result of absorption by chlorophyll at 680 nm and infrared absorption by water at 750 nm, both of which are accentuated by the high scattering. The shape of spectral attenuation curve has been a consistent feature during the past three years of observation. The extremely high total and selective absorptions of sunlight are characteristic of the shallow tributary estuaries of the Chesapeake Bay. The phytoplankton is subjected to extreme ranges of ambient light over short time periods and is strongly selected on the basis of chromatic adaptation. The spectral distribution of light at depth is essentially sunlight minus plant pigment absorption, with additional absorption in the blue by suspended material. (Jones-Wisconsin)
W75-10102

**GROWTH AND DISSIPATION OF PHYTOPLANKTON IN CHESAPEAKE BAY. III. INORGANIC CARBON REQUIREMENTS OF NATURAL POPULATIONS AND LABORATORY CULTURES OF PHYTOPLANKTON,**
Johns Hopkins Univ., Baltimore, Md. McCollum-Pratt Inst.
M. E. Loftus, A. Place, and H. H. Seliger.
Available from the National Technical Information Service, Springfield, Va 22161 as COO-3278-21, $4.00 in paper copy, $2.25 in microfiche. COO-3278-21 (Undated). 34 p, 7 fig, 3 tab, 33 ref. AEC AT(11-1)3278, NSF GI-32110.

Descriptors: *Photosynthesis, *Absorption, *Phytoplankton, *Carbon, Chesapeake Bay, Inorganic compounds, Cultures, Kinetics, Pyrrhophyta, Cyanophyta, Chlorophyta, Bicarbonates, Nannoplankton, Dinoflagellates, Mathematical studies.
Identifiers: Gymnodinum nelsoni, Prorocentr
minimum, Dunaliella tertiolecta.

Results of a detailed study of C-14 kinetics upt
in natural samples and in unialgal laboratory c
tures are presented. Natural phytoplankton sa
ples from Chesapeake Bay were collected at
0.5 m depth between 1100-1300 h by Van Dorn b
tle or as integrated samples pumped from 0.5
depth along a transect. The laboratory unialgal c
tures consisted of two Pyrrhophyta, Gymnodin
nelsoni and Prorocentrum minimum, c
Cyanophyta, an unidentified unicellular bl
green alga, and Chlorophyta, Dunaliella tertiol
ta. The rates of photosynthetic carbon fixation
natural populations of phytoplankton and for u
algal cultures of species isolated from those po
lations follow hyperbolic saturation kinetics w
respect to total inorganic carbon concentratio
The apparent half-saturation constants, measu
by C-14 uptake, are close to and in some ca
larger than ambient concentrations of total in
ganic carbon. Addition of bicarbonate ion to inc
bation bottles increased the measured C-14 upta
rates by factors as high as 2.5 for natural sampl
and 4.5 for laboratory cultures. There is eviden
that nannoplankton have lower half-saturati
values than larger dinoflagellates. The significa
difference in half-saturation between G. nelso
and P. minimum may have some relationship
their seasonal occurrence. (Jones-Wisconsin)
W75-10103

**EDUCING AND MODELING THE FUN
TIONAL RELATIONSHIPS WITHIN SUBLI
TORAL SALT MARSH AUFWUCHS COMM
NITIES - INSIDE ONE OF THE BLACK BOXE**
City Coll., New York. Dept. of Biology.
J. J. Lee.
Available from the National Technical Inform
tion Service, Springfield, Va 22161 as COO-325
16, $4.00 in paper copy, $2.25 in microfiche. AE
COO-3254-16 (Undated). 31 p, 4 fig, 2 tab, 60 re
AEC COO (11-1)3254, NSF GB 19245.

Descriptors: *Periphyton, *Model studies, *Sa
marshes, Population, Nematodes, Algae, Microo
ganisms, Dynamics, Trophic level, Protozoa, Ba
teria, Diatoms, Competition, Niches, Food web
Biological communities.
Identifiers: Foraminifera, Long Island(NY).

For the best part of 5 years, the distribution an
population structure of foraminifera during
growing seasons in a relatively small but ver
productive sublittoral portion of a Long Island sa
marsh have been studied and analyzed. Salt mars
aufwuchs communities are extremely complex a
semblages of more than several hundred species c
bacteria, fungi, algae, protozoa an
micrometazoa. At the present time information o
the population structure is too fragmentary to b
used in modeling and predicting community struc
ture. Studies of foraminifera, nematodes, an
microalgae grown in gnotobiotic culture suggest
is unreasonable to assume that measurement
made on one species will be good estimators fo
similar parameters of other species or the assem
blage as a whole. Nutritional experiments sugges
many meiofauna are selective feeders and gain dif
ferent nutritional values from the food they as
similate. If the phenomena of balanced diets an
special growth factors are widespread amon
meiofauna, it may be necessary to reconsider cer
tain aspects of energy flow modeling. Simulatio
of the trophic dynamics of Allogromia laticollan
was used to organize the information and to serv
as a generator of predictions to be further teste
experimentally. (Jones-Wisconsin)
W75-10104

**DIATOMS IN LAKES AND LAKE SEDIMENT
AS AN INDEX TO ENVIRONMENT. PART 2. A
STUDY OF PHYTOPLANKTON DISTRIBU
TION, LAKE CLASSIFICATION, AND**

**OPHIC INDICATORS IN MINNESOTA KES,**
nesota Univ., Minneapolis.
Tarapchak.
ilable from the National Technical Informa- Service, Springfield, Va 22161 as COO-2046- 7.60 in paper copy, $2.25 in microfiche. Final ort COO-2046-2, May 1, 1969-April 20, 1972. p, 43 fig, 58 tab, 111 ref. AEC AT(11-1)2046.

criptors: *Trophic level, *Bioindicators, ıtoms, *Lakes, Lake sediments, Phytoplank- Distribution patterns, Classification, Min- ta, Biological communities, Standing crops, ysophyta, Cyanophyta, Oligotrophy, otrophy, Eutrophication, Conductivity, Al- ity, Calcium, Magnesium, Secchi disks, ematical studies, Salinity, Physicochemical erties.
tifiers: Desmids, Species diversity, Lake clas- ation.

rms in phytoplankton distribution were eated, lake classification investigated, and erties of net phytoplankton, diatom assem- s, and whole-water phytoplankton communi- s indicators of trophic state evaluated. Range ophic conditions was defined by specific con- nce, alkalinity, a summation of calcium and esium, secchi disc transparency, and plankton standing crop. Lakes were clas- by performing cluster analysis on concentra- of major solutes, combinations of eight ic-state indicators, and suites of phytoplank- xa. The number of net taxa, desmids, and the ound quotient is correlated with the trophic ent, but diatom ratios and the diversity of assemblages are not so correlated. Conver- the standing crop of phytoplankton and spe- diversity in whole-water samples exhibit tically significant correlations with regional ent parameters. Typological studies reveal ke groupings, based on different sets of vari- are dissimilar in size, composition, and loca- especially those that involve biological varia- Algal properties that exhibit distinct trophic rences are the numbers of net taxa and ds, standing crop, and species number of -water communities. Desmids, ophytes, diatoms, and blue-green algae con- axa that are indicators of oligotrophy and rophy. (Jones-Wisconsin)
.0105

**OF ALGAE, ESPECIALLY DIATOMS, IN ASSESSMENT OF WATER QUALITY,**
my of Natural Sciences of Philadelphia, Pa. of Limnology.
imary bibliographic entry see Field 5A.
0112

**ER POLLUTION STUDY OF MALABEAM , GREENLAW BROOK AND ADJACENT AMS ON LORING AFB, MAINE,**
onmental Health Lab., Kelly AFB, Tex.
Davidson.
ble from the National Technical Informa- rvice, Springfield, Va 22161 as AD-785 373, n paper copy, $2.25 in microfiche. Report K) 74-18, September 1974. 84 p, 14 fig, 24 ref, 2 append.

ptors: *Water pollution sources, *Pollution ent, Streams, Lakes, Biomass, Food sing industry, Dissolved oxygen, Fluvial nts, Pesticide residues, Bioindicators, ms, Public health, Sewage treatment, s, Industrial wastes, Sewage effluents, ish, Invertebrates, Toxins, Heavy metals, Water Quality Standards, Water sampling, l properties, Chemical properties, Pesti-

ers: *Loring Air Force Base(Me), Green- ook(Me), Malabeam Lake(Me).

Greenlaw Brook and Malabeam Lake within the periphery of Loring Air Force Base, Maine was studied in June 1973. Surveys indicated the east branch of Greenlaw Brook was chronically polluted by industrial wastes from various base shops. Iron-fixing bacteria were the only living organisms in the upper portion of the stream. Contamination of Malabeam Lake and the west branch of Greenlaw Brook was not considered harmful to human health or aquatic life. The main part of Greenlaw Brook downstream from the sewage treatment plant was polluted with raw and partially treated sewage. This pollution and the industrial waste discharges to the stream's east branch significantly altered the number of organisms and species composition. Game fish could not survive due to invertebrate food supply reduction, breeding habitat elimination, and effects of toxicants and pollutants. It was recommended that industrial waste sources and waste treatment be studied to eliminate future discharges. Water from Malabeam Lake should be studied for a year, fish analyzed for heavy metals, and recommendations made. The sewage treatment plant must be upgraded. The east branch and main part of Greenlaw Brook should be off limits until toxic and inadequately treated discharges have stopped and the environment has recovered. (Buchanan-Davidson--Wisconsin)
W75-10113

**FIELD AND LABORATORY INVESTIGATIONS TO EVALUATE THE INFLUENCE OF NITRILOTRIACETIC ACID (NTA) ON EUTROPHICATION.**
Pacific Northwest Water Lab., Corvallis, Oreg.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-234 966, $4.25 in paper copy, $2.25 in microfiche. Report May-November 1970. 148 p, 62 fig, 28 tab, 8 ref, 3 append.

Descriptors: *Nitrilotriacetic acid, *Eutrophication, Bioassay, Algae, Lakes, Rivers, On-site investigations, Nitrogen, Phosphorus, Carbon, Plant growth, Primary productivity, Minnesota, North Carolina, Oregon, Chelation, Trace elements, Metals, Sediments, Degradation(Decomposition), Adsorption, Phytoplankton, California, Laboratory tests, Detergents.
Identifiers: NTA.

Field and laboratory investigations were conducted to evaluate the potential impact of nitrilotriacetic acid (NTA) on eutrophication. Studies included laboratory and in situ algal assays on 10 lakes and one river in different geographic areas and of various degrees of water quality. A series of additions (spikes) were made to these waters, including NTA, nitrogen, phosphorus, carbon, secondary sewage effluent resulting from settled primary effluent containing NTA, tertiary treated effluent of the latter, secondary sewage effluent without NTA, and tertiary effluent without NTA. Generally NTA had no dramatic effects on algal growth or primary productivity in Minnesota, North Carolina or Oregon lakes. Where there were stimulatory or inhibitory effects, they appeared to be related to the chelating properties of NTA and interaction with algal trace metal metabolism. Generally the stimulation of algal growth by phosphorus and by secondary sewage effluents was much greater than any stimulation resulting from NTA. There appeared to be an immediate, but slight, disappearance of NTA in lake and river sediments due to adsorption of NTA on particulate matter. After acclimitization there is a rapid disappearance of NTA and results suggest this is due to biochemical (microbial) degradation. (Jones-Wisconsin)
W75-10115

**MEASURES FOR THE RESTORATION AND ENHANCEMENT OF QUALITY OF FRESH-WATER LAKES.**
Environmental Protection Agency, Washington, D.C.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $2.85. Report EPA-430/9-73-005, 1973. 249 p, 6 fig, 19 tab, 229 ref, 10 append.

Descriptors: *Water quality, *Water pollution treatment, *Water pollution control, *Lakes, Nutrient removal, Cycling nutrients, Water types, Thermal properties, Public lands, Diversion, Sediment control, Oil wastes, Dredging, Sulfides, Destratification, Ammonia, Aeration, Mercury, Drawdown, Pesticides, Eutrophication, Arsenic compounds, Mechanical control, Biocontrol, Polychlorinated biphenyls, Chemcontrol, Harvesting, Radioactive wastes, Thermal pollution, Management, Water pollution sources, Toxins, Industrial wastes, Municipal wastes, Farm wastes, Mine drainage.
Identifiers: *Lake restoration, Water displacement, Phthalate esters.

Background information on lake environments followed by state-of-the-art information on remedial measures for enhancing and restoring the quality of lakes, ponds, and reservoirs is presented. The approach to the rehabilitation of degraded lakes is twofold: restricting input of undesirable materials and providing in-lake treatment for removal or inactivation of undesirable materials. Reducing or eliminating the sources of waste loading is the only restorative measure needed to achieve desired level of improvement in certain lakes in which natural flushing results in substantial improvements in quality. Remedial measures which restrict the input of contaminants include advanced wastewater treatment, nutrient diversion and allochthonous sediment control. Advanced wastewater treatment probably represents the best method available for curbing nitrogen and phosphorus input to waterways at moderate costs. Nutrient diversion may result in restoration in situations where incoming nutrient load enters from point sources. Useful existence of a water body can sometimes be prolonged by implementing control measures to reduce sedimentation rate. In-lake treatment measures in lake restoration programs now being investigated include dredging, nutrient inactivation, dilution and displacement, covering sediments, artificial destratification, and hypolimnetic aeration and drawdown. In advanced eutrophication stages attempts have been made to control nuisance organisms through mechanical, biological and chemical means. (Jones-Wisconsin)
W75-10122

**THE RECOVERY OF STREAM MACROBENTHOS FROM LOW PH STRESS,**
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
E. E. Herricks, and J. Cairns, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 843, $3.25 in paper copy, $2.25 in microfiche. Presented at The Midwest Benthological Society, 22nd Meeting, March 27-29, 1974. 14 p, 3 fig, 1 tab, 18 ref. OWRR B-034-VA(5).

Descriptors: Acid streams, Aquatic insects, Aquatic animals, Biological communities, Aquatic drift, Water quality, *Virginia, *Hydrogen ion concentration, *Benthos, Water pollution effects, Model studies.
Identifiers: Mill Creek(Va), Recovery(Streams).

The effects of short term low pH stress were studied in relation to recovery and restoration of aquatic macrobenthic communities. Experimental acid additions were made to a healthy productive stream, reducing pH to 4.0 from 8.0 for 15 minutes. Diversity and density were decreased (d 3.91 and 74 organisms/sq ft before acid vs. d 2.79 and 43 organisms/sq ft after acid). Recovery was related to downstream drift of recolonizing organisms; full recovery occurred within 19 to 28 days with density and diversity equaling or exceeding pre-stress values. A second study was made to observe drift born recolonizing organisms. Baetis sp. dominated

drift collections, and was the most abundant taxa in bottom fauna collections indicating a relationship between drift and recovery. Average drift intensity was 10 organisms or less during one 15 minute drift sample; drift rates were calculated to be in excess of 5,000 organisms/day.
W75-10127

**THE EFFECTS OF SELECTED HERBICIDES ON BACTERIAL POPULATIONS IN AN AQUATIC ENVIRONMENT,**
Clemson Univ., S.C. Dept. of Microbiology.
R. N. Ferebee.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 884, $4.75 in paper copy, $2.25 in microfiche. Ph.D. Dissertation, December 1972. 93 p, 15 fig, 10 tab, 70 ref. OWRT A-022-SC(2).

Descriptors: *Bacteria, Aquatic microorganisms, *Herbicides, Pollutants, *Water pollution effects, Culture, Reservoirs, 2,4,5-T, *Paraquat, Ureas, Organic acids, Eutrophication.
Identifiers: *Mesophillic bacteria, *Heterotrophic bacteria, *Diuron.

A laboratory culture system was used to continuously culture mesophilic, heterotrophic bacteria derived from a freshwater reservoir. Alterations in bacterial numbers and diversity of genera were studied both before and after additions of selected herbicides. Identical techniques for isolation and identification were used to compare culturable heterotrophic bacteria from a freshwater reservoir with those in the laboratory culture system. Three chemicals, representing the phenoxyalkonic acid, substituted urea, and dipyridyl classes of herbicides, were added to circulating vat culture vessels which contained untreated reservoir water. At concentrations to 1.4 mg/1, 2,4,5-T did not significantly affect that portion of the bacterial population tested. When the bacteria were exposed to 1.4 mg/1 paraquat there was an increase in counts and evidence for an envirhcment process. Findings following use of this herbicide suggest both direct and indirect effects on the bacterial populations. Diuron (1.4 mg/1) caused rapid increases in total counts with a following decrease. This herbicide also appeared to cause a decrease in genera diversity. The herbicides tested all remained qualitatively measurable in the culture system for three weeks.
W75-10133

**THE EFFECT OF A FUEL OIL SPILL ON BENTHIC INVERTEBRATES AND WATER QUALITY ON THE ALASKAN ARCTIC SLOPE, HAPPY VALLEY CREEK NEAR SAGWON, ALASKA,**
Geological Survey, Anchorage, Alaska.
J. W. Nauman, and D. R. Kernodle.
Available from Sup Doc, D.C. 20402, $3.15 single journal copy; $18.90 yearly subscription rate. Journal of Research of the U.S. Geological Survey, Vol 3, No 4, p 495-500, July-August 1975. 4 fig, 2 tab, 10 ref.

Descriptors: *Oil spills, *Environmental effects, *Alaska, *Water pollution effects, Benthos, Invertebrates, Water quality, Oily water, Oil pollution.
Identifiers: *Sagwon(Alaska), Happy Valley Creek(Alas).

Samples of aquatic organisms and water were collected upstream and downstream from leaks and spills of arctic diesel fuel oil into Happy Valley Creek near Sagwon, Alaska. All groups of benthic invertebrates were reduced in abundance at the downstream boundary of the spill area, whereas invertebrates at an upstream site were unaffected. No signficant differences in field water-quality characteristics were found between the two sites. (Woodard-USGS)
W75-10140

**FISH VIRUSES: BUFFERS AND METHODS FOR PLAQUING EIGHT AGENTS UNDER NORMAL ATMOSPHERE,**
Bureau of Sport Fisheries and Wildlife, Kearneysville, W. Va. Eastern Fish Disease Lab.
K. Wolf, and M. C. Quimby.
Appl Microbiol, Vol 25, No 4, p 659-664, 1973.
Identifiers: Atmosphere, Bluegill, Buffers, Carpio, Cells, Channel catfish, Eel, Egtved, *Fish viruses, Hematopoietic, Lymphocystis, Myxovirus, Necrosis, Pancreatic, Plaquing, Rhabdovirus, Viruses, *Plaque assay, *Methodology.

A universal procedure was sought for plaque assay of 8 fish viruses (bluegill myxovirus, channel catfish virus, eel virus, Egtved virus, infectious hematopoietic necrosis virus, infectious pancreatic necrosis virus, lymphocystis virus and the agent of spring viremia of carp (Rhabdovirus carpio), in dish cultures of various fish cells. Eagle minimal essential medium with sodium bicarbonate-CO2 buffer (Earle's salt solution) was compared with minimal essential medium buffered principally with tris (hydroxymethyl) aminomethane or N-2-hydroxyethylpiperazine-N' -2' -ethanesulfonic acid at a pH or in the range of 7.6-8.0 depending upon temperature. Five fish cell lines collectively capable of replicating all fish viruses thus far isolated were tested and quantitatively found to grow comparably well in the 3 media. Two-phase (gel-liquid) media incorporating the various buffer systems allowed plaquing at 15-33C either in partial pressures of CO2 or in normal atmosphere, but greater efficiency and sensitivity were obtained with the organic buffers and, overall, the best results were obtained with tris(hydroxymethyl)-aminomethane. Epizootiological data, specific fish cell line response and plaque morphology permit presumptive identification of most of the agents. At proper pH, use of organic buffers obviates the need for CO2 incubators.--Copyright 1973, Biological Abstracts, Inc.
W75-10257

**BENTHAL DECOMPOSITION OF ADSORBED OCTADECANE,**
Rutgers - the State Univ., New Brunswick. N.J.
H. L. Allen.
Available from University Microfilms, Inc., Ann Arbor, Michigan, 48106. Order No 74-27,578. PhD Thesis, 1974. 351 p.

Descriptors: *Oil pollution, *Water pollution effects, *Dissolved oxygen, Benthos, Environmental effects, Oil wastes, *Biodegradation, *Degradation(Decomposition), Adsorption.
Identifiers: *Octadecane.

An experimental flowing stream system was designed to test the environmental impact of octadecane, a significant component of crude oil. It is known that the long term adverse effects of oil pollution are primarily the destruction of the benthos by deposited oil and the reduction in dissolved oxygen concentration. The process involves both aerobic and anaerobic phases. This research attempted to characterize the behavior of a benthic deposit containing octadecane under varying conditions of seed concentration, flow rate, dissolved oxygen concentration, surface area, nutrient concentration, and salt concentration, and to determine rate controlling factors. Its objective was also to determine the relationship between the benthal decomposition of adsorbed octadecance and the overall oxygen uptake to the benthal deposit. It was found that: decomposition of suspended octadecane proceeds at a rate about 1.10 that of sewage; benthal oxygen uptake rate is a function of initial seed volatile concentration at the deposit surface; the effect of flow rate is partly attributed to the base activity of the deposits and partly to the adsorbed octadecane on the nature of the deposit-water interface; low nitrogen levels inhibit benthal oxygen uptake but low phosphaorus levels do not; and both the benthal oxygen uptake rate at constant flow and the effect of flow rate on uptake rate are functions of the reciprocal surface area of confined deposits. (Prague-FIRL)
W75-10260

## 5D. Waste Treatment Processes

**DESALTING PLANTS INVENTORY, RE NO. 5,**
Hawaii Univ., Honolulu. Coll. of Busines
For primary bibliographic entry see Field 3A
W75-09852

**TREATABILITY OF TEXTILE-DOMI WASTE MIXTURES,**
Auburn Univ., Ala. Dept. of Civil Engineerin
J. F. Judkins, Jr.
Available from the National Technical Inf tion Service, Springfield, Va 22161 as PB-24 $4.75 in paper copy, $2.25 in microfiche. Al Water Resources Research Institute, Auburn letin 23, February 1975. 86 p, 20 fig, 7 tab, 39

Descriptors: *Waste water treatment, Biol treatment, Activated sludge, *Domestic w Recycling, Alkalinity, Kinetics, Mixing, Tem ture.
Identifiers: *Textile wastes, Activated treatment, Textile-domestic wastes mix Joint treatment.

Qualitative and quantitative treatability inf tion was obtained on highly alkaline mixtu textile and domestic waste without pH adjust Mixture ratios, detention time, rate of solids cle, and temperature effects were investi The kinetic coefficients were determined for textile-domestic waste mixtures which used t waste from a single uniform batch. The max specific growth rate did not vary significant changes in textile-domestic waste mixture within a given textile batch. In general the s tion constant (Ks), yield coefficient (Y), and constant (Kd) increased as percentages of t waste in the mixture increased. At a given m ratio as temperature increased from 15 to maximum specific growth rate increased decreased, Y increased, and Kd remained stant. In order to predict the effect of temper change on the kinetic coefficients, values for the van't Hoff-Arhenius relationship determined for 10:90 and 25:75 textile dom waste mixtures. At a given temperature as th centage of textile waste in the mixture incr from 10 percent to 25 percent maximum sp growth rate, Ks, and Kd increased.
W75-09859

**MEANS FOR AND METHOD OF PURIF CONTAMINATED WATER,**
For primary bibliographic entry see Field 3A.
W75-09864

**WASTE WATER TREATMENT PLANT W BALANCED LOAD,**
Kappe Associates, Inc., Rockville, Md. (assig
S. E. Kappe, and D. C. Heil.
U S Patent No 3,886,065, 3 p, 3 fig, 4 ref; Of Gazette of the United States Patent Office, 934, No 4, p 1592, May 27, 1975.

Descriptors: *Patents, *Waste water treatm *Waste water disposal, Water levels, Flow trol, Flow augmentation, Water storage, Sto tanks.

A waste water treatment plant is described receives waste water at a widely fluctuating rate and discharges the treated water at a more uniform, balanced or averaged flow The aeration and clarification tanks themse are used to store the excess at peak loads higher water level; and a conduit that discha from the clarification tank has metering open to restrict the discharge of liquid from the cl

tank. Thus the liquid level in the aeration
rification tanks will rise or fall with fluctua-
waste flow to the treatment plant; but the
water will leave the plant at a much more
flow rate. (Sinha-OEIS)
867

E DISPOSAL SYSTEM,
on.
ent No 3,886,068, 7 p, 9 fig, 5 ref; Official
of the United States Patent Office, Vol
4, p 1592, May 27, 1975.

ors: *Patents, *Waste water treatment,
treatment, *Foam fractionation, *Foam
on, Separation techniques, Filtration,
, Water pollution treatment.

n for treating sewage is described in which
r of interconnected stations, in combina-
t both liquid and solid sewage to produce
e residue, useful as fertilizer, mulch, or
over and potable effluent. Raw sewage is
a slurrer where waste solids are broken
o small particles and treated with chemi-
isinfect, discolor and deodorize it. It is
to a foam generator which generates the
o an odorless foam. This foam is pumped
n facility where the foam is accumulated
ffluent separated from it via a fine wire
tinuous conveyor through which the ef-
drained or filtered leaving a mat-like
hich is removed from the conveyor into
s. The effluent drains into a reservoir in-
erator means which aerate the effluent,
h it is fed into a drain. (Sinha-OEIS)
9

AND EFFLUENT TREATING

z.
t No 3,886,073, 4 p, 8 fig, 6 ref; Official
f the United States Patent Office, Vol
p 1594, May 27, 1975.

rs: *Patents, *Waste water treatment,
treatment, *Water pollution treatment,
techniques, *Flocculation, Filtration,

pumped from the primary sewage treat-
tion through a module at which time a
g agent is introduced into the sewage.
ge and flocculent are agitated and
mixed in this module and it then passes
ion of flocculent module at which time
rity of the flocculated material is
out by baffles. The deflocculated ef-
passes to conventional first and second
ing tanks. Means are provided to back
modules to remove the flocculated
d cleanse the modules when necessary.
S)

FOR TREATING WATER,
Development Corp., Newfane, Vt.

aughlin.
No 3,887, 459, 11 p, 4 fig, 2 tab, 5 ref;
zette of the United States Patent Of-
5, No 1, p 293, June 3, 1975.

: *Patents, *Waste water treatment,
llution control, *Sewage treatment,
llution, Powerplants, Cooling, Aera-
, Waves(Water), Turbulence.
Translatory waves.

on pertains to cooling water effluent
generation stations to prevent thermal
natural bodies of water and in another
pertains to a more efficient method of
d treating sewage. A process is
r treating a body of water to cool and

to increase the dissolved oxygen content of the water by producing controlled translatory waves in the body of water. The process includes storing water in a reservoir at a selected height above the level of the body of water, periodically releasing specified quantities of water from the reservoir at a point below the level and in an upward direction toware the surface and into the body of water. The upward direction of the released water is accomplished by releasing the water against a deflector located near the base of the reservoir. The released water forms a translatory wave in the body of water and as it moves away from the reservoir, it breaks causing effective mixing of air and water, cooling the water and increasing the oxygen content of the water. The translatory wave produced is referred to a plunger breaker type. In this type of wave, the waves curl over in breaking enclosing an air pocket which explodes during the breaking process. This action accomplishes excellent mixing of air and water and where solid particles are present, breaking and pulverizing of the particles. (Sinha-OEIS)
W75-09874

**MAKING ACTIVE CARBON FROM SEWAGE SLUDGE,**
Combustion Engineering, Inc., Windsor, Conn. (assignee)
R. D. Nickerson, and H. C. Messman.
US Patent No 3,887, 461, 3 p, 1 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 935, No 1, p 293, June 3, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Waste disposal, Separation techniques, *Activated carbon, Adsorption, Water pollution treatment.
Identifiers: Pyrolitic treatment.

Sewage is subjected to primary treatment which includes allowing solids to settle out in a settling tank, and conveying the solids to a dryer where they are at least partially dried by hot gases. The sewage water moves on to a subsquent treatment tank where it can be treated with further additives. The solids are subjected to pyrolitic treatment in a furnace at temperatures within the range of 500 deg C-1000 deg C by passing a stream of hot gases through it. Active carbon and char are formed. The active carbon is separated from the char by entraining it in the gases leaving the furnace. The gases discharged from a fluidized bed pass through a wet scrubber where the fine carbon particles carried along in the gas stream are separated out. The separated carbon particles are relatively pure active carbon. The carbon slurry is recycled to the sewage system to absorb impurities from the sewage and to improve the quality of primary effluent. (Sinha-OEIS)
W75-09875

**METHOD FOR PURIFYING WASTE WATER,**
T. Minegishi.
US Patent No 3,888,751, 4 p, 6 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 935, No 2, p 721, June 10, 1975.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution control, *Electrolysis, Industrial wastes, Coagulation, Flocculation, Filtration, Separation techniques.

A method and device is described for purifying waste water by subjecting the water to a localized water electrolysis for the promotion of the flocculation of the solid waste material and its subsequent removal. Electrodes are positioned within a tubular member located within a vessel containing the waste water and the waste water is introduced into an electrolysis area located between two spaced electrodes which are subjected to a direct current potential. The incoming waste water is subjected to the action of the newly formed oxygen and hydrogen of the electrolysis process to cause a formation of nuclei which creates the flocculation or coagulation of the waste materials so that they are quickly separated from the water. The inorganic particles which are present in the waste water, particularly protein starch powder, fat, heavy metal, etc are coagulated so as to form separable balls of the material which may be made to float on the water surface of the vessel and which may be easily separated from the purified water and collected. (Sinha-OEIS)
W75-09882

**SEWAGE TREATMENT TANK,**
P. D'Aragon.
US Patent No 3,888,767, 3 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 935, No 2, p 726, June 10, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Sewage treatment, *Aerobic treatment, *Anaerobic digestion, Aeration, Septic tanks, Water pollution sources.
Identifiers: *Sewage treatment tanks.

The invention relates to a sewage treatment tank for the treatment of sewage from houses, hotels, garages, schools, and small industries where normal sewage collector systems do not exist. The sewage tank contains no mechanically moving parts and is composed of two adjacent compartments. In the first compartment most of the solids are separated from the liquids and are digested by anaerobs. The effluent passes to the second compartment where it is submitted to the action of aerobs in the presence of injected air. There is a pipe in each compartment adjacent to the wall separating the compartments. These pipes contain a plurality of holes in their upper portion which permits the continuous evacuation of gases produced in both the compartments. Both pipes also permit the removal of digested sediments from the compartments through the base of the pipes at predetermined intervals. The tanks may be made of many materials. Wood rendered impervious or plastics are both satisfactory materials. (Sinha-OEIS)
W75-09883

**APPARATUS FOR TREATING WATER CONTAINING IMPURITIES,**
Stanley Denki Kabushiki Kaisha, Tokyo (Japan); and Kabushiki Kaisha Inoue Japax Kenkyusho, Kanagawa (Japan). (assignees)
T. Techima, T. Nagasao, M. Tanaka, K. Ariga, and K. Inoue.
US Patent No 3,888,756, 5 p, 9 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 935, No 2, p 723, June 10, 1975.

Descriptors: *Patents, *Water purification, *Water pollution treatment, Water quality control, Demineralization, Industrial wastes, *Electrolysis, Electrodes, *Waste water treatment, Water treatment.

An apparatus is provided for treating drinking water or waste water containing impurities by the use of an electrolytic cell. The apparatus contains at least one pair of main electrodes opposed in the electrolytic cell to each other; a power source connected to the main electrodes; and a number of auxiliary electrodes places in pieces between the main electrodes. The auxiliary electrodes are uniformaly arranged in a mutually close relationship but insulated by nonconductive materials between the main electrodes so as to avoid any short circuit between the main electrodes. The nonconductive materials are placed in pieces so as to form a mixed filler layer together with the auxiliary electrodes. The nonconductive materials may be porous plastic holders. (Sinha-OEIS)
W75-09884

**REVIEW OF LITERATURE PERTINENT TO THE AQUEOUS CONVERSION OF RADIONUCLIDES TO INSOLUBLE SILICATES**

WITH SELECTED REFERENCES AND BIBLIOGRAPHY (REVISED),
Atlantic Richfield Hanford Co., Richland, Wash.
L. E. Brownell, C. H. Kindle, and T. L. Theis.
Available from NTIS, Springfield, Va. 22161, as Rept. No. ARH-2731 (Rev), $5.45 in paper copy, $2.25 in microfiche. Rept. No. ARH-2731 (Revised), December 1973. 119 p, 4 tab, 267 ref.

Descriptors: *Bibliographies, *Radioactive waste disposal, *Waste treatment, *Management, *Waste storage, Clays, Soils, Hydrothermal studies, Ion exchange, Cation exchange, Chemical reactions, Technology, Research and development, *Reviews.
Identifiers: Solidification, *Waste fixation.

Radioactive waste fission products and residual actinides in chemical processing plant wastes need to be isolated from biological processes until the radionuclides decay to innocuous levels. A promising method for effecting isolation is to convert the wastes to a highly insoluble material for final storage. The product should be inert for maximum immobility regardless of storage mode during the long-term and any interim storage. Naturally-occurring systems that may yield suitable product forms are the aluminosilicate mineral groups which form much of the earth's crust. Methods being investigated convert nuclear waste into crystalline aluminosilicate minerals wherein each of the nuclide cations are contained within individual molecular cages that constitute the crystal lattices. The literature pertinent to immobilization of cations by silicates, with emphasis on aqueous systems, was reviewed. This report summarizes the literature and includes a bibliography of about 600 references to assist other investigators. References are classified under the following groups: Clay materials, Structure, Technology and Chemistry, Absorption and Ion exchange. Cation Exchange, Fixation, and Diagenesis.
W75-09892

FAUNAL RESPONSE TO SPRAY IRRIGATION OF CHLORINATED SEWAGE EFFLUENT,
Pennsylvania State Univ., University Park. School of Forest Resources.
G. W. Wood, P. J. Glantz, D. C. Kradel, and H. Rothenbacher.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 678, $4.75 in paper copy, $2.25 in microfiche. Pennsylvania Institute for Research on Land and Water Resources University Park. Research Publication No. 87, June 1975, 89 p, 41 tab, 5 fig, 74 ref, append. OWRT B-059-PA(5). 14-31-0001-3932.

Descriptors: *Sewage effluents, *Irrigated land, Sludge, Wildlife, Mammals, Birds, E. coli, Mosquitoes, Song birds, Deer, Habitats, Microbiology, Chlorination, Water reuse, Recycling, Water pollution effects.
Identifiers: *Waste water irrigation, *Cottontail rabbit, Non-irrigated land, Sludge-injected effluent, Tissues analysis, Microbiological examination, Spray irrigation.

The only significant difference found in a 3-year comparison of cottontail rabbit populations confined to non-irrigated and sewage effluent irrigated aspen-white pineshrub habitat was in the significantly heavier body weights in the fall of juveniles on irrigated sites. Comparisons of spring and fall populations of mice in non-irrigated, effluent irrigated, and sludge-injected effluent irrigated mixed-oak forest habitat were made. Analyses of liver, kidney and bone tissues for cadmium, chromium, copper, nickel, lead and zinc were done on cottontail rabbits from effluent irrigated and non-irrigated sites. Whole-body analyses of dry ashed white-fotted mice carcasses for chromium, nickel, lead, and zinc were also made. Studies of the effects of effluent irrigation on production, nutritive quality, and use of deer forages in mixed-oak forest stands were done. Studies of songbirds revealed that their use of irrigated areas declined during the time of irrigation. A limited investigation of the influence of wastewater irrigation on disease incidence in several species of wild animals was done. Microbiological examination of the wastewater for total coliform, fecal coliform and fecal streptococci was done. (Sink-Penn State)
W75-09899

WATER CHLORINATION METHODS,
Capital Controls Co., Inc., Colmar.
For primary bibliographic entry see Field 5F.
W75-09910

ADVANCES IN AMMONIA AND NITRATE REMOVAL,
Dravo Corp., Pittsburgh, Pa.
E. S. Savage.
Industrial Water Engineering, Vol 11, No 4, p 12-16, July/August, 1974. 8 fig.

Descriptors: *Nitrogen, *Ammonia, *Industrial wastes, *Municipal wastes, *Waste water treatment, Toxicity, Eutrophication, Chlorine, Corrosion, Biological treatment, Denitrification, Microorganisms, *Nitrates.
Identifiers: Dravo Denite System.

Nitrogen present in industrial and municipal effluents can cause problems of toxicity, oxygen sag, eutrophication, chlorine demand, and corrosivity. Biological reduction of nitrates commonly occurs in waste treatment plants as a result of the action of facultative microorganisms which utilize oxygen from nitrates when the dissolved oxygen levels are too low. This naturally occurring process can be controlled and optimized for biological denitrification systems. Columnar denitrification, one type of system, is characterized by the fixed positioning of denitrifying bacteria in a packed column. Denitrification and suspended solids removal can be accomplished simultaneously in the same equipment. However, fouling of the denitrification filters and breakthrough of nitrate into the effluent at peak hydraulic rates or during low temperatures can also occur. The Dravo Denite System is described; the main components are the filter bottom, media, and control system. Its filter hardware can accommodate high loadings of suspended solids without excessive head loss and can backwash the high loadings from the filter without gradual fouling of the media and control system. The M-block filter bottom has inherent advantages in design, installation, and operation. Selection of the proper denitrification media depends on size, uniformity, density, and hardness. Automatic operation of the control system is recommended for the nitrogen purge cycle and for filter backwashing. The other controls should be as simple as possible without losing reliability and performance. (Orr-FIRL)
W75-09911

CARBON CONTACT-FILTRATION: HOW IT WORKS,
Seelye, Stevenson, Value, and Knecht, New York.
C. R. Lee, and T. Takamatsu.
Water and Sewage Works, Vol 121, No 8, p 84-87, August 1974. 9 fig, 1 tab, 20 ref.

Descriptors: *Activated carbon, *Waste water treatment, *Adsorption, *Tertiary treatment, Costs, Mathematical models, Chemical reactions, Separation techniques, Capital costs, Operating costs, Construction costs, Cost analysis, Cost comparisons, Maintenance costs.

Activated carbon treatment is used to remove dissolved organics or inorganics. The mechanism of removal can be adsorption which actually removes the dissolved organics from the solution and/or bio-oxidation of the adsorbed organics. The mechanism of adsorption is discussed. Physical adsorption results from inter-molecular forces of attraction. Chemical adsorption results from the formation of chemical bonds between molecules of the adsorbate and adsorbent. The sorption equilibrium depends on the concentrati of the materials, gas pressure, and temperatu Equations developed by Freundlich and Longm are presented. The theory of contact-filtration also discussed. Three modes are considered--s gle-stage system, multi-stage current flow syste and multi-stage counter-current flow syste Waste treatment cost is classified into two grou capital cost including construction, land, engine ing and contingency; and, operation and ma tenance cost including fuel, power, maintena materials and labor. When considering carb treatment costs, carbon inventory is included the capital cost and the make-up carbon and c bon regeneration costs are included in the ope tion and maintenance cost. A cost analysis presented for the actual expenses for carbon tre ment incurred at a South Tahoe, Nevada, wa reclamation plant during 1969 and 1970. Eq tions, figures, and graphs are used to illustrate penses and comparisons of costs. (Orr-FIRL)
W75-09912

CHARACTERIZATION OF MIXING AERATED LAGOONS,
McMaster Univ., Hamilton (Ontario). Dept. Chemical Engineering.
K. L. Murphy, and A. W. Wilson.
Journal of the Environmental Engineering Di sion, American Society of Civil Engineers, V 100, No EE5, p 1105-1117, October 1974. 7 fig tab, 18 ref.

Descriptors: *Aerated lagoons, *Waste wa treatment, *Mixing, Mathematical models, Ae tion, Oxygenation, Sewage treatment, *Oxidati lagoons.
Identifiers: Continuous Stirred Tank Reactor, Pl Flow Tubular Reactor.

Aerated lagoons have evolved from waste s bilization pond design as economical methods secondary treatment of large volumes of waste. rational approach for use in characterizing mixing behavior of aerated lagoons is presented. is generally assumed that an aerated lago behaves like a completely mixed reactor. The t idealized mixing extremes are the Plug Flow Tub lar Reactor (PFTR), a hypothetical vessel whe the fluid enters at one end and moves down vessel in uniform piston-like flow to the exit a the Continuous Stirred Tank Reactor (CST where mixing is so intense that no concentrati gradients exist and the concentration of the e stream is equal to the concentration at any point the vessel. Variations of these models and othe were fitted to tracer data taken from prototy aerated lagoons. The following conclusions we drawn from an analysis of the experimental da mixing patterns in aerated lagoons may differ si nificantly from the assumptions of either ide complete mixing or ideal plug flow; macromixi levels in aerated lagoons are more dependent upo lagoon geometry than upon aerator horsepow input over the range studied; dimensionless dispe sion number which characterizes the degree macromixing depends only on the lagoo geometry and flow rate; and the overall pe formance of aerated lagoons may be evaluate using the relatively simple unequally-sized CST in-series model. (Orr-FIRL)
W75-09913

SEWAGE PLAN WEDS FIVE MUNICIPAL TIES,
Parsons, Brinckerhoff, Quade and Douglas, Inc New York.
H. L. Michel, and J. V. Artale.
Water and Wastes Engineering, Vol 11, No 9, p 2 31, September 1974. 3 fig.

Descriptors: *Waste water treatment, *Sewa disposal, *Sewage treatment, Municipal waste Pumping plants, Sewerage, Trickling filter

ical treatment, Sewage lagoons, Chlorina-
lew Jersey, *Treatment facilities.

ve municipalities of Hamilton Township,
Windsor Township, Washington Township,
gh of Allentown, and part of the Township
per Freehold, all in the central part of New
have joined together in a sewage disposal
plan. The plan is technically, economically,
ally, and administratively attractive and is
ed to provide service for anticipated needs
ars from today. Two stage expansion of the
water treatment plant in Hamilton
hip is planned. The first stage would include
igh-rate trickling filter section for seconda-
gical treatment, additional digested sludge
, improvements to the post-chlorination
s and the recirculation pumping system in
tion of secondary treatment, construction
iles of interceptor sewers, 3 pumping sta-
d 4 miles of force mains, and a pumping
and force main to transport the treated ef-
lirectly to the Delaware River, about one
m the main treatment plant. The expansion
rease the capacity of the plant to 11 mgd.
cond stage of improving the waste water
nt includes a further expansion of the
nt plant capacity to 30 mgd, an increase in
g capacity, and the construction of five
ajor interceptors. The system is expected
mpleted by 1990. (Orr-FIRL)
914

ALYSIS OF RUNOFF IN AN URBAN
IN JAPANESE),

Kogyo Daigaku Kenkyu Hokoku,
ch Report of Chiba Institute of Technolo-
19, p 133-137, 1974. 3 fig, 4 ref.

ors: *Rainfall, *Sewage treatment,
pal water, *Runoff, Precipita-
nospheric), Analytical techniques, Rainfall
, *Urban runoff, Cities.
rs: Mannings law, *Tokyo(Japan).

of effective rainfall entering a sewage
in the Tokyo area were calculated and
d with observed values. The sewage chan-
ted is 4300 km long and its surrounding
nsidered to be 6.2 sq km. Market and re-
areas are located at the upper stream of
nel; industrial and business areas are
t the lower stream. Types of rainfall are
nto eleven categories based on the rainfall
and rainfall period. No clear relationship
effective rainfall and rainfall type was ob-
n all cases, the rainfall runoff to the
hannel was completed within one hour
precipitation stopped. The effective rain-
ased with an increase in the rainfall inten-
calculation used basic equations for the
rve, assuming Mannings law. (Katayama-
6

RADATION OF NTA DETERGENTS IN
EWATER TREATMENT SYSTEM,
pkins Univ., Baltimore, Md.
n.
Vater Pollution Control Federation, Vol
, p 2362-2371, October 1974. 3 fig, 2 tab,

rs: *Waste water treatment,
ts, *Phosphates, *Domestic wastes,
acetic acid, Water pollution sources.
: *Trisodium nitriloacetate, NTA.

l field test was performed to determine
radability of trisodium nitrilotriacetate
a domestic waste water treatment
e test was conducted over a three year
the Elm Farm Mobile Home Park near
ge, Va. The waste water treatment plant
of a 25,000 gallon mixed liquor basin,
aerated and mixed by an aerator driven by two 2.5 hp compressors. The mixed liquor is displaced to a conical clarifier through a submerged line to the clarifier's stilling well. The treated waste water is released to a stream; the waste sludge is disposed of on tilled land. The first release of the detergent to the community resulted in two findings: the total phosphorus in the treated waste water dropped from 18 to 20 mg/liter to 10 mg/liter in the first week and continued downward through the following weeks to a steady low of around 8 mg/liter; and, the community used much more of the detergent than was expected. The initial results indicated that the plant was unable to acclimate itself to shock concentrations of NTA. The detergent was again released to the community and the phosphorus and NTA levels were monitored. The results of this part of the study indicated that the plant influents had acclimated to 40 mg/liter NTA and consistently yielded effluents in the range of 0.3 to 1.0 mg/liter NTA. Good performance of the system was also shown by MBAS concentrations of less than 0.5 mg/liter and DOC reductions of 70 percent in the effluent. (Orr-FIRL)
W75-09920

**BIOLOGICAL PURIFICATION OF WASTE WATER AND SEWAGE.**
French Patent 11433W/07. Issued December 20, 1974. Derwent French Patents Report, Vol W, No 7, p 3, March 25, 1975.

Descriptors: *Waste water treatment, *Patents, *Biological treatment, *Sewage treatment, Oxidation, Sludge treatment, Aeration, Aerobic treatment, Bacteria, Treatment facilities.
Identifiers: Extended aeration.

A biological treatment process for waste water and sewage coming from small and medium sized communities involves total oxidation (extended aeration). Crude effluent is admitted directly into an oxidation-settlement tank which is equipped with a floating turbine to stir and homogenize the medium with an intense introduction of oxygen. This causes direct oxidation, allowing aerobic bacteria to live and multiply. After the aeration phase, the turbine is stopped and settlement takes place. The sludge falls to the bottom and the upper layer rapidly becomes limpid; it is evacuated through an automatic overflow valve. After the evacuation of the purified water, the valve closes and the plant may begin another cycle. (Prague-FIRL)
W75-09921

**AERATING EFFLUENT AND KEEPING SLUDGE IN SUSPENSION.**
French Patent 57251V/32. Issued September 27, 1974. Derwent French Patents Report, Vol 47, No 5, p 3, December 31, 1974.

Descriptors: *Patents, Aeration, Effluents, Suspensions, Sludge, Jets, Waste water treatment, Flow, Activated sludge.

Effluent is aerated and activated sludge is held in suspension by jets of water obliquely striking the surface. The vessel used may be circular, eliptical or polygonal in plan and is of constant cross-section through the greater part of its height. Jets strike the surface at not more than 60 degrees, preferably 10 to 20 degrees to the surface with a speed of between 3 to 12 m/sec (preferably 4 to 8 m/sec). The horizontal component of the tangent is in the general direction of the flow. (Prague FIRL)
W75-09922

**WATER TREATMENT WITH OZONE.**
For primary bibliographic entry see Field 5F.
W75-09923

**SEWAGE AND EFFLUENT BIOLOGICAL TREATMENT PROCESS.**
Belgian Patent 82653V/48. Issued November 4, 1974. Derwent Belgian Patents Report, Vol 5, No 48, p 2, January 7, 1975.

Descriptors: *Sewage treatment, *Patents, *Oxygen, Biological treatment, Effluents, Valves, *Waste water treatment, Liquids, Tanks, Separation, *Oxygenation.
Identifiers: Countercurrents.

A sewage and effluent biological treatment process uses oxygen in counter-current flow with liquid containing suspended oxidizable matter. The plant facility is designed for activated sludge treatment of sewage, industrial effluents and fermentation liquors. Liquid to be treated enters a series of covered oxygenation tanks; these communicate with each other through openings in the separating partitions. Automatic valves control the oxygen content of the gaseous phase, held at a predetermined value. Oxygen or air enriched with oxygen circulates counter-current to the liquid. The treated liquid leaves the last tank to pass into a separating tank from which the settled sludge is recycled back to the first tank. With regular oxygen feed into the various tanks, better operating conditions result: consumption of oxygen is reduced; the energy balance is improved; and the dimensions of the settlement tank can be reduced. (Prague-FIRL)
W75-09924

**BIBLIOGRAPHY ON THE APPLICATION OF REVERSE OSMOSIS TO INDUSTRIAL AND MUNICIPAL WASTEWATERS,**
Department of the Environment, Ottawa (Ontario). Waste Water Technology Centre.
H. K. Johnston, and H. S. Lim.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 18, (1973). 117 p, 5 fig, 1 tab, 730 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Reverse osmosis, *Membrane processes, *Municipal wastes, Membranes, *Bibliographies, Filtration.
Identifiers: *Ultrafiltration.

A bibliography has been developed of the literature published in the period 1968-1973, inclusive, on the various applications of reverse osmosis. The references presented emphasize the use of reverse osmosis for the treatment of industrial and municipal waste waters. The introduction provides information on the physical-chemical nature, theories, and mechanisms of the reverse osmosis process. Membrane properties, fabrication, and configurations for different applications are discussed in addition to various membrane cleaning techniques. A list of companies selling commercial reverse osmosis or ultrafiltration equipment is also included. (Orr-FIRL)
W75-09925

**REVIEW OF THE CANADIAN METAL FINISHING INDUSTRY: CONSUMPTION OF RAW MATERIALS AND OPTIONS FOR WATER POLLUTION CONTROL.**
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
Economic and Technical Review Report No. EPS 3-WP-75-2, March 1975. 151 p, 6 fig, 24 tab, 11 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Reviews, Water pollution control, Water reuse, *Canada, Metals, Legislation, Pollution abatement.
Identifiers: *Metal finishing industry, Chemical recovery, Metal recovery, Cyanide removal.

A review is presented of the processes used in the Canadian metal finishing industry, its waste products, and waste reduction processes. Background information is organized into various

sections dealing with: the mechanical, physical, non-metallic coating, chemical, and electrolytic processes, and waste water constituents; the results of a survey of the metal finishing industry; water pollution prevention practices such as substitution, water use, control of accidental spills and leaks, drag-out and drainage, reclamation, regeneration, solution concentration, and supervision; in-plant water pollution control techniques such as stream separation, water reuse, recovery of chemicals and metals, and concentrated dumps; removal of cyanide and chromium as well as other metals; and, existing Canadian legislation. (Orr-FIRL)
W75-09926

**FREEZE CRYSTALLIZATION: NEW WATER-PROCESSING TOOL,**
N. R. Iammartino.
Chemical Engineering, Vol 82, No 13, p 92-93, June 23, 1975. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Cooling towers, Pulp and paper industry, Water reuse, Potable water, Costs, Water purification.
Identifiers: *Freeze-crystallization, *Crystalex process, Electroplating wastes.

The Crystalex process has been developed by Avco Systems Division for use in purifying a wide range of industrial wastes such as electroplating wastes, cooling-tower blowdown, pulp mill bleach streams, and various inorganic and organic waste streams. The Crystalex process is a freeze-crystallization technique based on the principle that ice crystals formed by freezing in an aqueous medium are always pure. The mechanics of the process plus a schematic illustration are discussed. The Crystalex process can recover up to 95 percent of the influent as pure water for reuse. Production of potable water and recovery of valuable products are other uses of this process. Advantages of the process include: minimization of corrosion problems and construction materials cost by running at low temperatures and avoiding heat-transfer surfaces in the crystallization stage; elimination of costly pretreatment; consumption of a modest amount of energy; and, production of a high water recovery ratio. The installed cost of a 100,000 gal/day crystalex module is estimated at $400,000-650,000; significant economies of scale exist. (Orr-FIRL)
W75-09927

**JOINT TREATMENT OF PULPING AND MUNICIPAL WASTES,**
Procter and Gamble Co., Cincinnati, Ohio. Environmental Control Section.
C. A. Barton, J. F. Byrd, C. R. Faulkender, and O. H. Moss.
Journal Water Pollution Control Federation, Vol 47, No 5, p 998-1004, May 1975. 1 fig, 3 tab, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Municipal wastes, *Activated sludge, Cost allocation, Pulp and paper industry, Effluent, Treatment facilities, Wisconsin.
Identifiers: *Contact stabilization, Green Bay(Wisc), *Combined treatment.

The City of Green Bay, Wisconsin, the Charmin Paper Products Company, and the American Can Company are involved in the construction of a $60 million treatment plant for their combined wastes. The plant will be an activated sludge facility utilizing contact stabilization. It will be ready for start-up in 1975. The cooperation between the city, the mills, and the Green Bay Metropolitan Sewerage District in developing the contracts and financial arrangements for the joint treatment system is described. The rate structure, or cost allocation, was developed to depend on each mill's flow, BOD, and SS load. The final rate each year will reflect actual load as developed from the annual audit of the District's financial records. Basically, the contract between the city, the mills and the district states that the District will provide adequate treatment of the pulp mill effluent, the city will collect the sewer service charges, and the individual mills will pay their share of the operating costs based on actual loads and their share of the capital cost based on the design loads. (Orr-FIRL)
W75-09928

**MUNICIPALITY AND INDUSTRY JOIN IN WASTEWATER TREATMENT.**
Public Works, Vol 106, No 5, p 89-90, May 1975. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Municipal wastes, Activated sludge, Filters, Incineration, Cost allocation, Cities, Treatment facilities, Sludge, Ohio.
Identifiers: Hamilton(Ohio), Champion International, Paper mills, Vacuum filters, Fluid bed incinerator, *Combined treatment.

The City of Hamilton, Ohio, and the nearby paper mills of the Ohio Division of Champion International are constructing a waste water treatment facility for their combined wastes. The joint plant represents major savings in capital investment and operating costs for both the city and company. The facility will be an activated sludge plant consisting of aeration tanks and final clarifiers, with effluent aeration and five vacuum filters for dewatering the city's primary sludges, plus all secondary sludges generated, followed by incineration of the sludges in a fluid bed incinerator. The completed plant will be able to process 72,000 lbs dry solids per day and a maximum anticipated 1985 peak load of 32 mgd of waste water. Capital costs will be based on flow, BOD loading, sludge loading and an average weight factor of associated capital costs. Operating costs will be based on the actual loads. The present projected construction cost is $13 million; the completion date is late 1976. (Orr-FIRL)
W75-09929

**VACUUMING WASTE FROM WATER.**
American Machinist, Vol 119, No 11, p 52, June 1975.

Descriptors: *Waste water treatment, *Industrial wastes, Treatment facilities, Coolants, *Filters, Sludge disposal, Rivers, Landfills, Effluents, Dewatering, Equipment, *Filtration, Illinois, Separation techniques.
Identifiers: *Vacu-matic sludge filters, Oil-sludge particles, Chemical treatment.

International Harvester's East Moline, Illinois plant has recently installed a $500,000 waste water treatment facility. The facility treats contaminated machine coolant and other liquids, separating the filtered water which is pumped into the river from the sludge waste which is disposed of in a landfill. The contaminated water comes from a variety of machines and processes including lathes, drilling machines, paint preparation area, milling and hobbing equipment, saws and cutoff machines, and wash booths. The waste water is first channeled to large underground collection tanks. It is then piped to two settling tanks where floating oil-sludge particles are skimmed from the surface. The effluent is transferred to a floatation tank where chemicals are added and the resultant sludge is skimmed and dewatered for hauling. Chemical treatment consists of the addition of lime, alum, and an anionic polyelectrolyte. Dewatering of the sludge is accomplished with the aid of a Vacu-matic sludge filter. The sludge filter has a relatively large filtering zone for effective sludge cake generation. The filtering media does not have to be separated from the sludge because it is made of paper and decomposes in the landfill. The installation is capable of processing 54,000 gal of contaminated liquid every 24 hours. (Orr-FIRL)
W75-09930

**POLLUTION ABATEMENT IN THE PHA MACEUTICAL INDUSTRY,**
National Environmental Research Center, Edis N.J. Industrial Waste Treatment Research Lab
P. B. Lederman, H. S. Skovronek, and P. E. DesRosiers
Chemical Engineering Progress, Vol 71, No 4 93-97, April, 1975. 5 tab, 19 ref.

Descriptors: *Waste water treatment, *Industr wastes, Biological treatment, Activated sludg Aerated lagoons, Trickling filters, Treatme facilities, Adsorption, Reverse osmosis, Filt tion, Coagulation, Sedimentation, Chemi wastes, *Pollution abatement, Organic wastes.
Identifiers: *Pharmaceutical wastes, Ozone tre ment, Toxic wastes.

Pollution abatement in the pharmaceutical indu try is discussed. A summary is presented of study initiated in 1972 by the Pharmaceuti Manufacturers Association (PMA) to compile formation on the sources, volumes, and chara teristics of the industry's wastes, current tre ment processes, and future treatment needs. T industry's wastes were segregated into: formu tion/packaging; chemical synthesis; fermentatio biological products, and, extraction of natu products. Many generalities were made for each these segments but precise waste volumes, chara teristics or treatability could not be determine Biological treatment practices are commonly us for both on-site complete treatment, and pre-tre ment before discharge to a municipal facility. A tivated sludge and aerated lagoons are replacin the trickling filters used in older treatment faci ties. The general conclusion is that differe biological treatment methods, together wi segregation of strong or toxic wastes, neutraliz tion, and conventional coagulation and sediment tion, are capable of obtaining about 90 perce removal of BOD5 for all types of pharmaceutic wastes. The cost of the waste water treatment w found to range from $0.76/1000 gal to $2.27/10 gal. Future treatment needs include the use of a vanced waste water treatment processes such carbon adsorption, reverse osmosis, ultrafiltr tion, and ozone treatment, as well as mo research on ultimate disposal and/or resour recycling. (Orr-FIRL)
W75-09931

**RECOVERING ORGANIC MATERIALS FRO WASTEWATER,**
Rohm and Haas Co., Philadelphia, Pa.
B. W. Stevens, and J. W. Kerner.
Chemical Engineering, Vol 82, No 3, p 84-8 February, 1975. 2 fig, 1 tab, 10 ref.

Descriptors: *Waste water treatment, *Industri wastes, *Polymers, Adsorption, *Chemic wastes, Costs, Activated carbon, Organic com pounds, Solvents, *Organic wastes, Separatio techniques.
Identifiers: *Pharmaceutical wastes, Nontherm regeneration, *Recovery(Organic wastes).

The use of polymeric adsorbents for separatin and recovering organic compounds from chemic and pharmaceutical waste waters has been rapid increasing. Polymeric adsorbents permit no destructive adsorption, which allows recovery costly or short-supply products, and nontherm regeneration, which reduces fuel bills. A com parison of polymeric adsorbents with activate carbon is made. Polymeric adsorbents are good f both polar and nonpolar material, while activate carbon is good only for nonpolar substances. Bin ing energies of polymeric adsorbents are lowe than those of activated carbon for the same o ganic molecules, thus requiring smaller energy i puts for desorption. Solvent regeneration polymeric adsorbents is most effective when pe formed in situ. Careful selection of the solvent wi permit the recycling of a regenerant stream lade with an adsorbed organic compound thereby form ing a closed-loop, materials-recovery proces

Capital costs of polymeric adsorbent systems are comparable to those of activated carbon. Operating costs are less for polymeric adsorbent systems than for carbon systems when the concentration of dissolved organics is high. (Orr-FIRL)
W75-09932

TERTIARY TREATMENT: ADVANCED WASTEWATER TECHNIQUES,
. A. Young, P. N. Cheremisinoff, and S. M. eller.
ollution Engineering, Vol 7, No 4, p 26-33, April, 975. 7 fig.

escriptors: *Waste water treatment, *Industrial astes, *Tertiary treatment, Chemical precipitaon, Sedimentation, Nutrient removal, Activated rbon, Ion exchange, Chlorination, Reverse ososis, Electrodialysis, Freezing, Ozone, Foam paration.
entifiers: Physical-chemical treatment, Amonia stripping, Ionizing radiation.

dvanced waste water treatment methods can be her chemical or physical processes. There is rrently an increasing use of physical-chemical eatment over biological treatment most probably e to physical-chemical treatment's amenability instrument-automated control, reduced space quirements, better removal of toxic substances ch as heavy metals, and ability to adjust to varile influents and upset conditions. Sedimentan, chemical precipitations, phosphorus moval, activated carbon adsorption, ion change, ammonia stripping, chlorination, verse osmosis, electrodialysis, freezing, foam paration, ozonation, and ionizing radiation are processes used for the tertiary treatment of ste water. (Orr-FIRL)
5-09933

AVY METAL ADSORBENT.
nch Patent 01489V/01. Issued March 14, 1975.
nch Patents Abstracts, Vol W, No 17, p 3, e, 1975.

scriptors: *Waste water treatment, *Industrial stes, Resins, Heavy metals, *Patents, dsorption, Construction materials.
ntifiers: *Heavy metals removal.

adsorbent resin for the efficient removal of vy metals or heavy metal compounds in liquids gases, such as industrial waste water, river er, and automobile exhaust, is prepared by ting an aldehyde and/or a dithicarbamate with romatic compound having an OH, SH, NH2, OH, or COOMe group, where Me is Na, K 4, or 1/2Ca. It can be used in the form of a ular bed added to materials, such as concrete, ch are then used as containers for heavy metal tions, or for the production of pipes to transmaterial containing heavy metals. (Orr-FIRL)
-09934

TRUCTION OF SPENT OIL-WATER ULSIONS--USING INCANDESCENT COKE ORE QUENCHING,
ian Patent 22521W/14. Issued March 3, 1975.
vent Belgian Patents Report, Vol W, No 14, p ay, 1975.

riptors: *Waste water treatment, *Industrial es, Metals, *Patents, Oily water, Emulsions, ater interfaces.
ifiers: *Oil-water emulsions, Rolling mills, ace finishing plants, Coke.

destruction of spent oil-water emulsions is aclished by applying the emulsions or residues ned from such emulsions to the surface of inescent coke after it has been discharged from ven but before it has been quenched. The sion or its residue is applied from a pipe openbove the surface of the incandescent coke. This method provides an inexpensive way of disposing of large quantities of oil-water emulsions from metal processing plants such as rolling mills or surface finishing plants. Part of the material may be recovered through this technique. Iron turnings derived from metal processing do not interfere with the process and the metal is recovered when the coke is used in a blast furnace or cupola. The method is successful with residues containing oil in an amount equal to or less than 70 percent. (Orr-FIRL)
W75-09935

MEMBRANE PROCESSING IN THE METAL FINISHING INDUSTRY,
Abcor, Inc., Cambridge, Mass. Walden Research Div.
R. L. Goldsmith.
Transactions of the ASME, Journal of Engineering for Industry, Vol 97, No B-1, p 238-245, February, 1975. 4 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Membrane processes, *Reverse osmosis, Filtration, Coolants, Effluents, Incineration, Oil, Water reuse, Metals.
Identifiers: *Metal finishing industry, *Ultrafiltration, Electroplating wastes, Oily wastes.

Two important applications of membrane processing in the metal finishing industry are the use of reverse osmosis (RO) for electroplating waste treatment, and ultrafiltration (UF) for concentration of oily wastes before disposal. Reverse osmosis can be used for the closed-loop treatment of plating bath rinse waters with recycle of the plating chemicals and reuse of the purified water in rinsing operations. Closed-loop RO for treatment of segregated rinse waters and for treatment of mixed effluents are discussed in detail with reference to the advantages and limitations of each. In the treatment of waste-oil emulsions by UF, water and some low-molecular weight materials pass through the membrane, while the emulsified oil droplets and suspended particles are retained, concentrated, and continuously removed. UF is capable of concentrating emulsions to greater than 50 percent oil. These can be incinerated without the addition of fuel, or the oil can be reused by upgrading it to a fuel or lubricant. Data are presented for the UF concentration of several spent oil-containing coolants. (Orr-FIRL)
W75-09936

FACTORS INFLUENCING REVERSE OSMOSIS REJECTION OF INORGANIC SOLUTES FROM AQUEOUS SOLUTION,
Ford Motor Co., Dearborn, Mich. Scientific Research Staff.
M. E. Heyde, C. R. Peters, and J. E. Anderson.
Journal of Colloid and Interface Science, Vol 50, No 3, p 467-487, March, 1975. 5 fig, 7 tab, 65 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Reverse osmosis, *Membrane processes, Separation techniques, Aqueous solutions.
Identifiers: Cellulose acetate membranes, Partition coefficients, Electrical charge.

The potential use of reverse osmosis in a variety of waste water applications is discussed. The factors influencing reverse osmosis rejection of inorganic solutes from aqueous solution were examined with emphasis on the partition coefficients of inorganic compounds between water and cellulose acetate membranes. Electrical charge is the most important factor governing the cellulose acetate/water partition coefficients of electrolytes. The mean membrane/water partition coefficients of ions decrease with increasing solute charge, and increase with increasing ionic size. The effective charge of a salt does not necessarily correspond to its normal valence. The pH of the external solution alters the concentration of fixed membrane charges by shifting the equilibrium between ionized and unionized carboxyl groups on the membran are ion-pairing with H3O+ or OH- changes the effective solute charge. Concentrated salt solutions produce swelling or shrinkage of both homogeneous, fully dense cellulose acetate membranes and the surface skin of asymmetric cellulose acetate films. The membrane/water partition coefficients of electrolytes as well as their reverse osmosis rejection can be correlated with other physical measurements and with the lyotropic series. A comprehensive experimental basis is presented for understanding the mechanism of reverse osmosis rejection by cellulose acetate membranes. The results of this work may be used to predict reverse osmosis behavior under experimental conditions. (Orr-FIRL)
W75-09937

TREATMENT OF AQUEOUS WASTE STREAMS WITH HYDROGEN PEROXIDE TO REMOVE CHLORINATED ISOCYANURATES THEREFROM,
FMC Corp., New York. (assignee).
R. H. Carlson, R. N. Mesiah, and H. R. Chancey.
United States Patent 3,878,208. Issued April 15, 1975. Official Gazette of the United States Patent Office, Vol 933, No 3, p 1369, April, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, Chemical wastes, Pollution abatement, Water pollution control.
Identifiers: *Chlorinated isocyanurates, Hydrogen peroxide, Dechlorination.

The manufacture of chlorinated isocyanurates results in a waste water stream with a pH from 0.5 to 7.0, containing dissolved chlorinated isocyanurate. A treatment method for such waste streams is described. The streams are treated with hydrogen peroxide at a pH of 0.5 to 12.0. This causes a dechlorination of the contaminating chlorinated isocyanurate. A precipitation and subsequent recovery of the isocyanurate is then effected. (Orr-FIRL)
W75-09939

PROCESS FOR TREATING WASTE PHOTOGRAPHIC PROCESSING SOLUTIONS,
Fuji Photo Film Co., Ltd., Kanagawa (Japan). (assignee)
I. Shimamura, and H. Iwano.
United States Patent 3,869,383. Issued March 4, 1975. Official Gazette of the United States Patent Office, Vol 932, No 1, p 228, March, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, Ion exchange, Resins, *Patents, Chemical wastes, *Anion exchange.
Identifiers: Photographic processing solutions, Ferricyanides, Buffering compound.

A process is described for the treatment of waste photographic processing solutions containing ferricyanide and/or ferrocyanide ions. The waste solution, pH 7-9, is contacted with a weakly basic anion exchange resin in the free base form in the presence of a buffering compound. The buffering compound is added in an amount sufficient to maintain a buffering action at a pH of 7-9. The ferricyanide and ferrocyanide ions are thereby adsorbed on the anion exchange resin. (Orr-FIRL)
W75-09940

FLUIDIZED-BED INCINERATION OF URBAN SLUDGE (INCINERATION DES BOUES URBAINES EN LIT FLUDISE),
M. Tamalet.
Revue Generale de Thermique (Paris), No 150/151, p 511-517, June/July, 1974. 9 fig, 1 tab.

Descriptors: *Municipal wastes, *Sludge treatment, Waste water treatment, *Incineration, Costs, Combustion, Urban drainage, Waste disposal.
Identifiers: *Fluidized-bed incineration, Urban sewage sludge.

A method and the equipment for the fluidized-bed incineration of urban sewage sludge are described. A sand fraction of 0.5-2.0 mm is used as a fluidized medium. The sewage sludge is injected at the top of the fluidized-bed reactor to obtain lumps about 20 mm in size which then are heated rapidly. The prevention of malodorous emissions requires a minimum reactor temperature of 800 C. Incineration takes place in a temperature range of 800-850 C at an excess-air coefficient of 20 percent. The combustion products are carbon dioxide, water, and mineral ashes. The cost of the incineration increases rapidly with increasing water content in the sludge, as does the flue gas volume. The fluidized-bed sludge incineration is simple, economical and efficient. (Takacs-FIRL)
W75-09941

**ACTIVATED CARBON TREATMENT OF UNBLEACHED KRAFT EFFLUENT FOR REUSE,**
Saint Regis Paper Co., Pensacola, Fla. Research and Development Center.
E. W. Lang, W. G. Timpe, and R. L. Miller.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 246, $7.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/2-75-004, April 1975. 207 p, 30 fig, 41 tab, 52 ref, 10 append. EPA 1BB037, 12040 EJU.

Descriptors: *Water reuse, *Waste water, Treatment, *Activated carbon, Chemical wastes, Biochemical oxygen demand, *Industrial wastes, *Pulp wastes, Cost trends, Pilot plants, Effluents, Calcium carbonate, Tertiary treatment, Lime.
Identifiers: Pulp mill effluents, Color removal, *Unbleached kraft wastewater treatment, Microlime-carbon process, Total organic carbon.

A four-year pilot plant program was carried out to investigate the technical and economic feasibility of treating unbleached kaft pulp and paper mill effluent for reuse. Preliminary laboratory studies and cost estimated indicated that the following treatment sequences should be investigated in the pilot plant: (1) primary clarification, carbon adsorption, (2) lime treatment, carbon adsorption; (3) primary clarification, bio-oxidation, carbon adsorption. Water of reusable quality can be provided from unbleached kraft effluent by several combinations of treatment utilizing activated carbon. Unbleached pulping effluents typically contain about 1000 color units, 250 mg/l TOC, and 250 mg/l BOD. Reusable water quality as defined in this study is 100 color units and 100 mg/l TOC. The most economical treatment is the microlime-carbon process that utilizes low dosages of lime and clarification followed by carbon adsorption in down-flow granular carbon beds. Capital cost for treatment by this process of 9.6 mgd of unbleached kraft effluent from an 800-ton-per-day mill was estimated to be $6.7 million. Operating costs, inclusive of capital depreciation, were estimated to be $0.30 per 1000 gal and $3.58 per pulp-ton, including credit for the reused water. Carbon adsorption in continuous counter-current stirred contactors was found to have promise of lower operating cost and substantially lower capital costs as compared to adsorption in fixed beds. (EPA)
W75-10028

**SOLVENT SOLVES DEWATERING.**
Water and Wastes Engineering, Vol 11, No 9, p 84, September 1974.

Descriptors: *Waste water treatment, *Sludge treatment, *Dewatering, *Separation techniques, *Solvents, Municipal wastes, Industrial wastes, Solubility, Energy, Costs, Washington.
Identifiers: *Seattle(Wash).

A new process using a solvent for dewatering of municipal and industrial sludge has been developed by the Boeing Aerospace Company of Seattle. It is designed to comply with strict water and air pollution control regulations and will allow the reclamation of oil and other sludge constituents. A solvent of the aliphatic amine family which becomes completely miscible below 20C is mixed with the sludge. The resulting solution is a mixture of solid particles in a solution of water, solvent, oils, and fats. Solids are removed mechanically; water and solvent are separated by heating the solution to above 40C; and fats and oils are removed from the solvent by distillation. The solid portion is about 96% solid and will gather moisture in a normal atmosphere; the water is clear and sterile; and the oils and fats are of a commercially reclaimable grade. This technique is called the Boeing Extractive Sludge Treatment (BEST) and works equally well with highly organic or inorganic sludges. A theoretical savings of up to 90% in energy could be realized if BEST is used instead of some of the high temperature evaporation drying systems now used. Engineering cost analyses indicate an overall potential savings of 25% to 50% over present sludge dewatering methods. (Orr-FIRL)
W75-10037

**USING SLUDGE, OIL, AND WATER SEPARATION FOR RECYCLING WATER.**
Water and Sewage Works, Vol 121, No 11, p 41-42, November 1974.

Descriptors: *Waste water treatment, *Separation techniques, *Reclaimed water, *Oily water, *Water reuse, Water treatment, Oil wastes, Sludge, Oil pollution, *Recycling.
Identifiers: Endress+Hauser's Vibratrol, Oil reclamation.

The treatment and recycling of water, including the reclamation of constituents which can be reused, can be a contributing factor in energy supply and is becoming increasingly important. A system has been designed to reclaim oil and sludge constituents. It is the Endress+Hauser's Vibratrol, a submergible vibrating tuning fork level control. It is an automatically-controlled separator system that can be buried in the ground. The influent is collected and solids, oil and retreatable water are separated, reclaimed, totalized and treated continuously. Level control sites are the sludge/water interface, the oil level, the water level and water outflow totalization. The E+H Vibratrol vibrates in air, water, or a similar substance. When the tuning fork is contacted by sludge or solids at a predetermined level, it activates an agitator and pump for reclamation of sand, clay and gravel. The Vibratrol consists of a pair of piezo ceramic crystals mounted permanently within the tuning fork assembly. The piezo-electric principle is applied in a closed loop: power is supplied to a crystal which then oscillates, the oscillation is picked up by the tuning fork, increased to its natural resonant frequency, ending in a sympathetic, harmonic vibration which drives the second crystal to provide power output. (Orr-FIRL)
W75-10038

**CHEMICALS REDUCE SYSTEM ODOURS,**
Winnipeg Waterworks, Waste, and Disposal Div. (Manitoba).
A. Penman, and W. J. Borlase.
Water and Pollution Control, Vol 113, No 1, p 29, 33, January 1975.

Descriptors: *Odors, *Sewage treatment, Municipal wastes, Industrial wastes, Oil industry, *Canada, Chlorine, Pilot plants, Costs, *Waste water treatment.
Identifiers: *Micro-Aid, Winnipeg(Canada).

The sewage system of the City of Winnipeg, Canada accepts wastes from one major oil refinery and three meat packing plants at one of its lift stations. Upstream from the lift station, the combined industrial and municipal wastes have been causing sewer odors. Treatment of these odors in the past has been by chlorination. However, with increasing chlorine costs, possible difficulties in obtaining chlorine, and danger involved in its storage and use, alternative treatment methods have been investigated. In 1974, a product called Micro-Aid was tested over a seven-week period during the hottest summer months. The product is extracted from Yucca plants and consists of 10% natural saponins extracted from plants, 90% inert water, and 150 ppm of copper as a preservative. Five test sites were sampled for atmospheric temperature, sewage temperature, dissolved sulfide, atmospheric sulfide, pH, and general odor. Three periods of study compared Micro-Aid, chlorine, and no odor control treatment. Overall reduction of odors was found with Micro-Aid but chlorine provided better immediate reduction in atmospheric and dissolved sulfide levels. Micro-Aid does not reduce levels of dissolved sulfide within the sewage, but acts as a surfactant, reducing the surface tension of the sewage and keeping the hydrogen sulfide in solution. A one-year trial of this product for 1975 has been proposed. Although its costs are 25% higher than chlorine, operational and safety benefits may warrant its use. (Prague-FIRL)
W75-10040

**HYDRAULIC MODEL STUDY OF A LARGE-CAPACITY SETTLER IN A WATER CAPTURE SYSTEM (BADANIA HYDRAULICZNE MODELU DUZEGO OSADNIKA NA UJECIU WODOCIAGOWYM),**
W. Petrozolin.
Gaz, Woda i Technika Sanitarna, Vol 48, No 7, p 232-235, 1974.

Descriptors: *Hydraulic models, Flow rates, Efficiencies, Wind, Model studies, *Waste water treatment, *Sewerage.
Identifiers: *Warsaw(Poland), Settlers, Water capture.

Studies were conducted on a hydraulic model of a large capacity settler in the Warsaw sewage system in order to investigate the feasibility of improvements in the old settler built between 1924 and 1928. The scale was 1:25, the length of the model 32 m, the width 13 m, and the depth 12 to 16 cm. The model was installed in conditions similar to actual settlers. The studies were conducted in August, September, and October 1971; June 1972; and November 1972. The parameters studied were: the surface of the water in the settler, the intensity of the flow, division of flow through three openings, the wind, and the existence or absence of partitions impeding or changing flow direction. Wind was the major significant factor. Conclusions were reached by comparing mean velocities in selected partitions of the model with mean theoretical velocities. At maximum velocities from 1.42 m/min to 0.19 m/min, the mean velocities varied from 0.59 to 0.12 m/min, the mean active depths constituted a 23% to 77% of the total depth, and the mean actual velocity was 1.3 to 4.9 times higher than the mean theoretical velocity. The flow time varied from 2 to over 9 hours during various days or times of the day, influencing the maximum velocity and settling of the wastes. The disturbing action of the wind regulated the settler's activity, but efficiency could be increased by only four percent. (Urbanski-FIRL)
W75-10043

**ELEVATED TEMPERATURE TECHNIQUE FOR ENUMERATION OF SALMONELLAE IN SEWAGE,**
Central Public Health Engineering Research Inst., Nagpur (India). Div. of Microbiology.
P. M. Phirke.
Indian Journal of Medical Research, Vol 62, No 6, p 938-944, June 1974. 4 tab, 12 ref.

Descriptors: *Salmonella, *Pathogenic bacteria, *Sewage treatment, *Analytical techniques, *Pollutant identification, Bacteria, Cultures, Sewage bacteria, Water quality control, Sewage, Isolation, Waste water treatment.

ntifiers: Most probable number.

uantitative method for determining Salmonella ewage is described. The technique uses the t probable number method and incubation of samples at an elevated temperature of 41.5C in elenite brilliant green enrichment broth. The h is composed of mannitol, sodium taurocho- sodium selenite, peptone, yeast extract, tassium phosphate, brilliant green, and lled water. A sample of sewage was oughly homogenized by shaking and was sub- ded into seven portions. Each portion was ed as a separate sample and inoculated in icate sets. One set was incubated at 41.5C and other set was incubated at 37C. The data in- e that enrichment at 37C yields too low num- . The results from the 41.5C technique are r, more consistent and reliable than the ts from the 37C temperature. The difference lmonella recovery may be due to the fact that 7C most of the interfering organisms grow r and mask the growth of the Salmonella. ever, at 41.5C, Salmonella growth is nced and the growth of the interfering organ- is inhibited. This method for the determina- and enumeration of Salmonella will be of in assessing the effectiveness of sewage nent plants in the removal of Salmonella bac- (Orr-FIRL)
10045

**AUTOMATED METHOD FOR DETER- ATION OF RESIDUAL METHANOL IN TRIFIED EFFLUENTS,**
r Pollution Research Lab., Stevenage and).
Musselwhite.
r Pollution Control, Vol 74, No 1, p 110-111, 1 fig, 2 tab, 2 ref.

iptors: *Automation, *Waste water treat- *Denitrification, Monitoring, Sewage treat- Oxidation, Pilot plants, Costs, Effluents, s, Analytical techniques, *Pollutant identifi-

fiers: *Methanol, Technicon Auto Analyzer, ual method.

utomated method has been developed to nine the amount of residual methanol in fied effluents. Biological denitrification is o reduce the oxidized nitrogen content of ef- s which are discharged to rivers. Methanol is tly used as a carbon source when nitrified nts are deficient in biodegradable organic . Pilot plant studies have been conducted nethanol for denitrification. For economical ficient use of methanol, its concentration be monitored in denitrified effluents. A con Auto Analyzer and procedures for its described. The method is based on the ox- of methanol to formaldehyde, determined netrically after reaction with acetylacetone. ethod was suitable for monitoring residual ol either in discrete samples or continu- n denitrified effluents. Correction for inter- in the measurements of peaks may be ary in some instances, and the method is ap- to a wide range of sewage samples. -FIRL)
047

**OURCES AND LEVELS OF MERCURY SEWAGE OF A UNIVERSITY CAMPUS,**
n Illinois Univ., Carbondale. Dept. of try and Biochemistry.
nary bibliographic entry see Field 5A.
049

**IMENTAL EUTROPHICATION OF TER- IAL AND AQUATIC ECOSYSTEMS. ANNUAL REPORT OF THE UPLAND RGE PROJECT,**
aven National Lab., Upton, N.Y.

G. M. Woodwell, J. Ballard, M. Small, E. V. Pecan, and J. Clinton.
Report BNL 50420 (Biology and Medicine TID-4500), February 1974. 29 p, 17 fig, 11 tab, 12 ref. AEC AT(30-1)-16.

Descriptors: *Model studies, *Waste water treatment, *Tertiary treatment, *Aquatic habitats, *Terrestrial habitats, Groundwater recharge, Nutrient removal, Vegetation, Forests, Agriculture, Waste water disposal, Recycling, Sewage treatment, Nutrients, New York.
Identifiers: Brookhaven(NY).

Alternatives to dumping sewage into coastal oceans are being studied at the Brookhaven National Laboratory, New York. A report on the development of a system of sewage treatment that returns potable water to the water table and recycles the nutrients with the least input of fossil fuel energy is presented. The quality of groundwater varied; the highest quality was associated with undisturbed forest. The greatest variation was in nitrogen and calcium which were high in agricultural fields, low in oil fields and pine forests, and lowest in late successional oak-pine forests. After six months application of sewage, phosphorus and iron were totally absorbed, sulfur and magnesium partially absorbed, potassium and calcium decreasingly absorbed, and sodium and chlorine not absorbed. Nitrate nitrogen in the percolate of oak-pine forests treated with primary effluent rose slowly during September and October, and more rapidly in November and December. In the forest treated with secondary effluent, the nitrate-nitrogen level reached a maximum in November. In aquatic systems, meadows effectively reduced the organic content and reduced the specific conductance of sewage during the winter. A combination of aquatic and terrestrial systems will probably be the most effective treatment method. (Buchanan-Davidson--Wisconsin)
W75-10097

**AN INTEGRATED SYSTEM FOR DISPOSAL OF SLUDGES ORIGINATING FROM WATER SOFTENING AND SEWAGE TREATMENT IN MUNICIPALITIES,**
Kansas Univ., Lawrence. Dept. of Civil Engineering.
J. W. Moore.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 879, $8.50 in paper copy, $2.25 in microfiche. Ph.D. Thesis, 1971. 244 p, 43 fig, 38 tab, 54 ref. OWRT A-031-KAN(3). 14-31-0001-3016.

Descriptors: *Waste water treatment, *Sludge treatment, *Water softening, *Sludge disposal, Economics, Recirculated water, Kansas, Phosphorus, Hydrogen ion concentration, Chemical oxygen demand, Alkalinity, Sewage treatment, *Solid contact processes.

The objective was to explore the feasibility, both technically and economically, of developing an integrated system for the disposal of sludges originating from water softening and sewage treatment in municipalities. The proposed system consists of utilizing the water softening sludge in a beneficial use in the primary treatment process of the sewage treatment plant, then handling the resulting sludge in one disposal operation. A laboratory solids contact unit was constructed and operated on raw wastewater with lime softening sludge added at the rate of 600 milligrams per liter of raw sewage. Provisions were included for the recirculation of the lime softening sludge. The effluent from the solids contact unit was characterized and dewaterability studies were performed on the sludge retained in the unit. Both orthophosphate and total phosphorus concentrations normally present in domestic sewage can be reduced by about 20 per cent for orthophosphate and 30 per cent for total phosphorus by the addition of 600 milligrams of lime softening sludge per liter of raw sewage with continuous mixing. The total phosphorus removal can be increased to about 46 per cent by recirculation of the lime softening sludge. The addition of lime softening sludge with recirculation resulted generally in a pH of 7.8, chemical oxygen demand removal of 65 percent, five-day biochemical oxygen demand removal of 75 per cent and total solids removal of 35 per cent. A pH increase of about 0.4 pH unit and an alkalinity increase of about 50 milligrams per liter were observed. The sludge withdrawn from the primary unit can be expected to be about 3.5 times that resulting from conventional settling but when the total sludge quantities are compared for the overall system, including waste activated sludge and lime softening sludge, the lime softening sludge system results in a total sludge production only slightly larger than in separate systems. The mixture of lime softening sludge and primary sludge filtered well without filtration aids.
W75-10123

**A COMPUTER SIMULATION ANALYSIS OF SURFACE WATER QUALITY MANAGEMENT POLICIES UNDER DYNAMIC ECONOMIC AND HYDROLOGIC CONDITIONS,**
Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.
J. W. Hyden.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 842, $9.25 in paper copy, $2.25 in microfiche. Ph.D. Dissertation, August 1973. 294 p, 16 fig, 9 tab, 69 ref, 14 append. OWRT B-030-SC(5).

Descriptors: *Water quality standards, *Economics, *Management, Surface waters, *Simulation analysis, Computer models, Water policy, *Waste water treatment, *Optimization, Model studies, *Computer programs.

The general purpose of this research is to determine the optimal economic wastewater treatment levels for individual users in a river basin. The specific case used in this study consists of a series of firms located along a river, such as municipalities, wet process industries, or recreational facilities, which have the river as their only source of raw water supply, and as the ultimate discharge point of their wastewater. The economically optimal wastewater treatment assignment levels are defined as the minimization of the sum of costs imposed on the individual users for wastewater treatment and of those resulting from damages caused by waste discharges of the upstream users. It is shown mathematically that the optimum occurs when, for all users, the marginal treatment cost equals the sum of the respective downstream marginal damage costs. Analyses of the effectiveness of a given water quality management policy in maintaining reasonable economic efficiency as various conditions change are presented in a prototype, computer simulation program, in order to consider such an approach in river basin planning activities.
W75-10124

**USE OF LIME-SODA ASH SOFTENING SLUDGE FOR THE TREATMENT OF MUNICIPAL WASTEWATER,**
Kansas Univ., Lawrence. Dept. of Civil Engineering.
W. E. Johnson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 913, $2.25 in microfiche. M.S. Thesis, (1971). 47 p, 6 fig, 14 tab, 17 ref. OWRT Project A-031-KAN(2). 14-31-0001-3016.

Descriptors: *Kansas, Waste water treatment, *Sludge treatment, *Water softening, *Sludge disposal, Sedimentation, Recirculated water, Phosphorus, Hydrogen ion concentration, Lime, *Municipal wastes, Waste disposal.
Identifiers: Jar tests, *Lime-soda ash process, Lawrence(Kan).

Research was conducted on the characterization of the sludge produced by a lime-soda ash water softening process and the possible utilization of the lime sludge for precipitation of phosphorus and other pollutants from Lawrence wastewater. The lime sludge consisted of calcium carbonate (85%), magnesium hydroxide (4%), and volatile suspended solids (6%); 2.6 pounds of lime sludge was produced per pound of lime added to the water being treated in the softening process. About 400 to 600 mg of lime sludge per liter of wastewater could be added. This amount of lime sludge raises the pH about 0.5 of a pH unit which is not near the anticipated pH of 9.5. At a pH of 9.5 there is good phosphorus removal and additional BOD and COD removal. Jar tests with lime sludge and additional lime to raise the pH to 9.5 showed that lime sludge tends to resist a change in pH. Phosphorus removal from wastewater would not be significant on a continuous run basis with the amount of sludge produced by the Lawrence water treatment plant.
W75-10125

**LABORATORY SIMULATION OF SWINE MANURE LAGOONS,**
Clemson Univ., S.C. Dept. of Agricultural Engineering.
C. L. Barth.
Available from the National Technical Information Service , Springfield, Va. 22161 as PB-243 888, $3.25 in paper copy, $2.25 in microfiche. Presented at 70th Annual Meeting of the Association of Southern Agricultural Workers, Incorporated, February, 1973, Atlanta, Georgia. 9 p, 6 fig, 5 tab, 11 ref. OWRT A-025-SC(1).

Descriptors: *Farm lagoons, *Physical properties, *Chemical properties, *Anaerobic digestion, Lagoons, Temperature, Biodegradation, Southeast U.S., *Design criteria, Load distribution, Hogs, *Waste treatment.
Identifiers: Detention time, Volatile-solids-reduction, *Laboratory simulation, Load rates.

Anaerobic lagooning of swine manure waste is widely used and is considered successful in the Southern Region of the United States. Evaluation of the variation in design standards employed by individual states in the region indicates that much uncertainty exists in the application of present knowledge and design values. A progress report is presented on a study of anerobic lagooning properties of swine waste. Findings indicate the effect of loading rate and temperature in lagoon operation. This research provides basic knowledge on lagoon operation under conditions prevalent in the Southern Region and contributes to more uniformly applied design criteria.
W75-10137

**BIOLOGICAL WASTEWATER TREATMENT MODEL BUILDING FITS AND MISFITS,**
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
W. C. Boyle, and P. M. Berthouex.
Biotechnology and Bioengineering, Vol 16, No 9, 1139-1150, 1974. 6 fig, 3 tab, 43 ref.

Descriptors: *Biological treatment, *Waste water treatment, Statistics, *Model studies, Data collections, Treatment facilities, Design criteria, Operations, *Statistical models.
Identifiers: Model parameter estimation, Model discrimination.

During the past decade, statisticians have attempted to develop a uniform biological waste water treatment model which would aid in the design and operation of treatment facilities. A discussion of the validity of a single model is presented, including statistical problems in model parameter estimation and model discrimination. The physical process of fitting models usually precedes model building but parameter estimation processes are often overemphasized. Examples were given to illustrate that a model cannot be accepted simply because it fits the data. Goodness of fit is a necessary but not sufficient condition for acceptance of any model. When two or more conflicting models fit the data, it is necessary to give each model a chance to fail in order to verify a proposed model. (Prague-FIRL)
W75-10169

**MODELING MICROBIAL GROWTH IN WASTEWATER TREATMENT,**
Royal Inst. of Tech., Stockholm (Sweden). Dept. of Water Chemistry.
B. Hultman.
Journal Water Pollution Control Federation, Vol 47, No 4, p 843-850, April, 1975. 4 fig, 4 tab, 10 ref.

Descriptors: *Bacteria, *Biological Treatment, *Model studies, *Waste water treatment, Equations, Activated sludge, *Microbial degradation, Growth rates.
Identifiers: *Bacterial growth.

A model for bacterial growth was developed in order to choose suitable reactors for biological treatment of waste water. The growth equations for bacteria were divided into formation rate of living bacteria; formation rate of nonviable bacteria; utilization rate of substances necessary for cell synthesis; utilization rate of the energy source; utilization rate of the electron acceptor; and formation rate of a product. Bacteria may grow in suspensions, such as in the activated sludge process or anaerobic digesters, on inert contacting material such as trickling filters, rotating disks, contact aerators, or inert suspended solids, and on adsorbing materials such as activated carbon. Rate constants were determined using stocihiometric and thermodynamic theories. The most common method for the biological treatment of waste waters in Sweden, is the activated sludge process, where bacteria grow in suspension. However, in some process combinations including postprecipitation or biological nitrogen reduction, bacterial growth on inert or adsorbing contact materials may be superior to that in suspended growth reactors. (Prague-FIRL)
W75-10170

**NEEDED: $350 BILLION - AND A NEW NEEDS SURVEY,**
A. S. Heid.
Journal Water Pollution Control Federation, Vol 46, No 10, p 2254-2257, October 1974. 1 tab.

Descriptors: *Federal Water Pollution Control Act, *Water pollution control, *Pollution abatement, *Costs, *Construction, Facilities, Storm water, *Sewage treatment, Tertiary treatment, Sewers, Governments, Legislation, Governments supports, Financing, *Waste water treatment, Surveys.

State agencies have now estimated that to meet the 1983 goals of the Federal Water Pollution Control Act Amendments of 1972, they would require $350 billion. Money needed for treatment and control of storm water, a category not previously included, totals $235 billion. Omitting this category, the states' estimated needs for 1974 are $55 billion more than the $60 billion reported in the 1973 survey. The 1974 survey was ordered by Congress to provide information on states' estimated needs to form a basis for the consideration of a new authorization for granting construction funds and for future allocations to the states. The cost estimates of the 1973 survey represented only a first step in the necessary assessment of construction costs. However, as reported by R. Train, EPA administrator, the EPA preliminary analysis exaggerates the costs of meeting the requirements of PL 92-500; there are less expensive methods of abating storm water pollution than those figured in the costs. In addition, the EPA considers following categories the important areas for granting construction funds: Category I-costs necessary to achieve the required level of secondary treatment; Category II-costs necessary to achieve more stringent levels of treatment than secondary treatment for cases in which advanced treatment is implicit for meeting established standards for water quality; and, Category IVb-costs for new interceptor sewers. (Orr-FIRL)
W75-10174

**LET'S TRY 90% FIRST AND SEE WHAT OUR QUALITY IS LIKE,**
Wesleyan Univ., Middletown, Conn. Industrial Waste Lab.
For primary bibliographic entry see Field 5G.
W75-10175

**LACK OF PROMISED FEDERAL FUNDS HAMPERS WATER CLEANUP EFFORT.**
For primary bibliographic entry see Field 5G.
W75-10178

**DESIGN OF SURFACE WATER OUTFALLS TO RIVERS,**
Lothians River Purification Board (Scotland).
G. S. Hamilton, and G. A. Haig.
Surveyor, Vol 145, No 4313, p 48-49, February 7, 1975. 1 fig.

Descriptors: Surface waters, Rivers, Discharge(Water), *Design criteria, Drainage engineering, Hydrological aspects, Flood control, Outlets, *Outfall sewers, *Outlet works, *Sewers.

A design for a simple outfall arrangement from surface water drainage systems to a river is illustrated. The Lothians River Purification Board, Great Britain, has adopted engineering guidelines for discharging to rivers. Principles to be followed include protection of the river bed from scour, compatibility with the hydrological characteristics of the river, protection of the banks of the river, and access availability for inspection and maintenance. Once the outfall velocity has been selected, the energy of the water is dissipated and scour is resisted by the construction of energy dissipators in the form of steps, by angular outflow to the river (generally 60 degrees to the river flow), and by protection of the river bed by a gabion mattress. For all outfall design calculations, the engineer must consider the hydrological regime of a specific river to determine flood frequency curve in terms of river stage at the outfall point, so as to protect the surface water system in flood conditions. The banks of rivers are protected by wing walls with stable bank protection behind the walls; access to the outfall should be provided in the form of steps for sampling and maintenance purposes. (Prague-FIRL)
W75-10183

**THE MAGNETIC FLOWMETER AND ITS USE IN WASTE WATER TECHNOLOGY (DER MAGNETISCHE DURCHFLUSSMESSER UND SEINE ANWENDUNG IN DER ABWASSER-TECHNIK),**
For primary bibliographic entry see Field 5A.
W75-10185

**ENERGY EVALUATION AND ORGANIC COMPOUND INDEX IN MUNICIPAL SEWAGE WATER (IN JAPANESE),**
T. Aida, I. Munemiya, and K. Kawamura.
Gesuido Kyokai-shi, Vol 11, No 127, p 21-31, December 1974. 8 fig, 22 ref.

Descriptors: *Municipal wastes, *Sewage treatment, Sampling, Biochemical oxygen demand, *Organic compounds, Oxidation, *Waste water treatment, *Pollutant identification, *Organic wastes.
Identifiers: Enthalpy change, Organic compound index, Thermodynamics.

uation to calculate an approximate BOD was obtained from a thermodynamic con- ion based on the enthalpy change in oxida- actions of organic compounds. BOD was o 0.146 times the enthalpy change of organic unds. The applicability of the equation to sewage water samples was evaluated by ining BOD values of samples collected at ferent cities by the sodium oxide method. lculated BOD values agreed with the ob- values for untreated sewage water; how- ey did not agree for treated sewage water. dicates that highly undecomposable oxida- oducts contributed to the observed BOD Therefore a constant term must be added quation, depending on the sewage plants. A thermodynamic consideration was made D calculation; its correlation with BOD was For the same sewage water samples, the d TOC values were also analyzed and the correlation factors of BOD to COD and ere 0.5 and 1.3 respectively. (Katayama-

89

LOWMETER PASSES TESTS,
Signal Corp., West Warwick, R.I.
ieker, and J. S. Kontor.
id Wastes Engineering, Vol 12, No 4, p 58, 1975.

ors: *Analytical techniques, ientation, *Flow measurement, Liquids, ance, Equipment, Municipal water, treatment, Treatment facilities, *Waste atment, Pollutant identification.
rs: *Solids-bearing fluids, *Flowmeters.

eter for measuring solids-bearing fluids s been tested for two and one-half years water treatment plants in thirteen United ies. Conditions varied regarding metering n, line pressure, line size, and systems In all cases, the SBF was an extremely device. Most municipalities experienced blems with material build-up on the in- of their sludge lines; techniques to al- is problem are described. For example, f East Providence, Rhode Island recircu- ning water, the East Bay Municipal Utili- t in Oakland, California utilizes 140 F ater for flushing, and Orange County, uses extensive steaming at 250 F for s to keep the lines clean. Periodic main- or sewage treatment systems has also mized by using glass linings which are ptible to material buildup. The major ad- f the SBF system over previous fluids devices is that field checking is easily hed. The primary instrument can be field checked using a manometer. The ensors can be checked by visible means, differential pressure output of the sen- st that of a manometer directly on the When the two differential pressures performance of the associated instru- is easily checked. (Prague-FIRL)

RING UTILITY AND SEWAGE LINES AFROST SOIL,
ebov.
from the National Technical Informa- e, Springfield, Va. 22161, as AD-786 n paper copy, $2.25 in microfiche. May, , 69 fig, 19 tab, 6 append. Translated zhenernyye Kommunikatsii na rzlykh Gruntakh, Lit. po Stroitel'stvu ngrad, 176 p, 1972.

: *Sewers, *Sewerage, *Pipelines, on, *Design, Permafrost, Soil Soil properties.
Petroleum pipelines, Gas lines.

Various methods are presented of laying and designing pipelines for water supply, heat supply, and sewerage, in addition to trunk petroleum and gas lines in permafrost conditions. General information is presented on engineering utility and sewage lines in permafrost soil. The construction of sanitary engineering utility and sewage lines and trunk pipelines, is described. A collection of initial data is presented for calculating structures. Thermal calculations such as heat losses of pipelines, underground conduits, temperature of liquids in pipelines, and amount of insulation are discussed. The calculation of supports and foundations of engineering utility and sewage lines is outlined. Procedures for the thermal calculation of pipelines and for supports and footings of engineering utility and sewage lines in various permafrost soil conditions are set forth. The calculation theory is illustrated with examples from current design practice. (Orr-FIRL)
W75-10192

**LARGEST ADVANCED WASTEWATER TREATMENT PLANT IN THE U.S. AND IN THE WORLD,**
Stearns and Wheler, Cazenovia, N.Y.
D. E. Schwinn, and G. K. Tozer.
Environmental Science and Technology, Vol 8, No 10, p 892-897, October, 1974. 5 fig, 1 tab.

Descriptors: *Treatment facilities, *Waste water treatment, *District of Columbia, Design criteria, Control, Computers, *Tertiary treatment, Planning, Pilot plants.
Identifiers: Blue Plains Water Pollution Control Facility.

The District of Columbia's Blue Plains Water Pollution Control Facility has been studied since 1968. Key process steps to improve the plant have been underway since 1971. Design steps have been implemented concurrently with confirmatory tests at the EPA-DC Pilot Plant on D.C. waste water. Methods which were analyzed included: nitrogen removal by the biological nitrification-denitrification process, consisting of nitrification and denitrification reactors and sedimentation basins; phosphorus removal by the addition of alum and/or ferric chloride to both the secondary modified aeration system and the denitrification system; sludge processing by gravity thickening of primary and storm water sludges; and flotation thickening of secondary and advanced treatment sludges, followed by vacuum filtration and incineration. The advanced waste water treatment facilities were designed for operation in two halves to permit comparative tests while operating at different MLSS concentrations, chemical dosages, and other variables. When the treatment plant is completed, it will contain four computer systems, three for process control and one for data processing. The processes to be controlled by these systems are return sludge, waste sludge, chemical treatment (lime, ferric chloride or alum, methanol, and polymer), and pumping. Using the D.C. concurrent design and pilot plant testing has saved two years of time, and the plant to be built will be the largest of its type. (Prague-FIRL)
W75-10193

**OPERATION OF FULL-SCALE BIOLOGICAL PHOSPHORUS REMOVAL PLANT,**
Biospherics, Inc., Rockville, Md.
G. V. Levin, G. J. Topol, and A. G. Tarnay.
Journal Water Pollution Control Federation, Vol 47, No 3, p 577-590, March, 1975. 5 fig, 10 tab, 12 ref.

Descriptors: *Nutrient removal, *Phosphorus, Biological treatment, Treatment facilities, *New York, Monitoring, Activated sludge, Microorganisms, Precipitation(Chemical), *Waste water treatment, Aeration, Operating costs.
Identifiers: *Phosphorus removal, *Phostrip, Seneca Falls(NY).

The first full-scale installation of the Phostrip process of phosphorus removal from waste water, marketed by Union Carbide, is in operation at Seneca Falls, New York. The first thirty days of operation were closely monitored, then this biological process was installed on a permanent basis. The method is based on the use of activated sludge microorganisms to transfer phosphorus from inflowing waste water to a small concentration substream for precipitation. The activated sludge is subjected to anaerobiosis, inducing phosphorus release into the substream and providing phosphorus uptake capacity when the sludge is returned to the aeration basin. Total phosphorus effluents as low as 0.2 mg/liter were obtained in full scale plant operation, a level far below the New York State effluent limit of 1.0 mg/liter. Total costs of phosphorus removal, particularly operating costs, were drastically reduced, as compared to conventional methods. (Prague-FIRL)
W75-10194

**DISPOSAL OF WASTE ALUM SLUDGE FROM WATER TREATMENT PLANTS,**
Malcolm Pirnie, Inc., Paramus, N.J.
R. M. Gruninger.
Journal Water Pollution Control Federation, Vol 47, No 3, p 543-552, March, 1975. 3 fig, 5 tab, 4 ref.

Descriptors: *Alum, *Water treatment, *Waste water treatment, *New York, Dewatering, Waste disposal, Land management, Filtration, Separation techniques.
Identifiers: Gravity thickening, Landfill disposal.

The Environmental Protection Agency has classified alum sludge from water treatment plants as an industrial waste which may no longer be discharged to streams. Treatment plants in western New York State have been constructed and are operating plant scale alum sludge treatment units; four such alum sludge dewatering facilities are discussed. Characteristics of the sludges were affected by the substances used in water treatment and may be highly variable. No single system can economically dewater dilute alum sludge to the minimum acceptable concentration for landfill disposal. An investigation of alternatives indicated that the separation of the solids from alum sludge is best accomplished in a two stage system. The first step should be primary thickening by gravity to achieve a solids concentration of two to six percent total solids by weight. The second stage is mechanical dewatering, achieved through pressure filters, vacuum filters, or scroll centrifuges, obtaining a solids concentration of at least 20 percent total solids by weight. (Prague-FIRL)
W75-10195

**REMOVAL OF ORGANIC MATTER BY ACTIVATED CARBON COLUMNS,**
Illinois Univ., Urbana. Dept. of Civil Engineering.
F. B. DeWalle, and E. S. K. Chian.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 100, No EE5, p 1089-1104, October, 1974. 6 fig, 2 tab, 32 ref.

Descriptors: Activated carbon, *Activated sludge, Effluents, Sewage treatment, *Organic matter, Adsorption, *Waste water treatment, Tertiary treatment.
Identifiers: Molecular weight, *Activated carbon columns. TOC.

Activated carbon treatment is conventionally used as a tertiary unit process following activated sludge treatment. However, it has been suggested that there is significant leakage of organic matter through the columns and that activated sludge treatment adversely affects the removal of organic matter in activated carbon columns. An evaluation of the effect of activated sludge treatment on the composition of organics in the effluent and this effect on subsequent activated carbon treatment was conducted. The composition of the organic matter

in secondary effluent was studied as was the removal of these compounds in activated carbon columns. The major organic fraction adsorbed in activated carbon columns is a fulvic acid-like material with a molecular weight of 100 to 10,000. These compounds adsorb very well in activated carbon columns. Since they also represent a major fraction of the organic matter, adsorption in activated carbon columns was expected to increase with increasing degradation of the waste water. This phenomenon did occur in a study in which the TOC removal of a filtered mixed liquor by activated carbon increased in the succeding compartments of a plug-flow activated sludge unit. (Prague-FIRL)
W75-10197

**SECONDARY TREATMENT DESIGN FOR COMBINED WASTEWATERS, PART II,**
C. N. Smith.
Water and Sewage Works, Vol 122, No 4, p 82-84, April, 1975. 1 fig.

Descriptors: *Sewage treatment, *Design, *Waste water treatment, *Industrial wastes, Municipal wastes, Canneries, Tannery wastes, Aeration, Chlorination, Dewatering, Sludge, Effluents, Water pollution control, Treatment facilities, Filtration, Disinfection, Maine.
Identifiers: South Paris(Maine), Clarification, Carbonation, Chromium removal, Sulfide removal, Pretreatment(Waste water).

A unique Water Pollution Control Facility is being constructed at South Paris, Maine, for the joint treatment of wastes from the town, a cannery and a tannery. The project is scheduled for completion in the spring, 1975; the total cost is $6,800,000 of which $4,500,000 is the facility construction cost. A detailed outline of the treatment scheme is presented. The system includes: pretreatment of the combined cannery and municipal effluents; pretreatment of the beam house wastes and tan house wastes; primary clarification; aeration; carbonation; secondary clarification; and chlorination. The tannery effluents are treated by filtering through rotating drum screens, equalization, clarification, carbonation, and upflow clarification before being mixed with the pretreated municipal and cannery sludge in the aeration tanks. Two systems of sludge dewatering are provided, one for the sludge from the carbonation stage and one for the sludge from the secondary clarifier. The treatment will provide for 90 percent chromium removal, 100 percent sulfide removal, and 99 percent disinfection. (Orr-FIRL)
W75-10199

**CLEANING OF PETROLEUM-INDUSTRY EFFLUENT,**
V. P. Tronov, R. G. Nurutdinov, and A. D. Li.
Soviet Patent SU432106. Issued June 23, 1971.
Soviet Inventions Illustrated, Vol W, No 17, p 2, June, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, *Effluents, Emulsions, *Patents, Cleaning, *Oil pollution, Oil wastes.
Identifiers: Drainage tanks, Buffer tank.

A treatment method for a petroleum processing waste water stream is described. The petroleum is diluted by a stratum flooding system in an amount corresponding to a ratio of 0.4 between the total water flow and the emulsion flow. The water leaving the plant (98-99 percent) is sent into a feedstock line about one km from a preliminary tank. The retention time in the feedstock line is 15-21 minutes. An emulsion containing 10-12 percent water passes from the preliminary drainage tank to the next stage. The settled water from the preliminary drainage tank is sent to a buffer tank where it is kept for 1.5-2.0 hours before being pumped into the stratum flooding system for use as dilution water. If the starting emulsion contains less than 30 percent water, then the required phase ratio can be maintained by preliminary accumulation or addition from another source. (Orr-FIRL)
W75-10200

**MEAN ESTIMATE DEFICIENCIES IN WATER QUALITY STUDIES,**
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 5G.
W75-10202

**OPTIMAL CONTROL OF WATER POLLUTION IN A RIVER STREAM,**
Alberta Univ., Edmonton. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 5G.
W75-10206

**EFFECTS OF DEPOSIT RESUSPENSION ON SETTLING BASIN,**
Kyoto Univ. (Japan). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5F.
W75-10213

**DYNAMIC LEACHING STUDIES ON PULPWOOD BARK RESIDUES,**
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
A. H. Benedick, J. J. McKeown, and R. D. Hart.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 100, No EE4, Paper No 10701, p 869-882, August 1974. 15 fig, 3 tab, 1 equ, 1 ref.

Descriptors: *Water pollution control, Pulp and paper industry, *Leaching, *Sewage treatment, *Solid wastes, *Bark, Disposal, Operations, Effects, Biochemical oxygen demand, Industrial wastes, Water quality, Chemical oxygen demand, *Pulp wastes, *Waste water treatment.
Identifiers: Receiving waters, BODS.

Recent years have witnessed a growing concern by the pulp industry over the effect of bark disposal operations on receiving water quality. In these circumstances, the National Council of the Paper Industry for Air and Stream Improvement, Inc., undertook a laboratory study to define the quantities of BOD5, COD, and color leached from fresh and field-aged pulpwood bark residues under several experimental conditions. Barks from northeastern species were used in all investigations. Results showed that the quantity of BOD5, COD, and color leached from bark residues under dynamic leaching conditions depends on the field-storage age of the bark and on the conditions under which leaching occurs. Working curves for estimating BOD5, COD, and color contributions from northeastern pulpwood bark residues are presented. (Bell-Cornell)
W75-10214

**AUSTRIAN PLANT KNOCKS OUT NITROGEN,**
Technische Hochschule, Vienna (Austria). Institut fuer Wasserversorgung Abwasser reiningung und Gewasserschuts.
N. F. Matsche, and G. Spatzierer.
Water and Wastes Engineering, Vol 12, No 1, p 18-24, January, 1975. 9 fig, 2 tab.

Descriptors: *Treatment facilities, *Aeration, Effluents, Sludge treatment, Construction costs, Sewage treatment, Design criteria, Nitrogen, *Waste water treatment, Nitrification, *Denitrification.
Identifiers: *Vienna(Austria), *Nitrogen removal.

The Vienna-Blumental treatment plant in Vienna, Austria uses aeration with mammoth rotors, alternately with oxic and anoxic zones in the cycling mixed liquor, to accomplish nitrification and denitrification. With experiments using differing numbers of rotors, nitrogen removal level reached up to 85%. The plant has a pumping tion, screens, an aerated grit chamber, two a tion tanks, two final sedimentation tanks, a return sludge pumping station. Waste wate lifted by screw pumps; coarse material is remo by bar screens; sand and floatable materials removed in the grit chamber. Waste water fl directly to the aeration tanks. Mixed liquo clarified in two final sedimentation tanks. Effl flows directly to the receiving stream and return sludge is pumped back with a constant to enter the aeration tank with the raw w water. Excess sludge is removed from the re sludge by pumping it to the Liesingtal sewer t treated at Vienna's main sewage treatment p Evaluations of construction costs, design c and efficiency of the operation have been s since 1971. In 1974, different numbers of operi rotors were tested. Removal of excess sludge held constant. Pollutant loading varies when dustries discharge waste water into the sys Three plus three rotors is the normal op number for year round operation. NH4-N determined in laboratory tests; organic nitr was estimated as well. (Prague-FIRL)
W75-10225

**NEW SEPARATOR MAY SPUR INTEREST SEDIMENTATION,**
Glaus, Pyle, Schomer, Burns and DeHa Akron, Ohio.
R. Miller.
Water and Wastes Engineering, Vol 11, No 9, 42, September, 1974. 2 fig.

Descriptors: *Waste water treatment, *Suspe solids, *Separation techniques, Settling ba Equipment, Desilting, Settling velocity, Se treatment, Water pollution control.
Identifiers: *Lamella Separator.

It has been necessary in every type of water p tion control treatment to use some form of se or filter system to remove solids from l wastes. A new concept for rapid settling of s employing basic gravity settling theories, i Lamella Separator developed by the Axel Joh Institute in Sweden. The Lamella is a gravity l solid separation unit which utilizes thin pa plates packed as closely together as possibl still retaining a separation of settled solids the clear liquid that is to be discharged as effl Depending on the application and local condit the plates are spaced from 35 to 50 mm apart incline of 25 to 50 degrees. The influent is tributed evenly over the plates as it enters in tical direction; it then moves downward wit solids which settle to the bottom of each pla return tube carries the effluent concurrently the influent flow and back to the top of the where it is discharged. The settling solids dro the sludge collector at the bottom of the un theory, settling occurs on each plate provi settling area equivalent to the projected horiz area. External forces prevent the theoretical saving of 20 times from resulting. The actual saving is about 10 times. A pilot testing pro using the Lamella settler parallel with primar tling to provide a comparison was conduct Youngstown, Ohio. The unit performed wel flow rate of 200 gpm; a conventional tank w require 10 times the total surface area to h the same flow. At Youngstown, the system compact, exhibited a high rate and was not ously affected by load fluctuations. (Orr-FIR W75-10226

**EVOLUTION OF MICROFLORA DURING RIFICATION TREATMENT OF UR WATER BY ACTIVATED SLU (EVOLUTION DE LA MICROFLORE COURS D'UN TRAITEMENT D'EPURA D'EAUX URBAINES PAR BOUES ACTIVE**
Ecole Nationale Superieure Agronomiqu Grignon (France). Laboratoire de Recherch la Chaire de Microbiologie.

e.
Agronomiques, Vol 25, No 2-3, p 515-533, ab, 46 ref. (English summary).

ors: *Bacteria, *Biological treatment, ed sludge, Measurement, Water pollution, Nitrogen, Ammonia, *Waste water treat-dors, Municipal water, Treatment facili-

s: Bacterial pollution, Microflora.

ions of very different size and design npared for their efficiency of bacterial during treatment of urban water by the sludge process. It appeared that: bacteri-lora were quite homogeneous in the ven-anks; and, compared to the inflow, a of almost 90% the number of bacteria e revitalized is found in the outflow, for erichia coli and fecal streptococci. How-her station checked the sulphite reducing m spores. Very few nitrifying bacteria nd in either outflow. Ammonifying bac-e checked by the station but aerobic bacteria were not. Odor producing bac-ch were very numerous in the inflow, ced by 80% in the outflow, including in-us bacteria and hydrogen sulphide bacteria. The outflow contained con-numbers of sulphate reducing bacteria, use of chemical corrosion. Bacterial pol-cking-capacity of a large station was slightly less than that of an average size ague-FIRL)

CONCERNING DEWATERING OF COMMUNAL WASTE WATER ON SLUDGE DRYING BEDS UCHUNGEN ZUR ENTWAESSERUNG ULTER KOMMUNALER ABWAS-AEMME AUF SCHLAMMTROCKEN-N),

tschaft-Wassertechnik, Vol 24, No 8, p 74. 6 fig, 4 tab, 5 ref.

: *Sludge treatment, *Dewatering, Au-*Waste water treatment, Activated ter purification, Sludge disposal. Sludge drying beds.

udges from water purification formerly dried in beds with a depth of 20 cm ey were then manually removed. For automatic sludge removal equipment, rs are more suitable. For determination ct of the thicker layer on the drying periments were carried out: in 4 by 8 m s with concrete bases and drainage by 8 beds with cobbled bases and oes; and in 4 by 8 m beds with gravel r a period of several years, the in-he sludge layer (20, 30, or 40 cm), the se (concrete, cobbled pavement, or the origin of the sludge (mechanical or biological waste water treatment) was er natural conditions. Sludges dried on e base had a relatively pasty bottom the top and center did not differ much in sludges dried on gravel bases. For eaning of sludge drying areas, a layer of 40 cm was found to be best. The ss was impaired by the concrete base, with sludges from activated sludge ations. (Nave-FIRL)

NT INVESTIGATIONS INTO PAR-REATMENT SYSTEMS AT MAC-

eton, and T. H. Kirby.
ion Control, Vol 73, No 5, p 521-531, tab, 6 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Pre-treatment, Activated sludge, Filtration, *Pilot plants, Sewage treatment, Costs, Construction materials, Filters.
Identifiers: High rate biological treatment, Macclesfield(Great Britain).

Continued growth of the population in the drainage area coupled with the expansion of a pharmaceutical factory led to demand for additional capacity at the treatment works at Macclesfield, Great Britain. A biological treatment plant had been installed between 1961 and 1964. Experimental work on biological filtration was carried out between 1966 and 1969. In 1970, a second program was tested to assess the effectiveness of partial pretreatment of settled sewage for the reduction of BOD before its discharge onto biological filters. Two partial pre-treatment systems were examined: a high-rate activated sludge system using surface aeration; and a high-rate biological filtration using plastics filter media, each with a pilot plant. Comparisons of costs and efficiencies are given. It was concluded that a pilot plant is far more difficult to operate effectively than a full sized sewage works. Additionally, while a high rate activated sludge unit requires only the existing filter beds to be retained for secondary biological filtration, a high rate filtration unit needs the addition of extensive supplementary low rate biological filters. (Prague-FIRL)
W75-10229

**LIQUID FILTER APPARATUS,**
Hydromation Filter Co., Livonia, Mich. (assignee)
G. Hirs.
United States Patent 3,814,688. Issued June 4, 1974. Official Gazette of the United States Patent Office, Vol 923, No 1, p 264-265, June, 1974. 1 fig.

Descriptors: *Patents, *Water pollution treatment, Equipment, *Filters, Filtration, *Waste water treatment.
Identifiers: Liquid filter apparatus.

A liquid filtering device is described. The polluting liquid is introduced between opposed, planar, horizontal filter media. It then flows simultaneously through the opposed media to accrete the pollutants on the confronting faces of the media. The media are cleaned by interrupting the pollutant liquid flow and backwashing the upper filter media. Removable filter media can be discarded between the medial and lower chambers. This disposable filter is supported on a continuous conveyor and the medial and lower chambers may be separated to remove the disposable filter medium and the pollutants collected on both filter media. (Leibowitz-FIRL)
W75-10230

**A CONCEPT FOR MANAGING WASTE,**
Gulf Waste Disposal Authority, Houston, Tex.
J. P. Teller.
Chemtech, p 222-224, April 1975. 3 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Municipal wastes, Oil industry, Treatment, *Cost allocation, Texas, Organic compounds, Organic wastes, *Waste disposal, *Oil pollution.
Identifiers: Petrochemical plants, Gulf Coast Waste Disposal Authority, *Combined treatment.

The practical business aspects of a combined treatment system for wastes from several petroleum and petrochemical plants in the Houston, Texas, area are discussed. The Gulf Coast Waste Disposal Authority was organized in 1969 to dispose of industrial and municipal wastes. The Authority's first action was to convince five major companies, Champion International, Atlantic Richfield, Crown Central Petroleum, Petro-Tex Chemical, and Air Products and Chemical, to sign binding agreements to finance the 55 mgd Washburn Tunnel Facility. A treatability study was first performed which determined that the wastes were amenable to combined treatment. The next phase was the establishment of the initial costs and percentage involvement of each company and signing of contracts. Some of the main points of the contracts include: an Industrial Advisory Council; the right of the companies to take over operation of the plant if the Authority is unable to continue operation; arbitration in case of contract administration disputes; and, a specified method for payment of (if any) levied fines. The advantages of the joint approach include the following: tax-free capital investment; ad-valorem tax exemptions; sales-tax free purchases by the Authority; chemical costs savings through the balancing effects of the various combined wastes; and elimination of multiple laboratory facilities. (Orr-FIRL)
W75-10236

**DESIGN FOR SOLVENT RECOVERY,**
Chem-Pro Equipment Corp., Fairfield, N.J.
J. W. Drew.
Chemical Engineering Progress, Vol 71, No 2, p 92-99, February 1975. 11 fig, 6 tab, 4 ref.

Descriptors: *Reviews, *Costs, *Design criteria, Water pollution control, Phenols, Solvents, Water reuse, Recycling.
Identifiers: *Waste reuse, *Solvent recovery.

A review is given of the necessary steps to establish a system of reusing solvents from exhaust air and waste water in terms of costs, shortages, and pollution problems. Recovery involves removal of the solvent or collection of a liquid solvent contaminated with chemicals, dirt, and other solvents. The collected solvent must be purified, usually by distillation, and sometimes additionally by extraction. Flowsheets illustrate alternative recovery processes. While direct distillation of solvents from waste waters is possible, it is often more economical to do preliminary extraction with a water-immiscible solvent and then separation from the solvent by distillation. Commercial applications of this method are the removal of traces of phenol from waste water and the recovery of acetic acid from dilute aqueous solutions. The economic specifications for recovered solvents are: water content of the solvent, 0.05-0.50%; cross mixing of solvents, 0.5-5.0%; and organic content of the waste water, 10 to 100 ppm. Design optimization for a test system has been computed. Costs for any application are correlated with size, material of construction, and increases due to inflation. Safety and experience factors should also be included among design criteria. (Prague-FIRL)
W75-10239

**WASTE-HEAT STEAM RUNS EVAPORATIVE WATER PURIFIER.**
Chemical Engineering, Vol 82, No 6, p 34, March 17, 1975. 1 fig.

Descriptors: *Waste water treatment, Sewage, Industrial wastes, Oils, Chemicals, *Water purification, Desalination, Evaporation.
Identifiers: *Waste heat, Steam, Water purifiers.

An advanced method of waste water treatment has been developed by the Aluminum Company of America. Called the Alcoa Thermopure Process, this method uses waste heat and is related to previous environmental work in desalination. Low-pressure steam (5-10 psi) is generated by waste heat from various sources, such as furnace stacks. Wastes are concentrated by this process and can be recycled to recover chemicals and oils. Full-scale plant tests have used waste heat to treat effluent from a rolling mill. Earlier bench-scale and pilot plant tests showed that the process is effective for concentration of pollutants from sewage, suspended or emulsified oils, cooling towers, and chemical cleaning solutions. The basin unit operation employed is evaporation. Waste is pumped into the top of a vessel and dispersed by pres-

surized air; the mixture of air and waste water is then heated by hot air and water vapor. Steam introduced into the lower part of the vessel supplies the heat. Humidified air separates the concentrated liquid wastes and is conducted up to bypass line to tube exteriors in the upper part of the vessel. Air cools while it heats incoming waste water-air mixtures. Vapor condenses simultaneously to deionized-quality water. The concentrated liquid is discharged to a tank where wastes can be mechanically separated; if recycling is to be used, mixed wastes are then recirculated. (Prague-FIRL)
W75-10240

**EXTRACTION OF PETROLEUM HYDROCARBONS FROM OIL-CONTAMINATED SEDIMENTS,**
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5G.
W75-10241

**OZONE TECHNOLOGY GAINS SUPPORT.**
Canadian Chemical Processing, Vol 59, No 1, p 19-22, January 1975. 2 fig.

Descriptors: *Ozone, *Canada, *Water purification, *Potable water, Industrial wastes, Pulp and paper industry, Oil wastes, Municipal water, Reviews, Chlorine, Odors.
Identifiers: Montreal, Toronto, Quebec.

A state-of-the-art summary is given for current ozone uses and technology in Canada. Both Metro Toronto and Metro Montreal are installing large ozone plants for municipal water treatment. Montreal is building the world's largest ozone potable water treatment facility, while Toronto is installing ozone units for sewage treatment at two stations to eliminate odors. Most suppliers of ozonators to Canada are now from France and the United States; these corporations are discussed. Canadian industrial applications of ozone include its use in successfully removing phenol from petroleum refinery waste water and its use in treating kraft mill effluents in the paper industry. For such technology, the greatest expenditure is in ozonation equipment. Ozone generator outputs vary and costs are related to power consumption. Advantages of ozone both for industrial water treatment and for potable water are discussed. Chlorine is more prevalent in North America, while ozone is used widely in Europe. Specific water purification systems with ozone are cited in Long Island, New York, Indiantown, Florida, and Paris, France, and are compared with Canadian cities. (Prague-FIRL)
W75-10242

**POLLUTION LAB PAYS OFF--TWO WAYS.**
World Ports, Vol 37, No 4, p 20-21, March 1975.

Descriptors: *Oil pollution, *Industrial wastes, *Combined wastes, *Oil spills, *Monitoring, Water pollution control, Oregon, Waste water treatment, Pollutant identification.
Identifiers: Ballast wastes, Oil skimmers, Portland(Ore).

The operation of an oily ballast disposal plant at the Swan Island Ship Repair Yard, Portland, Oregon, is monitored so that waste water may be properly treated and then discharged to the municipal sewer system. Incoming material is checked for emulsification, to be sure that water is not chemically emulsified; for pH level, which must be corrected to be within the range 5.5 to 9.0; and for salt water content, which must be below 10,000 ppm. These criteria ensure that the ballast wastes will not kill the bacteria used in the sewage treatment system. Incoming waste water originates mainly from ships in drydock, where oil may have seeped into the bilge or where salt water may have been taken on as ballast while at sea. This water is treated in a separator where oil is skimmed off and remaining water is then tested. Water of an acceptable quality is dumped into the sewer system. The oil is sold for use in road work and rerefinement. Protection against oil spills is provided by two oil skimmers at the shipyard. (Prague-FIRL)
W75-10243

**APPLICATIONS OF TOXICITY TESTING TO SEWAGE-TREATMENT PROCESSES,**
Trent River Authority (England).
M. B. Green, D. G. Willetts, M. Bennett, R. F. Crowther, and J. Bourton.
Water Pollution Control, Vol 74, No 1, p 40-58, 1975. 13 fig, 8 tab, 15 ref.

Descriptors: *Biological treatment, *Sewage treatment, Toxicity, Laboratory investigation, Invertebrates, Water quality control, Effluents, Aerobic treatment, *Waste water treatment, *Pollutant identification.
Identifiers: Enchytraeid worms, Screening, *Toxicity tests.

Certain compounds present in industrial effluents are known to disrupt some of the biological stages of sewage treatment. Routine biological inspection of filters in the Upper Tame Main Drainage Authority area of Trent, Great Britain, indicated that filters at certain sewage treatment works had sparse populations of grazing invertebrates. The toxicity of sewage to macro invertebrates such as the enchytraeid worm Lumbricillus rivalis was tested. Applications of toxicity testing involve: measurement of compounds which are known to be deleterious to some extent and which are a usual feature of industrial effluent control, such as heavy metals in both aerobic and anaerobic treatment; industrial waste waters which are not readily controlled by limits determined by conventional analyses; and screening of newly-marketed formulations which might be present in sewage. Laboratory-scale activated sludge units and respirometric techniques were described. It was concluded that the application of toxicity testing to sewage treatment is a valuable method of re-assessing industrial effluent charges and of evaluating acceptable concentrations of certain wastes. Simple screening-test facilities are also useful to check and monitor problems concerning materials being discharged to a sewer. The techniques described are appropriate to the scale of sensitivity required for sewage treatment quality; for discharge of final effluent on watercourses, a higher level of sensitivity would be needed. (Prague-FIRL)
W75-10244

**COMPUTER CONTROL OF SEWAGE WORKS, PROGRESS AT NORWICH,**
C. E. Jones, and P. Cotton.
Public Health Engineer, No 14, p 46-51, March 1975. 1 fig, 7 ref.

Descriptors: *Computers, *Waste water treatment, *Sewage treatment, *Automation, *Pumps, Personnel, Monitoring, *Digital computers, Treatment facilities.
Identifiers: Central Processer Unit.

The progress of a sewage treatment system using a Kent K.70 Central Processer Unit, including a Digital Equipment PDP8E mini computer is discussed. The computer, working at Norwich, Great Britain, has executive control over 60 operating sequences known as control loops as well as 30 subsequences to these loops. Operator control panels and a control setting panel provide communication with the computer. The programs were simulated and site tested, and personnel were given special training in computer technology. The operation in its initial stages has been evaluated and it was found that programming difficulties and faults are minor. An authoritative glossary of sewage treatment terms should be produced to aid communication between various aspects of the control projects. The computer has gone on line; neither the C.P.U. nor the program have had m problems, and only five days were required t plement 30 percent of the programs. The com can monitor the duration of storm overfl operation of stand-by screen, operation of tegrator pumps, starting and stopping low pre effluent pump supplying screen, wash-water sumps, chemical storage tanks, and the oper of the standby detritor. Additionally, it can s the main pumping for operating pumps, s valves, selecting pump duty, and can keep rate records. The system can automatically a certain items such as opening of control valve speed of pumps more efficiently than by manual system. Concern was expressed number of hours of computer down time per hours; improvements have made the system reliable. (Prague-FIRL)
W75-10246

**COMPUTERIZED SEWER DESIGN: TOOL FOR AN OLD PROBLEM,**
Boyle Engineering, Santa Ana, Calif.
R. L. Ewing.
Water and Sewage Works, Vol 122, No 4, p 6 April, 1975. 4 fig.

Descriptors: Computers, *Sewers, *D criteria, Civil engineering, Costs, Hydrauli gineering, *Arizona, Construction costs, A cal techniques, *Computer programs, Input put analysis.
Identifiers: Plotted profile, Cost matrices, *S design, Phoenix(Ariz).

Computer utilization in design of civil engine systems has led to more systematic approach problems, including comprehensive analysi design parameters, cost data, and system con rations. The applicability of computer prog was demonstrated in the study of a relief s route for the city of Phoenix, Arizona. Input t computer included ground profile data, se flows from a master-plant study, types of holes, and hydraulic design criteria. The o from the computer supplied engineering docu tation such as: upstream and downstream man numbers; pipe length; pipe diameter; s capacity flowing full; design flow; velocit design flow; flow depth; invert eleva downstream and upstream; ground eleva downstream and upstream; and, depth to in upstream and downstream. When no obviou rors were noted, a plotted profile utilizing d data was drawn. Cost estimates of various cost matrices were computed. The complete port included a listing of pertinent design cri input data, system flows, system geometry, d output, quantity takeoff, cost summary by total project cost, and plotted design profile four alternatives computed, the city of Pho evaluated actual design benefits and relative struction costs and authorized one of the des A pitfall of using computer generated desig that engineers must thoroughly check both i data and output results against good engine judgment and must understand the limitatio the computer hardware and software i (Prague-FIRL)
W75-10253

**STATISTICAL ANALYSIS OF OPERATIO PERFORMANCE OF SOME PACK PLANTS,**
Department of Water Affairs, Pretoria (S Africa).
L. G. S. Turvey.
Water Pollution Control, Vol 74, No 2, p 193, 2 tab.

Descriptors: *Waste water treatment, *Sew treatment, Statistical analysis, Flow *Performance, Water pollution, Biological t ment, Efficiences, Suspended solids, Stand *Operations, Treatment facilities, Muni wastes.

fiers: Package plants, Performance evalua-

mary is given of the statistical analysis of en package plants treating sewage flows of nge 9 to 455 cu m/day. The packages in- biological filtration and activated sludge, using aeration by diffused air. All samples uent analyzed were collected between July nd November 1973 from the Transvaal area. ency curves for six pollution parameters lrawn. These were four hour permanganate (PV), free and saline ammonia (NH3), al oxygen demand (COD), suspended solids pH value, and nitrate (NO3). Curves in- percent conformances with government rds, and very poor performances were strated. For combinations of parameters, d COD, conformance with standards was or PV and NH3, 33%, COD and NH3, 31%, OD, and NH3, 30%, and PV, COD, NH3, , 26%. Such unsatisfactory package plant nance has been attributed to: underdesign; factory design; overloading; misuse such as ng; poor maintenance; poor supervision; or ination of these factors. Although package provide convenient treatment for new ip developments, army camps, and mining nities, their sub-standard performances e improved if they are to continue in use. -FIRL)
256

PITATION OF PHOSPHATES IN GE WITH LANTHANUM: AN EXPERI- AL AND MODELLING STUDY,
ter Univ., Hamilton, (Ontario).
elnyk.
le in microfiche from the National Library da at Ottawa. PhD Thesis, 1974.

tors: Water quality control, *Waste l, *Canada, *Waste water treatment, nates, *Sewage treatment, Precipita- emical), Recycling.
ers: *Chemical treatment, *Lanthanum, akes Water Quality Agreement.

ited States and Canada have designated e 'Great Lakes Water Quality Agreement' discharge of phosphates in sewage to the akes will be controlled. Chemical treat- precipitation is the most often used treat- ethod. Chemical dosage selection is empiri- requires extensive experimental studies to ed out by individual waste water treatment . The use of lanthanum as a chemical ting agent is modelled for the desirable Lanthanum has been found to be an effi- recipitating agent, causing low residual te concentration, and it can be economi- covered and recycled. The solubility of lanthanum, ortho-, pyro-, and osphate, lanthanum hydroxide and car- and the satability constants of the hydrox- polyphosphate ion complexes were mea- computer program was utilized for pre- he lanthanum dosage required for a par- sidual of dissolved phosphates given the ality of the waste water as expressed in ueous concentrations of ortho- and phates, calcium, magnesium, carbonates, chloride, sulphates, and pH. (Prague-

59

NSIONLESS DESIGN EQUATION FOR E LAGOONS,
xico Univ., Albuquerque.
sen.
from University Microfilms, Inc., Ann ichigan 48106, Order No 75-5900. PhD 974, 337 p.

rs: *Sewage lagoons, *Waste water , *Equations, Lagoons, *Sewage treatment, Biochemical oxygen demand, Climatic data, Statistical analysis, Regression analysis, Model studies, *Design criteria, Computer programs, Computer models.
Identifiers: *Dimensionless equations.

A lagoon design equation was developed based on loading and climatic factors. This dimensionless equation for surface area was based on the results of a one year study of a sewage lagoon. The year was divided into 296 sample periods; for each period data were collected on the chemical, biochemical, and climatic factors associated with the lagoon including biochemical oxygen demand, solar radiation, and wind speed. Stepwise regression analysis was used to determine predictive variables; after regression, the dimensionless products were seen as follows: MOT Number equals SURFACE AREA (SOLAR RADIATION) to the 1/3 power/INFLUENT FLOW RATE (INFLUENT BOD) to the 1/3 power; RED Number equals INFLUENT BOD minus EFFLUENT BOD/INFLUENT BOD; TTC Number equals WIND SPEED (INFLUENT BOD) to the 1/3 power/(SOLAR RADIATION) to the 1/3 power; TEMPR Number equals LAGOON LIQUID Temperature/AIR TEMPERATURE; and DRY Number equals RELATIVE HUMIDITY. The model design selected by a computer program for the estimation of non-linear parameters was: MOT = (2.47 to the RED power + 2.47 to the TTC power + 24.9/TEMPR + 150.0/DRY X 1,000,000. This equation is thus used to calculate the lagoon surface area needed to accomplish any desired BOD reduction (RED Number) given climatic data for the geographical area of a specific lagoon location. (Prague-FIRL)
W75-10261

**CALIFORNIA PLANT GETS STRAIGHT 'A'S IN COMPUTER CONTROL,**
San Jose-Santa Clara Water Pollution Control Plant, San Jose, Calif.
F. M. Belick, and F. N. Van Kirk.
Water and Wastes Engineering, Vol 12, No 3, p 20-24, 76-77, March, 1975.

Descriptors: *Computers, *Water pollution control, *California, Engineering design, Installation, *Waste water treatment, Monitoring, Flow data, Analog computers, Personnel, *Control systems, Treatment facilities.
Identifiers: *Direct digital control(DDC), San Jose/Santa Clara(Calif).

The San Jose/Santa Clara, California, water pollution control plant has been converted from Pneumatic analog control to direct digital control (DDC) with very little difficulty. Design and installation increased the plant capacity from 94 mgd to 160 mgd. Benefits of the DDC system include treatment efficiency, whereby process flow data is fed to the computer and updated every few seconds, achieving clean effluent discharge and flow balances within each unit process, and plant productivity, whereby most DDC control operations are in a central computer room and a larger(160 mgd) plant may be operated with no significant increase in personnel. Additionally, energy is conserved because automatic control of demand for air eliminates provision of excess air, as under a manual control system. Because the computer monitors loading rate of each tank and whether or not a particular one is in use, the flow of chemicals takes place only when they are needed, conserving the amount of chemicals. Moreover, the system has unlimited flexibility; changes in computer control are primarily changes only in software instructions, such as instrument ranges, alarm limits, or trend recording. With DDC, the plant management staff is continually provided with all types of operating information, pre-calculated and displayed graphically in appropriate engineering units, and accessible at an central location for use. (Prague-FIRL)
W75-10264

**A COMPUTER COMES TO MISSOURI,**
Springfield Water Dept., Mo.
R. D. Plank.
Water and Wastes Engineering, Vol 12, No 4, p 54-56, April, 1975.

Descriptors: *Computers, *Monitoring, *Treatment facilities, *Waste water treatment, *Municipal water, Automation, Data analysis, Measurement, Filters, *Missouri, Digital computers.
Identifiers: Springfield(Mo).

Digital computers are now being utilized to monitor and control the Fulbright water plant at Springfield, Missouri. A Honeywell VupaK on-line data acquisition and process control system monitors 109 separate functions of the municipal treatment and distribution system. Data points measure the total raw water flow into the plant from a reservoir and a spring which is fed from lake watersheds. Three venturi flow devices transmit signals for these measurements. Analog measurements include reservoir, storage tank, and clearwell levels, raw and finished water pH, effluent turbidity at several points, air and finished water temperature, and station pressure. In addition, the computer monitors operation of six mixed-media and dual-media filters, and can initiate backwash from a loss-of head signal or from effluent turbidity. Water quality is measured in a laboratory and manually entered into the computer in terms of residual chlorine, rising well level, inches of rainfall, chlorine tank weight, odor, color, bacteria, and conductivity. Monthly summaries of data on 79 points throughout the system are logged in. Items tabulated by the computer include total finished water, total wash water, total chemicals, and pump running times. This system has found flaws in the plant's previous measuring and control equipment. The operator need not have technical computer training, thus the system is easy for a water department to handle. (Prague-FIRL)
W75-10265

**CALCULATION OF REACTION MECHANISMS IN FERMENTATION BASINS WITH CONTINUOUS FLOW (ZUR BERECHNING VON REAKTIONSABLAEUFEN IN KONTINUIERLICH DURCHSTROEMTEN FERMENTERBECKEN),**
E. Adams, M. Boes, L. Hartmann, and H. Spreuer.
Wasserwirtschaft, Vol 64, No 10, p 294-301, 1974. 12 fig, 13 ref.

Descriptors: *Sewage treatment, Flow rates, *Biological treatment, Mathematical models, Equations, *Fermentation, Treatment facilities, Design criteria, *Waste water treatment.
Identifiers: Germany.

The performance and design of a biological sewage treatment facility with continuous flow is studied mathematically. The plant uses the fermentation process. Data processing and numerical mathematics do not yield reliable approximate solutions for the flows and chemical reactions. Rather, by using the theory of differential inequalities, with rigorous upper and lower bounds, an unknown exact solution of the system is determined. The dependency of the bounds on specific parameters is discussed. (Nave-FIRL)
W75-10267

**RESEARCH ON POLLUTION WITH POLYCHLORINATED BIPHENYLS AND POLYCHLORINATED TERPHENYLS IN SEWAGE PLANTS, (IN JAPANESE),**
T. Kowase, Y. Tsuchiya, Y. Okamoto, K. Yamazaki, and S. Mimura.
Tokyo Eisei Kenkyu Nenho (Annual Report of Tokyo Metropolitan Research Laboratory of Public Health), No 25, p 411-416, 1974. 3 fig, 9 ref.

Descriptors: *Polychlorinated biphenyls, *Sewage treatment, *Waste water treatment, Water pollu-

tion, Activated sludge, Effluents, Influent streams, Industrial wastes, Pollution identification.
Identifiers: *Polychlorinated terphenyls, Coprostanols, Japan.

Research was conducted on pollution by polychlorinated biphenyls (PCBs), polychlorinated terphenyls (PCTs), and coprostanols in sewage treatment plants. When influents, effluents, and activated sludges of some sewage plants were examined, PCBs was detected in all three materials. The maximum value of PCBs was detected in a Ukima, Japan, plant where industrial waste water is treated. PCTs were detected in influents and activated sludges, but not in effluents. The PCTs/PCBs ratio in activated sludges had an average value of 1/17. No correlation between coprostanol and PCBs could be demonstrated; a very slight correlation exists between coprostanol and PCTs. (Prague-FIRL)
W75-10271

**SEPARATION OF PHENOL FROM WASTE WATER BY THE LIQUID MEMBRANE TECHNIQUE,**
Exxon Research and Engineering Co., Linden, N.J.
R. P. Cahn, and N. N. Li.
Separation Science, Vol 9, No 6, p 505-519, 1974. 7 fig, 3 tab, 4 ref.

Descriptors: *Phenols, *Waste water treatment, Emulsions, Oil, Mathematical models, Laboratory tests, *Membrane processes, *Separation techniques.
Identifiers: Liquid membrane emulsion.

A number of systems have been compared for the removal of phenols from waste waters. The liquid membrane emulsion technique, which involves either oil-in-water or water-in-oil emulsions is described as to its performance in small scale laboratory tests. The impurity in the waste water, such as phenol, permeates across the oil membrane in its undissociated form and is then neutralized by the strong caustic or acid inside the aqueous droplets within the emulsion, thus preventing its escape back out into the waste water. A single-stage installation together with make-up, recycle, and disposal is described. Mathematical relationships are derived for the theoretical distribution and for the rate of permeation of phenol into an emulsion. The method is particularly useful where other techniques fail due to the presence of interfering substances, or very high or very low pH. (Prague-FIRL)
W75-10273

**PROBLEMS WITH EFFLUENT SEEPAGE FIELDS,**
Connecticut Univ., Storrs. Dept. of Civil Engineering.
K. H. Healy, and R. Laak.
Water and Sewage Works, Vol 121, No 10, p 64-67, October, 1974. 9 fig, 6 ref.

Descriptors: *Seepage control, *Design criteria, *Septic tanks, Effluents, Soil contamination effects, Hydraulic conductivity, Soils, *Connecticut, Path of pollutants, Water pollution sources, *Soil disposal fields, *Waste water treatment, Waste water disposal.
Identifiers: Seepage fields, Land application.

A rational method of designing seepage fields was investigated. Of septic tank seepage fields in Connecticut that failed, three quarters of them failed because the ground surrounding the field could not absorb the liquid, and the failures were a result of greatly reduced permeability at the soil interface due to biological activity. Design criteria were discussed for land application of an effluent. It was determined that a successful septic tank seepage field must have sufficient soil interface so that effluent application rate does not exceed from approximately 0.3 gpd/sq ft for clayey or silty soils to 0.8 gpd/sq ft for clean sands and gravels. If a potential hydraulic head of 12 inches can be provided, the sides and bottoms of trenches, beds, or pits can be used to compute this area. Also, if the ground surrounding a seepage field must have sufficient hydraulic conductivity to absorb the liquid faster than it is applied. This is a difficult requirement because the hydraulic conductivity is dependent upon a number of factors; these include existing soil permeability, groundwater elevation, and impermeable boundaries. If the designer is made aware of both the hydraulic conductivity and the soil interface area, he can specify site changes such as drainage or filling and should be able to then allow construction of a seepage field for effluent disposal, applicable to specific cases of subsurface disposal of domestic septic tank effluent. (Prague-FIRL)
W75-10274

**THE DEVELOPMENT OF A SCHEME TO CONSTRUCT LARGE DIAMETER SEWAGE PUMPING MAINS ACROSS THE RIVER TEES AND THE TEES RAILWAY MARSHALLING YARD,**
F. M. Firth.
Chartered Municipal Engineer, Vol 102, No 4, p 72-76, April, 1975. 5 fig.

Descriptors: *Sewage, *Waste water treatment, *Pipelines, Design criteria, Construction materials, Interceptor sewers, Water pollution control, Sewage treatment, Rivers.
Identifiers: *River Tees(Great Britain), Surge pressure analysis.

Construction of a two stage sewerage scheme has begun on the River Tees, Great Britain, one of the Country's most polluted estuaries. The first stage, to be completed by 1976, is a system of interceptor sewers, gathering flows to a point on the river where there already is a concentration of major sewer outfalls and where available land exists for a new sewage treatment works. The system will service a population of up to 170,000 with a maximum design flow of 3200 liters/sec. A large amount of variation in flow quantity to be pumped is accommodated by two pipelines of 1.0 m bore and one pipeline of 0.7 m bore. Design velocity within the mains is about 2.0 m/sec with a maximum pumping head of 21 m. Design criteria included possible routes of the pipeline with cost optimization, choice of pipeline material, and analysis of surge pressure. (Prague-FIRL)
W75-10275

**SUBMERSIBLE PUMPS MAKE BY-PASS POSSIBLE,**
Los Angeles County Sanitation District, Whittier, Calif.
For primary bibliographic entry see Field 8C.
W75-10276

**WASTEWATER LIFT STATION OPENS WAY TO URBAN EXPANSION.**
For primary bibliographic entry see Field 8C.
W75-10277

**WATER RESEARCH CENTER UNRAVELS THE NITRATE KNOT,**
J. Naughton.
Surveyor, Vol 4285, p 12-16, July, 1974. 6 fig.

Descriptors: *Nitrates, *Water pollution, *Effluent control, *Sludge disposal, Runoff, Sewage effluent, Industrial wastes, Domestic wastes, *Waste water treatment, Activated sludge, Biological filtration, Discharges, Clarification.
Identifiers: *Heteortrophic bacteria, Methanol, Molasses.

The Water Research Center, United Kingdom, has investigated the hazards of nitrates from sewage effluents and other sources reaching drinki
water supplies. An evaluation was made of the d
ferent methods of nitrate removal from sewage e
fluents at the WRC Stevenage Laboratory, co
summated by the start of full-scale trials at the R
Meads Sewage Works on the Lee River. T
method developed resulted in savings in treatme
costs, and in the capital costs of new work
Sewage and agricultural run-off are the greate
contributors to the nitrate problem. Research
Stevenage concentrated on the flooded filter co
cept. The method works on the principle that the
exists a group of facultative heterotrophic bacter
capable of modifying their metabolism to u
nitrate as a source of oxygen when there is no di
solved oxygen. Nitrate removal then can be e
fected by the deprivation of oxygen to a nitrifi
effluent, containing these bacteria. An addition
source of carbon is needed to achieve an adequa
rate of oxygen utilization and denitrificatio
Molasses and methanol are the cheapest ca
bonaceous materials for convenient use. Nitra
removals of about 90 percent are achieved wi
flooded filters, while experiments at low temper
tures showed a reduced efficiency in the filte
below 10 C. (Leibowitz-FIRL)
W75-10278

**POLLUTION CONTROL, NEXT STEP, PHYS
CAL/CHEMICAL TREATMENT, ACTIVATE
CHARCOAL,**
McMaster Univ., Hamilton (Ontario).
A. Benedek, and A. B. Redekopp.
Water and Pollution Control, Vol 112, No 9, p 2
26, September, 1974.

Descriptors: *Activated carbon, *Waste wat
treatment, *Municipal wastes, *Industrial waste
Sewage treatment, Tertiary treatment, Adsor
tion.

The range and type of waste water treatment un
operations have changed little over the last sixt
years although the volume and nature of municip
and industrial waste waters have changed rad
cally. Activated carbon adsorption is considere
the most important organic removal process to b
developed since the advent of the activated sludg
process in 1912. Activated carbon is a relativel
cheap, non-specific adsorbent with a high capacit
for most waste water organics. Activated carbo
columns are used as tertiary treatment to remov
nonbiodegradable components of waste wate
Water that is directly or indirectly recirculate
needs to have all possible organic matter removed
activated carbon treatment following biologica
oxidation is an economical and reliable method fo
this. Plants are now in operation based on th
physical-chemical treatment procedure. Ra
sewage entering such plants is chemically clarifie
with one of the metal coagulants used i
phosphorous removal such as alum, ferric or fer
rous salts or lime, and a polymeric flocculant
Chemical clarification can remove more than 90%
of the suspended solids in sewage. The clarifie
waste water is fed to activated carbon columns
with or without filtration. The advantages o
physical-chemical treatment over conventiona
treatment included: high organic treatment levels
almost complete suspended solids an
phosphorous removal; good removal of most non
biodegradable organics and trace metal ions; low
required land levels; low initial capital cost; eas
start-up; insensitivity to biological toxins; and
capability of handling highly fluctuating feed con
centration. (Orr-FIRL)
W75-10279

**ZETA POTENTIAL CONTROLS DIRECT FIL
TRATION COAGULATION,**
For primary bibliographic entry see Field 5F.
W75-10280

RACTERISTICS OF GAS-LIQUID CON- APPARATUS IN OZONE TREATMENT DRINKING WATER, (IN JAPANESE),
rimary bibliographic entry see Field 5F.
0281

CLE SLUDGE TO FEED FARMS,
/Hill, Denver, Colo.
chwing, and J. L. Puntenney.
and Waste Engineering, Vol 11, No 9, p 24- 74, 76, 78, September, 1974. 2 fig, 5 tab.

ptors: *Sludge disposal, *Fertilization, ents, *Sewage treatment, Anaerobic on, Drying, Incineration, Municipal wastes, ation methods, Environmental effects, Ir- n practices, Organic matter, *Colorado, cling.
iers: *Denver(Colorado).

etro Denver Sewage Disposal District No. ver, Colorado, is expanding and developing ive sludge disposal system. It will include stance pumping of sludge slurry, subsurface on, and air drying of the sludge for crop fer- on. On-site treatment of the sludge at the ex- facilities will consist of air flotation ing of the waste activated sludge and bic digestion of the combined waste ac- and primary sludges for stabilization. Land ration of the sludge is currently practiced e it makes possible the reuse of a poten- valuable material for fertilization and tes the buildup of nutrients in the treatment that results from the recycling of sludge. ironmental monitoring program tests core from the soil where the sludge is ed for nutrients, metals, and coliform bac- Wheat is planted annually and used as and hay for cattle. The expanded program ke sludge either in a dried or liquid state e to area farmers to use as fertilizer. An pplication limit will be set on each farmer's pending on the crop grown. The expendi- the proposed system compares favorably e cost of the current system and also well cost of incineration. (Orr-FIRL)
282

IPACT OF SECONDARY TREATMENT ASTES DISCHARGED INTO THE
--Subcomm. on Environmental Pollution-- on Public Works, U.S. Senate, 93d Cong, March 18, 1974. 425 p, multiple fig, photo,

ors: *Sewage treatment, *Federal Water Control Act, *Hawaii, *Municipal *Oceans, Pacific Ocean, State govern- Local governments, Water policy, Legisla- egal aspects, Regulations, Water law, nt, Waste treatment, Waste water treat- ater pollution treatment, Water treatment, nt facilities, Disposal, Sewage, Water pol- Water pollution sources, Federal govern-

rs: *Administrative regulations, *Coastal *Congressional hearings, *Federal Water Control Act Amendments of 1972, En- tal policy, Hazardous sub- Pollution).

act of secondary treatment on wastes d into the ocean is the subject of these earings. Particular emphasis is given to problems with the Federal Water Pollu- trol Act which requires that municipal ter facilities utilize secondary treatment 1977. Criticism is made of the inflexibili- Act, for failure to allow exceptions where afety and the ecology will not suffer. nmentators propose amending the Act to retion in granting permission for alterna- ment processes which will produce an better environmental effect. It is sug- gested that advanced primary treatment is sufficient for some areas of Hawaii. (Fernandez-Florida)
W75-10321

**IMPLEMENTATION OF THE FEDERAL WATER POLLUTION CONTROL ACT.**
For primary bibliographic entry see Field 5G.
W75-10322

**STEAM ELECTRIC POWER GENERATING POINT SOURCE CATEGORY--PROPOSED EFFLUENT GUIDELINES AND STANDARDS FOR INCOMPATIBLE POLLUTANTS.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10323

**MARINE SANITATION DEVICES--PROPOSED CERTIFICATION PROCEDURES AND DESIGN AND CONSTRUCTION REQUIREMENTS.**
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10324

**CANNED AND PRESERVED FRUITS AND VEGETABLES PROCESSING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10325

**LIQUID AND CRYSTALLINE CANE SUGAR REFINING SUBCATEGORY--EFFLUENT LIMITATIONS GUIDELINES AND PROPOSED PRETREATMENT STANDARDS.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10326

**INORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10327

**ELECTROPLATING POINT SOURCE CATEGORY; COPPER, NICKEL, CHROMIUM AND ZINC ON FERROUS AND NONFERROUS MATERIALS SUBCATEGORY.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10328

**THERMAL DISCHARGES--PROPOSED PROCEDURES FOR THE IMPOSITION OF ALTERNATIVE EFFLUENT LIMITATIONS.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10329

**ASBESTOS MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT LIMITATIONS GUIDELINES.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10330

**FERROALLOY MANUFACTURING POINT SOURCE CATEGORY.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10332

**FEEDLOTS POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10333

**GLASS MANUFACTURING POINT SOURCE CATEGORIES--EFFLUENT GUIDELINES AND STANDARDS.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10334

**THERMAL DISCHARGES.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10335

**BUILDERS PAPER AND BOARD MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT LIMITATIONS GUIDELINES.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10336

**STEAM ELECTRIC POWER GENERATING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10337

**DURABLE SLURRY PUMPS ARE HEART OF POLLUTION CONTROL FACILITY AT INLAND.**
For primary bibliographic entry see Field 8C.
W75-10340

**MASS TRANSFER TO NATURALLY FLOWING STREAMS,**
Delaware Univ., Newark. Dept. of Chemical Engineering.
V. M. Nadkarni, and T. W. F. Russell.
Industrial Engineering Chemical Process Design Development, Vol 12, No 4, p 414-416, 1973. 1 fig, 1 tab, 6 ref.

Descriptors: *Waste disposal, *Design engineering, Streams, *Waste water treatment, Mathematical models, Calculations, Estimating, *Mass transfer.
Identifiers: *Oxygen transfer rates.

Before planning a system of waste water disposal to naturally flowing streams, it is necessary for a process design engineer to estimate rates of oxygen transfer which will occur. In 1964, a typical correlation was developed by Downing and Knowles to calculate the mass transfer coefficient. While their method was an empirical one, a simpler semiempirical correlation is presented which is simpler in form and is superior in its agreement with published data. (Prague-FIRL)
W75-10341

**HIRE AN ACTIVATED CARBON PLANT FOR WASTE WATER TREATMENT,**
Chemviron S.A., Brussels (Belgium). Technical Dept.

C. Bailey.
Progress Engineering, No. 2, p 116-117, February, 1975. 1 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Activated carbon, Oil industry, Chemical industry, Treatment, Organic compounds, Adsorption, Textiles.
Identifiers: Chemviron Adsorption Service, Textile industry, Pharmaceutical industry, Package plants.

The increasingly complex chemical nature of waste streams as well as the more stringent effluent quality requirements has increased the employment of activated carbon treatment systems. A waste water treatment package using activated carbon is offered by Chemviron called the Chemviron Adsorption Service (CAS). The service combines the reliability of carbon adsorption with carbon regeneration and modular engineering. Systems are designed for each specific waste stream. A typical system includes: granular carbon adsorbers; a filtration system; a carbon transfer vessel to assist the periodic carbon replacement; and, pumps and controls. The following classes of compounds are readily adsorbed on carbon: aromatics, phenolics; chlorinated hydrocarbons; surfactants; soluble organic dyes; organic acids; branch-chained aliphatics; and high molecular weight amines. CAS offers an economical treatment process for both large and small firms; it provides guaranteed treatment objectives while involving no major capital investment by the user. Industries now using activated carbon treatment include the textile, petroleum, chemical, and pharmaceutical industries. (Orr-FIRL)
W75-10346

**UPGRADING EXISTING WASTEWATER TREATMENT PLANTS--CASE HISTORIES.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
Seminar Publication, August, 1973. 20 p, 11 fig, 6 tab.

Descriptors: *Waste water treatment, *Activated sludge, *Trickling filters, Nitrification, Biological treatment, Retention, *Treatment facilities.
Identifiers: Hydraulic-retention, *Technology transfer.

Case histories are presented which relate to upgrading the performance of activated sludge and trickling filter plants through modification of the biological processes. In these processes, the biochemical reaction rates depend on the concentration of the wastes and on the appropriate microorganisms capable of feeding on the wastes. Inadequate hydraulic-retention or contract time and solids retention time are the factors which may limit the actual plant performance to a less than optimum level. In addition to the case histories, an outline is presented which lists the process modification or addition and when to use it. The process modifications include: tightening process control; adding final tank capacity; increasing aerator solids level; increasing air supply or improving air distribution; increasing contact time; dividing the reactor into multiple compartments in series; contact stabilization; step aeration; completely mixed activated sludge; positive ventilation; media change; increasing recirculation; activated sludge recirculation; high rate trickling filters; activated sludge; and, a nitrification trickling filter. (Orr-FIRL)
W75-10347

**OZONE CHEMISTRY AND TECHNOLOGY-A REVIEW OF THE LITERATURE: 1961-1974,**
Franklin Inst. Research Labs., Philadelphia, Pa. Science Information Services Dept.
J. S. Murphy, and J. R. Orr.
Franklin Institute Press, Philadelphia, Pa, 1975. 392 p.

Descriptors: *Reviews, *Ozone, *Waste water treatment, Publications, Equipment, Instrumentation, *Bibliographies, Chemistry, Polymers.
Identifiers: Organic chemistry, Inorganic chemistry, Ozonization, Literature reviews.

The worldwide chemistry literature was thoroughly reviewed from 1961 to 1974 for all aspects of ozone chemistry and technology. Eleven state-of-the-art overviews covering nine subject areas comprise the body of the book with over 3,000 bibliographical entries as supportive material. The subject areas include the effects of ozone on vegetation, the effects of ozone on animals, ozone treatment of waste water, ozone in organic chemistry, ozone equipment and instrumentation, ozone involvement in atmospheric chemistry and meteorology, ozone in inorganic chemistry, ozone general chemistry and technical applications, and ozone in polymer chemistry. Thorough subject and author indexes are also included. (Orr-FIRL)
W75-10348

## 5E. Ultimate Disposal Of Wastes

**DISPOSAL OF WASTE STREAMS CONTAINING ASBESTOS,**
Dow Chemical Co., Midland, Mich. (assignee)
T. F. Lagess, and V. H. Maudlin.
US Patent No 3,887,462, 4 p, 6 ref; Official Gazette of the United States Patent Office, Vol 935, No 1, p 293, June 3, 1975.

Descriptors: *Patents, *Waste disposal, *Underground waste disposal, *Waste disposal wells, *Asbestos, Limestones, Alkaline earth metals.
Identifiers: Settling agents, Waste asbestos.

Waste asbestos carried in aqueous waste streams can be safely disposed of in underground cavities. Problems associated with such method of disposal in underground cavities, from which it may be desired to extract aqueous streams, are overcome by contacting the asbestos with a relatively dense settling agent which attaches to the asbestos and causes it to sink to the bottom of the cavity. The settling agent may be a finely divided rock or mineral, especially one which contains appreciable amounts of alkaline earth metal compounds. In some instances, relatively small amounts of water-soluble or water-miscible organic flocculating agents are added to aid the settling. Care should be taken to avoid aeration of the asbestos slurry because the asbestos, which contains tiny pores and voids, can capture small air bubbles within its fibrous structure and this makes settling more difficult. (Sinha-OEIS)
W75-09876

**SEWAGE PLAN WEDS FIVE MUNICIPALITIES,**
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
For primary bibliographic entry see Field 5D.
W75-09914

**A MODEL FOR PREDICTING THE EFFECTS OF SEWAGE EFFLUENT ON WETLAND ECOSYSTEMS,**
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5B.
W75-09915

**UNDERGROUND LIQUID WASTE DISPOSAL.**
American Society of Civil Engineers, New York. Task Committee on Underground Liquid Waste Disposal.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY3, p 421-435, March, 1975. 10 tab, 18 ref.

Descriptors: *Waste water disposal, *Indus wastes, *Underground waste disposal, W disposal wells, Injection wells.

A discussion underground liquid waste disposa cludes the following topics: information on the tent and character of underground liquid w disposal and the status of regulation in the U assessment of the impact that this disposal is ing and will have on the environmental and int ty of groundwater resources; and, recommen tion of appropriate courses of action to mon control, limit, or prohibit underground li waste disposal. Although the chemical industr the largest user of injection wells, a variet other industries also have constructed such w Most existing wells are between 1,000 and 6 feet deep. Ninety-five percent of existing w have average injection rates of less than 400 and 99 percent inject at average well-head p sures of less than 1,500 psi. Few examples of tamination of fresh groundwater were found. reported instances of degradation of o resources were found. Waste water with l quantities of dissolved inorganic chemicals are most likely to be injected. Any future restricti on injection will include that treatment must performed prior to injection. The policy of Ohio River Valley Water Sanitation Commissio presented as a rational basis for control of derground liquid waste disposal. (Orr-FIRL)
W75-09938

**FLUIDIZED-BED INCINERATION OF URB SLUDGE (INCINERATION DES BOUES U BAINES EN LIT FLUDISE),**
For primary bibliographic entry see Field 5D.
W75-09941

**RESEARCH STATUS ON EFFECTS OF LA APPLICATION OF ANIMAL WASTES,**
Kansas State Univ., Manhattan.
For primary bibliographic entry see Field 5B.
W75-10022

**GROUND WATER POLLUTION PROBLEMS THE NORTHWESTERN UNITED STATES,**
Geraghty and Miller, Port Washington, N.Y.
For primary bibliographic entry see Field 5B.
W75-10023

**GROUNDWATER POLLUTION BY WAS DISCHARGE (LA POLLUTION DES EAU SOUTERRAINES PAR LES DECHARGES),**
For primary bibliographic entry see Field 5B.
W75-10042

**AN INTEGRATED SYSTEM FOR DISPOSAL O SLUDGES ORIGINATING FROM WATER SO TENING AND SEWAGE TREATMENT IN M NICIPALITIES,**
Kansas Univ., Lawrence. Dept. of Civil Enginee ing.
For primary bibliographic entry see Field 5D.
W75-10123

**USE OF LIME-SODA ASH SOFTENIN SLUDGE FOR THE TREATMENT OF MU NICIPAL WASTEWATER,**
Kansas Univ., Lawrence. Dept. of Civil Enginee ing.
For primary bibliographic entry see Field 5D.
W75-10125

**HYDROLOGIC EVALUATION OF TH HAYSTACK BUTTE AREA WITH EMPHASI ON POSSIBLE DISCHARGE OF CLASS WASTES, EDWARDS AIR FORCE BASE CALIFORNIA,**
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W75-10161

GN OF SURFACE WATER OUTFALLS TO RS,
ans River Purification Board (Scotland).
imary bibliographic entry see Field 5D.
0183

PS: A POTENTIAL THREAT TO OUR NDWATER SUPPLIES,
onmental Protection Agency, Washington, Office of Solid Waste Management Pro-

imary bibliographic entry see Field 5B.
0184

URFACE ENVIRONMENT--PRIVATE ERTY OR PUBLIC DOMAIN,
a Polytechnic Inst. and State Univ., burg. Water Resources Research Center.
mary bibliographic entry see Field 4B.
0209

AVY JONES GARBAGE DUMP,
on Co., Portsmouth, R.I.
mary bibliographic entry see Field 5G.
0238

R QUALITY ROUTING OF UNSTEADY FLOW BY FINITE ELEMENT OD,
Univ, (Japan). Dept. of Civil Engineering.
mary bibliographic entry see Field 5B.
252

EMS WITH EFFLUENT SEEPAGE S,
ticut Univ., Storrs. Dept. of Civil En-g.
nary bibliographic entry see Field 5D.
274

LE SLUDGE TO FEED FARMS,
Hill, Denver, Colo.
nary bibliographic entry see Field 5D.
282

THERMAL,
ech Corp., Menlo Park, Calif.
bastian, T. D. Allen, and W. C. Laughlin,

nd Wastes Engineering, Vol 11, No 9, p 47-eptember, 1974. 2 fig, 2 tab.

ors: *Sludge disposal, *Incineration, n abatement, *Sewage treatment, Ulti-sposal, Solid waste, Oxidation, Drying, Equipment, *California, Waste treat-

rs: Furnaces.

oxidation of sewage sludge is achieving ls of technology and performance. A task the Environmental Protection Agency d a report in 1972 which stated that ncineration processes were an acceptable e for sludge disposal. Sludge incinerator designed to meet existing air quality stan-roduce acceptable stack emissions of oxides, sulfur oxides, odors, and particu-er. The total destruction of PCB, a type of chemical found in sewage sludges which degradable, is possible when oxidized in ion with sewage sludge. A schematic fur-resentation is presented of an advanced pe unit being constructed for the Liver-ater Reclamation Plant, Livermore, a. The top third of the furnace is the dry-fresh sludge in this section is dried by the m the combustion zone. The middle sec-ne furnace is where combustion of the ds occurs. The remaining ash cools in the rd of the furnace. Livermore also has plans for a separate multiple hearth furnace to recalcine or reclaim lime used in the treated process. Sludge incineration by the new methods will contribute less pollutants to the air than the 'clean' car of 1976. Sludge incineration is also an environmentally sound method for disposing of industrial liquid wastes. (Orr-FIRL)
W75-10284

THE IMPACT OF SECONDARY TREATMENT ON WASTES DISCHARGED INTO THE OCEAN.
For primary bibliographic entry see Field 5D.
W75-10321

MASS TRANSFER TO NATURALLY FLOWING STREAMS,
Delaware Univ., Newark. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W75-10341

## 5F. Water Treatment and Quality Alteration

DESALTING PLANTS INVENTORY, REPORT NO. 5,
Hawaii Univ., Honolulu. Coll. of Business Administration.
For primary bibliographic entry see Field 3A.
W75-09852

REVERSE OSMOSIS SYSTEM WITH AUTOMATIC VALVE FOR MODULE OPERATION CONTROL,
Desalination Systems, Inc., Escondido, Calif. (assignee)
For primary bibliographic entry see Field 3A.
W75-09877

APPARATUS FOR TREATING WATER CONTAINING IMPURITIES,
Stanley Denki Kabushiki Kaisha, Tokyo (Japan); and Kabushiki Kaisha Inoue Japax Kenkyusho, Kanagawa (Japan). (assignees)
For primary bibliographic entry see Field 5D.
W75-09884

WATER CHLORINATION METHODS,
Capital Controls Co., Inc., Colmar.
K. A. Moyer.
Water and Sewage Works, Vol 121, No 9, p 64-65, September 1974. 2 fig.

Descriptors: *Chlorination, *Water treatment, *Waste water treatment, *Chlorine, Equipment, Water quality control, Water purification, Disinfection, Sewage treatment.
Identifiers: Compound loop control.

Chlorination of waste water to destroy pathogenic, disease-producing organisms and avoid other forms of water degradation is used in almost all municipal and industrial water treatment applications. Chlorine gas is considered the best source for almost any chlorination were large volumes of water are to be chlorinated to high levels because it is a pure substance, it lowers pH slightly, is easy to control and apply, and is the cheapest source of chlorine based on pounds of available chlorine. Choosing the proper chlorination system depends on the chlorine demand, the amount of chlorine required to react with the organic and inorganic substances and to kill the bacteria; the chlorine dosage, the amount of chlorine put into the water; the chlorine residual, the amount of chlorine remaining after a specified contact period; and, the flow rate of the water. A water treatment plant that processes water with a constant chlorine demand but that experiences rapid, wide-ranging daily flow variations could use a flow proportioning chlorinator to automatically meter exact amounts of chlorine into the water. When the chlorine demand of the water source varies, it is necessary to use an amperometric instrument to automatically and continuously measure levels of chlorine residual. The best automatic chlorine feeding system is compound loop control. This is needed when both the water flow rate and chlorine demand vary significantly in the body of water being treated. It is a combination of a flow proportioning chlorinator and a chlorine residual control system. (Orr-FIRL)
W75-09910

WATER TREATMENT WITH OZONE.
Netherlands Patent 32218U/23. Issued November 6, 1974. Derwent Netherlands Patents Report, Vol 47, No 1, p 1, December 31, 1974.

Descriptors: *Patents, *Ozone, *Water treatment, Filters, Activated carbon, Construction materials, Filtration, Waste water treatment.
Identifiers: *Filter beds.

Water is treated with filtration and reduction of the ozone residue steps. The filter bed is described. This is composed of a uniform mixture of granular inert natural or synthetic microporous material, as well as granulated activated carbon of a similar physical nature. The best types of natural or synthetic components are those which are chemically reactive. (Prague-FIRL)
W75-09923

ASBESTOS IN DRINKING WATER,
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
For primary bibliographic entry see Field 5A.
W75-10030

FILTRATION OF WATER WITH A HIGH IRON CONTENT,
Viak A.B., Vallingby (Sweden).
A. Hult.
Effluent and Water Treatment Journal, Vol 14, No 5, p 265-267, May 1974. 3 fig, 2 tab, 2 ref.

Descriptors: *Groundwater, *Iron, *Manganese, *Filtration, *Oxidation, Potable water, Water supply, Public health, *Water treatment, Hydrologic aspects.

Iron is present in groundwater in many countries in amounts greater than 0.2 ppm, or exceeding the standards for potable public water supply. Effects of this excess of iron are a bad taste in the water and staining of laundry. Iron is commonly removed by precipitation through oxidation and filtration. Oxidation may be produced by aeration, sometimes combined with an increase of the pH value, or by adding oxidation agents other than air. Manganese in groundwater causes similar problems. Both field and laboratory investigations are necessary to determine the proper treatment for water containing iron or manganese. Satisfactory results were obtained by filtration of water with a very high iron content when the following factors were considered: suitable gradation of the filter material; choice of suitable alkali; and oxidation during filtration. (Prague-FIRL)
W75-10171

REPORT OF COMMITTEE ON SURVEY OF GROUND WATER SUPPLIES IN NEW ENGLAND.
New England Water Works Association, Boston (Mass).
For primary bibliographic entry see Field 4B.
W75-10182

LEGISLATIVE HISTORY OF THE SAFE DRINKING WATER ACT,
House, Washington, D.C.
For primary bibliographic entry see Field 5G.

W75-10186

**DISPOSAL OF WASTE ALUM SLUDGE FROM WATER TREATMENT PLANTS,**
Malcolm Pirnie, Inc., Paramus, N.J.
For primary bibliographic entry see Field 5D.
W75-10195

**EFFECTS OF DEPOSIT RESUSPENSION ON SETTLING BASIN,**
Kyoto Univ. (Japan). Dept. of Chemical Engineering.
T. Takamatsu, M. Naito, S. Shiba, and Y. Ueda.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 100, No EE4, Paper No 10705, p 883-903, August 1974. 18 fig, 4 tab, 74 equ, 12 ref.

Descriptors: *Environmental engineering, *Settling basins, *Dispersion, *Depth, Water treatment, Scour, Estimating, Optimization, Equations, *Mathematical models, Systems analysis, Waste water treatment, Model studies.
Identifiers: *Boundary value problems, *Scouring, Eigenvalues, Dispersion model, Prediction.

Scouring of deposits is one of the major factors in designing sedimentation basins for water and wastewater treatment systems. To express the degree of deposit resuspension, a scouring parameter is introduced into a dispersion model. The parameter is taken into account in one of the boundary conditions of a two-dimensional diffusion equation, which is simplified into a one-dimensional dispersion model. The scouring parameter is related to the longitudinal dispersion coefficient by a model experiment. On the basis of the mathematical expression developed, the existence of the optimum depth of a rectangular settling basin has been theoretically predicted and has been experimentally verified. (Bell-Cornell)
W75-10213

**ZETA POTENTIAL CONTROLS DIRECT FILTRATION COAGULATION,**
R. D. Letterman, and R. D. Tanner.
Water and Sewage Works, Vol 121, No 8, p 62-65, August, 1974. 9 fig, 2 tab, 12 ref. OWRR A-062 ILL(1).

Descriptors: *Water treatment, *Filtration, *Polymers, *Zeta potential, Polyelectrolytes, Turbidity, Water quality control, Water quality, Coagulation, Pilot plants, Illinois, Waste water treatment.
Identifiers: *Direct filtration, Chicago(Ill).

Currently growing is the practice of designing water treatment plants treating low turbidity water without the conventional sedimentation basins and flocculators and feeding coagulant treated water directly to the filters. The results are presented from a six month study using pilot filters at the Central Water Filtration Plant in Chicago, Illinois, and water from Lake Michigan to demonstrate how particle zeta-potential measurements can be used to determine the cationic polyelectrolyte concentration needed for effective operation of the direct filtration process. The polymers studied, Cat-Floc T, Nalcolyte 607, Nalcolyte 8101, and Magnifloc 570-C, each demonstrated an effective concentration range and an optimum concentration. The effective range corresponded to particle zeta potentials in the range -6 to 26 mv. The optimum concentration corresponded to a zeta potential of about 14 mv. When the optimum polymer concentration was achieved, maximum turbidity removal, maximum head loss development, and a shortened ripening period resulted. The amount of polymer that was required to reach a given particle zeta potential increased slightly as the influent water turbidity rose from 0.6 to 35.0 FTU. The effluent turbidity was independent of the influent turbidity in the effective concentration range. The rate of head loss buildup depended to a significant degree on the type of polymer utilized but the turbidity was effectively removed by all the polymers studied. (Ott-FIRL)
W75-10280

**CHARACTERISTICS OF GAS-LIQUID CONTACT APPARATUS IN OZONE TREATMENT FOR DRINKING WATER, (IN JAPANESE),**
N. Tabata.
Suido Kyokai Zasshi, No 482, p 16-27, November, 1974. 25 fig, 7 ref.

Descriptors: *Water treatment, *Ozone, *Potable water, Flow rates, Ultraviolet absorption, Flow, Water temperature, Instrumentation, *Waste water treatment.
Identifiers: Ozonemeter, *Gas-liquid contact.

The chemical and physical behavior of ozone in drinking water was studied during the construction of an efficient reaction bath of drinking water sterilization by ozone. Experiments were conducted using a 5 m resin tube (15 cm in diameter) with several sampling side tubes at different positions for ozone analyses. The ozone was bubbled from the bottom of the tube and water flowed in with either countercurrent or cocurrent motion against the ozone flow. Analyses of ozone were made by a UV absorption ozonemeter or by iodometry. Drinking water was boiled to exclude the dissolved chloride ion. The ozone absorption by water was more efficient in the countercurrent experiment than in the cocurrent experiment owing to a mixing effect. At a constant ozone flow rate, the dissolved ozone concentration increased with increasing reaction path length for the countercurrent experiment. However, the cocurrent experiment gave an increased concentration (1.5 g/cu m) up to 2 m reaction path length, but no further increase in the concentration was obtained with a longer path length. The water flow rate affected ozone absorption in that the increased flow rate decreased ozone absorption for the cocurrent experiment, but increased flow rate for countercurrent experiment, indicating more vigorous mixing between ozen and water. The decomposition constant of ozone was shown to be dependent on water temperature and water qualities. (Katayama-FIRL)
W75-10281

## 5G. Water Quality Control

**MECHANICAL MANAGEMENT OF AQUATIC VEGETATION: ANALYTICAL STUDIES OF UNIT OPERATIONS POTENTIALLY USEFUL IN THEIR PROCESSING,**
Wisconsin Univ., Madison. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 4A.
W75-09861

**MICROBIAL DEGRADATION OF PETROLEUM,**
Bioteknika International Inc., Alexandria, Va. (assignee).
E. N. Azarowicz.
U S Patent No 3,856,667, 6 p, 2 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 929, No 4, p 1698, December 24, 1974.

Descriptors: *Patents, *Oil pollution, *Microbial degradation, *Microorganisms, *Water pollution control, Water quality control, Oily wastes, Industrial wastes, *Pollution abatement.

A process for the microbial degradation of petroleum or oil waste materials is comprised of treating the petroleum or oily waste with a strain of Candida lipolytica for a sufficient time until degradation has been achieved. The microorganism strains employed have a broad spectrum of degradation capability and are capable of degrading crude petroleum as well as variety of organic molecule including aliphatic, aromatic and heterocyc compounds. The distinct unique advantages that the non-toxic microorganisms employed derived originally from edible substances wh are not toxic. The process can be used to remo oil spillage on the open sea, on sandy beache shingle beaches, rocky coast lines, harbors, a inland waters, or oily waste effluent materi discharged from industrial plants. There is restriction as to the fraction of petroleum which degradable. The microorganisms are seeded dispersed over an oil-spilled area by means boats, aircraft or other vehicles as appropria The mixture employed preferably includes a cell lose absorbent to prevent the oil from spreadin Additive nutrients for the microorganisms are al mixed with the absorbent. (Sinha-OEIS)
W75-09862

**PROCESS FOR CONTROLLING OIL SLICKS,**
S. W. Miranda.
U S Patent No 3,886,067, 5 p, 4 fig, 1 tab, 10 re Official Gazette of the United States Patent O fice, Vol 934, No 4, p 1592, May 27, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollutio *Water pollution control, Water quality contro *Foaming, Polymers, Resins, Skimming, Pollutio abatement.
Identifiers: Oleophilic foam.

Oil slicks on surface waters are controlled by a plying oleophilic foam material to the slick from boat or airplane. The foamable liquid can compris many different components which react to form a oleophilic foam material. The reactants in thi spray process are preferably compatible with o and can react with up to 75 percent by weight o oil. They preferably comprise a pre-formulate polymerizing system adapted to compensate fo properties of a wide variety of oils and include polymerizing agent component and a resin com ponent. These two components when mixed, reac at ambient temperature to form solid foa products. In one form the boat or aircraft contain means for separately spraying liquid streams o reactive resin foaming materials onto the wate surface to react with and bind the oil to form parti cles of foam or sponge-like clods which can b skimmed from the water surface. In another em bodiment the reactive chemicals are combined o board the craft to form a body of oleophilic foa which is then fed to a chipper and applied to th slick. (Sinha-OEIS)
W75-09868

**INDUSTRY VIEWPOINT (WATER QUALITY CONTROL),**
Mobil Oil Corp., New York.
A. R. Aitkins.
Natural Resources Lawyer, Vol 7, No 2, p 241-247, 1974. 20 ref.

Descriptors: *Federal Water Pollution Control Act, *Permits, *Oil pollution, *Water pollution, Water pollution control, Legal aspects, Penalties(Legal), Law enforcement, Regulation, Administration, Control, Discharge measurement, Political aspects, Research and development, Planning, Legislation, Water law, Constitutional law, Administrative agencies, Industrial wastes.
Identifiers: Oil discharges.

The Federal Water Pollution Control Act provides civil penalties for industries which discharge harmful quantities of oil. Section 311 defines a discharge in harmful quantities to include among others any that causes a film or sheen upon the surface of the water. But under Section 402, industrial users can get a National Pollutant Discharge Elimination System permit allowing oil discharges if the permittee is using the best practicable control technology and if he works within the specified permit limits. It is argued that the Congressional intent was to exempt permittees from

ion 311 penalties. The Environmental Protec- Agency (EPA) and the Coast Guard, however, that penalties can be imposed for a sheen even n the discharge is a permissible one quantita- y under Section 402. If the 'sheen' test is to be permittees should be allowed to show that the harge either was not harmful or was within the it quantitative limit. The constitutionality is tioned of the Section 311 penalties which are sed regardless of the fact that the discharge have been caused by an Act of God, an act of negligence of a third party and other things. standardization of permits is useful in order to permittees to similar standards and avoid cious application of the law to individual argers, but too much standardization can be ful. (Altuve-Florida)
09885

INE POLLUTION--LEGISLATION GATION, UNDERWRITING--WHERE ARE WHERE AWAY,
k, McHose, Wheat, Adams, and Charles, ngeles, Calif.
McHose.
n, Vol 10, p 251-298, 1974. 26 ref, append.

iptors: *Pollution abatement, *Water pollu- *Water pollution control, *Oceans, United , Oil, Oil pollution, Navigable waters, Pollu- Pollutant identification, Water pollution ef- Water pollution sources, Water pollution ent, Water, Water quality, Insurance, ation, Regulation, Transportation, Interna- commissions, International law, Interna- waters.
fiers: Administrative regulations, State pol- Contiguous zone, Hazardous sub- s(Pollution), International agreements, , Refuse Act of 1899, Oil Pollution Act.

rn over marine pollution of oceans and in- aters is a relatively recent development. The ow prohibits the discharge of oil or ous substances into the navigable waters of nited States and the contiguous zone in l quantities. Insurance requirements and state and federal laws are described. The mic impact of present legislation and ed regulations pose a strangulation threat to rine transportation industry. A suggested n is a return to the principle of international nity in maritime law. The way to accom- is in the field of marine pollution is by in- nal conventions, ratified, adopted, recog- nd followed by the United States, preempt- ividual states from enacting legislation in ld. (Gagliardi-Florida)
9887

ICIAL USES OF WASTE HEAT,
tional Atomic Energy Agency, Vienna a).
, A. Antonelli, and G. Boeri.
le from the National Technical Informa- rvice, Springfield, Va. 22161, as RT PROT- 4.00 in paper copy, $2.25 in microfiche. In- nal Atomic Energy Agency, Vienna, Oc- - 27, 1972. 49 p, 7 fig, 2 tab, 27 ref.

tors: *Water pollution, *Nuclear power- *Thermal pollution, *Rivers, Cooling tmosphere, Distribution, Fossil fuels, En- ntal effects, Beneficial use.
ers: *Thames River.

rmal effluents released into the environ- the electricity generating power stations t a substantial fraction of the total waste ected into the environment by human ac- A table shows the various percentage con- s to the total heat addition into the water hames at its estuary. From this table it can that condenser cooling water from power contributes about three quarters of the t added to the river water. The problem of thermal pollution of the waters is particularly serious in the case of nuclear power stations, because their energy conversion efficiency is presently lower than that of fossil-fueled power plants, and because the waste heat rejected from nuclear power stations is not distributed between the atmosphere and the water. (Houser-ORNL)
W75-09889

**A GENERAL LINEAR APPROACH TO STREAM WATER QUALITY MODELING,**
IBM Federal Systems Div., Gaithersburg, Md.
For primary bibliographic entry see Field 5B.
W75-09917

**JOINT TREATMENT OF PULPING AND MUNICIPAL WASTES,**
Procter and Gamble Co., Cincinnati, Ohio. Environmental Control Section.
For primary bibliographic entry see Field 5D.
W75-09928

**POLLUTION ABATEMENT IN THE PHARMACEUTICAL INDUSTRY,**
National Environmental Research Center, Edison, N.J. Industrial Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-09931

**TREATMENT OF AQUEOUS WASTE STREAMS WITH HYDROGEN PEROXIDE TO REMOVE CHLORINATED ISOCYANURATES THEREFROM,**
FMC Corp., New York. (assignee).
For primary bibliographic entry see Field 5D.
W75-09939

**DRAINAGE SYSTEM COOPERATES WITH NATURE,**
Woodland Development Corp., Houston, Tex.
For primary bibliographic entry see Field 4A.
W75-09942

**QUANTITATIVE ERROR ANALYSIS OF NUMERICAL METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS,**
Rutgers - the State Univ., New Brunswick, N.J. Dept. of Computer Science.
For primary bibliographic entry see Field 6G.
W75-10003

**PROCEEDINGS OF PUBLIC FORUM ON WATER RESOURCES PROBLEMS AND RESEARCH NEEDS IN SOUTHWESTERN MINNESOTA.**
Minnesota Univ., St. Paul. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W75-10006

**PROCEEDINGS OF PUBLIC FORUM ON WATER RESOURCES PROBLEMS IN SOUTHEASTERN MINNESOTA.**
Minnesota Univ., St. Paul. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W75-10007

**RESEARCH NEEDS AS RELATED TO THE DEVELOPMENT OF SEDIMENT STANDARDS IN RIVERS,**
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. Gessler.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 776, $3.75 in paper copy, $2.25 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series, No 60, May 1975, 35 p. OWRT A-025-COLO(1) 14-31-0001-4006.

Descriptors: *Research priorities, Sediments, Standards, Water quality, Rivers, *Water quality standards, Biota, Geomorphology, Hydrology, *Sediment distribution, Sedimentation.
Identifiers: *Research needs, *Sediment standards.

Standards for the sediment load in rivers and streams must be set and enforced at the tributary streams, else it becomes impossible to locate important sediment sources. Such standards need to be very sophisticated and must relate to the full grain size distribution of the moving sediment for geomorphic and biotic reasons. Such standards must be related to a few key parameters: the hydrology; the geomorphology; and the biota of the river. Each of these factors may not vary significantly within one region. Furthermore, the first two are so highly correlated that a separation may not be necessary. Instead of mapping each stream it may then be sufficient to map regions. Any combination of geomorphic and biotic characteristics of the region would then determine the standards applicable to the region's streams. (Evans-Colorado State)
W75-10013

**MANAGEMENT PRACTICES AFFECTING QUALITY AND QUANTITY OF IRRIGATION RETURN FLOW,**
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
L. G. King, and R. J. Hanks.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 827, $6.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/2-75-005, April 1975. 155 p, 27 fig, 54 tab, 15 ref, 2 append. EPA 1BB039, S801040.

Descriptors: *Irrigation, *Return flow, *Drainage, *Salinity, *Model studies, *Soil water movement, Nitrogen, Sprinkler irrigation, Management, Water quality, Fertilization, Tile drains, Path of pollutants, Water pollution sources.

Field and laboratory research was conducted to determine the effects of irrigation management and fertilizer use upon the quality and quantity of irrigation return flow. The total seasonal discharge of salts from the tile drainage system was directly related to the quantity of water discharged, because the solute concentration of the ground water was essentially constant over time. Under such conditions, reduction of salt content of return flow is accomplished by reduced drain discharge. Irrigation management for salinity control must be practiced on a major part of a particular hydrologic unit so that benefits are not negated by practices in adjoining areas. Field studies and computer models showed that salts may be stored in the zone above the water table over periods of several years without adversely affecting crop yields on soils with high 'buffering' capacity as encountered in this study. However, over the long term, salt balance must be obtained. Appreciable amounts of nitrate moved into drainage water at depths of at least 106 cm from the applications of commercial fertilizer and dairy manure to ground surface. Submergence of tile drains in the field reduced nitrate concentrations in the effluent, especially under heavy manure applications. (EPA)
W75-10019

**MEASURING EXTERNAL EFFECTS OF SOLID WASTE MANAGEMENT,**
Institute for Policy Analysis, La Jolla, Calif.
For primary bibliographic entry see Field 5B.
W75-10024

**COOPERATION COMBATS OIL SPILLS IN NORTH CAROLINA.**
Fueloil and Oil Heat, Vol 34, No 2, p 24-25, February 1975.

Descriptors: *Oil spills, *Water pollution control, Costs, Equipment, Planning, *North Carolina.
Identifiers: Oil boom, Oil skimmer, Oil spill protection.

Oil spill control in Randolph County, North Carolina has been incorporated into the county Rescue Squad operation. The Randolph County Oil Dealers Association decided in the spring of 1974 to plan for protection against major oil spills, and that members should cooperatively purchase pollution control equipment. Out of 29 area fuel dealers, 25 contributed to the project. The members have purchased a trailer with boom, skimmer, and oil absorbent, costing a total of $8000. A test using styrofoam pieces to represent oil was demonstrated for the public on Dula Lake; the entire clean-up was performed by rescue squad members, with dealers assisting only. The Ashe-Rand Rescue Squad has trained 25 of its members specifically for the use of oil spill containment equipment. In the event of a spill, the dealer responsible for the accident will pay for materials used, such as absorbent foam or fuel. (Prague-FIRL)
W75-10039

**GEOGRAPHICAL ANALYSIS OF OIL SPILL POTENTIAL ASSOCIATED WITH ALASKAN OIL PRODUCTION AND TRANSPORTATION SYSTEMS,**
Battelle-Pacific Northwest Labs., Richland, Wash.
W. H. Swift, R. E. Brown, L. V. Kimmel, M. M. Orgill, and P. L. Petersen.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-784 099, $8.50 in paper copy, $2.25 in microfiche. Report No CG-D-79-74, February 1974. 273 p, 55 fig, 56 tab, 189 ref. DOT-CG-23223-A.

Descriptors: *Oil pollution, *Oil spills, *Environmental effects, *Transportation, Demand, Oil industry, Alaska, Earthquakes, Oil fields, Arctic, Water pollution control, Probability, Routing, Climatic zones, Ocean currents, Tides.

With the anticipated increase in oil production, practically every mile of the mainland Alaska coastline will be subject to potential oil spills. The hostile environment of Alaska and the remoteness of most potential production areas makes the cleanup of offshore oil spills difficult to impossible for the U.S. Coast Guard, whose mission includes the prevention and control of oil spillage. In order to aid the long-range development of policy and technology to deal with problems associated with oil spills in Alaska, a discussion of the future of crude oil demand and transportation, the environmental conditions in potential spill areas, the expected behavior of oil in spill areas, and spill potential are discussed. The incidence of oil spills is a function of the location and amount of crude oil produced, production methods, the mode and route of transportation, the type and frequency of intermodal transfers, and the geographic and environmental setting of all handling operations. Recommendations to the Coast Guard include a review of present capabilities with emphasis on aircraft potential for detection and control of spills in the future, and the acquisition of a more extensive understanding of true environmental consequences of a spill. (Becker-Wisconsin)
W75-10121

**MEASURES FOR THE RESTORATION AND ENHANCEMENT OF QUALITY OF FRESHWATER LAKES.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5C.
W75-10122

**ECONOMIC INSTITUTIONS TO DETERMINE WATER QUALITY,**
Clemson Univ., S.C. Dept. of Economics.
J. B. Eastman.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 914, $5.25 in paper copy, $2.25 in microfiche. M.A. Thesis, May 1973. 114 p, 10 fig, 1 tab, 57 ref. OWRT A-030-SC(1).

Descriptors: *Institutions, *Resource allocation, *Water law, *Water rights, *Water quality, *Economic efficiency, Economics, Marginal costs, Marginal benefits, Riparian rights, Appropriative rights, Interstate compacts, Regulation, Water Quality Act, Rivers and Harbor Act, Ohio River, Discharge(Water).
Identifiers: Genossenschaffen, Property rights.

Existing and proposed economic and political institutions designed to allocate water quality rights are discussed. Criteria which a workable allocative system should meet were determined and existing and proposed allocative institutions were evaluated in light of those criteria. A full property rights system is proposed as a solution to the problem of determining optimum water quality
W75-10132

**LOW-FLOW CHARACTERISTICS OF WISCONSIN STREAMS AT SEWAGE-TREATMENT PLANTS,**
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 5B.
W75-10163

**PROCEDURE FOR EVALUATING ENVIRONMENTAL IMPACT,**
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 6G.
W75-10164

**EASING OF ENVIRONMENTAL LAWS,**
F. E. Haarhoff.
Factory, Vol 7, No 11, p 29-35, November 1974. 7 fig, 3 tab.

Descriptors: Pollution abatement, *Industrial wastes, *Pesticides, *Regulations, *Legislation, Ozone, Sewage treatment, Water purification, Waste water treatment, Public health, Potable water.

Current controversy over pollution control and abatement involves warnings from many people on the dangers of relaxing air and water standards, while many industry spokesmen urge the loosening of environmental rulings as an anti-inflation measure. Industry leaders are asking the government to weigh the public benefits from the regulatory programs against the public costs such as price increases resulting from passing on the costs of pollution abatement programs and jobs lost from the diversion of funds from installation of production plants. The EPA took 2846 enforcement actions against violators of water, air and pesticide laws between January, 1973, and March, 1974; fines and penalties imposed on polluters since December, 1970, total over $8,200,000. The EPA has developed an effective, quick-acting enforcement team to insure that the environmental laws will achieve cleaner air and water and safer use of pesticides. Industries have realized the penalties for polluting and have begun long-range plans of pollution abatement. The majority of companies responding to a recent survey of industrial pollution control expenditures state that neither future energy conservation programs nor higher energy prices will have significant effects on their long-range anti-pollution efforts. Some of industry's newest pollution control techniques will have applications also for sewage and water treatment. Ozone may soon replace chlorine as the
ceptable water purifier. Ozone the treatment of
fluent water from a sewage plant is able
economically meet Public Health Service requ
ments for potable water. (Orr-FIRL)
W75-10173

**NEEDED: $350 BILLION - AND A NEW NE
SURVEY,**
For primary bibliographic entry see Field 5D.
W75-10174

**LET'S TRY 90% FIRST AND SEE WHAT
QUALITY IS LIKE,**
Wesleyan Univ., Middletown, Conn. Indus
Waste Lab.
J. W. Masselli, N. W. Masselli, and M. G. Burf
Textile Industries, Vol 138, No 10, p 32-33,
145, October 1974. 1 tab, 4 ref.

Descriptors: *Pollution abatement, Standa
*Legislation, *Water quality control, Regulat
Pre-treatment, Biochemical oxygen dem
Chemical oxygen demand, Phenol, Sulfide, C
Industrial wastes, *Water quality standards.
Identifiers: *Combined municipal-industrial t
ment.

The problems and increased cost of analytical
ing and pollution abatement associated with
Effluent Guidelines and Standards, published
the Environmental Protection Agency on Jul
1974, are discussed. The BOD requirements
considered too stringent and impractical and u
tainable except at great cost. COD should not
required parameter because the mercury and si
used in the analysis may cause more harm to
ecology and economy than the large volume o
ganic wastes being investigated. Phenol should
have been considered a separate param
because it is rapidly oxidized and comple
removed in the activated sludge process. For
same reason, sulfide should not be a sepa
parameter. The APHA color determination is
ficult and confusing. Color determinations or c
removal should not be required except when
color of the receiving stream is significantly
tered visually. This listing of many parame
results in increased costs. The ruling that C
phenol, sulfide, and oil and grease are incomp
ble water pollutants which will interfere with
operation of municipal treatment plants is in
rect since these substances are now being tre
in activated sludge plants without lowering
ciency. Following this regulation means that
sentially double treatment will occur as the pl
must pretreat their wastes before joint treatme
allowed. The neutralization of an alkaline p
also unnecessary and even disadvantageous. (
FIRL)
W75-10175

**REGIONAL AUTHORITIES TAKE O
BRITAIN'S WATER/SEWAGE SYSTEMS,**
For primary bibliographic entry see Field 6E.
W75-10176

**LACK OF PROMISED FEDERAL FUNDS H
PERS WATER CLEANUP EFFORT.**
Engineering News-Record, Vol 193, No 15, p
25, October 1974.

Descriptors: *Waste water treatment, *Facili
*Legislation, *Federal Water Pollution Con
Act, Costs, Financing, Storm runoff, Urban
noff, Sewage treatment, Federal jurisdicti
Government supports, Government finance.

Cities in the U.S. are faced with the problem
how to meet the regulations of the 1972 Fed
Water Pollution Control Act. Difficulties in obt
ing equipment, material shortages, rapidly esca
ing prices and the lack of promised federal fu
all place limits on cities' ability to spend money

. The federal government is to provide he cost of municipal treatment works; this e number of projects that can be funded of the limited amount of money available. 4 survey of needs for municipal waste reatment works released in September ts a total of $114 billion needed to meet n water standards (excluding storm water t and/or control). The EPA expects to al- ly $3.5 billion for fiscal year 1975. There te between the federal government and ci- states over the cost of controlling the pol- used by storm water runoff. Chicago, San o, Atlanta and Boston report multi-million eeds for pollution control facilities for ater treatment. They plan to build deep stems, catchment basins, or other storm ntrol works. However, most of these ter plans rate so low on the EPA priority hey don't receive any federal funds. The ill not fund storm water facilities until local agencies show that they are neces- eet 1977 standards. (Orr-FIRL)
8

POLLUTION LAW DRAWS FLOOD OF INTS.
Week, Vol 115, No 16, p 37, October

rs: *Federal Water Pollution Control dustrial wastes, *Municipal wastes, Government finance, Regulation, Pollu- ement, Water pollution control, Legisla-

s: *PL 92-500.

ral Water Pollution Control Act Amend- 1972 (PL 92-500) were criticized by both nd municipal spokesmen at the Water Control Federation Conference in ring October, 1974. Chief complaints in- e requirement for uniform controls on even though differences in local situa- operations may exist; the large role of al government; the lack of adequate to meet the goals; the minimal alloca- research; and, the provision which unicipalities to recover new treatment ts in proportion to industrial wastes ne basic fault with PL 92-500 is that it is ffective and the goals are not realistic. It hat the National Commission on Water hich must report to Congress by Oc- 5, will recommend changes in the law eliminate the current problems. (Orr-

WATER'S ROLE IN WATER QUALI- GEMENT,
nia Dept. of Environmental Resources, . Bureau of Water Quality Manage-

d.
the Hydraulics Division, Proceedings of 101, No HY3, p 517-521, March 1975.

s: *Groundwater, *Water quality con- te jurisdiction, Water manage- ed), Surface waters, Water pollution, gy, *Pennsylvania, Administration, ty standards.
Gasoline spills.

islation requires each state to protect of its surface waters, yet this protec- d only indirectly for subsurface waters. rface waters/groundwater evaluation grated in water quality monitoring, the nsylvania was one of the first to design nsive Water Quality Management Plan ) to protect groundwater as a vital ver two-thirds of that state's public y and 99% of its private water supplies nt upon groundwater. The slow migra- tion of contaminated surface water has been demonstrated to cause groundwater pollution. Examples of this are landfill leachate, leaking industrial water impoundments, gasoline spills flushed to the soil, improperly developed spray irrigation sites, and urban runoff infiltration. The COWAMP plan considers groundwater in its role as a major water supply, including new developments in well construction. Groundwater is also seen as a transporting medium for contaminant dispersion; for example gasoline spills move on top of the water table and fumes may migrate up through the soil into buildings as it flows. Additionally, activities affecting the recharge/discharge balance influence waste water treatment and related costs. COWAMP hopes to identify existing hydrogeological characteristics, to study man's impact on existing resources, and to evaluate alternatives. This involves considering areas of poor water quality, areas requiring special protection, such as recharge zones, important watersheds, large population centers, and areas where major population growth is predicted. (Prague-FIRL)
W75-10180

**LEGISLATIVE HISTORY OF THE SAFE DRINKING WATER ACT,**
House, Washington, D.C.
P. N. Kyros.
Journal of the American Water Works Association, Vol 66, No 10, p 566-569, October 1974. 4 fig.

Descriptors: *Public health, *Potable water, *Water supply, Standards, *Legislation, Regulation, Water quality control, Water purification, *Water quality standards, *History.
Identifiers: *Safe Drinking Water Act.

A brief history of the Safe Drinking Water Act, the need for such legislation, some of the legislative obstacles encountered, and the major provisions of the final bill are discussed. Federal legislation concerning the safety of drinking water has been in the House since 1970. The need for such a bill was highlighted by many newspaper reports of concern over the quality of water and a HEW study conducted in 1969 and 1970 which concluded that approximately 5.4% of all US citizens were being served substandard water from approximately 5000 community water systems. Federal standards have been in effect since 1914 concerning the quality of potable water provided on interstate carriers and standards are now necessary to cover all aspects of water quality. Obstacles encountered included objections letting the EPA administer such a project, loss of interest after the Water Pollution Control Act of 1972 was passed, and the difficulty in knowing exactly what to legislate for or against. The Safe Drinking Water Act provides for the control of underground-injection programs to protect against endangering drinking water sources. Under this bill, the states will have the primary enforcement responsibility to monitor and inspect community water systems to assure their compliance with federal standards; the states will also have the power to grant variances to systems because of the characteristics of the raw-water source or because a required treatment technique is not necessary. Federal funds for research and demonstration projects also are part of the bill. (Orr-FIRL)
W75-10186

**INTERNATIONAL CONFERENCE ON THE CONSERVATION OF WETLANDS AND WATERFOWL.**
For primary bibliographic entry see Field 6G.
W75-10198

**MEAN ESTIMATE DEFICIENCIES IN WATER QUALITY STUDIES,**
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
B. J. Adams, and R. S. Gemmell.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol 101, No HY7, p 989-1002, July 1975. 6 fig, 10 equ, 44 ref.

Descriptors: *Water management(Applied), *Water quality control, *Stochastic processes, *Simulation analysis, Mathematical models, Variability, Planning, Design, Evaluation, Performance, Economics, Standards, Equations, Systems analysis, Waste water treatment, Estimating.
Identifiers: Sensitivity.

Mathematical models are employed in the design, performance prediction, and evaluation of alternative water quality management programs. Examined is the relative influence of deterministic and stochastic models on water quality management decisions to demonstrate some deficiencies of decisions based on mean estimates produced by deterministic models. Water quality management problems are studied which consider the implications of variability in waste generation, treatment plant performance, and receiving water behavior on the resulting variability of water quality. An example is provided in an evaluation of regional wastewater management alternatives given by the size, number, and location of regional treatment plants. It is concluded that an evaluation of water quality management alternatives without consideration for their performance variability may be so deficient as to negate the evaluation. (Bell-Cornell)
W75-10202

**OBJECTIVES OF WATER QUALITY PLANNING,**
Kansas Water Resources Board, Topeka.
K. S. Krause.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol 101, No HY3, Paper No 11200, p 471-476, March 1975.

Descriptors: *Water resources, *Planning, *Water quality control, Hydraulics, Decision making, Land use, Natural resources, Conservation, Irrigation, Education, Public health, Environment.

Planning is a useless effort if it does not produce a viable procedure for reaching its objectives. Our political process is presently atuned to crisis reaction, producing short-range decisions and simplistic solutions to problems which often serve to confuse and delay the adoptions of hard viable solutions. The control of water quality is a noble objective in itself; however, the need for it is symptomatic of a much deeper and profound disease that must be cured or prevented before a completely successful water quality control program can be achieved. The disease is that of 'living beyond our resource means'. To overcome this, the national objectives should be to: (1) minimize natural resource waste; (2) protect the public health and ecosystems; (3) provide for a system of control that has a practical probability of being achieved; and (4) provide for a positive decision-making process that leads to the rapid consumation of the objectives previously stated. (Bell-Cornell)
W75-10205

**OPTIMAL CONTROL OF WATER POLLUTION IN A RIVER STREAM,**
Alberta Univ., Edmonton. Dept. of Electrical Engineering.
V. Gourishankar, and R. L. Lawson.
International Journal of Systems Science, Vol 6, No 3, p 201-216, March 1975. 9 fig, 2 tab, 30 equ, 7 ref.

Descriptors: *Water pollution control, *River systems, *Optimization, Biochemical oxygen demand, Dissolved oxygen, Effluents, Organic wastes, Biodegradation, Environmental control, Costs, Waste disposal, Waste treatment, Industrial wastes, Equations, Mathematical models, Systems analysis.

Identifiers: *Multi-cost system optimization, Performance criteria, Artificial aeration, Dumping, Treated waste.

The application of optimal control techniques to ecological systems is discussed. Specifically, the control of pollution of water in a river stream is considered. The variables to be controlled are the concentration of biochemical oxygen demand and the level of dissolved oxygen. To achieve this, a procedure is presented for controlling dumping of industrial effluents and/or artificial aeration. A realistic determination of the optimum values of these controls is subject to several performance criteria relating to water quality. Since some of these criteria are contradictory, the problem is considered from the point of view of a multi-cost system. A lumped parameter state variable model is derived. Recently published theory on multi-cost system optimization is utilized, and numerical examples are presented. This procedure, which accounts for all the costs simultaneously, has an added advantage over existing methods in that not only can a linear combination with undetermined weighting factors be treated, but other functions of the costs can also be used. (Bell-Cornell)
W75-10206

**STATISTICAL EVALUATION OF REAERATION PREDICTION EQUATIONS,**
Tufts Univ., Medford, Mass. Dept. of Civil Engineering.
L. C. Brown.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 100, No EE5, Paper No 10849, p 1051-1068, October 1974. 5 fig, 6 tab, 13 equ, 21 ref.

Descriptors: *Water pollution control, *Statistical methods, *Atmosphere, *Mathematical models, *Environmental engineering, Regression analysis, Sanitary engineering, Least squares method, Equations, Hydraulics, Natural streams, Data collections, Systems analysis, Forecasting.
Identifiers: *Reaeration coefficient, Prediction error, Oxygen transfer.

The object of much of the experimentation in atmospheric reaeration of natural streams is to develop models for predicting the reaeration coefficient k sub 2. These prediction equations are statistical correlations of the hydraulic variables and fluid properties thought to be important in affecting k sub 2. Two previously reported models for predicting k sub 2 are reevaluated in the light of these criteria. Although the models are useful for estimating k sub 2, they do not adequately describe the variation in the observed data because their prediction error is significantly larger than the experimental error. Finally, the two statistical models are used to predict k sub 2 from data from a third, independent source. The prediction error varies between a factor of 2 - 3 about the predicted value. Comparison with values predicted by a model founded in the penetration theory for gas absorption is favorable. This suggests that theoretical models hold more promise than empirical correlations as a source for equations to predict k sub 2.
W75-10211

**RECOMMENDATIONS FOR ENVIRONMENTAL ENGINEERING EDUCATION,**
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 9A.
W75-10218

**SHORTCUT METHODS TEST ALGICIDES,**
Wisconsin Univ., Madison.
G. P. Fitzgerald.
Water and Sewage Works, Vol 121, No 9, p 85-87, September 1974. 5 tab, 12 ref.

Descriptors: *Algae, *Algal control, *Algicides, *Copper, Analytical techniques, Algal toxins, Phosphorus, Water treatment, Copper compounds, Water pollution control, Pollutant identification.

Rapid methods have been developed to determine the effectiveness of algicide applications. The effectiveness of various algicides can be demonstrated within one day's time by measurements of the ability of the algae to absorb PO4-P; dead algae do not absorb phosphorus. The previous procedure involved waiting at least a week and measuring the algae growth. The procedure designed can be adapted to planktonic algae, filamentous algae, or aquatic plants. The procedure combines nutritional tests for phosphorus with algicide applications to determine the relative effectiveness of algicides. The effect of various dosages of chemicals over different time periods on the ability of algae to absorb phosphorus or the phosphorus content of the algae were correlated with the death of the algae as determined By growth tests. The results of experiments performed using different copper products as algicides showed that: this test could be utilized to evaluate the relative effectiveness of algicides under different environmental conditions such as duration of treatment, pH, water hardness, or the presence of silt or dissolved organic matter; either the concentration of algicide or the treatment duration can be regulated to produce an effective treatment; the source of copper used as the algicide will determine the treatment duration or concentration required for a particular level of effectiveness; and, the minimum amount of algicide to be effective is related to the amount of algae present and is not related to the volume in which the algae are suspended. (Orr-FIRL)
W75-10234

**A CONCEPT FOR MANAGING WASTE,**
Gulf Waste Disposal Authority, Houston, Tex.
For primary bibliographic entry see Field 5D.
W75-10236

**THE DAVY JONES GARBAGE DUMP,**
Raytheon Co., Portsmouth, R.I.
G. V. Cox.
Environmental Science and Technology, Vol 9, No 2, p 108-111, February 1975. 6 tab.

Descriptors: *Oceans, *Waste disposal, *Municipal wastes, *Industrial wastes, Pollution abatement, Radioactive wastes, Organic compounds, Waste discharges, Water pollution effects, Environmental effects, Legislation, Heavy metals.
Identifiers: Ocean disposal, Petrochemicals.

Ocean disposal of municipal and industrial wastes has been strongly opposed, particularly by residents of Delaware, Florida, and New York. Recent legislation, such as the Marine and Sanctuaries Act of 1972 (P.L. 92-532) is discussed. In the fall 1972, an International Convention on the Prevention of Marine Pollution by Dumping of Wastes was held which specified certain materials which could not be released and restrictions on the quantities of other materials. The process of application and granting of permits to release wastes to marine waters is complicated, and involves regional jurisdiction of the EPA. Ocean dumping criteria include materials which are absolutely prohibited, such as high-level radioactive wastes, biological, chemical or radiological warfare agents, or persistent inert synthetic or natural floating materials; materials prohibited in other than trace quantities, such as mercury, cadmium, organohalogens, and oils and greases; strictly regulated materials, including petrochemicals, organic chemicals, and organic processing wastes, inorganic processing wastes, biocides, immiscible materials, and other wastes which might cause hazard to navigation. Types of ocean dumping permits are detailed. The pollution and ocean impact by ocean outfalls discharging sludge is also co
pared with potential hazards of ocean dumping
wastes. (Prague-FIRL)
W75-10238

**DESIGN FOR SOLVENT RECOVERY,**
Chem-Pro Equipment Corp., Fairfield, N.J.
For primary bibliographic entry see Field 5D.
W75-10239

**EXTRACTION OF PETROLEUM HYDROCA
BONS FROM OIL-CONTAMINATED SED
MENTS,**
Maryland Univ., College Park. Dept.
Microbiology.
J. D. Walker, R. R. Colwell, M. C. Hamming, and
H. T. Ford.
Bulletin of Environmental Contamination a
Toxicology, Vol 13, No 2, p 245-248, 1975. 2 tab,
ref.

Descriptors: *Oil wastes, *Solvent extraction
Marine microorganisms, Water pollution contr
*Biodegradation, Estuaries, Separati
techniques, Organic compounds, Oil pollutio
Chesapeake Bay, Sediments, Waste water tre
ment, Maryland.
Identifiers: *Petroleum hydrocarbons, *Benzen
Colgate Creek(Md).

The degradative capabilities of naturally-occurri
microorganisms in Chesapeake Bay are assess
by sampling on a regular basis. One area, that
Colgate Creek, is contaminated with petroleu
compounds, including cosmoline (a wax used
protect automobiles during Atlantic transpor
kerosine (used to wash wax from the autom
biles), motor oil, and tanker fuels. A study w
conducted to determine whether or not a corre
tion exists between numbers of petroleum-degra
ing microorganisms with amount of petroleum-li
material routinely extracted from sediment. In a
dition, a comparison is made of several metho
and solvents for extraction of estuarine water a
marine sediments. Comparison of the amount a
proportional representation of each compone
extracted, as determined by mass spectrometr
indicated that the material contained the hydroca
bons found in petroleum. The most effective s
vent found for the extraction was benzene
benzene-methanol azeotrope. A method
reciprocal shaking, employing benzene as the s
vent was thus determined to be the most efficie
extraction of petroleum hydrocarbons from bo
estuarine and marine sediments. (Prague-FIRL)
W75-10241

**PLANNING AND OPERATION OF URBA
WATER QUALITY MANAGEMENT SYSTEMS**
Cornell Univ., Ithaca, N.Y.
M. M. El-Sahragty.
Available from the University Microfilms, In
Ann Arbor, Michigan, 48106. Order No 74-24,28
PhD Thesis, 1974, 176 p.

Descriptors: *Water pollution control, Computer
*Systems analysis, *Model studies, Simulatio
analysis, Water quality control, Managemer
Planning, Operations, *Dynamic programmin
*Linear programming, Municipal water, Math
matical models.

The effectiveness of a systems analys
framework for planning water pollution contr
systems is investigated. A dynamic programmi
model was used under deterministic and stochast
conditions; a water quality index was used to o
tain optimal operating policy. A metropolit
economic-engineering urban water quality syste
was defined. Mathematical modeling and pr
gramming techniques are used to study intera
tions between physical, technological, economi
and social aspects of the problems of urban wat
quality management. A linear programming mod
was used for the definition of minimum requir

nent in the waste water control system and
e delineation of an optimal allocation of
ces within this system. Additionally, com-
imulation models are utilized for predicting
veness of the water pollution control
. (Prague-FIRL)
0262

GING FEDERAL-STATE RELATION-
IN WATER POLLUTION CONTROL
RAMS,
rgh Univ., Pa. Health Law Program.
hen.
ial Water Engineering, Vol 11, No 4, p 8-
/August, 1974.

tors: *Legislation, *Water pollution con-
Pollution abatement, Local governments,
government, Federal Water Pollution
Act, Water permits, Regulation, Water
overnment interrelations, *Federal-state
ghts conflicts.
ers: *Federal Water Pollution Control Act
ments of 1972.

ssion is presented to show why and how
l system of the Federal Government an-
demands for a more effective water pollu-
ntrol system and, in the process, how the
of the Federal Government in this area
increased and the states' powers
ed. Areas of interest include: the authority
s to regulate the quality of water within
ritorial limits (or their police powers); the
states to commence an action in Federal
Court to restrain a polluter from con-
ng the waters of a state from a point out-
boundaries; the doctrine of federal
tion which renders null and void state laws
in which Congress has acted (Minnesota
vented from having more strict laws about
power plants than the AEC allowed); the
tencies and confusion that prevailed in the
ncerning water pollution control; and the
standards set up by the Federal Water
n Control Act Amendments of 1972. The
ystem and the issues of the Amendments
ussed. The Amendments basically are a
of regulation that has the Federal Govern-
t the standards for water quality and the
vernments are then to supply the man-
to administer and enforce the permit
The author states that if the governmental
involved are primarily interested in the
of water pollution, then this new allocation
rs will provide the basis for a more effec-
rational water quality control program.
r, if the states feel that the system is an in-
nt of their rights, then the objectives of
ation will suffer substantially. (Orr-FIRL)
70

ATION OF OCEAN DUMPING--ONE
ATER,
Wildlife Federation, Washington, D.C.
mlet.
nental Law Reporter, Vol IV, p 50021-
74. 2 p, 5 ref.

ors: *Legislation, *Oceans, *Federal
ent, *Waste disposal, Sludge disposal,
ive waste disposal, Solid wastes, Water
, Waste identification, Environmental ef-
gulation, Administration, Permits, Ad-
ive agencies, Control, Research priori-
earch and development, Marine animals,
lants, Protection, Scientific personnel,
, Legal aspects, Pollutant identification.
s: *Ocean dumping, *Marine protection,
and Sanctuaries Act, Public hearings.

agencies and programs involved with
and researching ocean dumping are
. The Marine Protection, Research, and
es Act of 1972 was passed in an effort to
or strictly limit' the ocean dumping of harmful materials and to prevent 'unreasonable degradation' of the marine environment. Under the Act certain duties and responsibilities regarding ocean dumping were assigned to the Environmental Protection Agency (EPA), the Army Corps of Engineers, and the National Oceanographic and Atmospheric Administration. The Act places a strict ban on the ocean dumping of certain highly dangerous substances and gives the EPA the power to regulate dumping of other substances by the issuance of permits. The permit system suffers from a lack of funding and manpower and an inability to measure harm done by dumping. The author points out that recently the EPA suspended granting of special three-year, easily renewable permits and is now issuing primarily interim one-year permits which are subject to elaborate scrutiny prior to renewal. (Altuve-Florida)
W75-10285

**INTERNATIONAL LEGAL IMPLICATIONS OF OFF-SHORE TERMINAL FACILITIES,**
S. A. Dorshaw.
Texas International Law Journal, Vol 9, p 205-223 (1973). 19 p, 96 ref.

Descriptors: *International law, *International waters, *Oil industry, *Treaties, Law of the sea, Legal aspects, Jurisdiction, Political aspects, Continental shelf, Oceans, Federal jurisdiction, State jurisdiction, Governments, Governmental interrelations, Judicial decisions, Foreign countries.
Identifiers: *Off-shore terminal facilities, Submarine coastal lands, International Court of Justice.

Because of increasing advances in technology, a great concern has arisen over the issues of jurisdiction, sovereignty and control over submarine coastal lands. The author is particularly concerned with international conventions and general principles of international law that pertain to the rights and obligations of nations in the construction and operation of off-shore terminal facilities on the continental shelf and on the high seas. Because this type of facility is relatively new, the legal incidents have not been fully developed. While the 1958 Geneva Conference on the Law of the Sea did not address the problem specifically and in fact concerned itself primarily with issues related to the exploration and exploitation of natural resources, the exercise of jurisdiction by coastal nations over the outer continental shelf and the superadjacent high seas for construction and operation of offshore terminal facilities would probably constitute a reasonable use under the Geneva Convention. The only judicial forum available to test such jurisdicational power is the International Court of Justice at the Hague which has limited powers of enforcement. (Altuve-Florida)
W75-10286

**OBSTACLES TO TAMING CORPORATE POLLUTERS: WATER POLLUTION POLITICS IN GARY, INDIANA,**
Hampshire Coll. Amherst, Mass. Dept. of Political Science.
E. Greer.
Environmental Affairs, Vol 3, p 199-220, (1974). 22 p, 117 ref.

Descriptors: *Lake Erie, *Indiana, *Water pollution, *Legislation, Legal aspects, Governmental interrelations, Pollution abatement, Water pollution control, Industrial wastes, Water pollution sources, Law enforcement, Water quality, Industrial plants, Cost-benefit analysis, Economic impact, Social impact, Alternative costs, Area redevelopment, Benefits, Employment, Administration, Federal jurisdiction, State jurisdiction, Rivers and Harbors Act.
Identifiers: *Water Pollution Control Act, Bureaucracy, Indiana Stream Pollution Control Board.

Although U.S. Steel founded Gary, Indiana, it has failed to use its vast resources to limit harmful pollution and in fact is responsible for the grave pollution problems currently present in Gary and affecting Lake Michigan. The City of Gary has been placed in the precarious position of trying to protect its environmental existence while fearing that pressure on U.S. Steel to clean up its water pollution might cause it to leave Gary and seriously injure the economy. The State of Indiana has a Stream Pollution Control Board, but the Board has lacked the funding and impetus to effectively enforce the State's water pollution regulations. U.S. Steel has been held in violation of several regulations but has been given repeated extensions to remedy the situation. The 1899 Rivers and Harbors Act and the Water Pollution Control Act control the regular discharge of industrial effluents. Because of administrative problems, bureaucratic intricacies, and the complex interaction of the laws, the federal government has failed to substantially affect U.S. Steel's continuing pollution. (Altuve-Florida)
W75-10287

**APPLICATION OF NEPA TO EPA'S ENVIRONMENTAL REGULATORY ACTVITIES.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 6G.
W75-10288

**SUMMARIES OF FOREIGN GOVERNMENT ENVIRONMENTAL REPORTS.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 6G.
W75-10289

**PROPOSED 1973 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE-SALE, OFFSHORE MISSISSIPPI, ALABAMA, AND FLORIDA, VOLUME 3. ALTERNATIVES TO THE PROPOSED ACTION (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Bureau of Land Management, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va 22161 as USDC, EIS-MS-73-1651-F-3. October 17, 1973. 354 p, 3 map 36 tab, 16 fig, 7 graph.

Descriptors: *Continental shelf, *Environmental control, Oil, Oil pollution, *Mississippi, *Alabama, *Florida, Environmental effects, Environment, Leases, Offshore platforms, Fuels, Drilling, Alternative planning.
Identifiers: *Environmental impact statements.

This environmental impact statement consists of various alternatives to the proposed action. The three main alternatives to the project are to hold the sale in modified form, withdraw the sale, or delay the sale. (Gagliardi-Florida)
W75-10291

**FEDERAL VIEWPOINT (PERMIT ISSUANCE--ADMINISTRATIVE AND JUDICIAL REVIEW--OBSERVATIONS AND PROBLEMS),**
Environmental Protection Agency, Chicago, Ill. Enforcement Div.
W. H. Romanek.
Natural Resources Lawyer, Vol 7, p 225-230 (1974). 6 p, 2 ref.

Descriptors: *Federal Water Pollution Control Act, *Jurisdication, *Federal government, *Permits, *Legal review, *Administrative decisions, Legislation, Legal aspects, Administrative agencies, Regulation, Administration, Control, Judicial decisions, Adjudication procedure, Decision making, Management, Planning.
Identifiers: *Environmental Protection Agency, National Pollutant Discharge Elimination System, Public hearings, Standing, Administrative remedies.

The heart of the water quality program under the Federal Water Pollution Control Act is the permit system administered by the National Pollutant Discharge Elimination System (NPDES). The author is concerned with administrative and judicial review of proposed permits or issued NPDES permits. Under administrative review a person may seek a public hearing or an adjudicatory hearing. A public hearing is informally structured and is designed for the collection of facts relating to a permit issuance. Public hearings are held when the 'Regional administrator finds a significant degree of public interest in a proposed permit.' An adjudicatory hearing may follow a public hearing where a permit has been issued or may occur with regard to a proposed permit issuance. Adjudicatory hearings are similar to court proceedings; highly structured and dealing with sharply drawn issues. There is some question of standing to be a party for permit review but the author feels the agency will take a liberal view of standing requirements. The decision of the adjudicatory hearing may be reviewed by the Administrator of the Environmental Protection Agency. After a party has exhausted all of his administrative remedies he may seek judicial review in the Circuit Court of Appeals. (Altuve-Florida)
W75-10302

**LEGISLATION UNDER NEPA: PLAINTIFFS' PHYRRHIC VICTORIES DRAW CONGRESSIONAL FIRE, JUDICIAL WARNINGS,**
R. P. Higgins.
Missouri Law Review, Vol 39, p 415-429 (1974). 15 p, 99 ref.

Descriptors: *Legislation, *Legal aspects, *Legal review, *Judicial decisions, Administrative agencies, Administrative decisions, Environmental effects, Feasibility, Alternative planning, Project planning, Management, Cost-benefit analysis, Political aspects, Political constraints, Federal government, Federal project policy, Public benefits, Federal jurisdication.
Identifiers: *National Environmental Policy Act, *Environmental impact statement, Disclosure.

As a result of the passage of the National Environmental Policy Act of 1969 (NEPA), the federal courts have become available to environmental plaintiffs as forums for particular grievances and as means of opening the administrative process to citizens. In the early NEPA decisions, the courts focused upon the adequency of Environmental Impact Statements (EIS) issued by the agencies emphasizing the NEPA requirements for full disclosure of environmental impact and feasible alternatives. More recently the courts have begun to realize that disclosure along does not guarantee serious consideration of the pros and cons by the agency involved. Thus some courts have read section 101 of NEPA to require review on the merits throughout the process of the project planning, subjecting agency decisions to reversal in the event of a 'clear error of judgement'. In response, a legislative and judicial backlash appears to be building. Courts recently have noted that 'emotional environmentalism must be tempered with rational realism'. (Altuve-Florida)
W75-10303

**HARDY SALT CO. V. SOUTHERN PACIFIC TRANSPORTATION CO. (SUIT SEEKING INJUNCTIVE RELIEF OR DAMAGES FOR SALINITY CHANGES RESULTING FROM DEFENDANT'S CONSTRUCTION IN THE GREAT SALT LAKE).**
For primary bibliographic entry see Field 6E.
W75-10308

**SIERRA CLUB V. LYNN (ACTION FOR DECLARATORY AND INJUNCTIVE RELIEF WITH RESPECT TO DEVELOPMENT OF NEW HOUSING DEVELOPMENT).**
For primary bibliographic entry see Field 6G.
W75-10309

**ALABAMA'S WATER RESOURCES POLICY.**
Alabama Development Office, Montgomery.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-234 755, $3.25 in paper copy, $2.25 in microfiche. March 1973. 13 p, 1 map, 16 photo.

Descriptors: *Water policy, *Water resources, Land resources, *Alabama, Land, Population, Water conservation, Water demand, Water quality, Water quality control, Water resources development, Water sources, Water supply, Water utilization.
Identifiers: State policy.

Water resources policy and planning objectives are intimately related to each other and to the public interest. The policy of the State of Alabama is to bring about the systematic development of Alabama's human and natural resources, so that the total water resources of the state will be conserved, developed and used for the maximum benefit of all people of the state. A growing population, an expanding economy, and increasing urbanization make it continually more difficult to properly develop and manage the State's water resources. In future years, the problems of water resources management will become increasingly difficult as new and enlarged uses tax the state's resources. However, it is hoped that adequate and farsighted water resources policies supported by proper planning, implementation and management will enable the state to meet the challenge of providing a total environment of superior quality for all citizens of Alabama. Accomplishment of this objective will require, however, the cooperation of all levels of government, industry, business and the public. (Gagliardi-Florida)
W75-10310

**REPORT TO THE CONGRESS ON OCEAN DUMPING AND OTHER MAN-INDUCED CHANGES TO OCEAN ECOSYSTEMS (OCTOBER 1972 THROUGH DECEMBER 1973).**
National Oceanic and Atmospheric Administration, Washington, D.C.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 - Price $1.45. March 1974. 96 p, 1 photo, 4 tab, 83 ref, 2 append.

Descriptors: *Oceans, Water resources, *Protection, *Research and development, *Legisiation, Federal government, Water law, Marine fisheries, Resources, Legal aspects, Water pollution, Oil pollution, Dredging, Spoil banks, Fishing, Waste disposal, Mining.
Identifiers: *Marine Protection, Research and Sanctuaries Act, *Hazardous substances(Pollution), Non-point sources(Pollution), National Environmental Policy Act.

Pursuant to the requirements of the Marine Protection, Research and Sanctuaries Act, enacted on October 23, 1972, this first annual report was submitted to Congress by the Department of Commerce. The Act provides for the regulation of ocean dumping, research on ocean dumping and other man-induced changes to ocean ecosystems, and the designation, acquisition, and administration of marine sanctuaries. Section 201 of the Act requires the Secretary of Commerce to maintain a program of monitoring and research regarding the effects of ocean dumping and to report the findings periodically to Congress. The Secretary must include an evaluation of the short-term ecological effects and the social and economic factors involved in ocean dumping, as well as long range effects of pollution on fishing, and man-induced changes of ocean ecosystems. This report presents a perception of the problem of ocean dumping as well as an overview of the more complex, longer-term problems of man's effects on the world's oceans. Included are relevant activities from the enactment of this act through the end of calendar year 1973. (Fernandez-Florida)
W75-10311

**SMITH V. CITY OF COOKEVILLE (AC BY LANDOWNER WHOSE PROPERTY CONDEMNED BY CITY FOR USE IN REC TION DEVELOPMENT TO ENJOIN STRUCTION UNTIL ENVIRONMENTAL PACT STATEMENT IS FILED).**
For primary bibliographic entry see Field 6E.
W75-10312

**SCENIC RIVERS ASSOCIATION OKLAHOMA V. LYNN (SUIT SEE DECLARATORY JUDGMENT THAT MUST MAKE AN ENVIRONMENTAL IM STUDY PRIOR TO THEIR CONTEMPL ACTIONS).**
For primary bibliographic entry see Field 6E.
W75-10313

**TON-DA-LAY, LTD. V. DIAMOND (RE OF DENIAL OF APPLICATION FOR W SUPPLY AND SEWAGE TREATM SYSTEMS).**
For primary bibliographic entry see Field 6E.
W75-10314

**DUPONT DE NEMOURS AND CO. V. T (ACTION BY CHEMICAL MANUFACTU TO SET ASIDE REGULATIONS GOVER EFFLUENT DISCHARGE OF SULFURIC PLANTS).**
For primary bibliographic entry see Field 6E.
W75-10316

**OCEAN POLLUTION.**
Hearings--Subcomm. on Oceans and Atmosp -Comm. on Commerce, U.S. Senate, 93d Con Sess, June 12, 13 and 28, 1973. 393 p, 20 tab, pend.

Descriptors: *Atmosphere, *Oceans, *Oil p tion, Metals, Mercury, Wastes, Fallout, Oil spills, International commissions, Pollutants, lution abatement, Pollutant identification, M geology, Effluents, Rivers, Air, Air pollution pollution effects, Mining, Energy, Chlori hydrocarbon pesticides, Storm water, Env mental effects.
Identifiers: Congressional hearings, Internat agreements, Oil Pollution Act.

The Senate Subcommittee on Oceans and mosphere conducted ocean pollution hearing June 12, 13 and 28, 1973. Senate Bill 1067 prov for the amending of the Oil Pollution Act, 196 implement the 1969 and the 1971 amendmen the International Convention for the Preventi the Pollution of the Sea by Oil. S. 1070 prov for the implementation of the International vention Relating to Intervention on the High in Cases of Oil Pollution Casualties, 1969. S. provided for the amendment to the Marine Pro tion, Research and Sanctuaries Act of Among the topics considered by the Subcom tee, were the following: effluent inputs-river direct coastal discharges; ocean dumping; air lution; marine mining; energy development; chlorinated hydrocarbons and plastics; metals; mercury distribution; pollutant cha teristics; marine pollutants; fallout; oil in st waters; organic pollutants; and the scope marine pollution and the other deterioration o ocean's environmental quality. Also discu were the present state of the law of the sea; necessity for international agreements on s dards; the need to ensure that standards are forceable against foreign flag vessels; and the fects of oil pollution on the marine ecosyst (Galiardi-Florida)
W75-10318

**CHATTAHOOCHEE RIVER NATIO RECREATION AREA, GEORGIA.**
For primary bibliographic entry see Field 6G.
W75-10320

EMENTATION OF THE FEDERAL ER POLLUTION CONTROL ACT.
ngs--Subcomm. on Investigations and w--Comm. on Public Works, U.S. House of sentatives, 93d Cong, 2d Sess, February 5, April 2, 3, 4, June 25, 26, July 15, 16, 1974. multiple photo, fig, tab.

iptors: *Federal Water Pollution Control *Administration, Water pollution, *Water on control, Water pollution sources, Treat- acilities, Waste treatment, Effluents, Cities, Quality Act, Legislation, Legal aspects, ng, Regulation, Water law, Governmental lations, Federal government, Local govern- , State governments, Water pollution ef- Control, Water pollution treatment, Water , Water quality control.
iers: *Congressional hearings, *Federal Pollution Control Act Amendments of 1972, istrative regulations, Effluent limitations, nmental policy, Hazardous sub- s(Pollution).

gs were held before the House Subcommit- Investigations and Review for consideration gress in water pollution control under the l Water Pollution Control Act Amendments 2. The purpose was to evaluate the pro- operation during its earliest months, to te correction of defects either in legislation dministration, before valuable time is lost he program is permanently sidetracked. was made into major problems in order to the Environmental Protection Agency by providing more funds, clearing up tive ambiguities, and reducing redtape. ony revealed that the law had been slow in ing the environmental benefits anticipated. ms in the distribution of Federal funds to mmunities build waste treatment facilities discussed. State and local officials com- that they were being overwhelmed by hanging guidelines and regulations. Effects legislation on the electric power generating y were considered, and various final ef- guidelines, established by the EPA, were ed. (Fernandez-Florida)
0322

M ELECTRIC POWER GENERATING SOURCE CATEGORY--PROPOSED EF- NT GUIDELINES AND STANDARDS FOR MPATIBLE POLLUTANTS.
nmental Protection Agency, Washington,

l Register, Vol 39, No 196, Part IV, p 36210- October 8, 1974. 2 p.

ptors: *Water quality standards, nistrative agencies, *Regulation, *Water on control, Water pollution treatment, ents, Electric power, Water quality, Water control, Water treatment, Federal govern- Legislation, Legal aspects, Water Quality ederal Water Pollution Control Act, Water on, Water pollution sources, Treatment, ent facilities, Thermal power, Hydroelec- nts.
iers: Administrative regulations, Effluent ons, Pretreatment standards(Effluent), En- ental policy, Federal Water Pollution Con- t Amendments of 1972, Hazardous sub- s(Pollution), National Pollutant Discharge ation System.

is given pursuant to the Federal Water Pol- Control Act (FWPCA) as amended, of ed regulations amending the Steam Electric Generating Point Source Category. nes are to be established for each sub- y regarding the extent of application of ef- limitations and guidelines to existing s which discharge to publicly owned treat- works. The proposed regulation is intended lement a final regulation being promulgated neously, by the Environmental Protection Agency (EPA), which provides effluent limitations and guidelines for existing sources and standards of performance and pretreatment standards for new sources within the generating unit, small unit, old unit, and area runoff subcategories. However, the proposed regulation applies to the introduction of incompatible pollutants which are directed into publicly owned treatment works, rather than to discharges of pollutants to navigable waters. Pollutants are divided into two broad categories: compatible and incompatible. Compatible pollutants are generally not subject to pretreatment standards. It is the incompatible pollutants which are the subject of the proposed regulation. (Fernandez-Florida)
W75-10323

**MARINE SANITATION DEVICES--PROPOSED CERTIFICATION PROCEDURES AND DESIGN AND CONSTRUCTION REQUIREMENTS.**
Coast Guard, Washington, D.C.
Federal Register, Vol 39, No 42, Part II, p 8038-8044, March 1, 1974. 7 p.

Descriptors: *Water quality standards, *Administrative agencies, *Coast guard regulations, *Environmental sanitation, *Water pollution control, *Regulation, Control, Water quality, Water quality control, Water pollution sources, Federal government, Legal aspects, Sanitary engineering, Disposal, Sewage, Waste water(Pollution), Waste disposal, Environmental engineering, Sewage treatment, Waste water treatment, Water pollution, Waste treatment, Oceans.
Identifiers: Administrative regulations, Certification, *Federal Water Pollution Control Act Amendments of 1972, Coastal waters, Effluent limitations, Environmental policy, Hazardous substances(Pollution), National Pollutant Discharge Elimination System, Territorial waters.

This notice proposes Coast Guard regulations governing the design, construction, testing, certification, and manufacture of marine sanitation devices. In order to eliminate the discharging of untreated sewage from vessels into the waters of the United States, including territorial seas, subpart A prescribes regulations governing the design and construction of marine sanitation devices and procedures for certifying that marine sanitation devices meet the regulations and the standards of the Environmental Protection Agency (EPA), promulgated under the Federal Water Pollution Control Act. Further included are regulations governing the manufacture and operation of vessels equipped with marine sanitation devices. Subpart B prescribes procedures for certification of marine sanitation devices and recognition of facilities for the purpose of conducting tests and evaluations of marine sanitation devices. The final subpart provides specifications governing the design and construction of specified marine sanitation devices, and requires all devices, for which certification is requested, to meet the enumerated standards. Legal authority for these rules is found in the Federal Water Pollution Control Act. (Fernandez-Florida)
W75-10324

**CANNED AND PRESERVED FRUITS AND VEGETABLES PROCESSING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS.**
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 56, Part III, p 10862-10870, March 21, 1974. 9 p.

Descriptors: *Water quality standards, *Administrative agencies, *Regulation, *Water pollution control, Water pollution treatment, *Effluents, Water quality, Water quality control, Water treatment, Federal government, Legislation, Legal aspects, Water Quality Act, Water pollution, Federal Water Pollution Control Act, Water pollution sources, Treatment, Treatment facilities, Vegetable crops, Potatoes, Fruit crops, Canneries.
Identifiers: Administrative regulations, Effluent limitations, Pretreatment standards(Effluent), Environmental policy, Federal Water Pollution Control Act Amendments of 1972, Hazardous substances(Pollution), National Pollutant Discharge Elimination System.

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the Canned and Preserved Fruits and Vegetables Processing category of point sources, by amending 40 CFR Chapter 1, Subchapter N to add a new part 407. This final rulemaking is promulgated by the Environmental Protection Agency (EPA) pursuant to the Federal Water Pollution Control Act. Guidelines are established for the following subcategories: apple juice, apple products, citrus products, frozen potato products and dehydrated potato products. In addition, EPA is simultaneously proposing a separate provision stating the application of the limitations and standards to users of publicly owned treatment works which are subject to pretreatment standards. Notice is given of proposed regulations concerning the application of effluent limitations guidelines for existing sources to pretreatment standards for incompatible pollutants. (Fernandez-Florida)
W75-10325

**LIQUID AND CRYSTALLINE CANE SUGAR REFINING SUBCATEGORY--EFFLUENT LIMITATIONS GUIDELINES AND PROPOSED PRETREATMENT STANDARDS.**
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 55, Part III, p 10522-10528, March 20, 1974. 7 p.

Descriptors: *Water quality standards, *Administrative agencies, *Regulation, *Effluents, *Sugarcane, *Food processing industry, Pollutants, Industries, Navigable waters, Wastes, Industrial plants, Discharge(Water), Industrial waters, Water pollution sources, Environmental effects, Pollution abatement, Federal government, Standards, Water pollution, Waste water treatment, Waste treatment, Treatment, Treatment facilities.
Identifiers: Administrative regulations, Effluent limitations, Pretreatment standards(Effluent), Environmental policy, FWPCA Amendments of 1972, Hazardous substances(Pollution), National Pollutant Discharge Elimination System.

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the sugar processing category of point sources, by amending 40 CFR Chapter 1, Subchapter N, Part 409. Guidelines are established for the crystalline cane sugar and liquid cane sugar categories. The limitations govern the quantity and quality of pollutants or pollutant properties which may be discharged by a point source subject to the provisions of this regulations after application of the best available technology economically achievable. Additionally, the Environmental Protection Agency simultaneously proposes rules stating the application of the limitations and standards to users of publicly owned treatment works which are subject to pretreatment standards. Notice is given of proposed regulations concerning the application of effluent limitations guidelines for existing sources to pretreatment standards for incompatible pollutants. (Fernandez-Florida)
W75-10326

**INORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY.**
Environmental Protection Agency, Washington, D.C.

Federal Register, Vol 39, No 49, Part II, p 9612-9639, March 12, 1974. 28 p.

Descriptors: *Water quality standards, *Administrative agencies, *Regulation, *Chemical wastes, *Inorganic compounds, *Effluents, Chemical industry, Industries, Discharge(Water), Industrial wastes, Water pollution sources, Environmental effects, Pollution abatement, Federal government, Standards, Water pollution, Chemicals, Recycling, Waste water treatment, Waste treatment, Water reuse, Treatment, Treatment facilities, Flocculation.
Identifiers: *Administrative regulations, *Effluent limitations, *Pretreatment standards, Environmental policy, FWPCA Amendments of 1972, Hazardous substances(Pollution).

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the inorganic chemicals manufacturing category of point sources, by amending 40 CFR Chapter 1, Subchapter N, to add a new part 415. Twenty-two subcategories have been established based on the chemical product manufactured. Where total recycle, sale, recovery, or reuse of process waste water is technically and economically feasible, the discharge of all process waste water pollutants is limited. Discharge of pollutants to municipal treatment systems is allowed in limited quantities necessary to ensure adequate treatment and to prevent interference with the performance of the system. The effluent limitations in this regulation generally will be applied as absolute discharge limitations. Treatment alternatives include sedimentation basins, flocculators, and clarifiers. For chemical subcategories which disallow discharge of process waste water pollutants to navigable waters and for which ponds may be part of the treatment system, an allowance is provided to permit a discharge of process waste water from a plant located in an area where rainfall exceeds the evaporation rate or in the event of a catastrophic rainfall. (Fernandez-Florida)
W75-10327

**ELECTROPLATING POINT SOURCE CATEGORY; COPPER, NICKEL, CHROMIUM AND ZINC ON FERROUS AND NONFERROUS MATERIALS SUBCATEGORY.**
Environmental Protection Agency, Washington, D.C.
Federal Register. Vol 39, No 61, Part II, p 11510-11516, March 28, 1974. 7 p.

Descriptors: *Water quality standards, *Administrative agencies, *Regulation, *Effluents, *Inorganic compounds, *Iron alloys, Copper, Metals, Chromium, Zinc, Hydrogen ion concentration, Discharge(Water), Industrial wastes, Water pollution sources, Environmental effects, Pollution abatement, Federal government, Standards, Water pollution, Waste water treatment, Waste treatment, Treatment, Treatment facilities.
Identifiers: Administrative regulations, Effluent limitations, Pretreatment standards(Effluent), Environmental policy, FWPCA Amendments of 1972, Hazardous substances(Pollution), National Pollutant Discharge Elimination System.

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the electroplating category of point sources by amending 40 CFR Chapter 1, Subchapter N, to add a new Part 413. Subcategories governed by the regulation include: electroplating of copper, nickel, chromium, and zinc on ferrous and nonferrous materials. The provisions of this regulation are applicable to discharges of pollutants resulting from the process in which a ferrous or nonferrous base material is rack or barrel electroplated with copper, nickel, chromium, zinc, or any combination thereof. The best practicable control technology currently available consists of cyanide destruction, equalization, and pH adjustment. In addition, the Environmental Protection Agency is simultaneously proposing a separate provision stating the application of the limitations and standards to users of publicly owned treatment works which are subject to pretreatment standards, as well as application to pretreatment standards for incompatible pollutants. (Fernandez-Florida)
W75-10328

**THERMAL DISCHARGES--PROPOSED PROCEDURES FOR THE IMPOSITION OF ALTERNATIVE EFFLUENT LIMITATIONS.**
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 61, p 11434-11441, March 28, 1974. 8 p.

Descriptors: *Water quality standards, *Administrative agencies, *Permits, *Regulation, *Discharge(Water), *Thermal pollution, Legal aspects, Fish, Aquatic life, Wildlife, Biota, Bodies of water, Thermal water, Environmental effects, Effluents, Pollution abatement, Temperature, Water cooling, Water temperature, Federal government, Standards, Water pollution, Heated water, Federal Water Pollution Control Act.
Identifiers: Administrative regulations, Effluent limitations, *National Pollutant Discharge Elimination System, *Pretreatment standards(Effluent), Environmental policy, FWPCA Amendments of 1972, Hazardous substances(Pollution).

The proposed regulations establish procedures for the imposition of alternative effluent limitations on the thermal component of discharges, authorized by section 316(a) of the Federal Water Pollution Control Act, as amended. Alternative effluent limitations may be imposed by the Environmental Protection Agency Administrator, if the owner or operator of a point source has demonstrated to the satisfaction of the administrator that proposed effluent limitations are more stringent than necessary to assure the protection and propagation of a balanced indigenous population of shellfish and fish and wildlife. Granting of National Pollutant Discharge Elimination System permits is made contingent upon a showing by the applicant of absence of prior harm, in the case of a point source which has commenced operation and discharge, and a demonstration that representative, important species will be adequately protected. Evidence may be produced in the forms of historical biological data, physical monitoring data, engineering or diffusion models, or any other relevant information. (Fernandez-Florida)
W75-10329

**ASBESTOS MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT LIMITATIONS GUIDELINES.**
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 39, Part II, p 7526-7535, February 26, 1974. 10 p.

Descriptors: *Water quality standards, *Administrative agencies, *Regulation, Standards, *Effluents, *Asbestos, Silicates, Asbestos cement, Calcium compounds, Inorganic compounds, Federal government, Legal aspects, Control, Wastes, Industrial wastes, Environmental effects, Environmental control, Pollutants, Pollution abatement, Treatment, Waste treatment, Industrial plants, Specifications.
Identifiers: Administrative regulations, Effluent limitations, Pretreatment standards(Effluent), Environmental policy, Hazardous substances(Pollution).

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the asbestos manufacturing category of point sources by amendi 40 CFR Chapter 1, Subchapter N, to add a ne Part 427. Subcategories regulated include asbestos-cement pipe, asbestos-cement shee asbestos paper (starch binder), asbestos pap (elastomeric binder), asbestos millboard, asbest roofing products, and asbestos floor tile. Ea subpart delineates its applicability, specializ definitions, standards of performance a pretreatment standards for new sources, and e fluent limitations guidelines representing t degree of effluent reduction attainable by the a plication of the best practicable control technolo economically achievable and currently availabl Additionally, the Environmental Protection Age cy proposes a provision stating the application the limitations and standards to users of public owned treatment works which are subject pretreatment standards. (Fernandez-Florida)
W75-10330

**FERROALLOY MANUFACTURING POIN SOURCE CATEGORY.**
Environmental Protection Agency, Washingto D.C.
Federal Register, Vol 39, No 37, Part 11, p 680 6814, February 22, 1974. 9 p.

Descriptors: *Water quality standard *Regulation, *Administrative agencies, Standard *Effluents, *Iron alloys, Legal aspects, Contro Federal government, Wastes, Industrial waste Environmental effects, Environmental contro Alloys, Pollutants, Pollution abatement, Trea ment, Waste treatment, Industrial plants, Specif cations, Air pollution.
Identifiers: Administrative regulations, Efflue limitations, Pretreatment standards(Effluent), E vironmental policy, Hazardous su stances(Pollution).

The purpose of this notice is to establish final e fluent limitations guidelines by the Environment Protection Agency (EPA) for existing sources ar standards of performance and pretreatment sta dards for new sources in the ferroalloy manufa turing category of point sources, by amending CFR Chapter 1, Subchapter N, to add a new Pa 424. In addition, the EPA simultaneously propos a separate provision stating the application of t limitations and standards to users of public owned treatment works which are subject pretreatment standards. Subpart A of the regul tion covers open electric furnaces with wet air po lution control devices, and delineates efflue limitation guidelines representing the degree of e fluent reduction attainable by the application the best practicable control technology current available as well as economically achievable. Th part also sets standards of performance ar pretreatment standards for new sources. Subpa B regulates covered electric furnaces and oth smelting operations with wet air pollution contr devices, and subpart C sets guidelines for sl processing. (Fernandez-Florida)
W75-10332

**FEEDLOTS POINT SOURCE CATEGORY--EF FLUENT GUIDELINES AND STANDARDS.**
Environmental Protection Agency, Washingto D.C.
Federal Register, Vol 39, No 32, Part 11, p 570 5710, February 14, 1974. 7 p.

Descriptors: *Water quality standard *Standards, *Regulation, *Effluents, *Was treatment, *Feed lots, Administrative agencie Legal aspects, Administration, Wastes, Water po lution sources, Discharge(Water), Was water(Pollution), Water pollution, Treatmen Waste water treatment, Cleaning, Water pollutio treatment, Disposal, Sanitary engineering, Trea ment facilities, Industrial wastes, Navigabl waters, Confined pens, Farm wastes, Ruminants.

lentifiers: Administrative regulations, Effluent nitations, *FWPCA Amendments of 1972, retreatment standards(Effluent), Environmental olicy, Hazardous substances(Pollution).

he purpose of this notice is to establish final ef-ient limitations guidelines for existing sources d standards of performance and pretreatment andards for new sources in the feedlots category point sources, by amending 40 CFR Chapter 1, bchapter N, to add part 412. This regulation ap-ies to Subpart A--Subcategories Except Ducks, well as to Subpart B--Ducks Subcategory. eedlot' is defined as a concentrated, confined imal or poultry growing operation for meat, lk, or egg production. Discharge of process aste water pollutants to navigable waters is ohibited except when chronic rainfall causes an erflow of process waste water from a containing cility. Additionally, the Environmental Protec-n Agency simultaneously proposes rules stating e application of the limitations and standards to ers of publicly owned treatment standards. rther, notice is hereby given, pursuant to the deral Water Pollution Control Act, as amended, proposed regulations concerning the application effluent limitations guidelines for existing urces to pretreatment standards for incompati-e pollutants. (Fernandez-Florida)
75-10333

**LASS MANUFACTURING POINT SOURCE ATEGORIES--EFFLUENT GUIDELINES AND ANDARDS.**
vironmental Protection Agency, Washington, C.
deral Register, Vol 39, No 32, Part 111, p 5712-21, February 14, 1974. 10 p.

escriptors: *Water quality standards, dministrative agencies, Standards, *Regulation, ffluents, *Waste treatment, Legal aspects, Ad-nistration, Wastes, Water pollution sources, scharge(Water), Waste water(Pollution), Water llution treatment, Waste water treatment, eaning, Disposal, Sanitary engineering, Treat-ent facilities, Industrial wastes.
entifiers: Administrative regulations, Effluent nitations, *FWPCA Amendments of 1972, Glass nufacturing, Environmental policy, Hazardous bstances(Pollution), Pretreatment stan-rds(Effluent).

e purpose of this notice is to establish final ef-ent limitations guidelines for existing sources d standards of performance and pretreatment ndards for new sources in the glass manufactur-g category of point sources by amending 40 CFR apter 1, Subchapter N, Part 426. Guidelines are tablished for the following subcategories of nufacturing: sheet glass, rolled glass, plate ss, float glass, automotive glass tempering, and tomotive glass laminating. The various sub-tegories are individually described. Effluent nitations guidelines are delineated in terms presenting the degree of effluent reduction at-nable by the application of the best practicable ntrol technology currently available and the best ailable technology economically achievable. In dition, the Environmental Protection Agency nultaneously proposes a separate provision con-rning the application of the limitations and stan-rds to users of publicly owned treatment works ich are subject to pretreatment standards. rther, notice is given of proposed regulations ncerning the application of effluent limitations idelines for existing sources to pretreatment ndards for incompatible pollutants. (Fernandez-orida)
75-10334

**IERMAL DISCHARGES.**
vironmental Protection Agency, Washington, C.
deral Register, Vol 39, No 196, Part 11, p 36178-184, October 8, 1974. 7 p.

Descriptors: *Water quality standards, *Administrative agencies, *Permits, *Regulation, *Discharge(Water), *Thermal pollution, Legal aspects, Fish, Aquatic life, Wildlife, Biota, Bodies of water, Thermal water, Environmental effects, Effluents, Pollution abatement, Temperature, Water cooling, Water temperature, Federal government, Standards, Water pollution, Heated water.
Identifiers: Administrative regulations, Effluent limitations, *National Pollutant Discharge Elimination System, Pretreatment standards(Effluent), Environmental policy, FWPCA Amendments of 1972, Hazardous substances(Pollution).

These regulations describe procedures for the imposition of alternative effluent limitations, with respect to the thermal component of discharges, authorized by section 316(a) of the Federal Water Pollution Control Act, as amended. The Administrator of the Environmental Protection Agency is responsible for determining that effluent limitations on the thermal component of proposed discharges are ' more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the body of water into which the discharge is to be made'. The regulations require public notice of each proposed issuance, denial, or modification of a permit. An applicant may satisfy the burden of proof that aquatic biota will be adequately protected by showing an absence of prior appreciable harm, and provision for protection of representative important species through production of biological, engineering, and other data. Substantial, irreversible environmental modifications must be taken into consideration in identifying the balanced indigenous communities. (Fernandez-Florida)
W75-10335

**BUILDERS PAPER AND BOARD MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT LIMITATIONS GUIDELINES.**
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 9, Part 11, p 1818-1821, January 14, 1974. 4 p.

Descriptors: *Water quality standards, *Administrative agencies, *Regulation, *Water pollution control, *Water pollution treatment, *Effluents, Water quality, Water quality control, Water treatment, Federal government, Legislation, Legal aspects, Water Quality Act, Water pollution, Federal Water Pollution Control Act, Water pollution sources, Treatment, Treatment facilities, Pulp and paper industry, Pulp wastes, Wood wastes.
Identifiers: Administrative regulations, Effluent limitations, Pretreatment standards(Effluent), Environmental policy, Federal Water Pollution Control Act Amendments of 1972, Hazardous substances(Pollution), National Pollutant Discharge Elimination System.

Notice is given of proposed effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources for the builders paper and roofing felt subcategory of the builders paper and board manufacturing category of point sources. Legal authority for promulgation of these rules by the Environmental Protection Agency (EPA) is found in the Federal Water Pollution Control Act. The instant subcategory includes mills which produce the heavy papers used in the construction industry from cellulose fibers derived from waste paper, wood flour and sawdust, wood chips, and rags, without bleaching or chemical pulping. Builders papers are generally characterized as saturating papers, flooring paper, and deadening papers which are used in the construction and automotive industries. Significant pollutant parameters in waste waters include five day biochemical oxygen demand, total suspended non-filterable solids, and pH. Effluent limitations guidelines and standards of performance are established to control these pollutants. Treatment and control technology includes water re-use and recirculation, preliminary screening, primary sedimentation, biological treatment, and physical chemical treatment. (Fernandez-Florida)
W75-10336

**STEAM ELECTRIC POWER GENERATING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS.**
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 196, Part 111, p 36186-36207, October 8, 1974. 22 p.

Descriptors: *Water quality standards, *Administrative agencies, *Regulation, *Effluents, *Steam, *Electric power, Thermal power, Thermal powerplants, Waste treatment, Treatment, Treatment facilities, Pollutants, Industries, Navigable waters, Wastes, Industrial plants, Discharge(Water), Industrial wastes, Water pollution sources, Environmental effects, Pollution abatement, Federal government, Standards, Water pollution, Waste water treatment.
Identifiers: Administrative regulations, Effluent limitations, Pretreatment standards(Effluent), Environmental policy, FWPCA Amendments of 1972, Hazardous substances(Pollution), National Pollutant Discharge Elimination System.

The purpose of this notice is to establish final effluent limitations and guidelines for existing sources and standards of performance and pretreatment standards for new sources in the steam electric power generating category by amending 40 CFR Chapter 1, Subchapter N to add a new part 423. Subcategories regulated include: generating unit, small unit, old unit, and area runoff. With respect to the first three subcategories, this regulation applies to discharges resulting from the operation of a generating unit by an establishment primarily engaged in the generation of electricity for distribution and sale which principally results from a process utilizing fossil-type fuel or nuclear fuel in conjunction with a thermal cycle employing the steam-water system as the thermodynamic medium. Limitations are established regarding the quantity and quality of pollutants or pollutant properties which may be discharged by a point source subject to the provisions of this regulation. The pH of all discharges, as well as polychlorinated biphenol compounds, and low volume waste sources are limited through the application of a flow rate formula. (Fernandez-Florida)
W75-10337

**PAMLICO RIVER ESTUARY--PAST, PRESENT AND FUTURE,**
North Carolina State Univ., Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W75-10338

**TENTH ANNUAL REPORT, FISCAL YEAR 1974,**
Auburn Univ., Ala. Water Resources Research Inst.
For primary bibliographic entry see Field 9D.
W75-10339

## 6. WATER RESOURCES PLANNING

## 6A. Techniques Of Planning

**PROJECT EVALUATION IN WATER RESOURCES: BUDGET CONSTRAINTS,**
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.

D. C. Major, J. Cohon, and E. Frydl.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 567, $9.25 in paper copy, $2.25 in microfiche. Ralph M. Parsons Laboratory for Water Resources and Hydrodyanmics, Technical Report 188, September 1974. 284 p, 45 fig, 31 tab, 39 ref, 3 append. OWRT C-3370(no.3720)(1). 14-31-0001-3720.

Descriptors: *Project planning, *Budgeting, *Linear programming, *Delaware River, *Cost-benefit analysis, Federal budget, Non-reimbursable costs, Welfare(Economics), Economics, *Evaluation, Income analysis, Regional analysis, Floods, Powerplants, Water supply, *Pennsylvania, Investment, Income distribution, *Computer models.
Identifiers: *Multiobjectives, *Budget constraints, *Investment criteria, *Lehigh River(Penn), Income distribution, Regional income.

A multiobjective mathematical programming model was developed for the Lehigh River, Pennsylvania, in locally and globally optimal versions. Objectives for the Lehigh representing each of the four accounts of the Water Resources Council's proposed 1970 standards are discussed and the models are formulated for three of these: increasing national income, regional and class income distribution, and environmental quality. The design variables in the model are the reservoirs and power plants considered in the Corps of Engineers' 1961 report on the Delaware river basin, which includes the Lehigh. Runs of the models were made for one, two and three objectives, constrained by total and local budgets of varying size. Results from the globally optimal model are presented. These show the estimated effects on multidimensional net benefit surfaces and on the design variables of the budget constraints. There is a general discussion of the nature and use of budget constraints in multiobjective planning, and suggestions are made for implementing the work at the district (Corps) or region (Bureau of Reclamation) levels.
W75-09851

**APPLICATIONS OF INTEGER AND QUADRATIC PROGRAMMING TO FLOOD-PLAIN LAND USE MANAGEMENT,**
Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 6F.
W75-10008

**A COMPUTER SIMULATION ANALYSIS OF SURFACE WATER QUALITY MANAGEMENT POLICIES UNDER DYNAMIC ECONOMIC AND HYDROLOGIC CONDITIONS,**
Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.
For primary bibliographic entry see Field 5D.
W75-10124

**RESERVOIR RELEASE ROUTING MODEL FOR THE UPPER ARKANSAS RIVER BASIN OF COLORADO,**
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4A.
W75-10165

**TOTAL APPROACH FOR THE BOGOTA, COLUMBIA, WATER SUPPLY,**
Empresa de Aqueducto y Alcantarillado, Bogota (Colombia).
For primary bibliographic entry see Field 3D.
W75-10203

**EFFECT OF WIND WAVES AND WIND TIDES ON THE OPTIMUM CONTROL OF LARGE LAKES,**
Arizona Univ., Tucson. Bureau of Business Research.
For primary bibliographic entry see Field 4A.
W75-10204

**OPTIMAL CONTROL OF WATER POLLUTION IN A RIVER STREAM,**
Alberta Univ., Edmonton. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 5G.
W75-10206

**DETERMINISTIC MODEL OF DYNAMIC EUTROPHIC ESTUARY,**
Air Products and Chemicals, Inc., Allentown, Pa.
For primary bibliographic entry see Field 5B.
W75-10215

**A SENSITIVITY ANALYSIS OF SIMULATED RIVER BASIN PLANNING FOR CAPITAL BUDGETING DECISIONS,**
Idaho State Univ., Pocatello. Coll. of Business.
G. R. Wells.
Computers and Operations Research, Vol 2, No 1, p 49-54, April 1975. 4 fig, 1 tab, 12 ref.

Descriptors: *River basin development, *Multiple-purpose projects, *Simulation analysis, *Computer models, *Alternative planning, Capital, Budgeting, Decision making, Assessment, Reservoirs, *Oregon, Cost-benefit ratio, Operation and maintenance, Design, Probability, Dams, Size, Investment, Hydrologic data, Systems analysis.
Identifiers: *Sensitivity analysis, *Grande Ronde Basin(Ore), Operating procedures, Water uses, Water flows, Changes, Exogenous variables, Endogenous variables.

Application of a computer simulation model to the Grande Ronde River basin in northeastern Oregon is described. The model considers the effects of changes in sets of capital and in operating procedures on project benefits and costs. The methodology employed is probabilistic, utilizing hydrologic data for simulation of water flows and probability distributions for amounts of capital investment and annual operation and maintenance costs. Exogenous variables include: hydrologic data based on 41 years of historical data; capital sets for three different sizes of two reservoirs; and operating procedures for three scales of irrigation development. The functional relationships for benefits entail relationships between hydrologic phenomena and benefits for seven uses of water: irrigation; municipal and industrial water supply; recreation; salmon reared in reservoir; resident trout in reservoir; flood control; and anadromous fish. The endogenous variables resulting from running the model include net present benefits and benefit-cost ratios for nine reservoir combinations and three operating procedures (a decision set of 27). Results indicate that some decision sets are clearly superior to others and reduce the choice set from 27 to three. The simulation model provides a framework for the analysis of dam sizes for river basin planning. (See also W75-02615) (Bell-Cornell)
W75-10223

**RIVER POLLUTION CONTROL,**
Saint John's Coll., Cambridge (England).
M. G. Singh.
International Journal of Systems Science, Vol 6, No 1, January 1975. p 9-21, 5 fig, 6 equ, 10 ref.

Descriptors: *Water pollution control, *Rivers, *Simulation analysis, Digital computers, Optimization, Estimating, Reach(Streams), Biochemical oxygen demand, Dissolved oxygen, Equations, Mathematical models, Systems analysis.
Identifiers: *Cam River(Cambridge Engl), Automatic control systems, Cost function, Mass balance.

A preliminary study is made of the dynamic o
timization problem for a river with many pollute
using a recently developed model of a section
the river Cam near Cambridge, England. Due
the high dimensionality of the system, it is comp
tationally prohibitive to obtain optimal solutio
But the system has a fairly simple structure whi
could be utilized to alleviate the computatio
burden. A simple hierarchical structure
proposed for the river pollution control and t
strategy is demonstrated on a digital simulatio
For the practical implementation of the strategy
is necessary, however, to have available the st
vector of the system. In practice, only certain c
rupted measurements of the outputs are availab
It is therefore necessary to construct a state e
mator. Like the optimal controller, the optim
estimator also requires prohibitive amounts
computation. However, a hierarchical strate
similar to the control strategy could be used to
leviate the computational burden. Such an estim
tor is also demonstrated on a digital simulation
the river. The simple approach to control and st
estimation described here appears to be promisi
since it is able to provide virtually optimal p
formance and has modest enough computatio
requirements to enable it to be implemented o
single small computer. (Bell-Cornell)
W75-10224

**PROPOSED 1973 OUTER CONTINENTA SHELF OIL AND GAS GENERAL LEASE-SAL OFFSHORE MISSISSIPPI, ALABAMA, AN FLORIDA, VOLUME 3. ALTERNATIVES T THE PROPOSED ACTION (FINAL ENVIRO MENTAL IMPACT STATEMENT).**
Bureau of Land Management, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10291

**PLAN FORMULATION AND EVALUATIO STUDIES--RECREATION. VOL I OF EVALUATION OF RECREATION USE SU VEYS PROCEDURES,**
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 6B.
W75-10342

**PLAN FORMULATION AND EVALUATIO STUDIES--RECREATION. VOL. III OF V. PRELIMINARY ANALYSIS OF DAY US RECREATION AND BENEFIT ESTIMATIO MODELS FOR SELECTED RESERVOIRS,**
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 6B.
W75-10343

**PLAN FORMULATION AND EVALUATIO STUDIES--RECREATION. VOL. V OF V. GENERALIZED RECREATION DAY US PLANNING MODEL,**
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 6B.
W75-10345

## 6B. Evaluation Process

**PROJECT EVALUATION IN WATE RESOURCES: BUDGET CONSTRAINTS,**
Massachusetts Inst. of Tech., Cambridge. Dept. Civil Engineering.
For primary bibliographic entry see Field 6A.
W75-09851

**SOCIOLOGICAL IMPACT OF A FLOOD CO TROL RESERVOIR, HOWARD, PENNSY VANIA,**
Pennsylvania State Univ., Inst. for Research Land and Water Resources. University Park.
S. M. Leadley.

vailable from the National Technical Informa-
n Service, Springfield, Va. 22161 as PB-243 577,
.75 in paper copy, $2.25 in microfiche. Comple-
n Report, July 1975. 44 p, 2 tab, 3 append, 1 fig,
ref. OWRT A-017-PA(3). 14-31-0001-3238.

escriptors: *Social change, *Reservoir construc-
n, *Recreational facilities, *Social impact, So-
l aspects, Psychological aspects,
ennsylvania, Retention, Flood control, Reser-
irs, Pre-impoundment.
entifiers: *Neighborhood awareness, Perciptual
or, Perception, Families displaced, Jobs
minated, Community leaders, Family resilience,
ward(Penn).

e original assumption that individuals are capa-
of accurately reporting the magnitude of social
anges was unjustified as was noted in the data.
specific analysis of a number of variables relat-
to the variations in perceptual error revealed
t no one single factor could be used as a reliable
edictor of these errors. Other social and
ychological variables might be selected to better
present the selective processes of exposure, per-
ption and retention. For example, rather than
taining estimates from respondents regarding
milies displaced or jobs eliminated by reservoir
nstruction for the entire reservoir area, it may
necessary to use respondent-defined neighbor-
od areas within which the estimates are ob-
ned. For applied research, it is clear from the
gnitude of error that the average citizens and
o the community leaders fail to comprehend the
gnitude of changes in which they have been
ught up. This lack of awareness and understand-
appears to be one factor related to the depres-
n of apparanent organizational response to
anges in the physical and social environments.
nk-Penn State)
5-09854

ORGIA COUNTY COMMISSIONER AT-
TUDES TOWARD WATER PROBLEMS,
orgia Univ., Athens. Dept. of Political Science.
r primary bibliographic entry see Field 6E.
5-09855

E ECONOMIC IMPACT OF A SMALL
CREATION-ORIENTED RESERVOIR,
iversity of Southern Mississippi, Hattiesburg.
reau of Business Research.
L. Daniel, and D. C. Williams, Jr.
ailable from the National Technical Informa-
n Service, Springfield, Va. 22161 as PB-243 559,
75 in paper copy, $2.25 in microfiche. Mississip-
Water Resources Research Institute, Mississip-
State, Completion Report, July 1975. 30 p, 8 tab,
RT A-080-MISS(1).

scriptors: Economics, *Recreation, Reservoirs,
conomic impact, Model studies, *Mississippi,
valuation, *Income analysis, Costs, County
ernments, Wages, Taxes, Salaries.
ntifiers: *Flint Creek Reservoir(Miss).

s project sets up an economic model that is
dily applicable to evaluating the economic ef-
ts of small recreation-oriented reservoirs upon
local economies of the area in which the reser-
r is located. The economic effect was measured
erms of personal income. The approach used
s to determine the amount of basic income
ated by the reservoir, and then multiply that by
area's basic income multiplier. The model was
lied to Flint Creek Reservoir in Stone County,
sissippi. During a 12 month study period, the
ervoir attracted 104,336 visitors; most of them
e nonlocal. Expenditures by nonlocal visitors
e converted into basic income created in the
l area. Each camping visitor resulted in ap-
ximately $1.75 of additional basic income in the
a or a total $31,300 in new basic income. Day
tors added $1,300 to the total. Expenditures by
operator, the Pat Harrison Waterway District,
wages and salaries to local area residents represented an additional $82,400 in basic income. The basic income multiplier for Stone County is approximately 1.64. All basic income attributable to the reservoir was multiplied by this factor to obtain an estimate of the total effect of the reservoir on personal income in Stone County of $188,600. In addition, the reservoir generates approximately $15,900 annually of new sales taxes of which almost $13,500 is given to the county.
W75-09857

**FEASIBILITY AND POTENTIAL OF ENHANCING WATER RECREATION OPPORTUNITIES ON HIGH COUNTRY RESERVOIRS-PHASE I,**
Colorado State Univ., Fort Collins. Dept. of Recreation Resources.
R. Aukerman.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 564, $7.00 in paper copy, $2.25 in microfiche. Colorado, Environmental Resources Center, Fort Collins, Completion Report Series, No. 62, June 1975. 185 p, 19 fig, 51 tab, 43 ref, 2 append. OWRT B-104-COLO (2). 14-31-0001-4066.

Descriptors: *Feasibility studies, *Recreation, *Water sports, Reservoirs, Management, Reservoir storage, Recreation facilities, *Recreation demand, Fishing, *Sport fishing.
Identifiers: *High country reservoirs, *Water-based recreation.

High country water storage reservoirs were studied for the purpose of developing a user profile which could be used to predict recreation users desires. Findings identify several sub-groups of the recreation user public at high-country reservoirs. Management information has been gathered, which will be helpful in making decisions on what facilities to provide, where to provide them, which reservoirs to open for various users, what use might be expected, what type of access is needed, what users will pay for the experience, and what type of fishery is needed. A surprising findings from the fisherman profile indicates that most fishermen do not care if they catch a single fish, but are more interested in other qualities of the experience. (Evans-Colorado-State)
W75-09894

**METHODS TO FACILITATE MANAGERIAL EFFECTIVENESS IN MUNICIPAL WATER SYSTEMS,**
Mississippi State Univ., Mississippi State. Bureau of Business and Economic Research.
K. W. Hollman, R. F. Bush, J. F. Hair, Jr., E. E. Milam, and J. H. Sellers.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 565, $4.25 in paper copy, $2.25 in microfiche. Completion Report, Mississippi Water Resources Research Institute, Mississippi State, July 1975. 59 p, 14 tab. OWRT B-010-MISS(1).

Descriptors: *Cost analysis, *Management, Water supply, *Mississippi, *Municipal water, *Model studies, *Water management(Applied), Utilities, *Cost comparisons, Cost trends.
Identifiers: Multiple discriminant analysis, Multiple factor analysis.

The project focused on the quality of municipal water system management in Mississippi. The primary objectives were to determine what factors play a part in achieving greater efficiency in water system management and to what extent. An analytic model using multiple discriminant analysis and multiple factor analysis was formulated. A subset of 45 municipal water systems in Mississippi was used for the data base. Initially, twenty-two variables classified by degree of controllability and by major cost category were selected, but the model was later reduced to 12 variables. The systems were divided into three groups of 15 each on the basis of efficiency. Then the multivariate techniques were used to identify the significant cost variables within each general cost category at each efficiency level, and a relative numeric measure of the importance of each cost factor in each of the three levels of performance was computed. The study shows that a model with only a small number of variables, but with a high predictive accuracy, can be developed to assign water utilities to appropriate efficiency level groups. Information generated by the model will help municipal water managers to determine the amount of change in each of a few significant cost variables that is necessary for their system to reach a prespecified cost improvement goal.
W75-09895

**WATER RESOURCES DEVELOPMENT AND WILDERNESS VALUES: A STUDY OF THE UPPER HUDSON RIVER,**
Cornell Univ., Ithaca, N.Y., Water Resources and Marine Sciences Center.
G. R. Reetz.
Available from the National Technical Information Service as PB-243 736, $5.75 in paper copy, $2.25 in microfiche. Completion Report, 140 p, 26 tab, 11 fig, 151 ref, 2 append. OWRT A-043-NY(1). 14-31-0001-3832, 4032.

Descriptors: *Water resources development, *Decision making, Reservoir sites, *Hudson River, *Planning, Preservation, Environmental effects, *New York, Values, *Evaluation, Aesthetics, Water values, Social values.
Identifiers: Gooley Reservoir(NY), *Wilderness values, Preservation organizations.

Conflicts between water resources development proposals and desires to preserve natural environments have occurred in many areas of the United States, the debates often reaching the highest levels of government. Growing demands for both water and wilderness suggest a potential for increased competition in the future. The controversy over the proposed Gooley Dam, on the Upper Hudson River, provided a case study to examine the planning-evaluation-decision making processes as they relate to preservation-development conflicts. The Hudson River Gorge, focal point of the Gooley conflict, was visited by a total of 3900 people during the summers of 1972 and 1973. Questionnaires, with response rates from 85 to 87 percent, indicate an overwhelming desire to maintain the Gorge in its natural state. Major water resources planning programs were precipitated by the drought of the mid-1960's. Both Federal and State efforts identified the Gooley Reservoir as the most desirable alternative for meeting the water supply needs of the greater New York metropolitan area. Environmental parameters were examined but not given sufficient emphasis in initial planning efforts. Preservation interests, working through political processes, appear to have been more instrumental in preserving the Upper Hudson than were the planning agencies' attempts at environmental analysis.
W75-09898

**METHODS OF ESTIMATING PHYSICAL AND ECONOMIC EFFECTIVENESS OF WEATHER MODIFICATION,**
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 3B.
W75-09991

**ECONOMIC ASPECTS OF PRECIPITATION AUGMENTATION OVER THE GREAT LAKES,**
Illinois State Water Survey, Urbana.
G. E. Stout.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No. 399, Geneva (Switzerland), p 431-438, 1974. 4 fig, 2 tab, 4 ref.

Descriptors: *Weather modification, *Artificial precipitation, *Benefits, *Great Lakes, Cost-benefit analysis, Economics, Annual benefits, Lakes, Lake Michigan, Cloud seeding, Precipitation(Atmospheric), Rainfall, Snowfall.
Identifiers: *Lake level regulation.

It has been proposed by Dr. Helmut Weickmann that one could recycle, by cloud seeding, some of the evaporative water from the Great Lakes directly into one of the lakes. High evaporational rates occur when polar or arctic air masses cross an open warm water surface during the fall and early winter. The recycled water would be most beneficial during periods of low water levels in the lake system. The cloud physics aspects of such a water augmentation program were not discussed. It was assumed that a 10, 20, or 30% increase is within potential capability. The waters of the Great Lakes are used for power generation, shipping, recreation, and water supply. One would not want to seed the clouds during the period of high water. It is generally known that anytime the lake level exceeds the average lake level the benefits from extra water would be negligible. Losses to property are high when the lake levels approach their maximum levels. At the present time, Chicago has an adequate water supply from the lake, but as the demands increase and the population grows in the suburbs the city may eventually need to withdraw more water. The value of the water Chicago presently withdraws, plus the value of the benefits to navigation, power, and shore property from a 20% increase from cloud seeding during the critical years was estimated to be $4.5 to $6.8 million per year. Based on preliminary discussion with a commercial cloud seeder, the costs of a seeding program would be about $500,000 per fall. Therefore, the benefits on the conservative side appear to be about 9 to 1. (See also W75-09944) (Sims-ISWS)
W75-09992

**ON PHYSICAL AND ECONOMIC EFFECTIVENESS OF HAIL-SUPPRESSION PROJECTS,**
Institute of Experimental Meteorology, Obninsk (USSR).
For primary bibliographic entry see Field 3B.
W75-09995

**PROCEEDINGS OF WORKSHOP CONFERENCE ON IDENTIFICATION OF METROPOLITAN AREA WATER RESOURCES PROBLEMS AND ASSOCIATED RESEARCH NEEDS IN MINNESOTA.**
Minnesota Univ., St. Paul. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 793, $3.25 in paper copy, $2.25 in microfiche. Oct 1973, 22 p. OWRT A-028-MINN(4). 14-31-0001-4023.

Descriptors: *Water resources development, *Minnesota, *Research priorities, City planning, Comprehensive planning, Surveys, Land use, Coordination, Long-term planning.
Identifiers: *Water resources problems, *Minneapolis-St Paul Metropolitan area(Minn), Research needs.

The Water Resources Research Center, University of Minnesota, is developing a long-range comprehensive plan for water resources research in Minnesota involving Federal, State and local agencies, private organizations, Consultants, University of Minnesota, State and private Colleges, Interest Groups, and citizens. An attempt is being made to formulate broad research guidelines by inventorying research needs and assigning priorities. The object of this Workshop Conference was to identify research needs and priorities for the Minneapolis-St. Paul Metropolitan area in Minnesota. Conference participants identified the following high priority needed water resources research topics: Development of Water Resources Information System and Data Banks; Conservation of Water Resources; Groundwater System Analysis; Statewide Water Resources Planning; Solving Water Supply Problems in Twin Cities Metropolitan Area; Institutional Arrangements for Coordinating Water Resources Programs; On-Land Waste Disposal Practices; Financing Water Resources Programs; Shoreland, Floodplain and Water Surface Zoning; and Integrating Land-Use and Water Resources Planning. (Walton-Minnesota)
W75-10004

**PROCEEDINGS OF PUBLIC WORKSHOP CONFERENCE ON WATER RESOURCES PROBLEMS AND RESEARCH NEEDS IN CENTRAL MINNESOTA.**
Minnesota Univ., St. Paul. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 813, $3.25 in paper copy, $2.25 in microfiche. October 1973, 10 p. OWRT A-028-MINN(6). 14-31-0001-4023.

Descriptors: *Water resources development, *Minnesota, *Comprehensive planning, *Research priorities, Coordination, Surveys, Long-term planning.
Identifiers: *Water resources problems, Research needs.

The Water Resources Research Center, University of Minnesota, is developing a long-range comprehensive plan for water resources research in Minnesota involving Federal, State and local agencies, private organizations, Consultants, University of Minnesota, State and private colleges, Interest Groups, and citizens. An attempt is being made to formulate broad research guidelines by inventorying research needs and assigning priorities. The object of this Workshop Conference was to identify research needs and priorities for Central Minnesota. Conference participants identified the following high priority needed water resources research topics: Groundwater Pollution Hazards, Pollution Potentials in Lake Watersheds, Water Information System, Lake Management and Restoration Program, Water Resources Educational Programs, Thermal Pollution Standards and Credibility of Research Results. (Walton-Minnesota)
W75-10005

**PROCEEDINGS OF PUBLIC FORUM ON WATER RESOURCES PROBLEMS AND RESEARCH NEEDS IN SOUTHWESTERN MINNESOTA.**
Minnesota Univ., St. Paul. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 794, $3.25 in paper copy, $2.25 in microfiche. October 1973, 12 p. OWRT A-028-MINN(5). 14-31-0001-4023.

Descriptors: *Water resources development, *Minnesota, *Research priorities, Water quality, *Comprehensive planning, Coordination, Surveys, Long-term planning.
Identifiers: *Water resources problems, Research needs.

The Water Resources Research Center, University of Minnesota, is developing a long-range comprehensive plan for water resources research in Minnesota involving Federal, State and local agencies, private organizations, Consultants, University of Minnesota, State and private Colleges, Interest Groups, and citizens. An attempt is being made to formulate broad guidelines by inventorying research needs and assigning priorities. The object of this Workshop Conference was to identify research needs and priorities for Southwestern Minnesota. Conference participants identified the following high priority needed water resources research topics: Acceleration of Soil Conservation Practices, Reducing Waste Treatment Requirement Changes, Preventing Water Quality
oration through Soil Conservation Pra
Preventing Groundwater Pollution,
Resources Information Dissemination, Pr
tion of Wetlands, Erosion Control, and R
Between Tax Base and Land Retirement P
(Walton-Minnesota)
W75-10006

**PROCEEDINGS OF PUBLIC FORUM WATER RESOURCES PROBLEMS SOUTHEASTERN MINNESOTA.**
Minnesota Univ., St. Paul. Water Res
Research Center.
Available from the National Technical In
tion Service, Springfield, Va 22161 as PB-2
$3.25 in paper copy, $2.25 in microfiche. O
1973, 11 p. OWRT A-028-MINN(3). 14-3
4023.

Descriptors: *Water resources develo
*Minnesota, Comprehensive planning, *Re
priorities, Long-term planning, Coordinatio
veys, *Water quality.
Identifiers: *Water resources problems, Re
needs.

The Water Resources Research Center, Un
ty of Minnesota, is developing a long-rang
prehensive plan for water resources rese
Minnesota involving Federal, State and loca
cies, private organizations, Consultants, Un
ty of Minnesota, State and Private Colleg
terest Groups, and citizens. An attempt i
made to formulate broad research guideline
ventorying research needs and assigning pri
The object of this Forum was to identify re
needs and priorities for southeastern Min
Forum participants identified the followin
priority needed water resources research
Groundwater Quality, Groundwater Sta
Effects of Drainage on Groundwater, Wast
Treatment, Land Use, Reuse and Recyc
Water, Agricultural Drainage, Interdisci
Research, and Research on Research
(Walton-Minnesota)
W75-10007

**A STUDY OF WATER RESOU RESEARCH NEEDS IN MONTANA,**
Montana State Univ., Bozeman. Dept. of Ge
C. C. Bradley.
Available from the National Technical In
tion Service, Springfield Va., 22161, as
815, $3.75 in paper copy, $2.25 in micr
Research Report No 64, Montana Universit
Water Resources Research Center, Bo
December 1969, 26 p. OWRT A-026-MONT

Descriptors: *Research and Develo
*Planning, *Montana, Research priorities,
resources, Administration.
Identifiers: *Research needs, *Multi-disci
Research, *Interdisciplinary research.

Many important current problems require
research and interdisciplinary or multidisci
efforts. The objectives of this project w
define major areas of interdisciplinary o
tidisciplinary research requiring attention i
tana and to consider alternative adminis
structures that will facilitate research effo
well adapted to the traditional departmental
ture of the Montana State University. (Holje
tana State)
W75-10012

**IRRIGATION EFFICIENCIES IN PRODU CALORIES AND PROTEINS: AN ANNOT BIBLIOGRAPHY,**
California Univ., Los Angeles. School of
Health.
For primary bibliographic entry see Field 3F
W75-10076

ASTING A RIVER,
lifornia Univ., Berkeley. Coll. of Natural sources.
T. Parry, and R. B. Norgaard.
vironment, Vol 17, No 1, p 17-26, 1975. 1 tab.

scriptors: *Economic justification, *Cost-nefit analysis, *Economic prediction, *Discount es, *Dams, Cost analysis, Flood control, droelectric power, Irrigation effects, Recrea-n, Rivers, *California, Natural resources, servation, Reservoirs, Engineers estimates, timated benefits, Estimated costs, Reliability.
ntifiers: New Melones Dam(Calif), *Stanislaus er(Calif), Environmental costs.

timated costs and benefits from a Corps of En-eers benefit-cost analysis are re-evaluated with phasis on the degree to which sponsoring agen-s can arrange factors in a light favorable to their n projects. The New Melones Dam project on Stanislaus River, California has been analyzed costs and benefits several times since 1961, the 2 environmental impact statement analysis pro-ed the summarized benefit-cost calculations e examined. Corps of Engineers estimates of efits included the categories of flood control, gation, power generation, recreation, fish and dlife, water quality, and area development. h and low values are calculated in the reevalua-n for each benefit component. While the power eration benefits are accepted provisionally, the mated high value for the other benefits is less each component than in the Corps analysis. od benefits were overstated by a factor of two result of using the average benefit from a se-of projects. A $3.6 million discrepancy for ir-tion occurred because an anticipated crop e reduction was not taken into account. Other nponents were over estimated due to a range of rsights. The estimated project cost used in the inal benefit-cost ratio was low as a result of g an incorrectly calculated discount rate. cker-Wisconsin)
5-10116

E BENEFIT-COST RATIO IN RESOURCE VELOPMENT PLANNING,
nomic Research Service, Washington, D.C.
. Pavelis.
thern Journal of Agricultural Economics, Vol o 4, p 161-166, 1971. 4 fig, 1 tab, 15 ref.

criptors: *Cost-benefit ratio, *Project ning, *Economic efficiency, *Evaluation, timization, Mathematical studies, Return to e, Resource mix.

mathematical ratio of total capitalized efits over total capitalized costs can mislead ners and legislators to invest capital and other ts in less than fully efficient patterns of urce development. The benefit-cost ratio is nined for both linear and nonlinear cost func-s, and in terms of capital restrictions and rates turn. The benefit-cost ratio as popularly com-d in resource evaluations is an appropriate rion for allocation decisions if the ratio does change with the amount of money represented he total cost, i.e., there is a straight-line rela-between total costs and total benefits. Where fit-cost relationships are not linear, projects be compared validly by the benefit-cost ratio rion alone only if the scale is fixed at the same level among alternatives. Proper use of the fit-cost ratio in appraising projects with a inear function reflects changes in the relation osts are changed. If only one project with a inear function is being considered, the omic rule is to incur costs to the point where d total cost is equal to added total benefit. The ral rule for a multi-project series is to incur such that marginal net benefits are the same projects undertaken. (Becker-Wisconsin)
-10117

**PRIMARY ECONOMIC IMPACT OF THE GULF INTRACOASTAL WATERWAY IN TEXAS,**
Texas Engineering Experiment Station, College Station.
J. Miloy, and C. Phillips.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-11552, $7.25 in paper copy, $2.25 in microfiche. Sea Grant Program Report TAMU-SG-74-211, March 1974. 213 p, 39 fig, 38 tab, 45 ref.

Descriptors: *Input-output analysis, *Industrial production, *Texas, *Economic impact, *Inland waterways, Gulf coastal plain, Chemical industry, Oil industry, Barges, Land use, Transportation, Projections.
Identifiers: *Gulf Intracoastal Waterway, Commodity flow.

Industrial development in Texas reflects the continuing economic importance of water transportation as nearly three-fourths of the state's goods move by low-cost water transportation modes. Over 21 million acres adjoining the Texas shoreline constitute the state's coastal zone. An economic impact analysis, using input-output techniques, evaluating underlying processes linking various sectors of the economy, is presented for the coastal zone. Of the $1.77 billion which the Intracoastal Waterway directly contributes to the state's economy, the major components are from the water transportation industry and from the cargo value received from deep draft ports. A land use summary of the areas contiguous to the Texas portion of the Gulf Intracoastal Waterway indicates that this region is becoming increasingly attractive to firms that require high-volume low-cost transportation. Commodity flow statistics presented point to the chemical, crude petroleum and petroleum products industries as primary users. To facilitate the movement of these commodities, expanded and more efficient inland river systems and barges are needed. The future economic impact of the Intracoastal Waterway in Texas is determined based on anticipated demand for water transportation, which is influenced primarily by industrial growth in the coastal region and the cost of competing modes of transportation. (Becker-Wisconsin)
W75-10120

**THE EFFECTS OF AUTHORIZATION FOR WATER IMPOUNDMENTS ON SHORELAND TRANSITION,**
North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies.
S. F. Weiss, R. J. Burby, and T. G. Donnelly.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 880, $3.25 in paper copy, $2.25 in microfiche. Preliminary Completion Report, 1971. 11 p, 6 tab. OWRT B-025-NC(1).

Descriptors: *Planning, *Land development, *Reservoirs, *Impoundments, Urbanization, *Land use, *North Carolina, Shores, *Social change, *Social values, *Property values, Pre-impoundment, Reservoir sites.
Identifiers: New Hope Reservoir(NC), Falls Reservoir(NC).

Objectives were to: (1) Identify and evaluate factors which explain the location of land transactions, changes in land prices or value, and changes in land use patterns which occur after the authorization of water impoundments. (2) Develop and test a model to predict short-term changes in land ownership, land value, and land utilization. (3) Develop a system for monitoring changes in land values, land use, and predictive factors utilized in the transition model as they occur in reservoir areas. (4) Prepare policy guides to enable the Corps of Engineers and state and local governmental agencies to prevent the exploitation of land in authorized reservoir areas and to facilitate desirable development to meet public land use objectives. Research completed included: (1) delineation and mapping of the authorized reservoir study areas; (2) identification of all individuals, firms, and institutions owning property and all sales and transactions occurring in the reservoir study areas during a period extending five years prior to reservoir authorization through 1969; (3) identification of land use changes in the reservoir study areas between 1963 (before authorization) and 1970; (4) analysis of the impact of reservoir authorization in terms of yearly land sales and average sales prices before and after authorization; and (5) analysis of the characteristics and attitudes of pre-authorization landowners. (Howells-North Carolina State)
W75-10126

**CLASSIFICATION OF FRESHWATER WETLANDS IN THE GLACIATED NORTHEAST,**
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
F. C. Golet, and J. S. Larson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 852, $4.25 in paper copy, $2.25 in microfiche. U.S. Bureau of Sport Fisheries and Wildlife, Resource Publication 116, 1974. For sale by the Superintendent of Documents, U.S. Government Printing Office, Wash., D.C. Price $1.15. 56 p, 5 fig, 1 tab, 27 plates, 57 ref. OWRT

Descriptors: *Wetlands, *Wildlife, Classification, *Northeast United States, New England, *Land classification, New York, Pennsylvania, New Jersey, Aerial photography, Land use, Vegetation.

A wetland classification system based on life forms and sub-forms of vegetation is offered for glaciated New England, New York, Pennsylvania and New Jersey. It is compatible with currently used national and regional systems, but emphasizes maximum wetland production and diversity rather than waterfowl alone. An example of the application of the system employing aerial photography is provided as are 27 photographic plates of the several classes and sub-classes.
W75-10128

**ACTIVITIES, CHARACTERISTICS, AND OPINIONS OF LAKEFRONT RESIDENTS: KISSIMMEE RIVER BASIN, FLORIDA,**
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
J. R. Conner, J. E. Reynolds, and K. C. Gibbs.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 882, $4.25 in paper copy, $2.25 in microfiche. Bulletin 755, January 1973. 68 p, 1 fig, 28 tab. OWRT B-005-FLA(3) and OWRT B-007-FLA(9). 14-31-0001-3267.

Descriptors: *Water allocation(Policy), Water values, Water utilization, Water demand, Decision making, *Florida, *Attitudes, Water districts, *Property values, Aesthetics, Social values, *Water level fluctuations, *Recreation demand.
Identifiers: Kissimmee River basin(Fla), Lakefront residents.

Water in the Kissimmee River Basin can be controlled by the Central and Southern Florida Flood Control District. Both fluctuating and excessively low water levels have adverse impacts on the residents adjacent to the lakes and streams. In order to assess these impacts on the lakefront property and on aesthetic values held by the residents, studies are needed to identify the population of persons affected, to ascertain their opinions concerning various qualities of the lakes, and to determine the amount of lake use by these residents. The recreational users of the Kissimmee River Basin are of two types: (1) recreational visitors and (2) waterfront residents. This study was concerned with recreational data from a sample of waterfront residents in the Kissimmee River Basin. It was designed to obtain information regarding property values, recreational activities of the residents, ef-

fects of different water levels on the participation in different recreational activities, and opinions of the residents regarding the value of lakefront property as compared to other types of property. It was also concerned with the analysis and interpretation of the data obtained from this survey. (Morgan-Florida)
W75-10129

**A MATHEMATICAL PROGRAMMING APPROACH TO PUBLIC WATER PROJECT. PORTFOLIO SELECTION,**
Georgia Univ., Athens.
W. P. Neely.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 844, $6.25 in paper copy, $2.25 in microfiche. Ph.D. Dissertation, 1974, 161 p, 24 tab, 70 ref, 5 append. OWRT A-040-GA(3) 14-31-0001-3810.

Descriptors: Model studies, Projects, Multiple purpose, Cost-benefit ratio, Cost trends, Tennessee Valley Authority, *Mathematical studies, *Linear programming, *Capital, Budgeting, *Benefits, *Costs, *Long-term planning.
Identifiers: Multiple objectives, Portfolio selection, Net present value.

A model for selecting water resources projects for inclusion in portfolios of investment opportunities using mathematical programming techniques was developed and tested for several Tennessee Valley Authority projects. The portfolio approach was suggested as operationally superior to the independent project selection approach based on maximum benefit-cost ratio (BCR). The relationships of each project to each other project and to the expected budgets are accounted for with the portfolio approach. The (integer) programming method was suggested as a more effective method of portfolio selection than ranking by the maximum BCR. The optimum portfolio solution differs from the BCR solution due both to the complexity of the water resources problem and to the inadequacy of the BCR criterion. Long-term budget level determination was facilitated by the linear programming methods and individual project scheduling was improved by the programming method. The effects of uniform variation in costs and benefits were significant only in the case of variation in costs. Multiple objectives--economic and environmental improvement were incorporated into the model by use of the goal programming approach. Projects selected using the programming approach for portfolio selection were found to be different from those selected by BCR criteria and deemed superior on the basis of both net present value (NPV) and goal contribution.
W75-10131

**EVOLVING NATIONAL WATER POLICIES,**
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 6E.
W75-10201

**MEAN ESTIMATE DEFICIENCIES IN WATER QUALITY STUDIES,**
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 5G.
W75-10202

**OBJECTIVES OF WATER QUALITY PLANNING,**
Kansas Water Resources Board, Topeka.
For primary bibliographic entry see Field 5G.
W75-10205

**ISSUES IN WATER RESOURCES IMPACT ASSESSMENT,**
Stanford Univ., Calif. Dept. of Civil Engineering.
L. Ortolano.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol 100, No HY1, Paper No 10292, p 173-187, January 1974. 2 fig, 14 ref.

Descriptors: Water resources, *Water management(Applied), *Reservoirs, *Environmental effects, *Assessment, Evaluation, Planning, Decision making, *California, Environment, Social change.
Identifiers: *Impact prediction, *Carmel Valley(Calif).

Formal impact assessment, defined as the identification, description, and evaluation of changes associated with proposed actions, has been mandated by recent legislation relevant to Federal water resources agencies. An example involving proposed reservoirs in Carmel Valley, California to illustrate various concepts is introduced. Demonstrated is how 'evaluative factors'--defined as the goals, concerns, constraints, etc., that affected publics and other decision makers consider in ranking alternative actions--can be used in deciding on which impacts to forecast and at what levels of detail. Presented is a classification of 'causative factors' which encourages a systematic examination of the various aspects of a proposed action that may bring about change. Network diagrams of cause-effect relations, and the problems associated with the analysis of indirect impacts are also analyzed. The paper summarizes a number of characteristics of impact which can be used in describing the results of an impact assessment. Questions related to communication are especially important since a main reason for conducting an assessment is the development and communication of information to help people understand issues and make choices. (Bell-Cornell)
W75-10222

**A SENSITIVITY ANALYSIS OF SIMULATED RIVER BASIN PLANNING FOR CAPITAL BUDGETING DECISIONS,**
Idaho State Univ., Pocatello. Coll. of Business.
For primary bibliographic entry see Field 6A.
W75-10223

**PLANNING AND OPERATION OF URBAN WATER QUALITY MANAGEMENT SYSTEMS,**
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5G.
W75-10262

**ALABAMA'S WATER RESOURCES POLICY.**
Alabama Development Office, Montgomery.
For primary bibliographic entry see Field 5G.
W75-10310

**PLAN FORMULATION AND EVALUATION STUDIES--RECREATION. VOL I OF V. EVALUATION OF RECREATION USE SURVEYS PROCEDURES,**
Army Engineer District, Sacramento, Calif.
R. E. Brown, D. A. Crane, and A. M. Kinsky.
Army Engineer Institute of Water Resources IWR Research Report 74-R1, June 1974. 53 p, 8 fig, 2 tab, 3 append.

Descriptors: *Use rates, *Reservoirs, *Estimating, *Recreation, *Surveys, Sampling, Data collections, Methodology.
Identifiers: Stratified sampling, Statistical sampling designs.

An evaluation of the data collection program developed by the Corps of Engineers Sacramento District in 1966 is made and improved alternative survey procedures applicable for nationwide surveys at reservoir sites are suggested. Survey designs are evaluated with the criteria of reliability, efficiency, and fit. Survey data collected from visitors to recreational facilities are incorporated into the planning processes and the administration of Corps of Engineers civil works reservoir projects. Three years of data collection und
Sacramento District design have emphasi
inherent limitation--no precise quantitativ
mate regarding the reliability of sample resu
be made. The limitation lies within the intu
controlled selection of sample areas and
days. Four alternative sampling procedure
compared on least cost and reliability criter
procedures were (1) complete random sa
(2) sampling stratified on the basis of hom
ous projects, (3) sampling using the ratio
tendance to traffic count as the randomly
sample value, and (4) the stratification of d
combined with the ratio estimates of design
stratified designs (2 and 4) were the least c
the ratio sample value designs (3 and 4) g
highest reliability (lowest standard errors).
native sample design 4 appears most feasibl
W75-10343 thru W75-10345) (Becker-Wisco
W75-10342

**PLAN FORMULATION AND EVALU
STUDIES--RECREATION. VOL. III OF
PRELIMINARY ANALYSIS OF DAY
RECREATION AND BENEFIT ESTIM
MODELS FOR SELECTED RESERVOIRS,**
Army Engineer District, Sacramento, Calif.
R. E. Brown, and W. J. Hansen.
Army Engineer Institute for Water Res
Fort Belvoir, Va., IWR Research Report
June 1974. 78 p, 5 fig, 6 tab, 17 ref, 3 append.

Descriptors: *Recreation demand, *Esti
*Reservoirs, *Regional analysis, *Es
benefits, Water resources development,
sion analysis, Recreation facilities, *Cali
*Texas, Statistical models, Model
Methodology.
Identifiers: Sacramento(Calif),
Worth(Texas).

A multiple linear regression analysis for est
recreation demand and benefits is presente
models discussed are intended as bases for
ing an acceptable procedure for developin
for recreation and other aspects of
resources. Day use recreation estimat
developed from regression analysis of rec
use survey data collected at 19 reservoir
Fort Worth and Sacramento Army Corps
gineer Districts. Three general classificat
variables were considered: county specific
voir specific, and reservoir-county relatio
The variables included county populatio
density and median family income; sh
miles, accessible shoreline miles, water
area, total project area, project land, aver
nual precipitation, age of reservoir, le
growing season; and road mile distance b
the most populous city in the county
nearest reservoir access. Travel-cost is em
as a proxy for price to derive demand sc
from the regional estimators. The meth
presented is of great scope and intensity tha
estimating procedures, which were site
rather than regionally oriented. This meth
can be replicated, and the technique can
fully employed by Corps of Engineer re
planners. However, recreational use data
creasing quality are required as input. (S
W75-10342) (Becker-Wisconsin)
W75-10343

**PLAN FORMULATION AND EVALU
STUDIES--RECREATION. VOL. IV OF V
MATING RECREATIONAL FA
REQUIREMENTS,**
Army Engineer District, Sacramento, Calif
R. E. Brown, and G. Mueller.
Army Engineer Institute of Water Resourc
Research Report 74-R1, June 1974. 28 p,
ref, 1 append.

Descriptors: *Methodology, *Recreation d
*Reservoirs, *Estimating, *Recreation fa
Cost-benefit analysis, Use rates, Cam
Boat-launching ramps, Planning.

tifiers: Facility design day load, Turnover Picnicking.

collected at 52 reservoirs during 1966-1969 utilized to develop a general methodology for ating the number and type of principal ational facilities needed to serve a given er of recreation days at a proposed reservoir. method synthesizes planner judgement, exist- ecreation use data, and the concepts of esti- g annual recreational use employed by the s of Engineers. The facility requirements ing methodology developed assumes the size proposed reservoir site has been determined nnual total recreational use estimates have computed, implying that the planning process consideration is one of accommodating ational use. In the computation of recrea- use estimates, the concepts of design day, y design day load and maximum practical e used. Facility design day load, proportion al use, average party size and turnover rate ctors considered in the estimation of facility ements for picnic tables, camp sites and aunching lanes. A benefit-cost analysis for ational facilities, using a proposed project ground as an example, is appended. Although nitation of this benefit-cost analysis may be e, when used in conjunction with design day is, it is informational for recreational ng purposes. (See also W75-10342) (Becker- nsin)
0344

FORMULATION AND EVALUATION IES--RECREATION. VOL. V OF V. A RALIZED RECREATION DAY USE NING MODEL,
Engineer District, Sacramento, Calif.
Brown, and W. J. Hansen.
Engineer Institute for Water Resources, Belvoir, Va, IWR Research Report 74-R1, 974. 43 p, 3 fig, 5 tab, 22 ref.

ptors: *Recreation demand, *Estimating, rvoirs, *Regional analysis, *Estimated ts, Water resources development, Regres- nalysis, Recreation facilities, Southwest *California, Statistical models, Model stu- orecasting, Methodology.
iers: Sacramento(Calif).

lural guidelines for estimating reservoir tion use and benefits for planning water ces development is presented. A general g model that includes regional estimators dicting recreation use of proposed reservoir s and for predicting individual project de- schedules and recreation benefits is ed and replicated. The economic value of ion as a water resource project output is red by the willingness to pay for the amount eation consumed. The previous procedure estimate benefits as the product of a 'unit ue' multiplied by estimated total recreation ince the estimation of unit day values was a approximation, a theoretical model--the ost approach--was developed. The justifi- of using travel-cost as an estimator of ion benefit is derived from the differences n outdoor recreation and most consumer (1) the market price is usually nominal or nd (2) travel costs are large relative to mar- ce. Other factors influencing the user's ess to pay include proximity to site, site at- and the availability of substitutes. Estima- e developed on a regional basis for the ento and Southwestern Divisions of the of Engineers, with the Southwest divided quely large reservoirs and remaining reser- See also W75-10342) (Becker-Wisconsin)
345

## 6C. Cost Allocation, Cost Sharing, Pricing/Repayment

**PROJECT EVALUATION IN WATER RESOURCES: BUDGET CONSTRAINTS,**
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W75-09851

**THE ECONOMIC IMPACT OF A SMALL RECREATION-ORIENTED RESERVOIR,**
University of Southern Mississippi, Hattiesburg. Bureau of Business Research.
For primary bibliographic entry see Field 6B.
W75-09857

**METHODS TO FACILITATE MANAGERIAL EFFECTIVENESS IN MUNICIPAL WATER SYSTEMS,**
Mississippi State Univ., Mississippi State. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6B.
W75-09895

**CARBON CONTACT-FILTRATION: HOW IT WORKS,**
Seelye, Stevenson, Value, and Knecht, New York.
For primary bibliographic entry see Field 5D.
W75-09912

**A GENERAL LINEAR APPROACH TO STREAM WATER QUALITY MODELING,**
IBM Federal Systems Div., Gaithersburg, Md.
For primary bibliographic entry see Field 5B.
W75-09917

**JOINT TREATMENT OF PULPING AND MUNICIPAL WASTES,**
Procter and Gamble Co., Cincinnati, Ohio. Environmental Control Section.
For primary bibliographic entry see Field 5D.
W75-09928

**MUNICIPALITY AND INDUSTRY JOIN IN WASTEWATER TREATMENT.**
For primary bibliographic entry see Field 5D.
W75-09929

**THE BENEFIT-COST RATIO IN RESOURCE DEVELOPMENT PLANNING,**
Economic Research Service, Washington, D.C.
For primary bibliographic entry see Field 6B.
W75-10117

**A THEORETICAL AND EMPIRICAL APPROACH TO FISHERIES ECONOMICS,**
Victoria Univ. of Manchester (England). Dept. of Agricultural Economics.
J. M. Tomkins, and J. A. Butlin.
Journal of Agricultural Economics, Vol 26, No 1, p 105-124, 1975. 10 fig, 5 tab, 17 ref.

Descriptors: *Marine fish, *Fisheries, *Fish management, *Commercial fishing, *Model studies, Fish populations, Economic efficiency, Fish conservation, Regulation.
Identifiers: *Externalities, *Common-property resources, Manx Herring Fishery(England), Government appropriation.

The free competitive exploitation of a fishery as a common-property resource leads to an over-allocation of inputs to that fishery. A simple theoretical model developed to represent the commercial exploitation of the fishery is built around (1) the biological relationship between absolute increase in fish stock per time period and fish population size, and (2) the relationship between fishing yield and effort expended. The policy implications of the theory are that the fishery must be appropriated, preferably by the government, so that entry to the fishery can be restricted and exploitation maintained at the optimal level. The absence of such a policy leads to entry of new units into the fishery until excess profits are competed away, at which point the level of effort is greater than that is compatible with maintenance of the fish population. Each individual unit ignores the external effects of the demise of the fish population. An empirical study is presented that applies the theoretical model to the Manx Herring Fishery and investigated its economic efficiency and biological viability. Limitations of the model include: (1) its long-run static nature, and (2) the assumption of certain biological knowledge (which is not known) concerning the growth curves of the species under study. (Becker-Wisconsin)
W75-10118

**GEOGRAPHICAL ANALYSIS OF OIL SPILL POTENTIAL ASSOCIATED WITH ALASKAN OIL PRODUCTION AND TRANSPORTATION SYSTEMS,**
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5G.
W75-10121

**A COMPUTER SIMULATION ANALYSIS OF SURFACE WATER QUALITY MANAGEMENT POLICIES UNDER DYNAMIC ECONOMIC AND HYDROLOGIC CONDITIONS,**
Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.
For primary bibliographic entry see Field 5D.
W75-10124

**A MATHEMATICAL PROGRAMMING APPROACH TO PUBLIC WATER PROJECT. PORTFOLIO SELECTION,**
Georgia Univ., Athens.
For primary bibliographic entry see Field 6B.
W75-10131

**NEEDED: $350 BILLION - AND A NEW NEEDS SURVEY,**
For primary bibliographic entry see Field 5D.
W75-10174

**SECONDARY TREATMENT DESIGN FOR COMBINED WASTEWATERS, PART II,**
For primary bibliographic entry see Field 5D.
W75-10199

**A CONCEPT FOR MANAGING WASTE,**
Gulf Waste Disposal Authority, Houston, Tex.
For primary bibliographic entry see Field 5D.
W75-10236

**HOW MUCH 'RELIABILITY' IS 'ENOUGH',**
For primary bibliographic entry see Field 5A.
W75-10254

## 6D. Water Demand

**FEASIBILITY AND POTENTIAL OF ENHANCING WATER RECREATION OPPORTUNITIES ON HIGH COUNTRY RESERVOIRS-PHASE I,**
Colorado State Univ., Fort Collins. Dept. of Recreation Resources.
For primary bibliographic entry see Field 6B.
W75-09894

WATER AND WATER PROBLEMS IN THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT AND SOME POSSIBLE SOLUTIONS,
Southwest Florida Water Management District, Brooksville.
For primary bibliographic entry see Field 3C.
W75-10207

## 6E. Water Law and Institutions

GEORGIA COUNTY COMMISSIONER ATTITUDES TOWARD WATER PROBLEMS,
Georgia Univ., Athens. Dept. of Political Science.
V. L. Marando.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 578, $4.25 in paper copy, $2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No. ERC-0775, June 1975. 49 p, 7 tab, 8 ref, 1 append. OWRT A-045-GA(1). 14-31-000-4010.

Descriptors: *Attitudes, *Local governments, Water resources development, Political aspects, *Institutions, *Governmental interrelations, Institutional constraints, Georgia, Florida, *Water policy.
Identifiers: *County officials, Problem identification, Governmental responsibility.

The objective was to examine the attitudes of Georgia county commissioners toward water problems. The identification of water problems is necessary and precedes county decisions and policy on water issues. Commissioner attitudes toward water problems were examined within the context of all major issues which confront county commissioners. The basic assumption was that water issues constitute only a portion of the agenda of problems that confront commissioners. Three major conceptual components utilized for examining water issues were problem identification, problem severity and governmental responsibility. Eleven percent of the Georgia commissioners, as opposed to 17 percent of Florida commissioners, saw water and sewer problems as one of the two most pressing problems facing their county. When asked for details, even fewer Georgia commissioners identified any severe water problems. Furthermore, most commissioners viewed the responsibility for solving these problems as largely belonging to other governmental units. (James-Geo Tech).
W75-09855

INDUSTRY VIEWPOINT (WATER QUALITY CONTROL),
Mobil Oil Corp., New York.
For primary bibliographic entry see Field 5G.
W75-09885

LATITUDINAL ASPECTS OF THE LAW OF THE SEA AND OF PETROLEUM PRODUCTION,
Woods Hole Oceanographic Institution, Mass.
K. O. Emery.
Ocean Development and International Law Journal, Vol 2, No 2, p 137-149, 1974. 11 fig, 5 ref.

Descriptors: *International law, *Mineral industry, Land, Oceans, Population, Oil, Oil fields, Oil industry, International waters, International commissions, Industrial production, Taxes.
Identifiers: International agreements, State policy.

The land areas of the world lie mainly between 30 degrees S. Latitude and 70 degrees N. Latitude. Plans for ocean-floor sovereignty change this pattern very little. Probably by coincidence the latitudes of maximum population are the same as the latitudes of maximum oil production (20 degrees to 40 degrees N. Latitude). By contrast, the greatest concentrations of nations are farther south, and the greatest concentrations of gross national products are farther north. Addition of ocean floor to adjacent nations by rules now under consideration should not prompt undeveloped nations to concentrate upon claims to areas of ocean floor in the expectation that industrialized nations will extract the minerals and pay high taxes that might increase the standard of living in underdeveloped nations. Instead, these nations should recognize that most profits and jobs are found in the later stages of mining, manufacturing, distribution, and receiving of goods made from the minerals. Merely raising the prices of minerals or the taxes on them is not likely to solve the problem for underdeveloped nations because the price to these nations of manufactured goods is likely to be increased even more. (Gagliardi-Florida)
W75-09886

MARINE POLLUTION--LEGISLATION LITIGATION, UNDERWRITING--WHERE ARE WE, WHERE AWAY,
Lillick, McHose, Wheat, Adams, and Charles, Los Angeles, Calif.
For primary bibliographic entry see Field 5G.
W75-09887

THE FORGING OF THE UNION RECONSIDERED: A HISTORICAL REFUTATION OF STATE SOVEREIGNTY OVER SEABEDS,
Columbia Univ., N.Y. School of Law.
R. B. Morris.
Columbia Law Review, Vol 74, p 1056-1093, 1974. 215 ref, append.

Descriptors: *Continental shelf, *Atlantic Ocean, *Oil, *Oil industry, Energy, Subsoil, United States, Oceans, Navigation, State governments, State jurisdiction.
Identifiers: Energy crises.

The resolution of United States v. Maine will determine whether the states or the federal government has title to the continental shelf off the Atlantic coast. The litigation stems from the search for new sources of oil and gas as a response to the energy crisis. The defendant states, resisting the federal government's assertion of sovereignty over the seabed and subsoil off the Atlantic coast, predicate their claim on English law and specific colonial grants and charters. Critical to the states' claim is the contention that their existence as independent sovereignities proceded the formation of the national government. The United States, on the other hand, maintains that any rights to the seas, seabed and subsoil existed as an incident of external sovereignty, which it alone possessed as the sole sovereign entity to merge upon the issuance of the Declaration of Independence, if not before. The historical evidence indicates that the United States collectively asserted its jurisdiction over navigation even before the formation of the states. To argue that the states' assertion of a proprietary interest over the seabed and subsoil does not necessarily conflict with the federal domain over external affairs would be to ignore geographical realities, essential national defense concerns, critical energy needs and the whole course of American constitutional history. (Gagliardi-Florida)
W75-09888

WATER RESOURCES PUBLICATIONS RELATED TO THE STATE OF NEBRASKA THIRD EDITION.
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 10C.
W75-10015

A STUDY OF THE EFFECTS OF WATER INSTITUTIONS ON PLANNING AND MANAGEMENT OF WATER RESOURCES IN UTAH,
Utah State Univ., Logan. Dept. of Civil Engineering.
D. H. McLean.
Available from the National Technical Info
tion Service, Springfield, Va 22161 as PB-243
$9.25 in paper copy, $2.25 in microfiche. Ph.D
sertation, June 1972. 302 p, 5 tab, 8 fig, 139
OWRT B-037-UTAH(2). 14-31-0001-3134 OW

Descriptors: Institutions, Water rights, W
resource, *Planning, *Utah, Water districts
rigation, *Institutional constraints, *Manager
*Water law, Water users, Water utilization, W
allocation(Policy).
Identifiers: *Weber Basin(Utah).

Over the years each state has developed a con
system of water law and organizations for the
cation and distribution of water. In many
these institutions have imposed serious constr
upon the planning and the most efficient use
valuable resource. This study has attempte
identify and define the many water institutio
the state of Utah including those which have
wide functions and those having restrictiv
local functions. Federal agencies have not
defined except as they work through local or
organizations. An indepth study was made o
active water institutions in Weber County
included mutual irrigation companies, water
associations, irrigation districts, water conse
cy districts, special improvement districts, pr
water companies and municipal water compa
A review of Utah State water law is also g
(Haus-Utah State)
W75-10130

ECONOMIC INSTITUTIONS TO DETERM
WATER QUALITY,
Clemson Univ., S.C. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-10132

EASING OF ENVIRONMENTAL LAWS,
For primary bibliographic entry see Field 5G.
W75-10173

LET'S TRY 90% FIRST AND SEE WHAT
QUALITY IS LIKE,
Wesleyan Univ., Middletown, Conn. Indu
Waste Lab.
For primary bibliographic entry see Field 5G.
W75-10175

REGIONAL AUTHORITIES TAKE O
BRITAIN'S WATER/SEWAGE SYSTEMS,
J. Ardill.
Water and Sewage Works, Vol 121, No 68,
73, August 1974. 1 fig.

Descriptors: *Management, *Legislation, *W
management(Applied), Water supply dev
ment, Sewage treatment, Water utilization, R
voir operation, Government, *Regional ana
*Water districts.
Identifiers: *Water Authorities, England, Wa

On April 1, 1974, some 1600 water supply,
mangement, sewerage and other water agenci
England and Wales were taken over by ten W
Authorities (WAs). This fundamental change
was accomplished within nine months fro
passage of the legislation. Apart from the
posts of chief executive and directors of fi
and operations in each region, all other situa
were filled from among those already employ
the industry or local government. The York
Water Authority in northern England has
able to solidify into the form of organization t
the goal of the reorganization; the concentrati
all the diverse activities of the industry into a
number of territorial operating divisions with
gle line of management from the divis
director to the regional director of operations
philosophy of the Yorkshire WA is that the k
the integration of all the WAs' responsibil
such as the conservation and supply of w

oval and treatment of sewage, drainage and
d protection and the protection and enhance-
t of the amenity and recreational aspects of
r space, is the river itself. Rather than the
tional situation, where management has been
nized by professional hierarchies, the WAs
organizing on interdisciplinary lines to form a
m of management integration. It is expected
the regional system will produce savings in ad-
strative manpower, payroll, and elimination
necessary duplication in capital works. (Orr-
)
-10176

K OF PROMISED FEDERAL FUNDS HAM-
S WATER CLEANUP EFFORT.
rimary bibliographic entry see Field 5G.
-10178

ER POLLUTION LAW DRAWS FLOOD OF
PLAINTS.
rimary bibliographic entry see Field 5G.
10179

SLATIVE HISTORY OF THE SAFE
KING WATER ACT,
e, Washington, D.C.
rimary bibliographic entry see Field 5G.
10186

LVING NATIONAL WATER POLICIES,
r Resources Council, Washington, D.C.
Cobb.
eering Issues, Journal of Professional Ac-
s, Proceedings of ASCE, Vol 101, No EI3,
No 11427, p 375-382, July 1975.

iptors: *Water resources development,
ral resources, *Federal jurisdiction,
gy, Cost-benefit theory, Planning, *Water
, Regional analysis.
fiers: *Professional activities, *Government
ies, Regional planning, Cost repayment.

ederal role in developing a policy for water
lated land resources planning is briefly out-
The organization and functions of the U.S.
Resources Council that were established by
ater Resources Planning Act, Public Law 89-
e outlined. The major policy issues to which
Council is currently giving priority are
sed and include: (1) water for energy self-
ency; (2) the grant program authorized
Title III of Public Law 89-80; (3) level B
ng under Section 209 of Public Law 92-500;
e Council's Principles and Standards for
ng water and related land resources; and (5)
n 80 of the Water Resources Development
1974 which calls for a 1-yr presidential
of the Principles and Standards for water
ces planning, including planning objectives,
aring, and discount rates. (Bell-Cornell)
0201

R AND WATER PROBLEMS IN THE
WEST FLORIDA WATER MANAGE-
DISTRICT AND SOME POSSIBLE SOLU-
,
est Florida Water Management District,
ville.
mary bibliographic entry see Field 3C.
0207

RFACE ENVIRONMENT--PRIVATE
RTY OR PUBLIC DOMAIN,
Polytechnic Inst. and State Univ.,
burg. Water Resources Research Center.
nary bibliographic entry see Field 4B.
209

**SAFETY OF DAMS--BUREAU OF RECLAMATION,**
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8A.
W75-10221

**THE DAVY JONES GARBAGE DUMP,**
Raytheon Co., Portsmouth, R.I.
For primary bibliographic entry see Field 5G.
W75-10238

**CHANGING FEDERAL-STATE RELATIONSHIPS IN WATER POLLUTION CONTROL PROGRAMS,**
Pittsburgh Univ., Pa. Health Law Program.
For primary bibliographic entry see Field 5G.
W75-10270

**REGULATION OF OCEAN DUMPING--ONE YEAR LATER,**
National Wildlife Federation, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10285

**INTERNATIONAL LEGAL IMPLICATIONS OF OFF-SHORE TERMINAL FACILITIES,**
For primary bibliographic entry see Field 5G.
W75-10286

**OBSTACLES TO TAMING CORPORATE POLLUTERS: WATER POLLUTION POLITICS IN GARY, INDIANA,**
Hampshire Coll. Amherst, Mass. Dept. of Political Science.
For primary bibliographic entry see Field 5G.
W75-10287

**APPLICATION OF NEPA TO EPA'S ENVIRONMENTAL REGULATORY ACTVITIES.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 6G.
W75-10288

**SUMMARIES OF FOREIGN GOVERNMENT ENVIRONMENTAL REPORTS.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 6G.
W75-10289

**PRESERVATION AND ENHANCEMENT OF THE AMERICAN FALLS AT NIAGARA.**
American Falls International Board, Buffalo, N.Y.
Final Report to the International Joint Commission, June 1974. 154 p, 44 plate, 1 map, 9 tab, 1 append.

Descriptors: *History, *Rivers and Harbors Act, *Waterfalls, *International Joint Commission, *Talus, Rivers, Harbors, Scenery, International waters, Natural use, Erosion, Erosion control, International commissions.
Identifiers: Evidence.

Section 304 of the Rivers and Harbors Act deals with the American Falls at Niagara as a scenic spectacle of international significance and with the continuing process of change in the form and appearance of the Falls. The study concludes that the guiding policy should accept the process of change as a dynamic part of the natural condition of the Falls, and that the process of erosion and recession should not be interrupted. The American Falls International Board reported the following findings and conclusions to the International Joint Commission: that it is feasible to remove as much talus as desirable; that the appearance of the Falls cannot be studied in isolation; that the area is endangered by the possibility of erosion and other geological conditions; and that measures are both feasible and desirable to protect these areas in order to eliminate any hazards to persons or property or to the scenic beauty of the region. (Gagliardi-Florida)
W75-10290

**MINUTES OF THE 89TH MEETING, (ARKANSAS-RED-WHITE RIVER BASINS INTER-AGENCY COMMITTEE).**
Arkansas-White-Red Basins Inter-Agency Committee, Wichita, Kans.
For primary bibliographic entry see Field 4A.
W75-10300

**REGIONALISM AND THE LAW OF THE SEA: THE CASE OF SEMI-ENCLOSED SEAS,**
Rhode Island Univ., Kingston.
L. M. Alexander.
Ocean Development and International Law, Vol 2, p 151-185 (1974). 35 p, 2 tab, 1 map, 1 append.

Descriptors: *Geographical regions, *Shores, *Regions, Regulation, Gulfs, Water, Sea water, Conferences, South America, *International law, International waters.
Identifiers: International agreements, Coastal waters.

One of the possible outcomes of the Third Law of the Sea Conference may be a recognition of the right of countries within a geographical region to establish special juridical arrangements for their offshore areas. Regions may be of two types: common policy groupings, such as the Latin American or Soviet Union/East European Socialist states blocs; or complementary-use regions, as the Carribbean, Mediterranean, or other semi-enclosed seas. The authors postulate that serious attention should be given at the conference both to the definition of regions as geographic entities and to the delineation of the types of special rules and regulations which may be adopted within these regions. A summary of the geographic and legal/political characteristics of twenty-five 'semi-enclosed seas' are presented as illustrative of a clearly defined type of complimentary-use region for which specific jurisidictional arrangements might be made. (Gagliardi-Florida)
W75-10301

**FEDERAL VIEWPOINT (PERMIT ISSUANCE--ADMINISTRATIVE AND JUDICIAL REVIEW--OBSERVATIONS AND PROBLEMS),**
Environmental Protection Agency, Chicago, Ill. Enforcement Div.
For primary bibliographic entry see Field 5G.
W75-10302

**LEGISLATION UNDER NEPA: PLAINTIFFS' PHYRRHIC VICTORIES DRAW CONGRESSIONAL FIRE, JUDICIAL WARNINGS,**
For primary bibliographic entry see Field 5G.
W75-10303

**SURFACE WATERS AND THE CIVIL LAW RULE,**
Long and Aldridge, Atlanta, Ga.
C. C. Long, and E. E. Long.
Emory Law Journal, Vol 23, No 4, p 1013-1046 (1974). 24 p, 182 ref.

Descriptors: *Surface waters, *Cities, *Land use, *Adjacent land owners, *Riparian rights, Running waters, Runoff, Surface runoff, Streams, Urban runoff, Land development, Legal aspects, Civil law, Judicial decisions, Land tenure, Riparian land, Water rights, Water law.
Identifiers: *Civil law rule, Common enemy rule.

Because of increasing population growth and the concentration of people in urban areas, the

disposition of surface water has attained greater significance in the context of modern land development. The legal implications of the problem are considered, with particular focus on the application of the civil law rule of surface water in both its strictly applied and modified forms. Disturbance of the natural flow of water is prohibited under this doctrine, thus the duties of adjacent landowners are reciprocal and complementary. The rationale of the rule and various modifications of the rule in actual application by courts are discussed. Various bases for liability are surveyed in the context of remedies for the damaged plaintiff and possible defenses for the alleged wrongdoer. The authors dispute the contention that the civil law rule has inhibited land development, and conclude that the modifications of the civil law rule adequately balance conflicting interests and offer substantial predictability. (Fernandez-Florida)
W75-10304

**THE PUBLIC TRUST DOCTRINE AND THE CALIFORNIA COASTLINE,**
San Diego State Univ., Calif.
M. A. Eikel, and W. S. Williams.
The Urban Lawyer, Vol 6, No 3, p 519-571 (1974).
53 p, 1 chart, 274 ref.

Descriptors: *Coasts, *Beach erosion, Natural resources, *Legal aspects, *Environmental control, Beaches, Littoral, Oceans, Erosion, Damages, Erosion control, Land management, Conservation, Resources, Judicial decisions, Ownership of beds, Public rights, Regulation, Riparian land, State governments, Tidal marshes, Navigable waters, *California.
Identifiers: Coastal waters, *Coastal zone management, *Public trust doctrine, Environmental policy, Non-point sources(Pollution), State policy.

Man's interference with the rich and varied California coastline has resulted in beach erosion, pollution of bays and the ocean, and disruption and deterioration of the lagoon and estuarine environments. Environmental concern in the state has focused substantially on the area's coastal resources. This article considers the legal aspects of governmental involvement in preserving the coastal zone. Powers and constraints on power are discussed in the context of the 'public trust doctrine'. The authors suggest that the doctrine provides a legal tool for improving and preserving the natural environment. Generally, the public trust doctrine is based on the principle that the state holds title to tidelands and navigable waters subject to a trust with the public as beneficiary. Placing primary emphasis on California law, the paper traces the development of the doctrine and discusses the powers and duties of decision-makers who handle public trust land. (Fernandez-Florida)
W75-10305

**RULES AND REGULATIONS, SOUTHWEST WATER MANAGEMENT DISTRICT (FLORIDA).**
Southwest Florida Water Management District, Brooksville.
Florida Administrative Code, 16 G-4.004 thru 16 G-4.463 (1974). 122 p.

Descriptors: *Permits, *Water policy, *Administrative agencies, *Water management(Applied), *Florida, Local governments, State governments, Groundwater, Groundwater recharge, Surface waters, Water resources, Water shortage, Water supply, Water table, Aquifers, Water wells, Water law, Water levels.
Identifiers: *Florida Water Resources Act of 1972, State policy.

The purpose of the Rules and Regulations of the Southwest Florida Water Management District is to implement the declared water policy of the District and the State of Florida by effecting maximum beneficial utilization, development, and conservation of the water resources of the District. The Rules consist of five chapters, the first of which, 16CB-0, contains the purpose of the Rules, procedures for acquiring permit application, fee schedules, and provisions for the determination of minimum flows and levels. Chapter 16CB-1 contains rules for the protection of the works in the District, which is to be accomplished by requiring permits for those who find it necessary to interfere in any manner with any of the works of the District. Chapter 16CB-2 contains a program for the issuance of permits authorizing the consumptive use of water. Chapter 16CB-3 concerns the regulation of wells and the registration of any person who constructs a water well or test or foundation hold within District boundaries. Chapter 16CB-4 governs the management and storage of surface waters. Permits are required to construct, alter, abandon or remove any dam, reservoir, or impoundment. (Denvir-Florida)
W75-10306

**RULES OF CENTRAL AND SOUTHERN FLOOD CONTROL DISTRICT, CHAPTER 16CA, WITH COMMENTARY.**
Central and Southern Florida Flood Control District, West Palm Beach.
Florida Administrative Code, 16CA-0.01 thru 16CA-4.14 (1974). 16 p.

Descriptors: *Permits, *Water policy, *Administrative agencies, *Water management(Applied), Florida, Local governments, State governments, Groundwater, Groundwater recharge, Surface waters, Water resources, Water shortage, Water supply, Water table aquifers, Water wells, Water law, Water levels.
Identifiers: *Florida Water Resources Act of 1972, State policy.

The Rules of Central and Southern Florida Flood Control District were promulgated to effectuate its powers, duties and functions under the Florida Water Resources Act of 1972. The purpose of the regulations is to effect the maximum utilization of the waters in the District. The Rules consist of four chapters. Chapter 16CA-0 contains the scope of jurisdiction and powers and duties of the district. In addition, Chapter 16CA-0.06 sets forth activities for which permits must be sought, such as the diversion of water, construction, alteration, or abandonment of any dam or reservoir in the District, as well as any discharge into the waters of the District. Chapter 16CA-1 prescribes the procedures for filing of citizen complaints or objections, administrative enforcement procedures, quasi-judicial hearings before the governing board, and requests for hearings. Chapter 16CA-2 provides for the implementation of a permit system designed to regulate and control the use of ground and surface water within the District. Chapter 16CA-4 deals with the management and storage of surface waters in the District and the works necessary to those ends. (Denvir-Florida)
W75-10307

**HARDY SALT CO. V. SOUTHERN PACIFIC TRANSPORTATION CO. (SUIT SEEKING INJUNCTIVE RELIEF OR DAMAGES FOR SALINITY CHANGES RESULTING FROM DEFENDANT'S CONSTRUCTION IN THE GREAT SALT LAKE).**
501 F.2d 1156 (10th Cir. 1974). 14 p.

Descriptors: *Salinity, *Railroads, *Great Salt Lake, Royalties, Wastes, Navigation, *Utah, Easements, Salts, Brines, Shrimp, Rivers, Harbors, Rivers and Harbors Act.
Identifiers: Evidence, Injunctive relief, Nuisance(Legal aspects).

Plaintiffs brought consolidated actions seeking injunctive relief or damages for alleged injury from salinity changes resulting from defendant railroad's construction and operation of a causeway across the Great Salt Lake pursuant to an easement granted by the State of Utah. The United States District Court for Utah, Central Division, sustained the railroad's motion to dismiss, prompting plaintiffs' appeal. The Court of Appeals affirmed and held the plaintiffs, engaged in removing salt or brine shrimp and eggs from Great Salt Lake pursuant to royalty and license agreements with the State of Utah, failed to demonstrate the type of a business or economic interest entitling them to relief under state law for nuisance, waste or interference with business. The court further held that proof of navigation across the lake and up the Bear River to the railhead at Corinne, Utah, was not in itself sufficient to establish that the lake was a navigable water of the United States within the Rivers and Harbors Act. (Gagliardi-Florida)
W75-10308

**ALABAMA'S WATER RESOURCES POLICY**
Alabama Development Office, Montgomery.
For primary bibliographic entry see Field 5G.
W75-10310

**REPORT TO THE CONGRESS ON OCEAN DUMPING AND OTHER MAN-INDUCED CHANGES TO OCEAN ECOSYSTEMS (OCTOBER 1972 THROUGH DECEMBER 19**
National Oceanic and Atmospheric Administration, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10311

**SMITH V. CITY OF COOKEVILLE (ACTION BY LANDOWNER WHOSE PROPERTY WAS CONDEMNED BY CITY FOR USE IN RECREATION DEVELOPMENT TO ENJOIN CONSTRUCTION UNTIL ENVIRONMENTAL IMPACT STATEMENT IS FILED).**
381 F. Supp. 100 (M.D. Tenn. 1974).

Descriptors: *Recreation facilities, *Environmental control, *Eminent domain, *Tennessee, Condemnation recreation, Environmental effects, Environment, Construction, Lakes, Ponds, Resources development, Flood protection, Adjacent landowners, Administrative agencies.
Identifiers: *Environmental impact statement, Injunctive relief, National Environmental Policy Act, Standing(Legal).

Landowners, whose property was condemned by the City of Cookeville, Tennessee, filed suit to enjoin further construction and development of a recreation area on the ground that no environmental impact statement was filed and that they had been paid no relocation benefits. The federal district court held the landowners had standing to bring the action but were not entitled to relocation benefits which they had previously declined. In addition, the court found that the proposed project was a major federal action significantly affecting the environment requiring a formal environmental impact statement, but denied an injunction since the construction contracts had not been let but had been merely scheduled for negotiation. The court found it reasonable to permit defendants to advertise the job for bids, execute contracts and finalize bids, subject to preparation of the environmental impact statement. (Gagliardi-Florida)
W75-10312

**SCENIC RIVERS ASSOCIATION OF OKLAHOMA V. LYNN (SUIT SEEKING DECLARATORY JUDGMENT THAT MUST MAKE AN ENVIRONMENTAL IMPACT STUDY PRIOR TO THEIR CONTEMPLATED ACTIONS).**
382 F. Supp. 69 (E.D. Oklahoma 1974).

Descriptors: *Oklahoma, *Land development, *Water law, *Water quality, River basin dev

ent, River basins, Rivers, Southwest US, Judi-
l decisions, Environmental effects, Streams,
ildlife, Habitats, Aesthetics.
entifiers: *Environmental impact statement,
klahoma, *Illinois river basin, *HUD,
ational Environmental Policy Act, Injunctive
ief.

intiffs sought a declaratory judgment that the
partment of Housing and Urban Development
UD) must conduct an environmental impact
dy prior to approval and registration of a state-
nt of record and property report under the In-
state Sales Act, and sought injunctive relief
uiring HUD to withdraw approval of interstate
d sales filings pending an environmental review
cess. District Court Judge Bohanon found that
intiffs, environmental organizations, demon-
ated actual and potential environmental effects
many aspects of natural wildlife and water-re-
ed and other recreational activities if the
posed development of some 7,000 acres in Il-
is river basin were to occur and that HUD's
roval of documents filed under the Interstate
nd Sales Act was a major federal action, signifi-
tly affecting quality of the environment. Like
other federal agencies, HUD is required under
National Environmental Policy Act of 1969
EPA) to consider the environmental effects of
decisions and to use all practical means to avoid
ironmental degradation. Here, plaintiffs had
the burden of establishing an overriding public
erest in preservation of the area's character and
showing that failure to comply with NEPA
cedures would create a threat of environmental
ry. Thus, the court required HUD to withdraw
approval of the environmental injury. Thus, the
rt required HUD to withdraw its approval of
joint venture at issue in this case and also
dered its declaratory judgment that HUD con-
t an environmental impact study preparatory to
roval and registration of statement of record
property report under the Interstate Sales Act
ll cases. (Gerlach-Florida)
5-10313

**N-DA-LAY, LTD. V. DIAMOND (REVIEW DENIAL OF APPLICATION FOR WATER PPLY AND SEWAGE TREATMENT TEMS).**
N.Y.S.2d 820 (N.Y.S.Ct. 1974).

criptors: *New York, *Judicial decisions,
rmits, *Environmental control, *Adjudication
cedure, Water supply development, Waste
osal, Septic tanks, Sewage treatment, Land
re, Administrative agencies, State govern-
ts, Legislation, Land development, Regula-
, Water law, Aesthetics, Environmental ef-
s, Sewage disposal, Water quality control,
-structural alternatives.
tifiers: Environmental policy, State policy.

petitioner, a land development company,
ht the approval of the New York Department
Environmental Conservation, respondent
in, concerning planned water supply and
ge treatment systems. The systems would
e a vacation home community being
eloped on land owned by the petitioner. The
missioner rejected the applications and peti-
er appealed to the Appellate Division of the
eme Court of New York. The court held that
evidence supported the Commissioner's find-
hat the proposed water supply system did not
uately provide for proper and safe construc-
and for protection from contamination. The
t further held, however, that the evidence did
support a finding that the proposed supply did
meet any public necessity but that the
ence did support a finding that the proposed
ge disposal system consisting of individual
c systems would pollute area lakes. While
ting out that it is not within the Department's
er to reject petitioner's water and sewer
osal based on the aesthetic and ecological un-
ability of the entire development project, the court confirmed the Commissioner's ruling, as modified. (Deckert-Florida)
W75-10314

**SUTHERLAND V. HICKORY NUT CORP. (ACTION FOR DAMAGES CAUSED BY CONSTRUCTION OF ROADS BY ADJACENT PROPERTY OWNER WHICH ALTERED NATURAL DRAINAGE OF MOUNTAIN LAND).**
209 S.E.2d 301-305 (Ct. App. N.C. 1974).

Descriptors: *Adjacent landowners, *Judicial decisions, *Natural flow doctrine, *Obstruction to flow, Natural streams, Watercourses(Legal aspects), Legal aspects, Civil law, Common law, Land tenure, Riparian land, Water law, Water rights, Relative rights, Riparian rights, Alteration of flow, Reasonable use, Natural use, Drainage, Running waters, Land subsidence, *North Carolina.
Identifiers: *Liability(Legal aspects).

Plaintiff sued for damages incurred on his property by defendant's construction of roads on adjacent land resulting in alteration of the natural drainage of surface waters causing mud and silt to stop a drain and damage plaintiff's house and property. Defendant contended that the road did not alter the natural drainage of the water or change its path and that the road was built in conformity with engineering plans. The court followed the 'Civil-Law Rule', which recognizes a natural servitude of natural drainage between adjoining lands, so that the lower owner must accept the surface water which naturally drains into his land. On the other hand, the upper owner cannot change the natural drainage in a manner which would increase the natural burden. The court held that the lower landowner was not required to receive from higher land materials which in the natural condition of the lands would not be carried by the normal flow of surface waters. (Fernandez-Florida)
W75-10315

**DUPONT DE NEMOURS AND CO. V. TRAIN (ACTION BY CHEMICAL MANUFACTURERS TO SET ASIDE REGULATIONS GOVERNING EFFLUENT DISCHARGE OF SULFURIC ACID PLANTS).**
383 F. Supp. 1244-1256 (W.D. Va. 1974).

Descriptors: *Judicial decisions, *Legal review, *Regulation, *Administrative agencies, *Effluents, Wastes, Discharge(Water), Legal aspects, Constitutional law, Jurisdiction, Industrial wastes, Federal jurisdiction, Water law, Administration, Legislation, Federal Water Pollution Control Act, Water Quality Act, Federal government, Water pollution sources, Water pollution.
Identifiers: Administrative regulation, *Federal Water Pollution Control Act Amendments of 1972, Injunctive relief, Effluent limitations, Hazardous substances(Pollution).

An action was brought by chemical manufacturers for declaratory and injunctive relief against the Administrator of the Environmental Protection Agency (EPA), seeking to set aside regulations promulgated by the Administrator governing the effluent discharge of sulfuric acid plants, on grounds that the regulations were arbitrary, capricious, not supported by substantial evidence, beyond the authority of the EPA, and not in accord with procedures of the Federal Water Pollution Control Act Amendments of 1972. Three issues were before the court: (1) whether the Administrator has authority under section 301(b) of the Act to issue regulations establishing effluent limitations for sulfuric acid plants; (2) whether the regulations in question conform to section 304(b) of the Act and the notice and public participation provisions of the Administrative Procedure Act; and (3) whether the district court had jurisdiction to review the regulations in question and the procedures by which they were promulgated. The court concluded: (1) that the Administrator was authorized to promulgate by regulation the effluent limitation in issue; (2) that the structural and content requirements of such regulations under section 304(b) were satisfied; and (3) that judicial review of these limitations and guidelines is vested exclusively in the Court of Appeals. Thus, the court dismissed the action for lack of subject matter jurisdiction. (Fernandez-Florida)
W75-10316

**UNITED STATES V. ST. THOMAS BEACH RESORTS, INC. (ACTION TO ENJOIN OBSTRUCTION TO VIRGIN ISLANDS SHORELINE BY FENCES SEAWARD OF THE MEAN HIGH WATER LINE).**
386 F. Supp. 769-774 (D.C. V.I. 1974).

Descriptors: *Virgin Islands, *Seashores, *Trespass, *Public access, *Public rights, Judicial decisions, Constitutional law, Common law, Shores, Beaches, Boundaries(Property), Coastal structures, Legal aspects, Easements, Riparian rights, Equity, Land tenure, Water law, United States, Federal government, Legislation.
Identifiers: *Injunctive relief, Water rights(Non-riparians).

Plaintiff, United States, sought to enjoin the obstruction of the Virgin Islands shoreline. Defendant, beach resort, had erected chain link and barbwire fences which traversed the beach area. Plaintiff alleged that the inland extension of the fences, obstructing the shoreline, violated the Virgin Islands Open Shorelines Act and contravenes rights or property acquired by the United States by purchase of the islands from the Kingdom of Denmark. Defendant argued that the Open Shorelines Act was unconstitutionally vague and uncertain and that it is in violation of the Revised Organic Act of 1954, which makes impermissible the taking of property without just compensation. The court held that the applicable provisions of the Open Shorelands Act were not void for vagueness and did not amount of a taking of property from abutting landowners without just compensation. In granting that injunction, the court further held that the erection of fenses seaward of the mean high tide mark and the extending of fences inland constituted a trespass upon property belonging to the United States and a manifest interference with the right of the public to enjoy the shoreline. (Fernandez-Florida)
W75-10317

**OCEAN POLLUTION.**
For primary bibliographic entry see Field 5G.
W75-10318

**MOUNTAIN PARK RECLAMATION PROJECT, OKLAHOMA--NUECES RIVER PROJECT, TEXAS.**
For primary bibliographic entry see Field 4A.
W75-10319

**CHATTAHOOCHEE RIVER NATIONAL RECREATION AREA, GEORGIA.**
For primary bibliographic entry see Field 6G.
W75-10320

**THE IMPACT OF SECONDARY TREATMENT ON WASTES DISCHARGED INTO THE OCEAN.**
For primary bibliographic entry see Field 5D.
W75-10321

**IMPLEMENTATION OF THE FEDERAL WATER POLLUTION CONTROL ACT.**
For primary bibliographic entry see Field 5G.
W75-10322

STEAM ELECTRIC POWER GENERATING POINT SOURCE CATEGORY--PROPOSED EFFLUENT GUIDELINES AND STANDARDS FOR INCOMPATIBLE POLLUTANTS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10323

MARINE SANITATION DEVICES--PROPOSED CERTIFICATION PROCEDURES AND DESIGN AND CONSTRUCTION REQUIREMENTS.
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10324

CANNED AND PRESERVED FRUITS AND VEGETABLES PROCESSING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10325

LIQUID AND CRYSTALLINE CANE SUGAR REFINING SUBCATEGORY--EFFLUENT LIMITATIONS GUIDELINES AND PROPOSED PRETREATMENT STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10326

INORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10327

ELECTROPLATING POINT SOURCE CATEGORY; COPPER, NICKEL, CHROMIUM AND ZINC ON FERROUS AND NONFERROUS MATERIALS SUBCATEGORY.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10328

THERMAL DISCHARGES--PROPOSED PROCEDURES FOR THE IMPOSITION OF ALTERNATIVE EFFLUENT LIMITATIONS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10329

ASBESTOS MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT LIMITATIONS GUIDELINES.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10330

FERROALLOY MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10332

FEEDLOTS POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10333

GLASS MANUFACTURING POINT SOURCE CATEGORIES--EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10334

THERMAL DISCHARGES.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10335

BUILDERS PAPER AND BOARD MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT LIMITATIONS GUIDELINES.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10336

STEAM ELECTRIC POWER GENERATING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10337

## 6F. Nonstructural Alternatives

PROCEEDINGS OF WORKSHOP CONFERENCE ON IDENTIFICATION OF METROPOLITAN AREA WATER RESOURCES PROBLEMS AND ASSOCIATED RESEARCH NEEDS IN MINNESOTA.
Minnesota Univ., St. Paul. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W75-10004

APPLICATIONS OF INTEGER AND QUADRATIC PROGRAMMING TO FLOODPLAIN LAND USE MANAGEMENT,
Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.
J. L. Kaul, and C. E. Willis.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 773, $3.75 in paper copy, $2.25 in microfiche. Paper presented to Operations Research Society, San Juan, Puerto Rico, October 17, 1974. 38 p, 2 fig, 6 tab, 33 ref. OWRT B-043-MASS(1). 14-31-000-3896.

Descriptors: Flood control, *Land use, *Flood plain zoning, Decision making, Non-structural alternatives, Economic efficiency, Methodology, Mathematical models, Algorithms, Connecticut River, Risks, Management, Programming languages.
Identifiers: *Quadratic programming, *Integer programming, *Connecticut River basin.

Methodologies useful to planners at several levels for efficiently managing floodplains using both structural and non-structural measures are provided. The usefulness of these frameworks is demonstrated by applying them to a selected floodplain in the Connecticut River Basin. The algorithms for solving these two decision frameworks employ, respectively, integer and quadratic programming procedures. These frameworks enable the formulation of far more realistic and interesting situations than either of the only two previous applications of operations research methods (both linear programming applications). Major advantages of these two frameworks are that they are cast in a stochastic rather than a deterministic mode (hence enabling the capture of important effects of risk and uncertainty) and presume the demand for land in vario uses to be price flexible. The decision framewo considers floodplain zoning, flood proofing, a other structural alternatives as well as enabling t incorporation of external effects of floodpla development on communities upstream a downstream.
W75-10008

## 6G. Ecologic Impact Of Water Development

QUANTITATIVE ERROR ANALYSIS OF N MERICAL METHODS FOR PARTIAL DI FERENTIAL EQUATIONS,
Rutgers - the State Univ., New Brunswick, N Dept. of Computer Science.
R. Vichnevetsky, K. W. Tu, and J. A. Steen.
Available from the National Technical Inform tion Service, Springfield, Va 22161 as PB-243 9 $3.25 in paper copy, $2.25 in microfiche. Inter partmental Report DCS-TR-No 28. 5 p, 7 fig, 2 r March 1974. (Reprinted from Proceedings of t Annual Princeton Conference on Informati Science and Systems, Princeton Universi March 1974). OWRT B-045-NJ(2), B-049-NJ(2).

Descriptors: *Approximation method, Compu models, *Model studies, *Numerical analys Systems analysis, Water quality, Estuarine vironment, Equations.
Identifiers: *Partial differential equations, *Er analysis.

The principle of independence for small numeri errors is used to analyze global errors for cert classes of partial differential equations which ar in quality analysis for estuarial syste (Davidson-New Jersey)
W75-10003

WASTING A RIVER,
California Univ., Berkeley. Coll. of Natu Resources.
For primary bibliographic entry see Field 6B.
W75-10116

PROCEDURE FOR EVALUATING ENVIRO MENTAL IMPACT,
Geological Survey, Washington, D.C.
G. H. Davis.
In: Proceedings of Workshop Environmental pact Statements, Florida Technological Unive ty, Orlando, June 1973: Florida Technologi University Publucation, p 37-44, 1973. 3 fig, 4 re

Descriptors: *Environmental effects, Proj planning, Planning, Water management(Applie Federal government, Evaluation.
Identifiers: *Environmental impact.

A procedure that provides a numerical scale of vironmental impacts for the use of decis makers in choosing among various program al natives is reviewed. The matrix techni described in Geological Survey Circular 645 proven valuable as a checklist for those invol in developing impact statements, and had pro acceptable to the courts as a device for subdi ing and analyzing numerically the impacts given program. (Knapp-USGS)
W75-10164

EFFECTS OF FIRE ON THE PLANTS A ANIMALS OF A FLORIDA WETLAND,
California State Univ., Los Angeles. Dept. Biology.
R. J. Vogl.
Am Midland Nat. Vol 89, No 2, p 334-347, 1 Illus.
Identifiers: Alligator, Bird, *Burning, *Contro fire, *Florida, Mammals, *Wetlands, Aqu animals.

tal of 754 birds were recorded on a portion of a ida pond shore line during 63 visits for 4 mo. wing a controlled burn, while 236 birds were rved on an adjacent and comparable, but un- ed, shore line. Only 5 of the 35 bird species untered were seen more often on the un- ed site. Fire-induced bird and mammal injury ortality was unobserved even though the burn nbled a wildfire. Birds showed no fear of the nd some were attracted to the smoking land- e. Although some cold-blooded vertebrate ality occurred, other herptiles survived, and tors used the burned shore line almost exclu- y. Mammal populations of burned and un- ed areas appeared similar 4 mo. after the fire. al responses are considered related to the fire val of the heavy grass mat that otherwise red the water and soils and the foods con- d therein, and physically impaired new plant th. Burning also produced an earlier, more and far more productive growth of wet- ie plants.--Copyright 1973, Biological Ab- ts, Inc.
10181

RNATIONAL CONFERENCE ON THE SERVATION OF WETLANDS AND 'ERFOWL.
ing held at Ramsar, Iran, 30, Jan 3, Feb 1971. , Illus International Wildfowl Research Bu- Slimbridge (Glos), England, 1972. Carp, E

ifiers: *Conferences, *Conservation, Inter- nal meetings, Pesticides, Pollution, erfowl, *Wetlands.

book sets out the text of the Final Act of the erence and contains a summary record of its edings. The need for a wetlands convention elt in 1962 at the International Conference on nds held in France. There, it was decided list should be compiled of European and African wetlands of international im- nce. This final text of the convention is there- he result of 9 yr of careful study and interna- cooperation among scientific and legal ex- of a great number of countries, and several national organizations. The conference ed 11 recommendations for consideration ppropriate action involving the following top- conservation of the Wadden Sea, western Europe; conservation of Thjor- r, Iceland; conservation of North Bull Island, d; conservation of Lakes Ab-i-Istada and -e-Nawar, Afganistan; conservation of the ay Estuary, England; oil pollution; pesti- promotion of wetlands research; promotion nting research and education; African wet- wetlands and the Man and the Biosphere am. The book will be of interest to in- als and agencies involved in the conserva- f wetlands.--Copyright 1973, Biological Ab- s, Inc.
0198

S IN WATER RESOURCES IMPACT AS- MENT,
rd Univ., Calif. Dept. of Civil Engineering. imary bibliographic entry see Field 6B.
0222

ICATION OF NEPA TO EPA'S ENVIRON- AL REGULATORY ACTVITIES.
nmental Protection Agency, Washington,

ble from the National Technical Informa- ervice, Springfield, Va 22161, U.S.D.C., as 158, $4.75 in paper copy, $2.25 in iche. February 1973. 84 p.

iptors: *Environmental control, ronmental effects, *Regulation, Environ- Air pollution, Pesticides, Wastes, Solid , Radiation, Administrative agencies, Ad- rative decisions.

Identifiers: *Environmental impact statement, Administrative regulations, *National Environmental Policy Act.

The National Environmental Policy Act of 1969 (NEPA) requires all agencies of the federal government to prepare, in connection with all major federal actions significantly affecting the quality of the human environment, detailed environmental impact statements. However, such statements have not been prepared for environmental protective regulatory activities taken or concurred in by the Environmental Protection Agency (EPA). The Task Force which investigated the situation concluded that the EPA is entitled to maintain its permit position that NEPA does not legally apply to its regulatory programs. The Task Force reasoned that the application of NEPA to EPA programs would disrupt the agency's operations, and that the benefits to be gained by applying NEPA would not outweigh the significant harm caused by such disruption. The Task Force suggested that courts are likely to be able to resolve the issue in the most efficacious manner. It was the Task Force's recommendation that the Agency pursue a judicial determination that NEPA does not legally apply to its regulatory problems. (Gagliardi-Florida)
W75-10288

**SUMMARIES OF FOREIGN GOVERNMENT ENVIRONMENTAL REPORTS.**
Environmental Protection Agency, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-233 430, $3.25 in paper copy, $2.25 in microfiche. No 9, May 1973. 16 p.

Descriptors: *Publications, *Data collections, *Foreign countries, *Foreign research, Governments, Foreign projects, Data processing, Computers, Data storage and retrieval, Information exchange, Investigations, Translations, Information retrieval.
Identifiers: International agreements.

Pursuant to documents exchange agreements with environmental agencies of other countries, the Environmental Protection Agency (EPA) is building an international collection of environmental reports. This is the ninth in a series of announcements of foreign documents received. A computerized search system is being developed which will allow future retrieval of these summaries by country, subject area, and type of document. This series, which is devoted to summaries of government reports and focuses on legislative, economic and social aspects, supplements foreign scientific and technical literature abstracts covered by other EPA information services. Ultimately, the EPA plans to assemble a major collection of foreign government environmental documents and to develop several approaches to the dissemination of the information to EPA staff. These announcements contain brief English abstracts of the listed documents. The original documents may be obtained through the library Systems Branch. More detailed English abstracts and full text translations are also available. (Proctor-Florida)
W75-10289

**PROPOSED 1973 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE-SALE, OFFSHORE MISSISSIPPI, ALABAMA, AND FLORIDA, VOLUME 3. ALTERNATIVES TO THE PROPOSED ACTION (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Bureau of Land Management, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10291

**AUTHORIZED BONNEVILLE UNIT, CENTRAL UTAH PROJECT, UTAH (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-10292

**BIG HILL LAKE CREEK, KANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 8D.
W75-10293

**TYBEE ISLAND GEORGIA, BEACH EROSION CONTROL PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4D.
W75-10294

**TRED AVON RIVER, TALBOT COUNTY, MARYLAND (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineering District, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W75-10295

**INITIAL STAGE, GARRISON DIVERSION UNIT, PICK-SLOAN MISSOURI BASIN PROGRAM, NORTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Bureau of Reclamation, Billings, Mont. Upper Missouri Region.
For primary bibliographic entry see Field 8A.
W75-10296

**CLAYTON LAKE, JACK FORK CREEK, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 8A.
W75-10297

**WARM SPRINGS DAM AND LAKE SONOMA PROJECT, RUSSIAN RIVER BASIN, SONOMA COUNTY, CALIFORNIA, PART I (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 8A.
W75-10298

**WARM SPRINGS DAM AND LAKE SONOMA PROJECT, RUSSIAN RIVER BASIN, SONOMA COUNTY, CALIFORNIA. PART II (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 8A.
W75-10299

**LEGISLATION UNDER NEPA: PLAINTIFFS' PHYRRHIC VICTORIES DRAW CONGRESSIONAL FIRE, JUDICIAL WARNINGS,**
For primary bibliographic entry see Field 5G.
W75-10303

**SIERRA CLUB V. LYNN (ACTION FOR DECLARATORY AND INJUNCTIVE RELIEF WITH RESPECT TO DEVELOPMENT OF NEW HOUSING DEVELOPMENT).**
502 F.2d 43 (5th Cir. 1974).

Descriptors: *Environmental effects, *Environmental control, *Water pollution, Surface ground water relationships, Water pollution control, *Texas, Environment, Water pollution treatment, Water pollution effects, Groundwater movement, Groundwater, Surface waters, Aquifers.
Identifiers: *Environmental impact statement, Evidence, Injunctive relief.

Citizens groups brought action for declaratory and injunctive relief with respect to development of a

new community under a housing and urban development program. The United States District Court for the Western District of Texas denied the relief sought and entered judgment for the defendants, concluding that the Department of Housing and Urban Development (HUD) had satisfactorily complied with all relevant statutes. Furthermore, the court resolved to retain jurisdiction over the lawsuit for so long as might be necessary to ensure that the proposed environmental safeguards were fully instituted and implemented. The Fifth Circuit Court of Appeals held that the Secretary of HUD acted neither arbitrarily nor capriciously, nor failed to act in accordance with law when he granted developers of the new community federal assistance under the Urban Growth and New Community Development Act; that the environmental impact statement filed by HUD was sufficient; that plaintiffs failed to state claims under the Water Pollution Prevention and Control Act; that in absence of proof that the developer controlled the government agency's actions or caused its default, it could not be cast in judgment for attorney fees; and that as there remained no unadjudicated claim upon which relief could be granted, the trial court had improperly retained jurisdiction. (Gagliardi-Florida)
W75-10309

**REPORT TO THE CONGRESS ON OCEAN DUMPING AND OTHER MAN-INDUCED CHANGES TO OCEAN ECOSYSTEMS (OCTOBER 1972 THROUGH DECEMBER 1973).**
National Oceanic and Atmospheric Administration, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10311

**SMITH V. CITY OF COOKEVILLE (ACTION BY LANDOWNER WHOSE PROPERTY WAS CONDEMNED BY CITY FOR USE IN RECREATION DEVELOPMENT TO ENJOIN CONSTRUCTION UNTIL ENVIRONMENTAL IMPACT STATEMENT IS FILED).**
For primary bibliographic entry see Field 6E.
W75-10312

**OCEAN POLLUTION.**
For primary bibliographic entry see Field 5G.
W75-10318

**CHATTAHOOCHEE RIVER NATIONAL RECREATION AREA, GEORGIA.**
Hearing--Subcomm. on Parks and Recreation--Comm. on Interior and Insular Affairs U.S. Senate, 93d Cong, 2d Sess, October 29, 1974. 104 p.

Descriptors: *National parks, *National recreation areas, *National historic parks, *National historic sites, *Recreation, Natural resources, Water resources, Water supply, Scenery, *Georgia, Federal government, Administrative agencies, Federal reservations, Public lands, Conservation, Aesthetics, Parks, History, Education, Water pollution control, Water quality control, Legislation.
Identifiers: *Congressional hearings, Environmental policy, Nonpoint sources(Pollution), *Chattahoochee River area(Geo).

Hearings were held before the Senate Subcommittee on Parks and Recreation regarding S.1738, which is a bill to authorize the establishment of the Chattahoochee River National Recreation Area in the State of Georgia. The purpose of the legislation is to preserve and protect the natural, scenic, recreational, and historic values of a 48 mile segment of the Chattahoochee River from developments and uses which would substantially impair or destroy them. Emphasis was placed on the special importance of this legislation to the City of Atlanta. In addition to the natural, scenic, historic, educational, and recreational values to the Nation as a whole, this unpolluted segment of the river is the principal water supply for metro Atlanta. Further, it was stressed that additional parkland and open space is critically needed in the rapidly growing metro area. Opinion was expressed that few metropolitan centers have such a major natural resource which can still be preserved and protected from unplanned development. Additional testimony explained the corridor's values in detail. (Fernandez-Florida)
W75-10320

**AUTHORIZED BONNEVILLE UNIT, CENTRAL UTAH PROJECT, UTAH APPENDIX A (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-10331

**PAMLICO RIVER ESTUARY--PAST, PRESENT AND FUTURE,**
North Carolina State Univ., Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W75-10338

**THE COMPARISON OF THE ENVIRONMENTAL ASPECTS OF NUCLEAR AND FOSSIL FUELLED POWER STATIONS,**
New South Wales Univ., Kensington (Australia). School of Nuclear Engineering.
For primary bibliographic entry see Field 8C.
W75-10349

## 7. RESOURCES DATA

### 7A. Network Design

**AN ICE NUCLEI CONCENTRATION BENCHMARK NETWORK,**
National Oceanic and Atmospheric Administration, Boulder, Colo. Atmospheric Physics and Chemistry Lab.
P. A. Allee.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR), WMO No 399, Geneva (Switzerland), p 499-506, 1974. 4 fig, 7 ref.

Descriptors: *Networks, *Measurement, *Nucleation, *United States, Southwest US, Ice, Distribution, Pacific Northwest US, Pacific Ocean, On-site data collections, Equipment, Filters, Atmospheric physics, Meteorology.
Identifiers: *Ice nuclei, Ice nuclei concentrations.

An ice nuclei concentration benchmark network was established in the western United States by the National Oceanic and Atmospheric Administration. The purpose of the network is to determine the climatological mean and variation for the ice nuclei concentration throughout the 17 westernmost states and the north Pacific Ocean. The network consists of field monitors located at 19 National Weather Service locations selected as most likely to be free from anthropogenic sources of ice nuclei. The instrumentation of the network consists of two parts: (1) the equipment for collecting ice nuclei at the field monitoring site, and (2) an NCAR Ice Nucleus Analyzer for the activation and counting of ice nuclei particles on the membrane filter. The data accumulated during May, June, and July 1973 were analyzed. The ice nuclei concentration was partially analyzed on both a daily and a monthly summary basis. No strong correlations between the daily ice nuclei concentration and local meteorological elements were found. No evidence of 'ice nucleus storms' progressing across the network was detected, as previously shown to exist over the north Pacific Ocean. Monthly ice nuclei concentration averag at the network stations showed a monotonic i crease when related to the distance of the stati from the seashore, which can be interpreted th the earth's surface is a source of ice nucl Monthly ice nuclei concentration averages at t network stations increased during May, June, a July 1973. (See also W75-09944) (Sims-ISWS)
W75-09999

**SEAGRASS ECOSYSTEMS. RECOMMENDATIONS FOR RESEARCH PROGRAMS.**
For primary bibliographic entry see Field 2L.
W75-10106

**PRODUCTIVITY/PHYSIOLOGY WORKING GROUP,**
Texas Univ. at Austin. Dept. of Botany.
For primary bibliographic entry see Field 2L.
W75-10107

**SYSTEMATIC ECOLOGY WORKING GROUP**
Nijmegen Univ. (Netherlands). Lab. of Aquat Ecology.
C. den Hartog.
In: 'Seagrass Ecosystems. Recommendations f Research Programs,' Proceedings of the Intern tional Seagrass Workshop, October 22-26, 197 Leiden, The Netherlands, p 15-22. 1 ref.

Descriptors: *Marine plants, *Grasse *Ecosystems, *Life cycles, Biological commu ties, Resistance, Vegetation establishment, Pla growth, Revegetation, Coasts, Environmental e fects, Oceans, Plant groupings, Investigation Phenology, Productivity, Water pollution effec Speciation, Ecotypes, Data collections, Distrib tion patterns, Ecological distribution.
Identifiers: *Seagrass, Eelgrass, Internatio Seagrass Workshop.

The Systematic Ecology Working Gro discussed topics regarding the taxonomic a ecological research needs of seagrass populatio communities, and ecosystems. The focus was the necessity for studies both in the field a laboratory on the life cycle of seagrasses, th tolerance to environmental factors and pollutan and establishing their potential as well as actu ecological range. Recolonization by transplanti techniques for stock replenishment, lost due pollution, disease, or natural phenomena, or f creating new seagrass areas. Synecology based a wide variety of characters and community str ture. Distribution of seagrass or the facto responsible for observed distribution patterns; a the need for additional taxonomic information to the species and intraspecific level. Strateg are proposed for research in each area and reco mendations are made for investigative techniqu (See also W75-10106) (Auen-Wisconsin)
W75-10108

**DECOMPOSITION WORKING GROUP,**
Aarhus Univ. (Denmark). Lab. of Ecology.
For primary bibliographic entry see Field 2L.
W75-10109

**CONSUMER ECOLOGY WORKING GROUP,**
Amakusa Marine Biological Lab., Tomio (Japan).
For primary bibliographic entry see Field 2L.
W75-10110

**OCEANOGRAPHY,**
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W75-10111

NATIONAL STREAM QUALITY ACNTING NETWORK (NASQAN)--SOME STIONS AND ANSWERS,
gical Survey, Reston, Va.
rimary bibliographic entry see Field 5A.
10168

OGICAL WASTEWATER TREATMENT EL BUILDING FITS AND MISFITS,
nsin Univ., Madison. Dept. of Civil and Enental Engineering.
rimary bibliographic entry see Field 5D.
0169

ISTICAL EVALUATION OF REAERAPREDICTION EQUATIONS,
Univ., Medford, Mass. Dept. of Civil Eng.
imary bibliographic entry see Field 5G.
0211

AL PROGRAM FOR WATER NETWORK YSIS,
Research Association, Marlow(England).
mics Group.
mary bibliographic entry see Field 7C.
0220

RWAY MONITORING SYSTEM.
nical Engineering, Vol 96, No 8, p 52-53, 1974. 1 fig.

ptors: *Computers, *Monitoring, *Control s, *Water management(Applied), Mathe- models, Rivers, Canals, Inflow, Tidal Oxidation-reduction potential, Conductivity, cal oxygen demand, Turbidity, Solar radia-

iers: *Waterway monitoring systems, s 305 process computer, *Belgium.

gium the first computerized waterway netnonitoring system in Europe began opera- is an electronic installation, utilizing a s 305 process computer, and is to be developed to surpass pure monitoring ns and to calculate in advance the levels in nd dams to automatically ensure efficient istribution for all rivers and canals in Belgie completed installation is expected to cost million DM. Presently, 240 level-measurons are connected by an electronic remotesystem to make up the waterways installaformation is transmitted by a Z 701 time- multiplex remote supervisory control operating by pulse-code modulation. The of water in the rivers and canals and the t discharges and outflows can be monintinually. A mathematical model will work nction with the process computer so as to the dams in the rivers for flood prevention igh water, and shortage during low water. uence of precipitation in the model of the river behavior will help to forecast and dams. At Roselies on the Sambre qualitadies are planned for an environmental int station, measuring water temperature ivity corresponding to salt content, pH edox potential, COD value (chemical oxmand), turbidity, and solar irradiation. itz-FIRL)
48

ORING THE QUALITY OF SURFACE

Gloeilampenfabrieken N.V., Eindhoven ands).
ary bibliographic entry see Field 5A.
51

MONITORING: AN ENVIRONMENTAL STATE ESTIMATION PROBLEM,
California Univ., Davis. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5A.
W75-10255

## 7B. Data Acquisition

FREE-GRAB DEVICE FOR COLLECTING UNDERWATER SAMPLES,
Le Nickel S.A., Paris (France); and Centre National pour l'Exploitation des Oceans, Paris (France). (assignee).
A. Rossfelder.
U S Patent No 3,885,440, 4 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 934, No 4, p 1392, May 27, 1975.

Descriptors: *Patents, *Sampling, *Underwater, Bottom sampling, Equipment.
Identifiers: Free-grab sampling device.

A free-grab device is described for collecting underwater samples, particularly poly-metallic nodules deposited on ocean beds, sometimes at very great depths which may be as much as 6,000 meters. The term 'free-grab device' is used to designate sampling equipment which, in contrast to dredges, is released at the surface of the water without being connected to a ship or to a fixed surface installation. The device is caused to sink by a ballast which overcomes the action of one or more floats. When the device touches the sea-bed it releases the ballast automatically and, under float action, rises to the sea surface where it is recovered and where the samples contained are removed. The device is comprised of a box-like frame, the bottom and two sides faces of which are covered at least partially by a orificed wall, the other side faces being uncovered. Two similar pick-up jaws which are fitted with scraping blades and are pivoted on the frame. In the open position they extend generally towards one another and in closed position they are in effective engagement with the uncovered side faces of the frame. Locking means lock the jaws in open position and release means acting on the locking means free the jaws when the device touches the sea-bed. (Sinha-OEIS)
W75-09866

THE ACQUISITION OF INFORMATION DURING ATTEMPTS AT WEATHER MODIFICATION,
Tel-Aviv Univ. (Israel). Dept. of Environmental Sciences.
W. D. Scott.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR). WMO No 399, Geneva (Switzerland), p 353-362, 1974. 4 fig, 1 tab, 6 ref.

Descriptors: *Weather modification, *Measurement, *Data collections, *Cloud seeding, Instrumentation, Radar, Clouds, Sampling, On-site investigations, Model studies, Cloud physics, Meteorology.
Identifiers: Airborne instrumentation.

Unfortunately, in most of the weather modification projects underway, resource limitations are such that little information is available regarding the specifics of the seeding effort. The seeding proceeds, nonetheless, with the hope that the result will be beneficial. It is disquieting that we have accepted such an attitude which stems from the belief that weather modification is truly operational. The general lack of progress in the measurement of cloud elements may be a reflection of this attitude. If a weather modification effort is to have a high probability of success, it must be able to acquire appropriate information and use it for project planning. This information must include variations in sensitive parameters and be statistically significant. It is apparent that most of the present instruments utilize direct sampling techniques and must be supplemented or replaced by instruments which employ remote sensing techniques. (See also W75-09944) (Sims-ISWS)
W75-09986

DETERMINATION OF MOLECULAR HYDROGEN SULFIDE,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W75-10025

A NEW INFRARED INSTRUMENT FOR MONITORING OIL FILMS ON WATER,
Wright and Wright, Inc., Newton Center, Mass.
For primary bibliographic entry see Field 5A.
W75-10044

AN EXPERIMENTAL STUDY OF THE DETECTION OF ICE NUCLEI ON MEMBRANE FILTERS AND OTHER SUBSTRATA,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 2B.
W75-10052

EQUIVALENT BLACKBODY TEMPERATURE OF THE TOP OF A SEVERE STORM,
Lyndon B. Johnson Space Center. National Aeronautics and Space Administration, Houston, Tex.
For primary bibliographic entry see Field 2B.
W75-10054

EVALUATION OF AN ERTS-1 DATA COLLECTION PLATFORM INSTALLED IN THE ALPINE TUNDRA, COLORADO,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
R. G. Barry, and J. M. Clark.
Journal of Applied Meteorology, Vol 14, No 4, p 622-626, June 1975. 2 fig, 2 tab, 3 ref. NASA Contract NAS 5-21880.

Descriptors: *Meteorological data, *Remote sensing, *Mountains, *Colorado, Instrumentation, Weather data, Measurement, Satellites(Artificial), Rain gages, Anemometers, Data transmission, Meteorology, Evaluation.
Identifiers: *ERTS-1.

An ERTS-1 Data Collection Platform instrumented with meteorological sensors has been operated for more than a year at 3536 m in the Front Range, Colorado. The interface system and sensor performance were shown to operate well, although the message interval is suitable only for certain types of parameters with the present interface system. (Sims-ISWS)
W75-10055

MEASUREMENT OF SMALL DISCHARGES THROUGH V-NOTCH WEIRS,
Leupold and Stevens, Inc., Beaverton, Oreg.
For primary bibliographic entry see Field 8B.
W75-10059

REMOTE DETECTION OF POLLUTION OF WATER RESERVOIRS AND PHYTOPLANKTON BY OPTICAL METHODS,
K. A. Kondratyev, A. A. Buznikov, and D. V. Pozdnyakov.
Available from the National Technical Information Service, Springfield, Va 22161 as N74-19970, $3.25 in paper copy, $2.25 in microfiche. NASA Technical Translation F-14,767, March 1974. 19 p, 3 fig, 19 ref. Translated from Vodnye Resursy, No 3, p 65-74, 1972.

Descriptors: *Remote sensing, *Water pollution, *Phytoplankton, *Oil pollution, Electromagnetic waves, Infrared radiation, Fluorescence, Oceans, Freshwater, Tracking techniques, Spectrophotometry.
Identifiers: Laser.

A review of data shows that remote detection of oil films and phytoplankton can be conducted by optical methods as the refractive index of oil is higher than the refractive index of water. In the infrared range, higher values of the reflection coefficient from a surface covered by oil must be expected. A catalogue of the optical properties of oil types and petroleum products in various stages of transformation, to which they are subjected in natural conditions, could be made. The stable correlations between the thickness of an oil layer, its composition and optical contrast in different lighting conditions and the state of the sea surface must be studied. It is important to carry out simultaneous complex measurements in various regions of the electromagnetic spectrum, the results of which could complement each other, and also to carry out independent, direct measurement of the investigated parameters. These methods can be used for detecting oil deposits and also for the search for shoals of fish indicated by increased concentration of phytoplankton. Results showed that the fluorescence method can be used successfully, if a powerful laser is used as an active locator. (Jones-Wisconsin)
W75-10098

**UTILIZATION OF AERIAL PHOTOGRAPHS FOR MEASURING LAND USE CHANGES IN WATERSHEDS,**
Clemson Univ., S.C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W75-10136

**THE MAGNETIC FLOWMETER AND ITS USE IN WASTE WATER TECHNOLOGY (DER MAGNETISCHE DURCHFLUSSMESSER UND SEINE ANWENDUNG IN DER ABWASSERTECHNIK),**
For primary bibliographic entry see Field 5A.
W75-10185

**NEW FLOWMETER PASSES TESTS,**
General Signal Corp., West Warwick, R.I.
For primary bibliographic entry see Field 5D.
W75-10190

**WATER POLLUTION MONITORING SYSTEM, (IN JAPANESE),**
For primary bibliographic entry see Field 5A.
W75-10196

**ROUTINE SURVEILLANCE ALTERNATIVES FOR WATER QUALITY MANAGEMENT,**
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W75-10250

**TV SYSTEM GIVES AUTOMATIC ALARM AS WESS AS VISUAL MONITORING OF AIR AND WATER POLLUTION.**
For primary bibliographic entry see Field 5A.
W75-10263

**WATER MONITORING IS BIG BUSINESS.**
For primary bibliographic entry see Field 5A.
W75-10269

**CHARACTERISTICS OF GAS-LIQUID CONTACT APPARATUS IN OZONE TREATMENT FOR DRINKING WATER, (IN JAPANESE),**
For primary bibliographic entry see Field 5F.
W75-10281

## 7C. Evaluation, Processing and Publication

**FINITE ELEMENT MODELING OF FLOW THROUGH POROUS MEDIA,**
State Univ., of New York, Buffalo. Faculty of Engineering and Applied Sciences.
For primary bibliographic entry see Field 5B.
W75-09900

**RAIN STIMULATION EXPERIMENTS: DESIGN AND EVALUATION,**
California Univ., Berkeley. Statistical Lab.
J. Neyman, and E. L. Scott.
In: Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification, October 1-7, 1973, Tashkent (USSR) WMO No 399, Geneva (Switzerland), p 449-457, 1974. 5 fig, 2 tab, 13 ref. ONR Contract N00014-69-A-0200-1060.

Descriptors: *Weather modification, *Evaluation, Effects, *Cloud seeding, *Design, Statistics, Cloud physics, Climatology, Meteorology, Model studies, *Artificial precipitation, Rainfall.
Identifiers: Extra-area effects, Downwind effects.

Because of the inordinate variability of natural rainfall from one unit of observation to the next and because of the changes in rainfall regimes each lasting several years, the only method now known of gaining reliable information on possible effects of cloud seeding is through properly designed randomized experiments. The establishment of rain stimulation technology requires a theory of the atmospheric phenomena resulting from cloud seeding, a theory that is empirically verifiable. This verification can be accomplished only through randomized experiments. The effects of cloud seeding observed empirically in randomized experiments are occasionally positive, occasionally negative, and occasionally no change, and are extensive in both time and place. With reference to summer convective clouds, several interrelated but independently conceived mechanisms of post cloud-seeding phenomena have been suggested. Contrary to experimental situations in many other domains, experiments with rain stimulation are 'multidimensional,' involving such questions as (1) How far does the effect of cloud seeding extend, and (2) When does the effect of cloud seeding begin and when does it end. No statistical theory applicable to such questions exists. Its development requires the cooperation of active mathematical statisticians. (See also W75-09944) (Sims-ISWS)
W75-09994

**QUANTITATIVE ERROR ANALYSIS OF NUMERICAL METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS,**
Rutgers - the State Univ., New Brunswick, N.J. Dept. of Computer Science.
For primary bibliographic entry see Field 6G.
W75-10003

**CLIMATE OF MINNESOTA - PART VII - AREAL DISTRIBUTION AND PROBABILITIES OF PRECIPITATION IN THE MINNEAPOLIS-ST. PAUL METROPOLITAN AREA,**
Minnesota Agricultural Experiment Station, St. Paul.
For primary bibliographic entry see Field 2B.
W75-10009

**SURFACE WATER DATA, REFERENCE INDEX, CANADA 1974.**
Water Survey of Canada, Ottawa (Ontario).
Information Canada, Ottawa, 1974. 265 p.

Descriptors: *Canada, *Surface waters, *Dat
lections, *Hydrometry, Gaging, Gaging sta
Measurement, On-site data collections, Dra
area, Discharge measurement, Indexing, G
Rivers, Lakes, Streams, Tributaries, S
discharge relations, Water levels.

Hydrometric surveys are conducted by the
Survey of Canada under various agreements
the provinces and territories who contribu
the cost of the basic field investigations
were carried out in accordance with mu
agreed-upon plans. The first edition of a Su
Water Data Reference Index for each provi
region was published for 1966. Subsequen
tions are published annually. The gaging st
are listed by province or territory, in an ups
to downstream order. The main body of this
is a tabulation of stations showing station nu
and name, drainage area, gage location, disc
records, type of gage, operation schedule, a
marks. The names of rivers and lakes for
data are available are given in a station nu
index and an alphabetical index. The overall
racy of hydrometric data referred to depen
(1) the stability of the stage-discharge relatio
or if the control is unstable, the frequen
discharge measurements, and (2) the accura
observations of stage, measurements of disc
and interpretation of records. In general, da
lected during open-water periods are more re
than those collected during periods of ice
tions or those obtained by estimation. Fu
water level data collected utilizing a water
recorder are more reliable and accurate than
using a manual gage only, especially for sm
flashy streams. (Scott-ISWS)
W75-10064

**HISTORICAL STREAMFLOW SUMM
BRITISH COLUMBIA, TO 1973.**
Water Survey of Canada, Ottawa (Ontario).
Information Canada, Ottawa, 1975. 694 p.

Descriptors: *Canada, *Hydrometry, *Basi
collections, *Streamflow, *Gaging sta
Discharge(Water), Flow, Drainage area, Me
ment, Surface waters, On-site data collec
Discharge measurement, Flow rates, Annual
discharge, Monthly, Average, Annual.
Identifiers: *British Columbia, Daily.

Hydrometric surveys in British Columbia ar
ducted by the Water Survey of Canada
agreement with the Province of British Col
Descriptive information about gaging statio
given in tables of monthly and annual
discharges. This included such items as l
and longitude, drainage area, and whether th
is natural or regulated (the year that reg
began was given, if known). International G
Stations were identified and the nam
cooperating agencies who supply data were
Unusual conditions were explained. The His
Streamflow Summary publications contai
for both active and discontinued streamflo
tions and do not contain any water leve
These publications are published every three
and contain data for all streamflow stations
entire period of record not just the data for
tervening three years. For gaging stations
systematic streamflow data were obtained,
lowing were tabulated for the period of re
1973 inclusive: (1) summary of monthly and
mean discharges, (2) annual maximum inst
ous discharges, (3) annual maximum and mi
daily discharges, (4) identification of the e
recorded for the period of record, (5) annu
discharge in acre-feet. A number of correct
revisions were made to previously publishe
(Scott-ISWS)
W75-10065

**HISTORICAL STREAMFLOW SUMMAR
TARIO, TO 1973.**
Water Survey of Canada, Ottawa (Ontario).
Information Canada, Ottawa, 1975. 349 p.

iptors: *Canada, *Hydrometry, *Basic data
tions, *Streamflow, *Gaging stations,
arge(Water), Flow, Drainage area, Measure-
Surface waters, On-site data collections,
arge measurement, Flow rates, Annual mean
rge, Monthly, Average, Annual.
fiers: *Ontario, *Quebec, Daily.

metric surveys at stations in Ontario, in-
g those stations operated in Quebec, are
cted by the Water Survey of Canada.
ptive information about gaging stations was
in tables of monthly and annual mean
rges. This included such items as latitude
ngitude, drainage area, and whether the flow
ural or regulated (the year that regulation
was given, if known). International Gauging
ns were identified and the names of
rating agencies who supply data were given.
al conditions were explained. The Historical
flow Summary publications contain data
th active and discontinued streamflow sta-
and do not contain any water level data.
publication are published every three years
ntain data for all streamflow stations for the
period of record not just the data for the in-
ng three years. For gaging stations where
atic streamflow data were obtained, the fol-
were tabulated for the period of record to
clusive: (1) summary of monthly and annual
lischarges, (2) annual maximum instantane-
charges, (3) annual maximum and minimum
ischarges, (4) identification of the extreme
ed for the period of record, (5) annual total
ge in acre-feet. A number of corrections or
ns were made to previously published data.
ISWS)
0066

RICAL STREAMFLOW SUMMARY, AL-
A, TO 1973.
Survey of Canada, Ottawa (Ontario).
ation Canada, Ottawa, 1974. 327 p.

ptors: *Canada, *Hydrometry, *Basic data
ons, *Streamflow, *Gaging stations,
rge(Water), Flow, Drainage area, Measure-
Surface waters, On-site data collections,
rge measurement, Flow rates, Annual mean
ge, Monthly, Average, Annual.
ers: *Alberta, Daily.

metric surveys in Alberta are conducted by
ter Survey of Canada under agreement with
vince of Alberta. Descriptive information
gaging stations was given in tables of
y and annual mean discharges. This in-
such items as latitude and longitude,
e area, and whether the flow is natural or
ed (the year that regulation began was
f known). International Gauging Stations
dentified and the names of cooperating
s who supply data were given. Unusual
ns were explained. The Historical Stream-
mmary publications contain data for both
nd discontinued streamflow stations and
ontain any water level data. These publica-
e published every three years and contain
r all streamflow stations for the entire
f record not just the data for the interven-
e years. For gaging stations where syste-
reamflow data were obtained, the follow-
e tabulated for the period of record to 1973
e: (1) summary of monthly and annual
scharges, (2) annual maximum instantane-
harges, (3) annual maximum and minimum
scharges, (4) identification of the extreme
d for the period of record, (5) annual total
ge in acre-feet. A number of corrections or
s were made to previously published data.
SWS)
067

RICAL STREAMFLOW SUMMARY,
AND NORTHWEST TERRITORIES, TO

urvey of Canada, Ottawa (Ontario).
Information Canada, Ottawa, 1974. 50 p.

Descriptors: *Canada, *Hydrometry, *Basic data collections, *Gaging stations, Discharge(Water), Flow, Drainage area, Measurement, Surface waters, On-site data collections, Discharge measurement, Flow rates, Annual mean discharge, Monthly, Average, Annual.
Identifiers: *Northwest Territories, *Yukon Territory, Daily.

Hydrometric surveys in the Yukon and Northwest Territories are conducted by the Water Survey of Canada under agreement with the Territories. Descriptive information about gaging stations was given in tables of monthly and annual mean discharges. This included such items as latitude and longitude, drainage area and whether the flow is natural or regulated (the year that regulation began was given, if known). International Gauging Stations were identified and the names of cooperating agencies who supply data were given. Unusual conditions were explained. The Historical Streamflow Summary publications contain data for both active and discontinued streamflow stations and do not contain any water level data. These publications are published every three years and contain data for all streamflow stations for the entire period of record not just the data for the intervening three years. For gaging stations where systematic streamflow data were obtained, the following were tabulated for the period of record to 1973 inclusive: (1) summary of monthly and annual mean discharges, (2) annual maximum instantaneous discharges, (3) annual maximum and minimum daily discharges, (4) identification of the extreme recorded for the period of record, (5) annual total discharge in acre-feet. A number of corrections or revisions were made to previously published data. (Scott-ISWS)
W75-10068

**HISTORICAL STREAMFLOW SUMMARY, MANITOBA, TO 1973.**
Water Survey of Canada, Ottawa (Ontario).
Information Canada, Ottawa, 1974. 161 p.

Descriptors: *Canada, *Hydrometry, *Basic data collections, *Gaging stations, Discharge(Water), Flow, Drainage area, Measurement, Surface waters, On-site data collections, Discharge measurement, Flow rates, Annual mean discharge, Monthly, Annual, Average.
Identifiers: *Manitoba, Daily.

Hydrometric surveys in Manitoba are conducted by the Water Survey of Canada under agreement with the Province of Manitoba. Descriptive information about gaging stations was given in tables of monthly and annual mean discharges. This included such items as latitude and longitude, drainage area, and whether the flow is natural or regulated (the year that regulation began was given, if known). International Gauging Stations were identified and the names of cooperating agencies who supply data were given. Unusual conditions were explained. The Historical Streamflow Summary publications contain data for both active and discontinued streamflow stations and do not contain any water level data. These publications are published every three years and contain data for all streamflow stations for the entire period of record not just the data for the intervening three years. For gaging stations where systematic streamflow data were obtained, the following were tabulated for the period of record to 1973 inclusive: (1) summary of monthly and annual mean discharges, (2) annual maximum instantaneous discharges, (3) annual maximum and minimum daily discharges, (4) identification of the extreme recorded for the period of record, (5) annual total discharge in acre-feet. A number of corrections or revisions were made to previously published data. (Scott-ISWS)
W75-10069

**HISTORICAL STREAMFLOW SUMMARY, SASKATCHEWAN, TO 1973.**
Water Survey of Canada, Ottawa (Ontario).
Information Canada, Ottawa, 1975. 250 p.

Descriptors: *Canada, *Hydrometry, *Streamflow, *Basic data collections, *Gaging stations, Discharge(Water), Flow, Drainage area, Measurement, Surface waters, On-site data collections, Discharge measurement, Flow rates, Annual mean discharge, Monthly, Average, Annual.
Identifiers: *Saskatchewan, Daily.

Hydrometric surveys in Saskatchewan are conducted by the Water Survey of Canada under agreement with the Province of Saskatchewan. Descriptive information about gaging stations was given in tables of monthly and annual mean discharges. This included such items as latitude and longitude, drainage area, and whether the flow is natural or regulated ( the year that regulation began was given, if known). International Gauging Stations were identified and the names of cooperating agencies who supply data were given. Unusual conditions were explained. The Historical Streamflow Summary publications contain data for both active and discontinued streamflow stations and do not contain any water level data. These publications are published every three years and contain the intervening three years. For gaging stations where systematic streamflow data were obtained, the following were tabulated for the period of record to 1973 inclusive: (1) summary of monthly and annual mean discharges, (2) annual maximum instantaneous discharges, (3) annual maximum and minimum daily discharges, (4) identification of the extreme record for the period of record, and (5) annual total discharge in acre-feet. A number of corrections or revisions were made to previously published data. (Scott-ISWS)
W75-10070

**HISTORICAL STREAMFLOW SUMMARY, ATLANTIC PROVINCES, TO 1973.**
Water Survey of Canada, Ottawa (Ontario).
Information Canada, Ottawa, 1974. 135 p.

Descriptors: *Canada, *Hydrometry, *Streamflow, *Basic data collections, *Gaging stations, Discharge(Water), Flow, Drainage area, Measurement, Surface waters, On-site data collections, Discharge measurement, Flow rates, Annual mean discharge, Monthly, Average, Annual.
Identifiers: *Newfoundland and Labrador, *New Brunswick, *Nova Scotia, *Prince Edward Island, Daily.

Hydrometric surveys in Newfoundland and Labrador, New Brunswick, Nova Scotia, and Prince Edward Island are conducted by the Water Survey of Canada under individual cooperative arrangements with each provincial government or its agency. Descriptive information about gaging stations was given in tables of monthly and annual mean discharges. This included such items as latitude and longitude, drainage area, and whether the flow is natural or regulated (the year that regulation began was given, if known). International Gauging Stations were identified and the names of cooperating agencies who supply data were given. Unusual conditions were explained. The Historical Streamflow Summary publications contain data for both active and discontinued streamflow stations and do not contain any water level data. These publications are published every three years and contain data for all streamflow stations for the entire period of record not just the data for the intervening three years. For gaging stations where systematic streamflow data were obtained, the following were given for the period of record to 1973 inclusive: (1) summary of monthly and annual mean discharges, (2) annual maximum instantaneous discharges, (3) annual maximum and minimum daily discharges, (4) identification of the extreme recorded for the period of record, (5) annual total discharge in acre-feet. A number of corrections or revisions were made to previously published data. (Scott-ISWS)

W75-10071

**A COMPUTER SIMULATION ANALYSIS OF SURFACE WATER QUALITY MANAGEMENT POLICIES UNDER DYNAMIC ECONOMIC AND HYDROLOGIC CONDITIONS,**
Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.
For primary bibliographic entry see Field 5D.
W75-10124

**A MATHEMATICAL PROGRAMMING APPROACH TO PUBLIC WATER PROJECT. PORTFOLIO SELECTION,**
Georgia Univ., Athens.
For primary bibliographic entry see Field 6B.
W75-10131

**A MODEL OF ONE-DIMENSIONAL PERCOLATION TO A WATER TABLE USING A COMPUTER SIMULATION LANGUAGE,**
Clemson Univ., S.C. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W75-10138

**DISCHARGE MEASUREMENTS AT LOW-FLOW PARTIAL-RECORD STATIONS IN IOWA,.**
Geological Survey, Iowa City, Iowa.
Open-file report, May 1975. 157 p.

Descriptors: *Streamflow, *Low flow, *Iowa, Data collections, Discharge measurement, Basic data collections, Base flow, Gaging stations, Flow characteristics, Hydrologic data.
Identifiers: Partial-record stations(Iowa).

This report compiles discharge measurements made at 433 low-flow partial-record stations in Iowa during the period 1957-74. A low-flow partial-record station is a site at which low-flow discharge measurements are made systematically over a period of years. Most of these measurements were made during periods of base flow when streamflow is primarily from groundwater sources. For estimating characteristics of low flows at a partial record site, the baseflow measurements are correlated with concurrent flows at nearby gaging stations where continuous records are available. By using these relations the flow characteristics at the gaging station are transferred to the partial-record site. The listing starts with streams in the Mississippi River basin (Part 5) and is followed by streams in the Missouri River basin (Part 6). After the station number and name are descriptive paragraphs containing information on the location and the drainage area. These are followed by a tabulation of the discharge measurements in chronological order. (Woodard-USGS)
W75-10144

**HYDROLOGIC DATA FOR URBAN STUDIES IN THE DALLAS, TEXAS METROPOLITAN AREA, 1973,**
Geological Survey, Austin, Tex.
B. B. Hampton.
Open-file report, June 1975. 146 p, 4 fig, 3 tab, 7 ref.

Descriptors: *Hydrologic data, *Urban runoff, *Watersheds(Basins), *Urban hydrology, *Texas, Rainfall, Storm runoff, Data collections, Runoff, Hydrographs, Mass curves, Water yield, Discharge(Water), Urbanization, Watershed management.
Identifiers: *Dallas(Tex).

This report presents the compilation and analysis of hydrologic data collected in urban or partly urban drainage basins in the Dallas, Texas, metropolitan area during the 1973 water year. The objectives of the Dallas area program are: To determine, on the basis of historical data and hydrologic analyses, the magnitude, frequency and areal extent of flooding; to document and define floods of greater than ordinary magnitude; and to determine the effect of urban development on flood peaks and volume. During the 1973 water year, storms producing the highest peak discharges occurred on March 9-10; April 23-24; May 11-12; June 3-4, 19-21; July 7-8; and Sept. 26-27, 1973. These storms produced a variety of rainfall amounts, intensities, durations, and distribution in the drainage basins. Weighted rainfall, for these storm periods upstream from continuous-record gaging stations and selected crest-stage partial-record stations, are given. The storm analyses, hydrographs, and mass curves also are included. (Woodard-USGS)
W75-10148

**HYDROLOGIC DATA FOR NORTH CREEK, TRINITY RIVER BASIN, TEXAS, 1973,**
Geological Survey, Austin, Tex.
R. M. Slade, Jr.
Open-file report, May 1975. 44 p, 2 fig, 3 tab.

Descriptors: *Flood control, *Check structures, *Retaining walls, *Hydrologic data, *Texas, Runoff, *Watershed management, Basic data collections, Watershed protect, *Flood Prev. Act, Water resources development.
Identifiers: Tarrant County(Tex), Trinity River Basin(Tex).

During the period 1951-62, the U.S. Geological Survey began hydrologic investigations in 12 small watersheds in cooperation with the Texas Water Development Board, the Soil Conservation Service, the San Antonio River Authority, the city of Dallas, and the Tarrant County Water Control and Improvement District No. 1. The 12 study areas were chosen to sample watersheds having different rainfall, topography, geology, and soils. In five of the study areas (North, Little Elm, Mukewater, Little Pond-North Elm, and Pin Oak Creeks), streamflow and rainfall records were collected prior to construction of the floodwater-retarding structures, thus affording the opportunity for analyses of the conditions 'before and after' development. A summary of the development of the floodwater-retarding structures in summary of the development of the floodwater-retarding structures in each study area as of Sept. 30, 1973, is tabulated. This watershed-development program will have varying but important effects on surface- and ground-water resources of river basins, especially where a large number of the floodwater-retarding structures are built. (Woodard-USGS)
W75-10149

**HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1973,**
Geological Survey, Austin, Tex.
H. D. Buckner.
Open-file report, May 1975. 13 p, 1 fig.

Descriptors: *Hydrologic data, *Watersheds(Basins), *Texas, Streamflow, Discharge(Water), Gaging stations, Rainfall, Water yield, Reservoirs, *Watershed management, Flood control, Retaining walls, Reservoir yield, Water levels.
Identifiers: *Mountain Creek(Tex), *Trinity River basin(Tex).

The stream-gaging stations on Mountain Creek near Cedar Hill and Walnut Creek near Manfield, Texas provide hydrologic data to define runoff characteristics from small drainage basins. They also serve as index stations for inflow into the reservoir and provide operational data for the reservoir. In addition, the station Walnut Creek near Mansfield is equipped with a recording rain gage. The stage station near Duncanville provides data pertinent to operation of the gates in the Mountain Creek Lake Dam. The reservoir-content station at the dam provides records of reservoir stage and contents. The stream-gaging s
Mountain Creek at Grand Prairie provides re
of outflow from Mountain Creek Lake an
basin. Basin outflow for the 1973 water yea
161,400 acre-feet which is 89,020 acre-feet
the 13-year average (1960-73) of 72,380 acre
Storage in Mountain Creek Lake showed
gain of 6,350 acre-feet during the water year.
fall for the 1973 water year was about 46 in
which is about 12 inches above the long-term
(1960-73). (Woodard-USGS)
W75-10150

**HYDROLOGIC DATA FOR URBAN STU
IN THE AUSTIN, TEXAS METROPOL
AREA, 1973,**
Geological Survey, Austin, Tex.
R. N. Mitchell.
Open-file report May 1975. 61 p, 3 fig, 1 tab.

Descriptors: *Hydrologic data, *Urban r
*Watersheds(Basin), *Urban hydrology, *
Runoff, Rainfall, Storm runoff, Data collec
Hydrographs, Mass curves, *Watershed ma
ment, Water yield, Urbanization.
Identifiers: *Austin(Tex).

Rainfall and runoff data are tabulated for
and Wilbarger Creeks in the Austin,
metropolitan area for the 1973 water year (O
1, 1972 to September 30, 1973). The wei
mean rainfall in the Waller Creek study ar
stream from 38th Street was 40.10 inches, o
above the mean annual rainfall for Austin of
inches. Mean daily discharge was 1.75 cfs;
runoff was 10.27 inches, or 26% of rainfal
weighted-mean rainfall upstream from 23d
was 40.13 inches, or 24% above the mean
rainfall for Austin. Mean daily discharge wa
cfs; annual runoff was 12.38 inches, ir 31% o
fall. Weighted-mean rainfall in the Will
Creek study area was 36.32 inches, or 12%
the mean annual rainfall for Austin of 32.49 i
Mean daily discharge was 2.19 cfs; annual
was 6.44 inches, or 18% of rainfall. Rainfall-
data for 5 storms are summarized. Comput
with hydrograph and mass curves are includ
each storm. (Woodard-USGS)
W75-10151

**CHEMICAL AND PHYSICAL CHA
TERISTICS OF WATER IN ESTURIE
TEXAS, OCTOBER 1970-SEPTEMBER 197**
Geological Survey, Austin, Tex.
D. C. Hahl, and K. W. Ratzlaff.
Texas Water Development Board, Austin,
191, May 1975. 153 p, 13 fig, 8 tab, 11 ref.

Descriptors: *Estuaries, *Water quality, *
*Gulf of Mexico, Mixing, Bays, Currents(W
Physical properties, Sampling, Method
Chemical analysis, Estuarine environmen
flow, Encroachment, Tidal effects, Hydr
data, Data collections, Nutrients, Inorganic
pounds, Organic compounds.

In September 1967, the U.S. Geological S
and the Texas Water Development Board b
cooperative water-resources investigation
principal estuaries along the Texas coast
Galveston Bay and the Rio Grande. The obj
of the investigation are to define: (1) The
rence, source, and distribution of nutrients;
physical, organic, and inorganic water-quali
stituents and their areal distribution an
variations; (3) the chemical and physical c
teristics of Gulf water that enters the estuar
the occurrence, quality, quantity, and disp
of drainage entering the estuarine systems;
the current patterns, directions, and rates of
movement. This report is the fouth in an ann
ries of basic-data reports and includes mor
100 pages of tabulated data collected duri
1971 water year. (Woodard-USGS)
W75-10153

APORATION DATA IN TEXAS--COMPILA-ON REPORT, JANUARY 1907-DECEMBER 9,
as Water Development Board, Austin.
. Dougherty.
ort 192, June 1975. 237 p, 6 fig.

criptors: *Evaporation, *Basic data collec-s, *Texas, Surface waters, Evaporation pans, ometers, Methodology, Hydrologic data.

cimpilation of all available historical pan-oration data which habe been obtained in as, spanning a 64-year period from January through Dedember 1970 is tabulated. This pilation of evaporation data was gathered 114 stations which have been in operation in as during some part of the period 1907-70. Lo-ons of these stations are shown. The bulk of oration measurements were made from three s of evaporation pans. They are the Bureau of t Industry pan (BPI), National Weather Ser-pan (WS), and the Young screen pan (Y). eral other pan types and the evaporometer been utilized in Texas, but the volume of rd obtained with these is small compared to from the three main types of evaporation . (Woodard-USGS)
-10154

ITAL PROGRAM FOR WATER NETWORK LYSIS,
er Research Association, Marlow(England). nomics Group.
Donachie.
nal of the Hydraulics Division, Proceedings of E, Vol 100, No HY3, Paper No 10424, p 393-March 1974. 4 fig, 2 tab, 15 equ, 4 ref.

riptors: *Water distribution(Applied), nputer programs, *Systems analysis, draulics, *Networks, Digital computers, Pres-Pipes, Valves, Pumps, Engineering, Equa-, Low flow, Mathematical models.
ifiers: *Newton-Raphson method, ices(Mathematics).

ribed is a digital computer program for the and efficient analysis of water distribution orks. Pressures and flows are solved by a fied Newton-Raphson method. This method ves the problems of pressure initialization reatly increases convergence, particularly in ms containing pumps or pressure-reducing s, or both. The program incorporates an auto-balancing routine which greatly reduces the t in the initial balancing of the model against al system. This same routine can also be used e sizing of reinforcement mains to enable the m to meet future demands; work is now being ded to incorporate full recognition of cost s. The program will automatically amend esistances so that calculated pressures agree measured pressures. Both the system equa-and those for the automatic balancing routine erived. The program uses either Imperial or its, the choice being specified by the user. ples are shown of the improved rate of con-nce and the automatic balancing. Modifica-to the normal Newton-Raphson technique escribed which lead to improved computing ency and to improved stability of the pro-under low flow conditions. (Bell-Cornell)
0220

PUTER CONTROL OF SEWAGE WORKS, GRESS AT NORWICH,
imary bibliographic entry see Field 5D.
0246

PUTERIZED SEWER DESIGN: NEW FOR AN OLD PROBLEM,
Engineering, Santa Ana, Calif.
imary bibliographic entry see Field 5D.
0253

**A DIMENSIONLESS DESIGN EQUATION FOR SEWAGE LAGOONS,**
New Mexico Univ., Albuquerque.
For primary bibliographic entry see Field 5D.
W75-10261

**CALIFORNIA PLANT GETS STRAIGHT 'A'S IN COMPUTER CONTROL,**
San Jose-Santa Clara Water Pollution Control Plant, San Jose, Calif.
For primary bibliographic entry see Field 5D.
W75-10264

**A COMPUTER COMES TO MISSOURI,**
Springfield Water Dept., Mo.
For primary bibliographic entry see Field 5D.
W75-10265

# 8. ENGINEERING WORKS

## 8A. Structures

**ARTIFICIAL REEF,**
E. R. Boots.
US Patent No 3,888,209, 6 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 935, No 2, p 547, June 10, 1975.

Descriptors: *Patents, *Beach erosion, Shore protection, Coastal structures, Reefs, Deposition(Sediments).
Identifiers: Artificial reefs, Marine organisms.

The object of the invention is to provide a practical method and apparatus for offshore reef construction which serves to correct an imbalance in the natural accretion-degradation cycle so as to prevent substantial erosion of a beach area by the net movement of beach materials away from the shore. An offshore submerged reef structure is in a form which may be transported to and placed in the desired offshore location and built up to a desired height. The base reef element is preferably secured to the ocean floor by pile members or stakes which are passed through the base element and driven into the ocean floor. The base reef element is preferably of inverted U-shaped cross section having openings to permit sand and other particulate matter normally held in suspension in the sea water to deposit and settle within the reef structure to afford it greater anchorage and stability. The base reef element may serve as the habitat for an implanted marine organism, such as a sabellariid organism, which over the years will continue to grow and build up the size and height of the reef. Composite artificial reefs are arranged end-to-end and relative to the shoreline so as to interfere with the destructive shoreline currents by deflecting the incoming waves. (Sinha-OEIS)
W75-09879

**DESIGN IMPLICATIONS OF HYDRAULIC JUMPS AT SUDDEN ENLARGEMENTS,**
Mozambique Univ., Lourenco Marques. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-10061

**ARTIFICIAL REEFS FOR TEXAS.**
Texas A and M Univ., College Station. Industrial Economics Research Div.
For primary bibliographic entry see Field 3E.
W75-10119

**DESIGN OF SURFACE WATER OUTFALLS TO RIVERS,**
Lothians River Purification Board (Scotland).
For primary bibliographic entry see Field 5D.
W75-10183

**RECOMMENDATIONS FOR ENVIRONMENTAL ENGINEERING EDUCATION,**
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 9A.
W75-10218

**SAFETY OF DAMS--BUREAU OF RECLAMATION,**
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
D. A. Gray.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol 100, No HY2, Paper No 10354, p 267-277, February 1974. 1 fig, 1 tab, 2 ref.

Descriptors: *Dams, *Safety, *Hydraulics, *Governments, *Reclamation, *Water resources, *Spillways, *Reservoirs, Design, Earthquakes, Floods, Hydrology, Legislation, Landslides, Water supply, Water works, Concrete dams, Earth dams, Maintenance.
Identifiers: Systems engineering.

The program of the Bureau of Reclamation for monitoring the safety of its existing dams includes periodic examinations, dam behavior measurements, spillway capacity reevaluations, seismic and other structural reevaluations, operating instruction documentation and updating, and landslide and upstream dam surveillance. The Bureau has responsibility for the safety of dams for 240 reservoirs with capacities ranging from 1,000 acre-ft. to 29,755,000 acre-ft., all located in 17 western states. Its reservoirs of 5,000 acre-ft. or more in capacity total approximately one-tenth of those in the United States. Recent studies have revealed that a substantial number of Bureau dams constructed before 1950 require spillway capacity determinations using present day hydrologic techniques and data. The adequacy of spillway capacity at older dams of significant size in the United States should be reviewed. (Bell-Cornell)
W75-10221

**COMPUTERIZED SEWER DESIGN: NEW TOOL FOR AN OLD PROBLEM,**
Boyle Engineering, Santa Ana, Calif.
For primary bibliographic entry see Field 5D.
W75-10253

**THE DEVELOPMENT OF A SCHEME TO CONSTRUCT LARGE DIAMETER SEWAGE PUMPING MAINS ACROSS THE RIVER TEES AND THE TEES RAILWAY MARSHALLING YARD,**
For primary bibliographic entry see Field 5D.
W75-10275

**AUTHORIZED BONNEVILLE UNIT, CENTRAL UTAH PROJECT, UTAH (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Bureau of Reclamation, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va 22161 as USDC, EIS-UT-73-1289-F-1, $21.25 in paper copy, $2.25 in microfiche. August 2, 1973. 941 p, 56 map, 32 tab, 24 fig, 6 graph, 13 photo.

Descriptors: *Utah, *Diversion structures, *Irrigation systems, *Water supply development, Reservoirs, Pumping plants, Aqueducts, Tunnels, Canals, Drains, Dikes, Industrial water, Wildlife habitats, Fishing, Recreation, Salinity, Colorado River, Aesthetics, Community development.
Identifiers: *Environmental impact statements, *Uinta Basin(Utah), *Bonneville Basin(Utah).

The project will divert water from the Uinta Basin in the Bonneville Basin in Utah. This will be accomplished by construction of new reservoirs and enlargement of existing reservoirs; construction of 140 miles of aqueducts, tunnels and canals; three power plants; nine pumping plants; 13 miles of dikes and 200 miles of pipe drains. The project will

supply immediate and projected water needs for irrigation, municipal and industrial needs and power production. In some areas, the project will have a significant adverse effect on fish and wildlife habitats as well as loss of quality fishing and stream recreation. In the areas of the reservoirs, however, fishing and water related sports will be substantially increased. Two other effects will be increased salinity of the Colorado River and permanent aesthetic land changes. Alternatives considered were alternate sources of water, various scales of partial construction or non-construction of authorized unit and alternative location. (Altuve-Florida)
W75-10292

**INITIAL STAGE, GARRISON DIVERSION UNIT, PICK-SLOAN MISSOURI BASIN PROGRAM, NORTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Bureau of Reclamation, Billings, Mont. Upper Missouri Region.
Available from the National Technical Information Service, Springfield, Va 22161 as USDC, EIS-ND-74-0058-F, $17.25 in paper copy, $2.25 in microfiche. January 10, 1974. 740 p, 61 fig, 22 dwg, 12 tab, 2 append.

Descriptors: *Environmental effects, *Missouri River, *North Dakota, *River basin development, *Water supply development, Central U.S., Reservoirs, Irrigation water, Reservoir construction, Water yield improvment, Recreation, Water management(Applied), Water distribution(Applied), Irrigation systems, Diversion, Alteration of flow, Canals, Irrigation canals, Lateral conveyance structures, Agriculture, Wildlife habitats, Lakes, Streamflow, Federal government, Water resources development.
Identifiers: *Environmental impact statements, Missouri River(ND), Lake Lakakamea(ND).

The project entails construction of a system of reservoirs, canals, and laterals to divert water from the Missouri River and Lake Lakakamea in the Missouri Basin of North Dakota. About 30% of the population of North Dakota resides in the project area, which is predominantly rural and agricultural. As a result of the project, substantial water supplies will be provided for irrigation, municipal and industrial use, fish and wildlife developments, outdoor recreation, and improvement of base flows of local streams. Adverse environmental effects include a 5% flow depletion in the Missouri River, increased stream salinity, stabilized flow of intermittent streams, intrusion of rough fish, and inundation of some archaeological sites. Alternatives considered were: no development, precipitation management, use of ground water, alternate locations, and modification of planned distribution systems. Although the short-term uses of the area will be hampered by construction activity and temporary disruption of wildlife habitats, long-term benefits will be gained in agriculture, water resources and quality, recreation, and the economy. In addition to commitments of water and land resources, electric power, construction materials, and public and private funds, there will be irreversible losses of vegetation, wildlife, archaeological, and mineral resources. Comments indicated overwhelming support of the project. (Fernandex-Florida)
W75-10296

**CLAYTON LAKE, JACK FORK CREEK, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Tulsa, Okla.
Available from the National Technical Information Service, Springfield, Va 22161 as USDC, EIS-OK-74-0199-F.

Descriptors: *Environmental effects, *Oklahoma, *Dam construction, *Flood routing, *Water supply, Dams, Check structures, Damsites, Water control, Water storage, Water management(Applied), Flood control, Water supply development, Federal government, Flood protection, Streams, Artificial lakes, Archaeology, Recreation, Agriculture, Lumber, Wildlife, Waterfowl, Vegetation effects.
Identifiers: *Environmental impact statements, *Clayton(Okla), Dam effects, Jackfork Creek(Okla).

The project involves the construction of a dam and lake on Jackfork Creek, north of Clayton, Oklahoma. The mountainous terrain is covered with timber of commercial value, and small areas are used for pasture and cultivation. Significant reduction of annual flood damge and production of a dependable water supply are expected to be the main impacts of the project together with enhanced recreational resources. Adverse results will be suffered by animal and plant life, stream-oriented recreation, archaeological sites, and numerous families, roads, and utility lines which must be relocated. Alternatives considered were: (1) no action, (2) defer water management to other government agencies, (3) construct a dry lake, (4) utilize upstream multipurpose projects, (5) use levees, and (6) acquire flood plain rights. The benefits of the lake to the area outweigh maintaining the status quo because the project will enhance the environment for a larger number of people than is possible under the present use. Resources committed to developing lands for the present agricultural use and costs of dam construction and road relocation cannot be regained. Generally, comments indicated concern over destruction of the present environment. (Fernandez-Florida)
W75-10297

**WARM SPRINGS DAM AND LAKE SONOMA PROJECT, RUSSIAN RIVER BASIN, SONOMA COUNTY, CALIFORNIA, PART I (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, San Francisco, Calif.
Available from the National Technical Information Service, Springfield, Va 22161 as USDC, EIS-CA-73-1910-F-1, $10.50 in paper copy, $2.25 in microfiche. December 10, 1973. 415 p, 4 fig, 15 plate, 16 photo, 5 append.

Descriptors: *Dams, *Reservoirs, *Channel improvement, *Water supply, *Flood protection, *Channel improvement, *Water supply, *Flood protection, Levees, Earth dams, *California, Recreation, Fish hatcheries, Environmental effects, Erosion, Dusts, Turbidity, Air environment, Wildlife, Mosquitoes, Litter, Water supply development, Anadromous fish, Flood plains.
Identifiers: *Environmental impact statements, *Dry Creek(Calif).

The project entails the construction of an earthfill dam 319 feet high on Dry Creek, California, which will impound a reservoir having a capacity of 381,000 acre-feet. The project includes recreation facilities, a fish hatchery, and channel improvements. A total of 17,650 acres of land will be acquired. Short-term environmental effects of the project include increased erosion, dust and stream turbidity, changed air quality, increased noise, loss of wildlife habitat, unsightly spoil disposal, clearing operations, cut slopes, increased liter, mosquitoes, and rattlesnake exposure. The long-term environmental effects include increased water supply, decreased flooding of downstream areas, changed stream flow regime, reduced downstream sediment transport, changed channel conditions, gravel operations and closure pattern, improved anadromous fishery, increased recreational opportunities and traffic, and the possibility of reduced seismic ability. The following alternatives were considered: other scales of development at the same site; selection of another nearby site for the dam; construction of one or more other dams; combination of non-reservoir alternatives, such as levees, wastewater reclamation, better utilization of existing water supplies, control of flood plain land uses, and no action. (See also W75-10299) (Gagliardi-Florida)
W75-10298

**WARM SPRINGS DAM AND LAKE SONO PROJECT, RUSSIAN RIVER BASIN, SONO COUNTY, CALIFORNIA. PART II (FINAL VIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, San Francisco, Calif.
Available from the National Technical Info tion Service, Springfield, Va 22161 as USDC, CA-73-1910-F-2, $12.25 in paper copy, $2.2 microfiche. December 10, 1973. 506 p, 3 fig.

Descriptors: *Dams, *California, Environm control, Environment, Springs, Lakes, Ri Environmental effects.
Identifiers: *Environmental impact statem *Sonoma County(Calif), Russian basin(Calif).

Part II of the Warm Springs Dam and Sonoma Project, Russian River Basin, Son County, California, environmental impact s ment consists of thirty-three comments from ous agencies, groups and individuals. Comm were received from the United States De ments of Agriculture, Commerce, Interior, Transportation, and the Environmental Prote Agency and Federal Power Commission, an Friends of the Earth and Sierra Club. (See W75-10298) (Gagliardi-Florida)
W75-10299

**MOUNTAIN PARK RECLAMATION PROJ OKLAHOMA--NUECES RIVER PROJ TEXAS.**
For primary bibliographic entry see Field 4A.
W75-10319

**AUTHORIZED BONNEVILLE UNIT, CENT UTAH PROJECT, UTAH APPENDIX A (FI ENVIRONMENTAL IMPACT STATEMENT)**
Bureau of Reclamation, Washington, D.C.
Available from National Technical Inform Service, Springfield, Va 22161, USDC, as UT-73-1289-F-2, $13.25 in paper copy, $2.2 microfiche. August 2, 1973. 592 p.

Descriptors: *Utah, *River basin develop *Environmental effects, *Water supply dev ment, Water resources development, Fe government, Effects, Environment, Eco Habitats, Irrigation effects, Population, V conservation, Water conveyance, Water dist tion(Applied), Resources, Resources dev ment, Potential water supply, Water su Dams, Reservoirs.
Identifiers: *Environmental Impact Statem *Orem(Utah), Dam effects, Environmental po

These materials comprise Appendix A of the Environmental Statement for the Bonneville Central Utah Project, Utah. Contents consi written comments which were received in re of the August 14, 1972, draft environmental ment and in connection with the September 2 23, 1972, public hearing at Orem, Utah. The objective of the project is to provide 313,000 feet of additional water to the Great Basin of for continued municipal and industrial expan In accomplishing this objective, constructio dams, reservoirs, aqueducts, tunnels, canals pumping plants will be necessary. A numb commentators found the project to be a wel answer to the area's water needs. (Ferna Florida)
W75-10331

## 8B. Hydraulics

**SUDDEN RELEASE OF WATER FRO LONG PRISMATIC FLUME,**
Mississippi State Univ., Mississippi State. De Agricultural and Biological Engineering.
J. C. McWhorter, and J. B. Allen.
Available from the National Technical Info tion Service, Springfield, Va. 22161, as PB

$3.75 in paper copy, $2.25 in microfiche. Mis-
ppi Water Resources Research Institute, Mis-
ppi State, Completion Report, July 1975. 24 p,
g, 4 tab, 5 ref. OWRT A-086-MISS(1).

criptors: *Hydraulics, Unsteady flow,
locity, *Flumes, *Open channel flow, *Flow
acteristics, Dye releases, *Dye dispersion,
ribution.
tifiers: Velocity distribution curves.

purpose was to acquire both qualitative and
titative knowledge of flow characteristics
lting from the sudden release of water from
end of a long, straight flume of rectangular
s section. The flume bottom was adjusted to a
zontal plane, filled to the desired still water
h, and the quick-opening gate was released.
ie cameras were located on a line parallel to
ong axis of the flume in order to photograph
vater movements at 5 predetermined stations.
chronized clocks were located along the flume
at each station and indicated the time after the
se of the gate. Dye was injected into the water
vertically spaced openings at each station at
us time intervals. The glass wall of the flume
marked with a grid system at each station so
photographs showed the position of the dye,
vater depth, and the time. This procedure per-
d the determination of the velocity at any
depth, and station. Volume changes from the
le enabled the calculation of average veloci-
Tests were conducted with the flume horizon-
nd filled to 4 different initial depths. The
ement of the dye at each station immediately
the sudden release of the gate was studied.
advancing dye front presented a velocity dis-
tion curve.
-10017

RAULIC MODEL STUDY OF A LARGE-
ACITY SETTLER IN A WATER CAPTURE
TEM (BADANIA HYDRAULICZNE
DELU DUZEGO OSADNIKA NA UJECIU
OCIAGOWYM),
primary bibliographic entry see Field 5D.
-10043

SUREMENT OF SMALL DISCHARGES
OUGH V-NOTCH WEIRS,
old and Stevens, Inc., Beaverton, Oreg.
eupold, Jr., and R. S. Blois.
r and Sewage Works, Reference Number
p R148-R150, April 30, 1975. 1 fig, 4 tab.

riptors: *Weirs, *Discharge(Water), *Flow
urement, Streamflow, Flowmeters, Flow
, Water measurement, Sewers, Open chan-
Irrigation canals.
ifiers: V-notch weirs.

harge measurement of small streams, irriga-
canals, sewers, and other open channels can
tisfactorily achieved with the use of V-notch
. The four sizes of V-notches commonly used
0, 60, 45, and 22.5 deg. The size selected will
nd on the expected maximum flow and the al-
ble depth over the weir. Minimum recom-
ded depths of flow over V-notch weirs were
for 90 deg, and 0.1 ft for 45 and 22.5 deg. If a
operator instrument is used to continuously
d the water level, it is important to select a
size that will give at least 0.3 ft of head for the
ge low-flow condition. Construction sug-
ons were discussed for installation of tempo-
and permanent weirs. Discharges in cubic feet
econd and million gallons per day were tabu-
for each weir size for heads ranging from 0.1
9 ft. (Humphreys-ISWS)
10059

RODYNAMIC LEVELLING OF AN OFF-
RE TIDE GAUGE,
ute of Oceanographic Sciences, Taunton
land).
Alcock, and D. T. Pugh.
In: The Institution of Civil Engineers Proceedings, Part 2, Research and Theory, Vol 59, p 123-137, March 1975. 6 fig, 3 tab, 7 ref.

Descriptors: *Tides, *Hydrodynamics, *Waves(Water), Mathematical models, Hydraulics, Water levels, Europe, Oceanography, Shallow water, Coasts, Gages, Currents(Water), On-site data collections, Model studies.
Identifiers: *Offshore tides, *Offshore water levels, Tidal cycle.

When designing structures which extend to a considerable distance offshore, it is desirable to have offshore measurements of water level which are referred to the same datum as simultaneous coastal measurements. By using the hydrodynamic equations and only limited current observations, a datum level was transferred to a gage 12.9-km offshore in the Wash on the east coast of England, across water of 7.5-m average depth, where the mean spring tidal range is 6.4 m. Mean values over a lunar tidal cycle were computed. By calculating the datum level on an hourly basis as well, the apparent datum variations were used to investigate the limitations of the simple model applied. Level transfer was estimated to be accurate to within 0.04 m; the maximum uncertainty arises in estimating the residual gradients due to advection and bottom friction terms. (Lee-ISWS)
W75-10060

**DESIGN IMPLICATIONS OF HYDRAULIC JUMPS AT SUDDEN ENLARGEMENTS,**
Mozambique Univ., Lourenco Marques. Dept. of Civil Engineering.
L. E. de M. Magalhaes, and P. Minton.
In: The Institution of Civil Engineers Proceedings, Part 2, Research and Theory, Vol 59, p 169-174, March 1975. 5 fig, 1 tab, 7 ref.

Descriptors: *Hydraulic jump, *Hydraulic models, *Hydraulic design, Open channel flow, Open channels, Hydraulics, Steady flow, Jets, Sluice gates, Channels, Gate control, Laboratory tests, Model studies, Cross-sections.
Identifiers: *Sudden enlargement channels, Channel geometry.

A laboratory model study was described of the formation of hydraulic jumps at the junction between a narrow open channel with a fast flow and broad open channel with a slow flow (both flows in the same direction). The channels were rectangular in cross section with parallel side walls and a horizontal bed. The size of the model was large enough to suggest that the results should be applicable to full-scale river situations. The flow in the jet from the 0.2-m wide sluice gate in the narrow channel was measured by a calibrated orifice meter. The depth and Froude number of the jet were calculated from the depth upstream of the sluice by the energy equation. An independent water supply was provided for the 0.54-m wide broad channel to give a flow in the same direction as the flow in the narrow channel. The depth of water in the combined downstream channel, measured on the center line 2 m from the sluice, was controlled by the downstream weir. The results indicated that when a hydraulic jump occurs where it is not constrained to two dimensions, it will assume a form (oblique, normal, or submerged) appropriate to the conditions. The effects of many variables, such as the channel breadth ratio and the angle between the broad channel flow and the flow from the sluice, must be studied for a complete understanding of hydraulic jump formation. However, the information obtained confirms that hydraulic jumps at sudden enlargements form at a lower downstream depth than two-dimensional theory would indicate. Thus, a jump forming at an enlargement can submerge a sluice with a downstream depth less than that required to submerge the sluice in a two-dimensional flow. (Lee-ISWS)
W75-10061

**FRICTION COEFFICIENTS FOR LAMINAR SHEET FLOW OVER ROUGH SURFACES,**
University of the West Indies, Kingston (Jamaica).
H. O. Phelps.
In: The Institution of Civil Engineers Proceedings, Part 2, Research and Theory, Vol 59, p 21-41, March 1975. 16 fig, 5 tab, 17 ref.

Descriptors: *Roughness(Hydraulic), *Sheet flow, *Overland flow, *Laboratory tests, *Flow resistance, Fluid mechanics, Reynolds number, Froude number, Hydraulics, Transition flow, Friction, Laminar flow, Dimensional analysis, Boundary layers.
Identifiers: Relative roughness.

Systematic tests of sheet flow in the laminar and transition regions were carried out on eight surfaces of varying degrees of roughness. The Darcy friction coefficient was the primary dependent variable. Analysis of the results showed that the product of the Darcy coefficient and the Reynolds number, a constant in steady laminar flow on a smooth surface, was a function of the relative roughness. It was also found that the critical value of the Reynolds number decreased as the relative roughness increased. Measurable effects, similar to those observed in turbulent flow over rough surfaces, were produced by changes in shape and concentration of roughness elements. The association of roll waves with the beginning of the transition region suggested that this form of instability contributed to the change of flow regime and lead to the conclusion that the Froude number was significant. The possibility of developing a roughness standard was explored. (Adams-ISWS)
W75-10062

**A MODEL FOR EARTHQUAKES NEAR PALISADES RESERVOIR, SOUTHEAST IDAHO,**
Geological Survey, Denver, Colo.
D. Schleicher.
Available from Sup Doc, GPO, Wash., D.C. 20402, $3.15 single journal copy, $18.90 yearly subscription rate. Journal of Research of the U.S. Geological Survey, Vol 3, No 4, p 393-400, July-August 1975. 7 fig, 21 ref.

Descriptors: *Earthquakes, *Reservoirs, *Model studies, *Idaho, Faults(Geologic), Water levels, Stress, Seasonal, Seismic properties.
Identifiers: *Palisades Reservoir(Idaho), Epicenter.

The Palisades Reservoir, Idaho, seems to be triggering earthquakes: epicenters are concentrated near the reservoir, and quakes are concentrated in spring, when the reservoir level is highest or is rising most rapidly, and in fall, when the level is lowest. Both spring and fall quakes appear to be triggered by minor local stresses superposed on regional tectonic stresses; faulting is postulated to occur when the effective normal stress across a fault is decreased by a local increase in pore-fluid pressure. The spring quakes tend to occur when the reservoir level suddenly rises: increased pore pressure pushes apart the walls of the graben flooded by the reservoir, thus decreasing the effective normal stress across faults in the graben. The gall quakes tend to occur when the reservoir level is lowest: water that gradually infiltrated poorly permeable zones during high reservoir stands is then under anomalously high pressure, which decreases the effective normal stress across faults in the poorly permeable zones. (Woodard-USGS)
W75-10139

**INJECTION-PIPE SYSTEM FOR ARTIFICIAL RECHARGE,**
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 4B.
W75-10142

HYDROLOGIC DATA FOR NORTH CREEK, TRINITY RIVER BASIN, TEXAS, 1973,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-10149

VALVE STROKING IN SEPARATED PIPE FLOW,
Edinburgh Univ. (Scotland). Dept. of Mechanical Engineering.
M. Driels.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol 100, No HY11, Paper No 10940, p 1549-1563, November 1974. 12 fig, 34 equ, 9 ref, 4 appen.

Descriptors: *Valves, *Hydraulics, *Water hammer, *Cavitation, Pipe flow, Piping systems(Mechanical), Air entrainment, Surges, Equations, Simulation analysis, Computer programs, Velocity, Control, Algorithms, Mathematical models.
Identifiers: Fluid flow, Transients, Prediction, Steady-state pressure, Valve closure, Linear closure, Method of characteristic.

Apart from assessing the magnitude of a pressure surge propagated within a pipe flow system, the engineer needs to be able to reduce the surge, possibly using a process known as valve stroking. Although methods of valve stroking exist, they are not applicable to systems in which flow separation occurs due to the loss of control by the valve on the separated column. Developed are two methods for dealing with such a situation. It is shown that for the first method, a surge reduction of 40% is typical; these results are supported by experimental evidence. The second method indicates that a 95% reduction in the surge is possible, although at present no experimental data are available to confirm this. (Bell-Cornell)
W75-10210

TRANSFORMATION OF MOODY DIAGRAM,
Haile Sellassie I Univ., Addis Ababa (Ethiopia). Dept. of Civil Engineering.
K. C. Asthana.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol 100, No HY6, Paper No 10624, p 797-808, June 1974. 1 fig, 1 tab, 21 equ, 2 ref.

Descriptors: *Pipe flow, *Hydraulics, *Darcys law, *Moody resistance diagrams, Headloss, Friction, Equations, Pipes, Size, Velocity.

The Moody diagram has been extensively used for the solution of pipe flow problems. A revised pipe flow diagram between dimensionless parameters is developed based on the transformation of the Moody diagram with the help of the Darcy equation. The revised diagram eliminates the repeated use of the Darcy equation, the friction factor, and the need of successive trials in the solution of pipe flow problems. It provides a more direct, simple, and convenient means of solving pipe flow problems within the range of accuracy expected from the original Moody diagram. (Bell-Cornell)
W75-10216

TRANSIENT CONTROL IN LOWER SACRAMENTO RIVER,
Bureau of Reclamation, Sacramento, Calif. Applications Branch.
For primary bibliographic entry see Field 4A.
W75-10219

SAFETY OF DAMS--BUREAU OF RECLAMATION,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8A.
W75-10221

## 8C. Hydraulic Machinery

MECHANICAL MANAGEMENT OF AQUATIC VEGETATION: ANALYTICAL STUDIES OF UNIT OPERATIONS POTENTIALLY USEFUL IN THEIR PROCESSING,
Wisconsin Univ., Madison. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 4A.
W75-09861

GEOTHERMAL BRINE ENERGY TO GENERATE POWER,
Chevron Research Co., San Francisco, Calif. (assignee).
J. R. B. Ellis, and A. W. Pryor.
U S Patent No 3,862,545, 3 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 930, No 4, p 1761, January 28, 1975.

Descriptors: *Patents, *Geothermal studies, *Thermal properties, *Subsurface waters, Brines, Salts, Electric powerplants, Steam turbines, Energy.

A process is described for using energy from a hot brine to generate power. The process consists of flashing the hot brine in a flash zone to form steam and a concentrated brine. The steam is used to drive a power-generating turbine. Exhaust steam from the turbine is condensed. This condensate from the turbine exhaust is combined with the concentrated brine to form a restored brine and consequently the restored brine is returned to the source of the hot brine. Oxygen is excluded from the system to minimize corrosion. The flash zone contains at least one flash drum and preferably the hot brine is flashed without any substantial crystallization of the soluble salts. (Sinha-OEIS)
W75-09863

REVERSE OSMOSIS SYSTEM WITH AUTOMATIC VALVE FOR MODULE OPERATION CONTROL,
Desalination Systems, Inc., Escondido, Calif. (assignee)
For primary bibliographic entry see Field 3A.
W75-09877

VALVE STROKING IN SEPARATED PIPE FLOW,
Edinburgh Univ. (Scotland). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W75-10210

CALIFORNIA PLANT GETS STRAIGHT 'A'S IN COMPUTER CONTROL,
San Jose-Santa Clara Water Pollution Control Plant, San Jose, Calif.
For primary bibliographic entry see Field 5D.
W75-10264

SUBMERSIBLE PUMPS MAKE BY-PASS POSSIBLE,
Los Angeles County Sanitation District, Whittier, Calif.
J. A. Redner, and J. E. Kenmir.
Water and Wastes Engineering, Vol 12, No 4, p 62, 64, April, 1975.

Descriptors: *Pumps, Valves, Pipes, Flood control, Equipment, Installation, Sewerage, *Waste water treatment, *California.
Identifiers: *Los Angeles County(Calif), Submersible pumps, Pumping stations.

Five submersible pumps in Los Angeles County, California, have been installed to provide emergency by-pass of waste water pumping stations. This installation was in response to a flooding in 1972 when power was lost and waste water from a wet well flooded the pump house. Portable s
mersible pumps were chosen because of operat
reliability. Of the pumping stations in the Los A
geles district, 23 have volume and head conditi
in the correct range for high-capacity electric s
mersible pumps. Of these stations, conditi
range from 9000 gpm at 26 feet to 1200 gpm at
feet. Extreme emergency conditions would requ
two pumps in parallel to handle the flow. T
pumps ordered consist of two 30 hp Flygt Mo
CS 3200, two 77 hp High Volume Flygt Model
3300, and one 88 hp High Head Flygt Model
3300. In an emergency, a pump will be rushed
truck to the disabled pump station. A qu
coupling discharge pipe can be connected t
flanged fitting on the pump and the pump
discharge pipe will be lowered into a pump
manhole along guide rails. The free end of the
minum discharge pipe will then be connected t
permanently installed force main connection p
using a victaulic coupling. The entire connect
operation should average only thirty minutes
fore actual by-pass pumping begins. (Prag
FIRL)
W75-10276

WASTEWATER LIFT STATION OPENS W
TO URBAN EXPANSION.
The American City, Vol 90, No 3, p 59-60, Mar
1975.

Descriptors: *Pumps, Sewerage, Installati
Sewage treatment, Maintenance, Equipme
Waste water treatment, Illinois.
Identifiers: *Pump stations, Homewood(Ill).

A pre-engineered underground pump station
built and installed in Homewood, Illinois in or
to control the sewerage system of an expanding
sidential development. This lift station is capa
of transferring up to 8.3 mgd of sewage collec
from the annexed area to the Homewood receiv
line. The station has three pumps, with two
these already put into operation. Sewage will fl
into a 4000 gallon wet well; as this well fills, b
pressure on a compressor-operated air bubbler
creases until a mercury pressure switch is ac
ated. At a pre-determined level, the switch en
gizes one of the two pumps. The mercury press
of each pump is set so that both pumps n
operate during periods of maximum flow,
tributing their work evenly. The pumps t
discharge the sewage through a check valve an
discharge gate valve to a force main; the sew
then flows by gravity for another one and
quarter miles to the treatment plant. Each pum
rated at 4200 gpm against a total dynamic heac
38 feet and is driven by 60 hp, 875 rpm electric
tors. Only a six-week installation period
required for the entire station, which arrived p
constructed from Ecodyne in Kansas. Thus
maintenance has been minimal, and records
meter readings are kept daily. (Prague-FIRL)
W75-10277

MINUTES OF THE 89TH MEETI
(ARKANSAS-RED-WHITE RIVER BASI
INTER-AGENCY COMMITTEE).
Arkansas-White-Red Basins Inter-Agency C
mittee, Wichita, Kans.
For primary bibliographic entry see Field 4A.
W75-10300

DURABLE SLURRY PUMPS ARE HEART
POLLUTION CONTROL FACILITY AT
LAND.
Iron and Steel Engineer, Vol 52, No 4, p 97,
April, 1975. 2 fig.

Descriptors: *Waste water treatment, *Indust
wastes, Pumps, Filtration, Treatment facilit
Water quality control, Chlorination, Coo
towers, Filters, Hydrogen ion concentration.
Identifiers: Steel mills, pH control, Biocide a
tion.

nd Steel Company's continuous slab casting lity at Indiana Harbor Works has been in ration for two years. The initial design require- nts of maximum quality production and water lity control were fulfilled through the success- implementation of a closed-loop cooling water ation and treatment plant. Four slurry handling ps act as filtration unit feed pumps and as fil- ion media scrubbing pumps at different times he sequence of the 24 hr filtration cycle. romation Filter Corporation designed and in- ed the high-performance, in-depth water filtra- system. The process involves a deep-bed filter finely divided permanent filter media. The uted liquid, often containing up to 200 ppm of abrasive mill scale, enters the center of the r bed and flows radially outward through the r media. High inlet velocities drive the con- nants into the bed. The pressure and velocity ease as the liquid passes through the media itting continuous dirt and particle entrap- t. In addition to the filtration, treatment com- es chlorination, pH control, biocide addition, a pass through a cooling tower. (Orr-FIRL) -10340

COMPARISON OF THE ENVIRONMEN- ASPECTS OF NUCLEAR AND FOSSIL LLED POWER STATIONS,
South Wales Univ., Kensington (Australia). ol of Nuclear Engineering.
Holy.
lable from the National Technical Informa- Service, Springfield, Va 22161 as Rept No 740555, $4.00 in paper copy, $2.25 in ofiche. May 20, 1974. p 153-161, 2 tab, 10 fig, f.

criptors: *Nuclear powerplants, *Nuclear gy, *Fossil fuels, *Electric powerplants, nparative benefits, *Effluents, lioactivity, Air pollution, Water pollution, contamination, Environmental effects, an population, Thermal pollution, Public h, Coals, Sulfur.
tifiers: Fuel reprocessing.

of the major problems facing our society are the growing demands for energy and the tion associated with its generation. World ves of fossil fuels alone will not meet these nds, and it is obvious that other power es, such as nuclear fission, must supplement ombustion processes currently used. In this r, the major environmental hazards as- ted with both fossil fuelled and nuclear power ns are discussed, using data both from Aus- and overseas. The environmental and biolog- effects of air pollution, thermal pollution, active effluent from power stations and fuel cessing plants, and radioactive waste sal are dealt with, and the safety of nuclear r stations discussed. Two methods are out- for the comparison of hazards associated fossil fired and nuclear plants, and one of is used in the analysis. The paper is not in- d to provide an exhaustive study of the sub- ut rather to indicate the major points of con- and to illustrate a possible approach using a e model for such environmental com- ns. (Houser-ORNL) 10349

## Soil Mechanics

NEERING UTILITY AND SEWAGE LINES RMAFROST SOIL,
rimary bibliographic entry see Field 5D. 10192

LIQUEFACTION BY TORSIONAL SIM- HEAR DEVICE,
ington Univ., Seattle. Dept. of Civil En- ring.
bashi, and M. A. Sherif.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol 100, No GT8, p 871-888, August 1974. Paper 10752. 19 fig, 4 tab, 4 ref.

Descriptors: *Soil liquefication, *Shear, *Measurement, Stress, Earthquakes, Shear device, Laboratory tests, Equipment.
Identifiers: *Torsional simple shear device.

As a result of severe earthquakes, structural damage due to soil liquefaction has become an area of study in many research laboratories. A simple shear device, the conventional equipment for liquefaction laboratory study, has several difficulties. A new instrument eliminates such effects as wall friction without sacrificing requirements of duplicating in situ stress and strain conditions. The new instrument called the Torsional Simple Shear Device, was compared with the simple shear test equipment. It was found that with the Torsional Simple Shear Device one can check and verify the adequacy of the amount of soil saturation prior to cyclic testing and one can study the effects of lateral soil confinement on the liquefaction potential of the test sample. In addition, the Torsional Simple Shear Device tests the soil with a unique cross-sectional area and imposes uniform shear strains and stresses, thus providing more reliable experimental results. (Prague-FIRL)
W75-10231

BIG HILL LAKE CREEK, KANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
Available from the National Technical Information Service, Springfield, Va 22161 as USDC, EIS-KS-73-1621-F, $8.50 in paper copy, $2.25 in microfiche. October 11, 1973, 271 p, multiple tab, multiple map.

Descriptors: *Multiple-purpose reservoirs, *Environmental effects, *Kansas, *Dam construction, *Earth dams, Watershed management, Watersheds(Basins), Water supply development, Water supply, Flood protection, flood plains, Flooding, Engineering structures, Multiple-purpose projects, Artificial lakes, Federal government, Water conservation, Wildlife habitats, Recreation, Embankments, Impoundments, Flood control.

This project is located on Big Hill Creek in southern Kansas and calls for the construction of a lake for flood control, water supply, and recreation. A 4,425-foot long earthen embankment will be constructed creating a lake having a capacity of 40,600 acre-feet at the top of the flood pool. The project site is a predominantly agricultural and rural area. Construction of the lake will largely eliminate flood damage in the area below the dam and will provide 8.5 million gallons per day of high quality water supply for the next 100 years. 2700 acres of cropland, pasture and woodland will be committed to the project, with 1240 acres inundated by the conservation pool and another 280 acres subject to periodic flooding. 12 miles of stream habitat will be lost and nine archaeological sites will adversely affected. Various combinations of dry lakes and water supply lakes, various flood plain management programs, and no action were among alternatives considered. The project will enhance the long term productivity of the region, and except for construction materials, will require no irretrievable commitment of resources. The area inundated will be committed for the life of the project. There appears to be no significant oppositon to this project. (Deckart-Florida)
W75-10293

TYBEE ISLAND GEORGIA, BEACH EROSION CONTROL PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4D.
W75-10294

## 8I. Fisheries Engineering

MARKING ALEWIFE FRY WITH BIOLOGICAL STAINS,
Department of the Environment, Halifax, (Nova Scotia). Fisheries Service.
B. M. Jessop.
Prog Fish-Cult, Vol 35, No 2, p 90-93, 1973.
Identifiers: *Alewife, Alosa-pseudoharengus, *Biological stains, Fry, *Fish marking, Fish handling.

Bismark brown Y was more suitable than neutral red from the immersion staining of young alewives (Alosa pseudoharengus). It was less toxic than neutral red and produced an identifiable mark for a longer time. Should the difficulties experienced in handling these fish be overcome, the marking method may be of practical use in population estimates.--Copyright 1973, Biological Abstracts, Inc.
W75-10029

INFLUENCE OF LIGHT INTENSITY ON THE BIOENERGETICS OF CHANNEL CATFISH,
Missouri Univ., Columbia.
E. F. McDonald.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-73-11007, $3.75 in paper copy, $2.25 in microfiche. MS thesis, May 1973. Report No. NOAA-73052409. 36 p, 2 fig, 5 tab, 11 ref. NOAA 2-164-R.

Descriptors: *Fish behavior, *Light intensity, *Animal physiology, *Channel catfish, Fish diseases, Animal growth, Productivity, Respiration, Water quality, Growth rates, Metabolism, Aquiculture, Economics, Oxygen requirements.

The primary objective was to measure growth and food conversion of the channel catfish, Ictalurus punctatus, as affected by light. Also studied were the behavior, metabolism, feeding, and growth at different light intensities. Investigations were conducted under three light intensities of full, 1/10th full, and negligible. For the larger fish there was significantly greater growth under negligible light intensity. For small fish there was no significant difference between weight gain under different light conditions. Oxygen consumption indicated that for the larger fish the differences between activity curves at each intensity were not great, but the medium intensity curve showed the highest levels of activity. For the small fish oxygen consumption curves indicate that activity pattern of fish under medium and high light intensity were nearly identical except that fish activity under high light intensity appears to be more depressed during the hours of light. Medium and high light curves show the highest levels of activity at 'lights on' and 'lights out' with the lowest levels during the hours of light. Light intensity must be considered only a secondary determinant of success and efficiency in catfish production when compared to the problems associated with pathology; both parasitic and bacterial diseases were evident. (Jones-Wisconsin)
W75-10100

ARTIFICIAL REEFS FOR TEXAS.
Texas A and M Univ., College Station. Industrial Economics Research Div.
For primary bibliographic entry see Field 3E.
W75-10119

# 9. MANPOWER, GRANTS AND FACILITIES

## 9A. Education (Extramural)

**WATER RESOURCES PUBLICATIONS RELATED TO THE STATE OF NEBRASKA THIRD EDITION.**
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 10C.
W75-10015

**RECOMMENDATIONS FOR ENVIRONMENTAL ENGINEERING EDUCATION,**
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
W. O. Pipes.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 100, No EE2, Paper No 10459, p 243-252, April 1974.

Descriptors: *Water pollution, *Water quality control, *Education, *Environmental engineering, Land use, Natural resources, Air pollution, Public health, Radiation, Protection, Research, Sanitary engineering, Solid wastes, *Manpower.
Identifiers: Accreditation, Continuing education, *Engineering education, Fellowships, Industrial hygiene, Professional advancement, Public works, Refuse disposal.

Presented is a summary and discussion of the recommendations which were put forth at the Third National Conference on Environmental Engineering Education held at Drexel University, Philadelphia, in August 1973. Reports and proposed recommendations were originally developed by seven committees in preparation for the Conference. The proposed recommendations were discussed and modified and some were adopted at the Conference. The recommendations are concerned with the identity of, the manpower needs for, and educational programs for environmental engineering. A large number of civil engineers and some engineers with other educational backgrounds have identified with environmental engineering as a field of practice. The field is broad because it is concerned with protecting human populations from environmental hazards and with protecting environments from the effects of human activities. (Bell-Cornell)
W75-10218

**TENTH ANNUAL REPORT, FISCAL YEAR 1974,**
Auburn Univ., Ala. Water Resources Research Inst.
For primary bibliographic entry see Field 9D.
W75-10339

## 9D. Grants, Contracts, and Research Act Allotments

**WATER RESOURCES PUBLICATIONS RELATED TO THE STATE OF NEBRASKA THIRD EDITION.**
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 10C.
W75-10015

**TENTH ANNUAL REPORT, FISCAL YEAR 1974,**
Auburn Univ., Ala. Water Resources Research Inst.
J. C. Warman.
1974. 69 p, 1 fig, 19 photo, 1 tab, 38 ref. OWRT A-999-ALA(3).

Descriptors: *Alabama, *Water quality control, *Water resources development, *Water supply development, Agriculture, Water pollution, Water, Water quality, Water quality standards, Water resources, Water supply, Water conservation, Water pollution control, Water pollution effects, Water pollution sources, Water pollution treatment, Pollutant identification, Pollutants, Pollution abatement, Waste water(Policy), Waste water treatment, Wastes, Waste treatment, Waste water disposal.
Identifiers: Hazardous substances(Pollution).

Alabama's most pressing water problems are in the area of water quality management and protection and in water resources planning. Other problem areas highlighted by the state's new Water Resources Research Advisory Committee are included in the categories of water cycle and water supply augmentation and conservation. Principal areas considered include: the nature of water, the water cycle, conservation in agriculture, identification of pollutants, sources and fate of pollution, the effects of pollution, waste treatment processes, ultimate waste disposal, water quality control, techniques of planning, evaluation processes, cost allocation, cost sharing, and pricing and repayment. (Gagliardi-Florida)
W75-10339

# 10. SCIENTIFIC AND TECHNICAL INFORMATION

## 10C. Secondary Publication And Distribution

**HUMAN RADIATION DOSE STUDIES. A SELECTED BIBLIOGRAPHY.**
Technical Information Center (AEC), Oak Ridge, Tenn.
For primary bibliographic entry see Field 5A.
W75-09890

**TERRESTRIAL AND FRESHWATER RADIOECOLOGY, A SELECTED BIBLIOGRAPHY,**
Washington State Univ., Pullman. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W75-09891

**REVIEW OF LITERATURE PERTINENT TO THE AQUEOUS CONVERSION OF RADIONUCLIDES TO INSOLUBLE SILICATES WITH SELECTED REFERENCES AND BIBLIOGRAPHY (REVISED),**
Atlantic Richfield Hanford Co., Richland, Wash.
For primary bibliographic entry see Field 5D.
W75-09892

**BIBLIOGRAPHY ON THE APPLICATION OF REVERSE OSMOSIS TO INDUSTRIAL AND MUNICIPAL WASTEWATERS,**
Department of the Environment, Ottawa (Ontario). Waste Water Technology Centre.
For primary bibliographic entry see Field 5D.
W75-09925

**WATER RESOURCES PUBLICATIONS RELATED TO THE STATE OF NEBRASKA THIRD EDITION.**
Nebraska Univ., Lincoln. Water Resources Research Inst.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 778, $5.25 in paper copy, $2.25 in microfiche. Publication No 7, May 1975, 100 p. OWRT A-999-NEB(16) 14-31-0001-5027.

Descriptors: *Bibliographies, *Publications, *Nebraska, *Information exchange, State governments, Federal government, Universities, ganizations, Coordination, *Water resources.

This is the third edition of 'Water Resources I cations Related to the State of Nebraska' v lists water-related publications from Neb state, federal and university agencies and d ments. The material provided should facilita exchange of information between the vario ganizations interested in Nebraska's w Complete author and key word indexes are tained in this third edition. Listings are referenced whenever practical. The Table of tents indicates major subdivisions of the bi raphy: Federal agencies, State agencies, Uni ty of Nebraska, Chadron State College, L Plate South Natural Resources District, and souri River Basin Commission. (Stork-Nebra
W75-10015

**SURFACE WATER DATA, REFERE INDEX, CANADA 1974.**
Water Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 07C
W75-10064

**IRRIGATION EFFICIENCIES IN PRODU CALORIES AND PROTEINS: AN ANNOT BIBLIOGRAPHY,**
California Univ., Los Angeles. School of H Health.
For primary bibliographic entry see Field 03F
W75-10076

**OZONE CHEMISTRY AND TECHNOLO REVIEW OF THE LITERATURE: 1961-1974**
Franklin Inst. Research Labs., Philadelphia Science Information Services Dept.
For primary bibliographic entry see Field 05D
W75-10348

## 10D. Specialized Information Center Services

**SURVEY OF LAKE REHABILITA TECHNIQUES AND EXPERIENCES,**
Wisconsin Dept. of Natural Resources, Madi
For primary bibliographic entry see Field 05C
W75-10078

## 10F. Preparation Of Reviews

**RAIN ENHANCEMENT - A REVIEW,**
Commonwealth Scientific and Industrial Res Organization, Epping (Australia). Div. of Physics.
For primary bibliographic entry see Field 03B
W75-09950

**UPGRADING EXISTING WASTEWA TREATMENT PLANTS--CASE HISTORIES**
Environmental Protection Agency, Washin D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 05D
W75-10347

**OZONE CHEMISTRY AND TECHNOLO REVIEW OF THE LITERATURE: 1961-1974**
Franklin Inst. Research Labs., Philadelphia Science Information Services Dept.
For primary bibliographic entry see Field 05D
W75-10348

# SUBJECT INDEX


**SORPTION**
Growth and Dissipation of Phytoplankton in Chesapeake Bay. III. Inorganic Carbon Requirements of Natural Populations and Laboratory Cultures of Phytoplankton,
W75-10103 5C

**STRACTS**
Terrestrial and Freshwater Radioecology, a Selected Bibliography,
W75-09891 5A

**ETYLCHOLINESTERASE**
Toxicity of DFP and Related Compounds to Squids in Relation to Cholinesterase Inhibition and Detoxifying Enzyme Levels,
W75-09909 5C

**TIVATED CARBON**
Making Active Carbon from Sewage Sludge,
W75-09875 5D

Carbon Contact-Filtration: How It Works,
W75-09912 5D

Activated Carbon Treatment of Unbleached Kraft Effluent for Reuse,
W75-10028 5D

Pollution Control, Next Step, Physical/Chemical Treatment, Activated Charcoal,
W75-10279 5D

Hire an Activated Carbon Plant for Waste Water Treatment,
W75-10346 5D

**TIVATED CARBON COLUMNS. TOC**
Removal of Organic Matter by Activated Carbon Columns,
W75-10197 5D

**TIVATED SLUDGE**
Joint Treatment of Pulping and Municipal Wastes,
W75-09928 5D

Removal of Organic Matter by Activated Carbon Columns,
W75-10197 5D

Evolution of Microflora During Purification Treatment of Urban Water by Activated Sludge Evolution de la Microflore au Cours D'un Traitement D'Epuration D'eaux Urbaines Par Boues Activees),
W75-10227 5D

Upgrading Existing Wastewater Treatment Plants--Case Histories.
W75-10347 5D

**PTIVE TRAINABLE NETWORK**
Forecasting Watershed Pollution Using a Model,
W75-10249 5A

**ACENT LAND OWNERS**
Surface Waters and the Civil Law Rule,
W75-10304 6E

**ACENT LANDOWNERS**
Sutherland v. Hickory Nut Corp. (Action for Damages Caused by Construction of Roads by Adjacent Property Owner Which Altered Natural Drainage of Mountain Land).
W75-10315 6E

**ADJUDICATION PROCEDURE**
Ton-Da-Lay, Ltd. v. Diamond (Review of Denial of Application for Water Supply and Sewage Treatment Systems).
W75-10314 6E

**ADMINISTRATION**
Implementation of the Federal Water Pollution Control Act.
W75-10322 5G

**ADMINISTRATIVE AGENCIES**
Rules and Regulations, Southwest Water Management District (Florida).
W75-10306 6E

Rules of Central and Southern Flood Control District, Chapter 16CA, with Commentary.
W75-10307 6E

Dupont De Nemours and Co. v. Train (Action by Chemical Manufacturers to Set Aside Regulations Governing Effluent Discharge of Sulfuric Acid Plants).
W75-10316 6E

Steam Electric Power Generating Point Source Category--Proposed Effluent Guidelines and Standards for Incompatible Pollutants.
W75-10323 5G

Marine Sanitation Devices--Proposed Certification Procedures and Design and Construction Requirements.
W75-10324 5G

Canned and Preserved Fruits and Vegetables Processing Point Source Category--Effluent Guidelines and Standards.
W75-10325 5G

Liquid and Crystalline Cane Sugar Refining Subcategory--Effluent Limitations Guidelines and Proposed Pretreatment Standards.
W75-10326 5G

Inorganic Chemicals Manufacturing Point Source Category.
W75-10327 5G

Electroplating Point Source Category; Copper, Nickel, Chromium and Zinc on Ferrous and Nonferrous Materials Subcategory.
W75-10328 5G

Thermal Discharges--Proposed Procedures for the Imposition of Alternative Effluent Limitations.
W75-10329 5G

Asbestos Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-10330 5G

Ferroalloy Manufacturing Point Source Category.
W75-10332 5G

Glass Manufacturing Point Source Categories--Effluent Guidelines and Standards.
W75-10334 5G

Thermal Discharges.
W75-10335 5G

Builders Paper and Board Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-10336 5G

Steam Electric Power Generating Point Source Category--Effluent Guidelines and Standards.
W75-10337 5G

**ADMINISTRATIVE DECISIONS**
Federal Viewpoint (Permit Issuance--Administrative and Judicial Review--Observations and Problems),
W75-10302 5G

**ADMINISTRATIVE REGULATIONS**
The Impact of Secondary Treatment on Wastes Discharged into the Ocean.
W75-10321 5D

Inorganic Chemicals Manufacturing Point Source Category.
W75-10327 5G

**ADSORPTION**
Carbon Contact-Filtration: How It Works,
W75-09912 5D

Heavy Metal Adsorbent.
W75-09934 5D

Biochemical and Nutritional Interactions Between the Oyster (Crassostera Virginica (Gmelin) and its Environment,
W75-10011 5C

**AERATED LAGOONS**
Characterization of Mixing in Aerated Lagoons,
W75-09913 5D

**AERATION**
Austrian Plant Knocks Out Nitrogen,
W75-10225 5D

**AERIAL PHOTOGRAPHY**
Utilization of Aerial Photographs for Measuring Land Use Changes in Watersheds,
W75-10136 4C

**AEROBIC TREATMENT**
Sewage Treatment Tank,
W75-09883 5D

**AEROSOLS**
Some Data About the Mechanism of the Artificial Dissipation of Supercooled Fog,
W75-09949 3B

Preparation and Properties of 'Pure' Silver Iodide Aerosol,
W75-09998 3B

**AERSOLOS**
On the Possibility of Generating Downdrafts by Introducing a High Concentration of Coarse Aersol Particles in the Atmosphere,
W75-09980 3B

**AGRICULTURAL WATERSHEDS**
Predicting Evapotranspiration from Agricultural Watersheds Under Dry Conditions,
W75-09860 2D

**AGRICULTURE**
Irrigation Efficiencies in Producing Calories and Proteins: An Annotated Bibliography,
W75-10076 3F

**AIRPORTS**
Design of a Modern Thermal Fog Dissipation System for Airports,
W75-09947 3B

**ALABAMA**
Proposed 1973 Outer Continental Shelf Oil and Gas General Lease-Sale, Offshore Mississippi, Alabama, and Florida, Volume 3. Alternatives to the Proposed Action (Final Environmental Impact Statement).
W75-10291 5G

**ALABAMA**

Alabama's Water Resources Policy.
W75-10310 5G

Tenth Annual Report, Fiscal Year 1974,
W75-10339 9D

**ALASKA**
The Effect of a Fuel Oil Spill on Benthic Invertebrates and Water Quality on the Alaskan Arctic Slope, Happy Valley Creek Near Sagwon, Alaska,
W75-10140 5C

**ALBERTA**
Historical Streamflow Summary, Alberta, to 1973.
W75-10067 7C

**ALEWIFE**
Marking Alewife Fry with Biological Stains,
W75-10029 8I

**ALGAE**
Use of Algae, Especially Diatoms, in the Assessment of Water Quality,
W75-10112 5A

Shortcut Methods Test Algicides,
W75-10234 5G

**ALGAL-BACTERIAL DYNAMICS**
The Effects of Artificial Destratification on the Water Quality and Microbial Populations of Hyrum Reservoir,
W75-09897 5C

**ALGAL CONTROL**
Shortcut Methods Test Algicides,
W75-10234 5G

**ALGICIDES**
Shortcut Methods Test Algicides,
W75-10234 5G

**ALPINE RESERVOIRS**
Siltation Rates and Life Expectancies of Small Headwater Reservoirs in Montana,
W75-09858 2J

**ALTERNATIVE PLANNING**
A Sensitivity Analysis of Simulated River Basin Planning for Capital Budgeting Decisions,
W75-10223 6A

**ALUM**
Disposal of Waste Alum Sludge from Water Treatment Plants,
W75-10195 5D

**AMMONIA**
Advances in Ammonia and Nitrate Removal,
W75-09911 5D

**ANACOSTIA RIVER BASIN (MD)**
Effects of Sediment Control on Sediment Transport in the Northwest Branch Anacostia River Basin, Montgomery County, Maryland,
W75-10141 2J

**ANAEROBIC DIGESTION**
Sewage Treatment Tank,
W75-09883 5D

Laboratory Simulation of Swine Manure Lagoons,
W75-10137 5D

**ANALYTICAL TECHNIQUES**
Asbestos in Drinking Water,
W75-10030 5A

Quantitative Large-Volume Sampling Technique,
W75-10031 5A

Methods for the Determination of Specific Organic Pollutants in Water and Waste Water,
W75-10032 5A

A Rational Approach for Predicting the Dissolved Oxygen Profile in Receiving Waters,
W75-10034 5A

Elevated Temperature Technique for Enumeration of Salmonellae in Sewage,
W75-10045 5D

A Portable Gas Chromatographic Technique to Measure Dissolved Hydrocarbons in Sea Water,
W75-10096 5A

Some Applications of Thermal Infra-Red Linescan in Water Resources Studies,
W75-10188 5A

New Flowmeter Passes Tests,
W75-10190 5D

GLC Determination of PPB Levels of Citrate by Conversion to Bromoform,
W75-10191 5A

The Determination of Benzidine in Wastewaters,
W75-10232 5A

Estimates of Oil in Aquatic Sediments by Fluorescence Spectroscopy,
W75-10235 5A

Fecal Contamination--The Water Analyst's Responsibility Part II,
W75-10258 5A

Interrupted-Sweep Voltammetry for the Identification of Polychlorinated Biphenyls and Naphthalenes,
W75-10268 5A

Water Monitoring is Big Business.
W75-10269 5A

Analyzing Organics in Dilute Aqueous Solutions,
W75-10350 5A

**ANIMAL PHYSIOLOGY**
Toxicity of DFP and Related Compounds to Squids in Relation to Cholinesterase Inhibition and Detoxifying Enzyme Levels,
W75-09909 5C

Influence of Light Intensity on the Bioenergetics of Channel Catfish,
W75-10100 8I

**ANION EXCHANGE**
Process for Treating Waste Photographic Processing Solutions,
W75-09940 5D

**APHANIZOMENON**
The Effects of Artificial Destratification on the Water Quality and Microbial Populations of Hyrum Reservoir,
W75-09897 5C

**APPROXIMATION METHOD**
Quantitative Error Analysis of Numerical Methods for Partial Differential Equations,
W75-10003 6G

**AQUATIC HABITATS**
Experimental Eutrophication of Terrestrial Aquatic Ecosystems. First Annual Repo the Upland Recharge Project,
W75-10097

**AQUATIC WEED CONTROL**
Mechanical Management of Aquatic Ve tion: Analytical Studies of Unit Opera Potentially Useful in their Processing,
W75-09861

**AQUATIC WEEDS**
Changes in the Submerged Macrophyte munities of Lake Wabamum as a Resu Thermal Discharges,
W75-10074

**AQUIFER CHARACTERISTICS**
Aquifer Parameters by a Chemical T Technique: Non Linear Mixing in the Ro Confined Aquifer,
W75-09893

Ground-Water Hydrology of Garner Va San Jacinto Mountains, California--A M matical Analysis of Recharge and Discharg
W75-10158

**AQUIFERS**
Finite Element Modeling of Flow Thr Porous Media,
W75-09900

Groundwater Pollution by Waste Discharge pollution des eaux souterraines par Decharges),
W75-10042

The Cape Cod Water Program, A Current ysis,
W75-10283

**ARID CLIMATES**
Critical Levels of Phosphorus and Nitrog Texas Impoundments,
W75-10072

**ARIZONA**
Computerized Sewer Design: New Tool f Old Problem,
W75-10253

**ARKANSAS**
Carbon-14 Ages of Water From the Ark Hot Springs,
W75-10145

Minutes of the 89th Meeting, (Arkansas-White River Basins Inter-Agency Committ
W75-10300

**ARKANSAS RIVER BASIN (COLO)**
Reservoir Release Routing Model for Upper Arkansas River Basin of Colorado,
W75-10165

**ARKANSAS-WHITE-RED BASINS**
Minutes of the 89th Meeting, (Arkansas-White River Basins Inter-Agency Committ
W75-10300

**AROCLOR**
Effects of PCB (Aroclor 1254) and P, P' On Production and Survival of Daphnia M Strauss,
W75-09905

**ARSENIC COMPOUNDS**
Arsenic in Sediments on the Continental of Southeast Australia,
W75-10177

CIAL PRECIPITATION
Enhancement - A Review,
9950 3B

s of Seeding Cumulonimbus Clouds
at the Modification of Precipitation in
eppe Part of the Ukraine,
9951 3B

rizzles Extracted From Unsaturated Air
by Seeding with Hygroscopic Nuclei,
9952 3B

etical Research into Artificial Stimulation
cipitation for Fighting Forest Fires,
9956 2B

ility of Meso- and Synoptic-Scale
er Modification from Carbon Particle
E,
9957 3B

ole of Solid Precipitation Elements in
l and Artificial Production of Rain in
9958 3B

all Enhancement,
9959 2C

xperimental Seeding of Frontal Clouds in
in Order to Increase Precipitation,
9960 3B

d-Based Cloud Seeding Experiment at
During Winter,
9961 3B

Artificial Modification of Clouds and
tation in a Mountainous Region,
9962 3B

g Requirements for Rapid Glaciation or
ation of a Mixed Phase Cloud,
9963 3B

ramid Pilot Cloud-Seeding Project,
9964 3B

ML 1973 Florida Area Cumulus Experi-
9981 3B

is of Estimating Physical and Economic
veness of Weather Modification,
9991 3B

nic Aspects of Precipitation Augmenta-
er the Great Lakes,
9992 6B

aluation of Extended Area Effects from
ts to Modify Local Clouds and Cloud
s,
9993 3B

Stimulation Experiments: Design and
tion,
9994 7C

IAL RECHARGE
n-Pipe System for Artificial Recharge,
142 4B

IAL SALT WATER REEFS
al Reefs for Texas.
119 3E

FORM FIBERS
s in Drinking Water,
030 5A

**ASBESTOS**
Disposal of Waste Streams Containing Asbestos,
W75-09876 5E

Asbestos in Drinking Water,
W75-10030 5A

Asbestos Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-10330 5G

**ASSESSMENT**
Issues in Water Resources Impact Assessment,
W75-10222 6B

**ASULAM**
Effect of Asulam in Wildlife Species: Acute Toxicity to Birds and Fish,
W75-09903 5C

**ATLANTIC OCEAN**
The Forging of the Union Reconsidered: A Historical Refutation of State Sovereignty Over Seabeds,
W75-09888 6E

Estimates Using Fluorescence Spectroscopy of the Present State of Petroleum Hydrocarbon Contamination in the Water Column of the Northwest Atlantic Ocean,
W75-10233 5A

**ATMOSPHERE**
Statistical Evaluation of Reaeration Prediction Equations,
W75-10211 5G

Ocean Pollution.
W75-10318 5G

**ATMOSPHERIC PHYSICS**
Feasibility of Meso- and Synoptic-Scale Weather Modification from Carbon Particle Seeding,
W75-09957 3B

**ATPASE**
Toxaphene Inhibition of ATPase Activity in Catfish, Ictalurus Punctatus, Tissues,
W75-09908 5C

**ATTENUATION**
Measurements of Absolute Scalar Irradiance Spectra in Rhode River,
W75-10102 5C

**ATTITUDES**
Georgia County Commissioner Attitudes Toward Water Problems,
W75-09855 6E

Activities, Characteristics, and Opinions of Lakefront Residents: Kissimmee River Basin, Florida,
W75-10129 6B

**AUSTIN (TEX)**
Hydrologic Data for Urban Studies in the Austin, Texas Metropolitan Area, 1973,
W75-10151 7C

**AUSTRALIA**
Arsenic in Sediments on the Continental Shelf of Southeast Australia,
W75-10177 5B

**AUTOMATIC MONITORING**
Routine Surveillance Alternatives for Water Quality Management,
W75-10250 5A

**AUTOMATION**
An Automated Method for Determination of Residual Methanol in Denitrified Effluents,
W75-10047 5D

Water Pollution Monitoring System, (In Japanese),
W75-10196 5A

Computer Control of Sewage Works, Progress at Norwich,
W75-10246 5D

**AVAILABLE WATER**
Hydrologic Reconnaissance of the Wah Wah Valley Drainage Basin, Millard and Beaver Counties, Utah,
W75-10167 4B

**AVERAGE FLOW**
Estimating Mean Streamflow in the Duchesne River Basin, Utah,
W75-10166 2E

**BACTERIA**
Quantitative Large-Volume Sampling Technique,
W75-10031 5A

Comparison of Autoclave and Ethylene Oxide-Sterilized Membrane Filters Used in Water Quality Studies,
W75-10048 5A

The Effects of Selected Herbicides on Bacterial Populations in an Aquatic Environment,
W75-10133 5C

Modeling Microbial Growth in Wastewater Treatment,
W75-10170 5D

Evolution of Microflora During Purification Treatment of Urban Water by Activated Sludge (Evolution de la Microflore au Cours D'un Traitement D'Epuration D'eaux Urbaines Par Boues Activees),
W75-10227 5D

**BACTERIAL GROWTH**
Modeling Microbial Growth in Wastewater Treatment,
W75-10170 5D

**BARK**
Dynamic Leaching Studies on Pulpwood Bark Residues,
W75-10214 5D

**BASIC DATA COLLECTIONS**
Historical Streamflow Summary, British Columbia, to 1973.
W75-10065 7C

Historical Streamflow Summary, Ontario, to 1973.
W75-10066 7C

Historical Streamflow Summary, Alberta, to 1973.
W75-10067 7C

Historical Streamflow Summary, Yukon and Northwest Territories, to 1973.
W75-10068 7C

Historical Streamflow Summary, Manitoba, to 1973.
W75-10069 7C

Historical Streamflow Summary, Saskatchewan, to 1973.
W75-10070 7C

**BASIC DATA COLLECTIONS**

Historical Streamflow Summary, Atlantic Provinces, to 1973.
W75-10071 7C

Evaporation Data in Texas--Compilation Report, January 1907-December 1970,
W75-10154 7C

**BEACH EROSION**
Artificial Reef,
W75-09879 8A

Tybee Island Georgia, Beach Erosion Control Project (Final Environmental Impact Statement).
W75-10294 4D

The Public Trust Doctrine and The California Coastline,
W75-10305 6E

**BEACHES**
A Study of Beach Ground-Water Hydrology and Chemistry,
W75-10077 2F

**BEAUFORT (NC)**
Identity and Regulation of Nutrients Limiting Phytoplankton in the Shallow Estuaries Near Beaufort, N.C.,
W75-10084 5C

**BELGIUM**
Waterway Monitoring System.
W75-10248 7A

**BENEFITS**
Economic Aspects of Precipitation Augmentation Over the Great Lakes,
W75-09992 6B

A Mathematical Programming Approach to Public Water Project. Portfolio Selection,
W75-10131 6B

**BENTHOS**
The Recovery of Stream Macrobenthos from Low pH Stress,
W75-10127 5C

**BENZENE**
Extraction of Petroleum Hydrocarbons from Oil-Contaminated Sediments,
W75-10241 5G

**BENZIDINE**
The Determination of Benzidine in Wastewaters,
W75-10232 5A

**BIBLIOGRAPHIES**
Human Radiation Dose Studies. A Selected Bibliography.
W75-09890 5A

Terrestrial and Freshwater Radioecology, a Selected Bibliography,
W75-09891 5A

Review of Literature Pertinent to the Aqueous Conversion of Radionuclides to Insoluble Silicates with Selected References and Bibliography (Revised),
W75-09892 5D

Bibliography on the Application of Reverse Osmosis to Industrial and Municipal Wastewaters,
W75-09925 5D

Water Resources Publications Related to the State of Nebraska Third Edition.
W75-10015 10C

Irrigation Efficiencies in Producing Calories and Proteins: An Annotated Bibliography,
W75-10076 3F

Ozone Chemistry and Technology-A Review of the Literature: 1961-1974,
W75-10348 5D

**BIOACCUMULATION**
Importance of Water pH in Accumulation of Inorganic Mercury in Fish,
W75-09904 5A

**BIOASSAY**
Phthalate Esters, Heartrate Depressors in the Goldfish,
W75-09902 5C

Effect of Asulam in Wildlife Species: Acute Toxicity to Birds and Fish,
W75-09903 5C

Importance of Water pH in Accumulation of Inorganic Mercury in Fish,
W75-09904 5A

Effects of PCB (Aroclor 1254) and P, P' DDT On Production and Survival of Daphnia Magna Strauss,
W75-09905 5C

The Effect of Methyl Mercury on Gill Metabolism and Blood Parameters of Rainbow Trout,
W75-09906 5C

Toxicity of DFP and Related Compounds to Squids in Relation to Cholinesterase Inhibition and Detoxifying Enzyme Levels,
W75-09909 5C

**BIODEGRADATION**
Extraction of Petroleum Hydrocarbons from Oil-Contaminated Sediments,
W75-10241 5G

Biodegradation of Linear Alkylate Sulfonates in River Model (In Japanese),
W75-10247 5B

Benthal Decomposition of Adsorbed Octadecane,
W75-10260 5C

**BIOINDICATORS**
Diatoms in Lakes and Lake Sediments as an Index to Environment. Part 2. A Study of Phytoplankton Distribution, Lake Classification, and Trophic Indicators in Minnesota Lakes,
W75-10105 5C

Use of Algae, Especially Diatoms, in the Assessment of Water Quality,
W75-10112 5A

**BIOLOGICAL COMMUNITIES**
North Carolina Marine Algae. III. A Community of Ceramiales (Rhodophyta) on a Glass Sponge From 60 meters,
W75-10087 5C

**BIOLOGICAL STAINS**
Marking Alewife Fry with Biological Stains,
W75-10029 8I

**BIOLOGICAL TREATMENT**
Biological Purification of Waste Water and Sewage.
W75-09921 5D

Biological Wastewater Treatment Model Building Fits and Misfits,
W75-10169 5D

Modeling Microbial Growth in Waste Treatment,
W75-10170

The Magnetic Flowmeter and Its Use in W Water Technology (Der magnet Durchflussmesser und seine Anwendung i Abwassertechnik),
W75-10185

Evolution of Microflora During Purific Treatment of Urban Water by Activated S (Evolution de la Microflore au Cours Traitement D'Epuration D'eaux Urbaine Boues Activees),
W75-10227

Pilot-Plant Investigations into Partial Pre ment Systems at Macclesfield,
W75-10229

Applications of Toxicity Testing to Sev Treatment Processes,
W75-10244

Calculation of Reaction Mechanisms in mentation Basins with Continuous Flow Berechnung von Reaktionsablaeufen in tinuierlich Durchstroemten Fermenterbech
W75-10267

**BIOMASS**
The Structure and Production of Phytopla in Mikolajskie Lake,
W75-10093

**BIRD EGGS**
DDT and PCB Levels in Lake Coeur D'A Idaho, Osprey Eggs,
W75-09907

**BLACK VERMILLION WATERSHED (KAN**
Predicting Evapotranspiration from Ag tural Watersheds Under Dry Conditions,
W75-09860

**BONNEVILLE BASIN (UTAH)**
Authorized Bonneville Unit, Central Utah ject, Utah (Final Environmental Impact ment).
W75-10292

**BORON**
Determination of Trace Quantities of Bor Surface Water Bodies and in Drinking (Spurenbestimmung von Bor in Oberfla gewassern und Trinkwassern),
W75-10041

**BOSMINA LONGIROSTRIS**
Studies to Determine Methods for Cul Three Freshwater Zooplankton Species,
W75-10027

**BOUNDARY VALUE PROBLEMS**
Effects of Deposit Resuspension on Se Basin,
W75-10213

**BRITISH COLUMBIA**
Historical Streamflow Summary, B Columbia, to 1973.
W75-10065

**BROWN ROT**
An Unusual Brown Rot Outbreak in a F Citrus Grove Following Sprinkler Irri With Phytophthora-Infested Water,
W75-10245

**BLES**
ne Possibility of Using Charged Bubbles in oud Modification,
75-09979 2B

**GET CONSTRAINTS**
oject Evaluation in Water Resources: Budget onstraints,
75-09851 6A

**GETING**
oject Evaluation in Water Resources: Budget onstraints,
75-09851 6A

**GARIA**
eview of Recent Work on Hail Suppression in ulgaria,
75-09971 3B

n the Thermodynamic Criteria for the Intensi- of Convective Cloud Development,
75-09989 2B

**LFROGS**
ffects of Introduced Bullfrogs, Rana ntesbeiana, on the Native Frogs of the San aquin Valley, California,
75-10114 2I

**NING**
ffects of Fire on the Plants and Animals of a orida Wetland,
75-10181 6G

**BAGE**
ffect of Water Table Depth on Yield of abbage, Squash and Tendergreen,
75-09918 3F

**MIUM**
ochemical and Nutritional Interactions etween the Oyster (Crassostera Virginica melin) and its Environment,
75-10011 5C

**CITE**
quifer Parameters by a Chemical Tracer chnique: Non Linear Mixing in the Roswell onfined Aquifer,
75-09893 2F

**IFORNIA**
valuation of Ground Water Resources: Liver- ore and Sunol Valleys,
75-10063 2F

rinkling Cattle for Relief from Heat Stress,
75-10082 3F

ffects of Introduced Bullfrogs, Rana ntesbeiana, on the Native Frogs of the San aquin Valley, California,
75-10114 2I

asting a River,
75-10116 6B

round-Water Hydrology of Garner Valley, n Jacinto Mountains, California--A Mathe- atical Analysis of Recharge and Discharge,
75-10158 2F

ydrologic Evaluation of the Haystack Butte ea with Emphasis on Possible Discharge of ass-I Wastes, Edwards Air Force Base, alifornia,
75-10161 5B

ansient Control in Lower Sacramento River,
75-10219 4A

sues in Water Resources Impact Assessment,
75-10222 6B

The Infrared Studies of Santa Barbara Channel Oil Spill,
W75-10237 5A

California Plant Gets Straight 'A's in Computer Control,
W75-10264 5D

Submersible Pumps Make By-Pass Possible,
W75-10276 8C

Think Thermal,
W75-10284 5E

Warm Springs Dam and Lake Sonoma Project, Russian River Basin, Sonoma County, California, Part I (Final Environmental Impact Statement).
W75-10298 8A

Warm Springs Dam and Lake Sonoma Project, Russian River Basin, Sonoma County, California. Part II (Final Environmental Impact Statement).
W75-10299 8A

The Public Trust Doctrine and The California Coastline,
W75-10305 6E

Plan Formulation and Evaluation Studies--Recreation. Vol. III of V. A Preliminary Analysis of Day Use Recreation and Benefit Estimation Models for Selected Reservoirs,
W75-10343 6B

Plan Formulation and Evaluation Studies--Recreation. Vol. V of V. A Generalized Recreation Day Use Planning Model,
W75-10345 6B

**CAM RIVER (CAMBRIDGE ENGL)**
River Pollution Control,
W75-10224 6A

**CANADA**
Review of the Canadian Metal Finishing Industry: Consumption of Raw Materials and Options for Water Pollution Control.
W75-09926 5D

Asbestos in Drinking Water,
W75-10030 5A

Chemicals Reduce System Odours,
W75-10040 5D

Surface Water Data, Reference Index, Canada 1974.
W75-10064 7C

Historical Streamflow Summary, British Columbia, to 1973.
W75-10065 7C

Historical Streamflow Summary, Ontario, to 1973.
W75-10066 7C

Historical Streamflow Summary, Alberta, to 1973.
W75-10067 7C

Historical Streamflow Summary, Yukon and Northwest Territories, to 1973.
W75-10068 7C

Historical Streamflow Summary, Manitoba, to 1973.
W75-10069 7C

Historical Streamflow Summary, Saskatchewan, to 1973.
W75-10070 7C

Historical Streamflow Summary, Atlantic Provinces, to 1973.
W75-10071 7C

Ozone Technology Gains Support.
W75-10242 5D

Precipitation of Phosphates in Sewage with Lanthanum: An Experimental and Modelling Study,
W75-10259 5D

Water Monitoring is Big Business.
W75-10269 5A

**CANALS**
Residential Canals Along the Gulf Coast,
W75-10016 5B

Effects of Lowering Interior Canal Stages on Salt-Water Intrusion into the Shallow Aquifer in Southeast Palm Beach County, Florida,
W75-10156 4B

**CAPE COD (MASS)**
The Cape Cod Water Program, A Current Analysis,
W75-10283 4B

**CAPITAL**
A Mathematical Programming Approach to Public Water Project. Portfolio Selection,
W75-10131 6B

**CARBON**
A Model of Inorganic Carbon Limitation in Natural Waters,
W75-10088 5C

Growth and Dissipation of Phytoplankton in Chesapeake Bay. III. Inorganic Carbon Requirements of Natural Populations and Laboratory Cultures of Phytoplankton,
W75-10103 5C

**CARBON BLACK DUST**
Feasibility of Meso- and Synoptic-Scale Weather Modification from Carbon Particle Seeding,
W75-09957 3B

**CARBON RADIOISOTOPES**
Petroleum Pollutants in Surface and Groundwater as Indicated by the Carbon-14 Activity of Dissolved Organic Carbon,
W75-10035 5A

Carbon-14 Ages of Water From the Arkansas Hot Springs,
W75-10145 2K

**CARMEL VALLEY (CALIF)**
Issues in Water Resources Impact Assessment,
W75-10222 6B

**CATTLE**
Sprinkling Cattle for Relief from Heat Stress,
W75-10082 3F

**CAVITATION**
Valve Stroking in Separated Pipe Flow,
W75-10210 8B

**CAYUGA LAKE (NY)**
Microbiology and Water Quality in a Tributary of Cayuga Lake,
W75-09896 5C

**CENSUS**
Desalting Plants Inventory, Report No. 5,
W75-09852 3A

CEPHALOPODS
Toxicity of DFP and Related Compounds to Squids in Relation to Cholinesterase Inhibition and Detoxifying Enzyme Levels,
W75-09909 5C

CHANNEL CATFISH
Effect of Asulam in Wildlife Species: Acute Toxicity to Birds and Fish,
W75-09903 5C

Toxaphene Inhibition of ATPase Activity in Catfish, Ictalurus Punctatus, Tissues,
W75-09908 5C

Influence of Light Intensity on the Bioenergetics of Channel Catfish,
W75-10100 8I

CHANNEL IMPROVEMENT
Tred Avon River, Talbot County, Maryland (Final Environmental Impact Statement).
W75-10295 4A

Warm Springs Dam and Lake Sonoma Project, Russian River Basin, Sonoma County, California, Part I (Final Environmental Impact Statement).
W75-10298 8A

Warm Springs Dam and Lake Sonoma Project, Russian River Basin, Sonoma County, California, Part I (Final Environmental Impact Statement).
W75-10298 8A

CHARGED BUBBLES
The Possibility of Using Charged Bubbles in Cloud Modification,
W75-09979 2B

CHATTAHOOCHEE RIVER AREA (GEO)
Chattahoochee River National Recreation Area, Georgia.
W75-10320 6G

CHECK STRUCTURES
Hydrologic Data for North Creek, Trinity River Basin, Texas, 1973,
W75-10149 7C

CHELATION
Copper (II)--Nitrilotriacetate Complexes in Aqueous Solution,
W75-10086 5C

CHEMICAL PROPERTIES
Fluxes, Residence Times, and Sources of Some Elements to Lake Michigan,
W75-10090 5C

Experimentally Increased Fish Stock in the Pond Type Lake Warniak. I. Physical and Chemical Conditions in Lake Water,
W75-10094 5C

Laboratory Simulation of Swine Manure Lagoons,
W75-10137 5D

CHEMICAL REACTIONS
Electrolytic Decomposition of Water,
W75-09881 3E

CHEMICAL TREATMENT
Precipitation of Phosphates in Sewage with Lanthanum: An Experimental and Modelling Study,
W75-10259 5D

CHEMICAL WASTES
Recovering Organic Materials from Wastewater,
W75-09932 5D

Inorganic Chemicals Manufacturing Point Source Category.
W75-10327 5G

CHESAPEAKE BAY
Phosphorus Kinetics in the Euphotic Zone of the Chesapeake Bay,
W75-10101 5C

CHLORINATED HYDROCARBON PESTICIDES
Chlorinated Hydrocarbons in the Lake Ontario Ecosystem, (IFYGL),
W75-10018 5A

CHLORINATED ISOCYANURATES
Treatment of Aqueous Waste Streams with Hydrogen Peroxide to Remove Chlorinated Isocyanurates Therefrom,
W75-09939 5D

CHLORINATION
Water Chlorination Methods,
W75-09910 5F

CHLORINE
Water Chlorination Methods,
W75-09910 5F

CHYDORUS SPHAERICUS
Studies to Determine Methods for Culturing Three Freshwater Zooplankton Species,
W75-10027 5A

CITIES
Surface Waters and the Civil Law Rule,
W75-10304 6E

CITRATES
GLC Determination of PPB Levels of Citrate by Conversion to Bromoform,
W75-10191 5A

CITY PLANNING
Drainage System Cooperates with Nature,
W75-09942 4A

CIVIL LAW RULE
Surface Waters and the Civil Law Rule,
W75-10304 6E

CLADOCERA
The Geochemical and Biostratigraphic Record of Natural and Pollutional Eutrophication of Minnesota Lakes,
W75-10010 5C

Studies to Determine Methods for Culturing Three Freshwater Zooplankton Species,
W75-10027 5A

CLAYTON (OKLA)
Clayton Lake, Jack Fork Creek, Oklahoma (Final Environmental Impact Statement).
W75-10297 8A

CLIMATOLOGY
Hailstorms in Japan,
W75-09967 3B

Convective Cloud Study Results Applied to Weather Modification,
W75-09988 2B

CLOUD CHAMBER STUDIES
Some Data About the Mechanism of the Artificial Dissipation of Supercooled Fog,
W75-09949 3B

CLOUD DYNAMICS
Summary of Observations Indicating Dyn
Effect on Salt Seeding in Warm Cu
Clouds,
W75-10057

CLOUD PHYSICS
Simulation of the Natural Process of Hail
mation and Its Transformation Under th
fluence of Artificial Crystallizaton,
W75-09970

CLOUD SEEDING
Rain Enhancement - A Review,
W75-09950

Results of Seeding Cumulonimbus C
Aimed at the Modification of Precipitati
the Steppe Part of the Ukraine,
W75-09951

Rapid Inducement of Precipitation by Se
Stratified Air Layers,
W75-09953

On the Efficient Size and Concentratio
Spray Drops for Stimulating Warm Clouds
W75-09954

Numerical Simulation of Cloud Seeding E
ments,
W75-09955

The Role of Solid Precipitation Elemen
Natural and Artificial Production of Ra
Israel,
W75-09958

Snowfall Enhancement,
W75-09959

The Experimental Seeding of Frontal Clo
Winter in Order to Increase Precipitation,
W75-09960

Ground-Based Cloud Seeding Experime
Delhi During Winter,
W75-09961

The Artificial Modification of Clouds
Precipitation in a Mountainous Region,
W75-09962

The Pyramid Pilot Cloud-Seeding Project,
W75-09964

Hail Process Investigation and Hail Sup
sion Activities in the U.S.S.R.,
W75-09965

On the Results of Practical Protection of
ble Agricultural Crops from Hail by the
(Zaknigmi) Method (The Results of Five
Work, 1969-1973),
W75-09969

Review of Recent Work on Hail Suppress
Bulgaria,
W75-09971

The Experimental Program to Modify
ricanes,
W75-09972

Results of Experimental and Operational
on Combating Forest Fires,
W75-09974

Convective Cloud Modification to R
Thunderstorm Activity,
W75-09975

he Possibility of Using Charged Bubbles in loud Modification,
/75-09979 2B

he EML 1973 Florida Area Cumulus Experi-ent,
/75-09981 3B

echnical Devices for the Artificial Modifica-on of Cloud and Fog,
/75-09982 3B

nti-Hail Rockets and Shells,
/75-09984 3B

adar Methods and Equipment for Hail pression,
/75-09985 3B

ne Acquisition of Information During At-mpts at Weather Modification,
/75-09986 7B

eliminary Results of Experiments Using eding Rockets with Combustible Shells,
/75-09987 3B

n Evaluation of Extended Area Effects from tempts to Modify Local Clouds and Cloud stems,
/75-09993 3B

in Stimulation Experiments: Design and valuation,
/75-09994 7C

dar Characteristics of Cumulonimbus Clouds ring Their Natural Development and Artifi-l Seeding,
/75-09996 2B

Nuclei Generator Technology,
/75-10001 3B

mmary of Observations Indicating Dynamic fect on Salt Seeding in Warm Cumulus uds,
/75-10057 3B

UDS
namic Methods of Convective Cloud Modifi-ion by Means of Artificial Vertical Jets,
/75-09973 3B

the Possibility of Generating Downdrafts by roducing a High Concentration of Coarse rsol Particles in the Atmosphere,
/75-09980 3B

nvective Cloud Study Results Applied to ather Modification,
/75-09988 2B

uivalent Blackbody Temperature of the Top a Severe Storm,
/75-10054 2B

mmary of Observations Indicating Dynamic ect on Salt Seeding in Warm Cumulus uds,
/75-10057 3B

T GUARD REGULATIONS
rine Sanitation Devices--Proposed Certifica-n Procedures and Design and Construction quirements.
/75-10324 5G

TAL WATER
lico River Estuary--Past, Present and Fu-e,
/75-10338 2L

COASTAL WATERS
The Impact of Secondary Treatment on Wastes Discharged into the Ocean.
W75-10321 5D

COASTAL ZONE MANAGEMENT
The Public Trust Doctrine and The California Coastline,
W75-10305 6E

COASTS
Seagrass Ecosystems. Recommendations for Research Programs.
W75-10106 2L

The Public Trust Doctrine and The California Coastline,
W75-10305 6E

COLOR
Color Measurement Methods for Surface Water Receiving Colored Wastes,
W75-10135 5A

COLOR MEASUREMENT
Color Measurement Methods for Surface Water Receiving Colored Wastes,
W75-10135 5A

COLORADO
Evaluation of an ERTS-1 Data Collection Platform Installed in the Alpine Tundra, Colorado,
W75-10055 7B

Reservoir Release Routing Model for the Upper Arkansas River Basin of Colorado,
W75-10165 4A

Recycle Sludge to Feed Farms,
W75-10282 5D

COLORADO RIVER
Colorado River-Flow Management,
W75-10208 4A

COMBINED CAPACITY (DESALTING PLANTS)
Desalting Plants Inventory, Report No. 5,
W75-09852 3A

COMBINED MUNICIPAL-INDUSTRIAL TREATMENT
Let's Try 90% First and See What Our Quality is Like,
W75-10175 5G

COMBINED TREATMENT
Joint Treatment of Pulping and Municipal Wastes,
W75-09928 5D

Municipality and Industry Join in Wastewater Treatment.
W75-09929 5D

A Concept for Managing Waste,
W75-10236 5D

COMBINED WASTES
Pollution Lab Pays Off--Two Ways.
W75-10243 5D

COMMERCIAL FISHING
A Theoretical and Empirical Approach to Fisheries Economics,
W75-10118 6C

COMMON-PROPERTY RESOURCES
A Theoretical and Empirical Approach to Fisheries Economics,
W75-10118 6C

COMPACTION
Status of Land Subsidence Due to Ground-Water Withdrawal Along the Mississippi Gulf Coast,
W75-09856 2F

COMPARATIVE BENEFITS
The Comparison of the Environmental Aspects of Nuclear and Fossil Fuelled Power Stations,
W75-10349 8C

COMPLEXES
Copper (II)--Nitrilotriacetate Complexes in Aqueous Solution,
W75-10086 5C

COMPREHENSIVE PLANNING
Proceedings of Public Workshop Conference on Water Resources Problems and Research Needs in Central Minnesota.
W75-10005 6B

Proceedings of Public Forum on Water Resources Problems and Research Needs in Southwestern Minnesota.
W75-10006 6B

COMPUTER MODELS
Project Evaluation in Water Resources: Budget Constraints,
W75-09851 6A

Finite Element Modeling of Flow Through Porous Media,
W75-09900 5B

A Model of One-Dimensional Percolation to a Water Table Using a Computer Simulation Language,
W75-10138 2G

A Sensitivity Analysis of Simulated River Basin Planning for Capital Budgeting Decisions,
W75-10223 6A

COMPUTER PROGRAMS
A Computer Simulation Analysis of Surface Water Quality Management Policies Under Dynamic Economic and Hydrologic Conditions,
W75-10124 5D

Digital Program for Water Network Analysis,
W75-10220 7C

Computerized Sewer Design: New Tool for an Old Problem,
W75-10253 5D

COMPUTERS
Computer Control of Sewage Works, Progress at Norwich,
W75-10246 5D

Waterway Monitoring System.
W75-10248 7A

California Plant Gets Straight 'A's in Computer Control,
W75-10264 5D

A Computer Comes to Missouri,
W75-10265 5D

CONFERENCES
Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification.
W75-09944 3B

**CONFERENCES**

International Conference on the Conservation of Wetlands and Waterfowl.
W75-10198 6G

**CONGRESSIONAL HEARINGS**
Chattahoochee River National Recreation Area, Georgia.
W75-10320 6G

The Impact of Secondary Treatment on Wastes Discharged into the Ocean.
W75-10321 5D

Implementation of the Federal Water Pollution Control Act.
W75-10322 5G

**CONNECTICUT**
Problems with Effluent Seepage Fields,
W75-10274 5D

**CONNECTICUT RIVER BASIN**
Applications of Integer and Quadratic Programming to Floodplain Land Use Management,
W75-10008 6F

**CONSERVATION**
International Conference on the Conservation of Wetlands and Waterfowl.
W75-10198 6G

**CONSTRUCTION**
Needed: $350 Billion - And a New Needs Survey,
W75-10174 5D

Engineering Utility and Sewage Lines in Permafrost Soil,
W75-10192 5D

**CONTACT STABILIZATION**
Joint Treatment of Pulping and Municipal Wastes,
W75-09928 5D

**CONTINENTAL SHELF**
The Forging of the Union Reconsidered: A Historical Refutation of State Sovereignty Over Seabeds,
W75-09888 6E

Arsenic in Sediments on the Continental Shelf of Southeast Australia,
W75-10177 5B

Proposed 1973 Outer Continental Shelf Oil and Gas General Lease-Sale, Offshore Mississippi, Alabama, and Florida, Volume 3. Alternatives to the Proposed Action (Final Environmental Impact Statement).
W75-10291 5G

**CONTROL SYSTEMS**
Waterway Monitoring System.
W75-10248 7A

California Plant Gets Straight 'A's in Computer Control,
W75-10264 5D

**CONTROLLED FIRE**
Effects of Fire on the Plants and Animals of a Florida Wetland,
W75-10181 6G

**CONVECTION**
Dynamic Methods of Convective Cloud Modification by Means of Artificial Vertical Jets,
W75-09973 3B

On the Thermodynamic Criteria for the Intensity of Convective Cloud Development,
W75-09989 2B

Removal of Pyrotechnic Generated Tracer Placed by Aircraft in a Convective Updraft,
W75-10000 3B

**COPEPODS**
Studies to Determine Methods for Culturing Three Freshwater Zooplankton Species,
W75-10027 5A

**COPPER**
Copper (II)--Nitrilotriacetate Complexes in Aqueous Solution,
W75-10086 5C

Shortcut Methods Test Algicides,
W75-10234 5G

**COPPER COMPOUNDS**
Copper (II)--Nitrilotriacetate Complexes in Aqueous Solution,
W75-10086 5C

**COST ALLOCATION**
A Concept for Managing Waste,
W75-10236 5D

**COST ANALYSIS**
Methods to Facilitate Managerial Effectiveness in Municipal Water Systems,
W75-09895 6B

**COST-BENEFIT ANALYSIS**
Project Evaluation in Water Resources: Budget Constraints,
W75-09851 6A

Wasting a River,
W75-10116 6B

**COST-BENEFIT RATIO**
The Benefit-Cost Ratio in Resource Development Planning,
W75-10117 6B

**COST COMPARISONS**
Methods to Facilitate Managerial Effectiveness in Municipal Water Systems,
W75-09895 6B

**COSTS**
A General Linear Approach to Stream Water Quality Modeling,
W75-09917 5B

A Mathematical Programming Approach to Public Water Project. Portfolio Selection,
W75-10131 6B

Needed: $350 Billion - And a New Needs Survey,
W75-10174 5D

Water Pollution Law Draws Flood of Complaints.
W75-10179 5G

Design for Solvent Recovery,
W75-10239 5D

How Much 'Reliability' is 'Enough',
W75-10254 5A

**COTTONTAIL RABBIT**
Faunal Response to Spray Irrigation of Chlorinated Sewage Effluent,
W75-09899 5D

**COUNTY OFFICIALS**
Georgia County Commissioner Attitudes Toward Water Problems,
W75-09855 6E

**CRITICAL NUTRIENT LEVELS**
Critical Levels of Phosphorus and Nitrogen Texas Impoundments,
W75-10072

**CROP PRODUCTION**
Effect of Water Table Depth on Yield Cabbage, Squash and Tendergreen,
W75-09918

Irrigation Efficiencies in Producing Calo and Proteins: An Annotated Bibliography,
W75-10076

**CRYSTALEX PROCESS**
Freeze Crystallization: New Water-Proces Tool,
W75-09927

**CULTURES**
Studies to Determine Methods for Cultu Three Freshwater Zooplankton Species,
W75-10027

**CUMULONIMBUS CLOUDS**
Results of Seeding Cumulonimbus Clo Aimed at the Modification of Precipitatio the Steppe Part of the Ukraine,
W75-09951

**CYCLING NUTRIENTS**
Decomposition Working Group,
W75-10109

**CYCLOPS BICUSPIDATUS THOMASI**
Studies to Determine Methods for Cultu Three Freshwater Zooplankton Species,
W75-10027

**DALLAS (TEX)**
Hydrologic Data for Urban Studies in the las, Texas Metropolitan Area, 1973,
W75-10148

**DAM CONSTRUCTION**
Big Hill Lake Creek, Kansas (Final Envi mental Impact Statement).
W75-10293

Clayton Lake, Jack Fork Creek, Oklah (Final Environmental Impact Statement).
W75-10297

**DAMS**
Wasting a River,
W75-10116

Colorado River-Flow Management,
W75-10208

Safety of Dams--Bureau of Reclamation,
W75-10221

Warm Springs Dam and Lake Sonoma Pro Russian River Basin, Sonoma County, Cal nia, Part I (Final Environmental Impact S ment).
W75-10298

Warm Springs Dam and Lake Sonoma Pro Russian River Basin, Sonoma County, Cal nia. Part II (Final Environmental Impact S ment).
W75-10299

**DAPHNIA**
Effects of PCB (Aroclor 1254) and P, P' On Production and Survival of Daphnia M Strauss,
W75-09905

APHNIA MAGNA
Effects of PCB (Aroclor 1254) and P, P' DDT On Production and Survival of Daphnia Magna Strauss,
W75-09905 5C

ARCYS LAW
Transformation of Moody Diagram,
W75-10216 8B

ATA COLLECTIONS
The Acquisition of Information During Attempts at Weather Modification,
W75-09986 7B

Surface Water Data, Reference Index, Canada 974.
W75-10064 7C

Summaries of Foreign Government Environmental Reports.
W75-10289 6G

T
Effects of PCB (Aroclor 1254) and P, P' DDT On Production and Survival of Daphnia Magna Strauss,
W75-09905 5C

DDT and PCB Levels in Lake Coeur D'Alene, Idaho, Osprey Eggs,
W75-09907 5A

Chlorinated Hydrocarbons in the Lake Ontario Ecosystem, (IFYGL),
W75-10018 5A

Microbial Degradation of DDT,
W75-10091 5C

CISION MAKING
Water Resources Development and Wilderness Values: A Study of the Upper Hudson River,
W75-09898 6B

GRADATION (DECOMPOSITION)
enthal Decomposition of Adsorbed Octadecane,
W75-10260 5C

LAWARE RIVER
roject Evaluation in Water Resources: Budget onstraints,
W75-09851 6A

NITRIFICATION
n Automated Method for Determination of esidual Methanol in Denitrified Effluents,
W75-10047 5D

ustrian Plant Knocks Out Nitrogen,
W75-10225 5D

VER (COLORADO)
ecycle Sludge to Feed Farms,
W75-10282 5D

TH
ffects of Deposit Resuspension on Settling asin,
W75-10213 5F

ALINATION
everse Osmosis System with Automatic Valve r Module Operation Control,
W75-09877 3A

ALINATION PLANTS
esalting Plants Inventory, Report No. 5,
W75-09852 3A

DESALINIZATION
Means for and Method of Purifying Contaminated Water,
W75-09864 3A

DESIGN
Rain Stimulation Experiments: Design and Evaluation,
W75-09994 7C

Engineering Utility and Sewage Lines in Permafrost Soil,
W75-10192 5D

Secondary Treatment Design for Combined Wastewaters, Part II,
W75-10199 5D

DESIGN CRITERIA
Laboratory Simulation of Swine Manure Lagoons,
W75-10137 5D

Design of Surface Water Outfalls to Rivers,
W75-10183 5D

Design for Solvent Recovery,
W75-10239 5D

Computerized Sewer Design: New Tool for an Old Problem,
W75-10253 5D

Monitoring: An Environmental State Estimation Problem,
W75-10255 5A

A Dimensionless Design Equation for Sewage Lagoons,
W75-10261 5D

Problems with Effluent Seepage Fields,
W75-10274 5D

DESIGN ENGINEERING
Mass Transfer to Naturally Flowing Streams,
W75-10341 5D

DESTRATIFICATION
The Effects of Artificial Destratification on the Water Quality and Microbial Populations of Hyrum Reservoir,
W75-09897 5C

DETERGENTS
Biodegradation of NTA Detergents in a Wastewater Treatment System,
W75-09920 5D

DETERMINISTIC MODELS
Deterministic Model of Dynamic Eutrophic Estuary,
W75-10215 5B

DETRITUS
Decomposition Working Group,
W75-10109 2L

DEW DURATION
Dew Duration in Central Iowa,
W75-10212 3F

DEWATERING
Mechanical Management of Aquatic Vegetation: Analytical Studies of Unit Operations Potentially Useful in their Processing,
W75-09861 4A

Solvent Solves Dewatering.
W75-10037 5D

Studies Concerning Dewatering of Digested Communal Waste Water Sludges on Sludge Drying Beds (Untersuchungen zur Entwaesserung ausgefaulter kommunaler abwasserschlaemme auf Schlammtrockenplaetzen),
W75-10228 5D

DFP
Toxicity of DFP and Related Compounds to Squids in Relation to Cholinesterase Inhibition and Detoxifying Enzyme Levels,
W75-09909 5C

DIATOMS
The Geochemical and Biostratigraphic Record of Natural and Pollutional Eutrophication of Minnesota Lakes,
W75-10010 5C

Diatoms in Lakes and Lake Sediments as an Index to Environment. Part 2. A Study of Phytoplankton Distribution, Lake Classification, and Trophic Indicators in Minnesota Lakes,
W75-10105 5C

Use of Algae, Especially Diatoms, in the Assessment of Water Quality,
W75-10112 5A

DIBUTYL PHTHALATE
Phthalate Esters, Heartrate Depressors in the Goldfish,
W75-09902 5C

DIELDRIN
Chlorinated Hydrocarbons in the Lake Ontario Ecosystem, (IFYGL),
W75-10018 5A

DIGITAL COMPUTERS
Computer Control of Sewage Works, Progress at Norwich,
W75-10246 5D

DIMENSIONLESS EQUATIONS
A Dimensionless Design Equation for Sewage Lagoons,
W75-10261 5D

DINOFLAGELLATES
The Response of Gymnodinium Breve to Municipal Waste Materials,
W75-10033 5C

DIRECT DIGITAL CONTROL (DDC)
California Plant Gets Straight 'A's in Computer Control,
W75-10264 5D

DIRECT FILTRATION
Zeta Potential Controls Direct Filtration Coagulation,
W75-10280 5F

DISCHARGE (WATER)
Measurement of Small Discharges Through V-Notch Weirs,
W75-10059 8B

The Discharge of South Carolina Streams as it Relates to Link Magnitude,
W75-10134 2E

Ground-Water Hydrology of Garner Valley, San Jacinto Mountains, California--A Mathematical Analysis of Recharge and Discharge,
W75-10158 2F

Water Quality Routing of Unsteady River Flow by Finite Element Method,
W75-10252 5B

**DISCHARGE (WATER)**

Thermal Discharges--Proposed Procedures for the Imposition of Alternative Effluent Limitations.
W75-10329 5G

Thermal Discharges.
W75-10335 5G

**DISCOUNT RATES**
Wasting a River,
W75-10116 6B

**DISPERSION**
Finite Element Modeling of Flow Through Porous Media,
W75-09900 5B

Effects of Deposit Resuspension on Settling Basin,
W75-10213 5F

**DISSOLVED OXYGEN**
A General Linear Approach to Stream Water Quality Modeling,
W75-09917 5B

A Rational Approach for Predicting the Dissolved Oxygen Profile in Receiving Waters,
W75-10034 5A

Benthal Decomposition of Adsorbed Octadecane,
W75-10260 5C

**DISTILLATION**
Desalting Plants Inventory, Report No. 5,
W75-09852 3A

**DISTRICT OF COLUMBIA**
Largest Advanced Wastewater Treatment Plant in the U.S. and in the World,
W75-10193 5D

**DIURON**
The Effects of Selected Herbicides on Bacterial Populations in an Aquatic Environment,
W75-10133 5C

**DIVERSION**
Recovery of Polluted Lakes. A Swedish Research Program on the Effects of Advanced Waste Water Treatment and Sewage Diversion,
W75-10081 5C

**DIVERSION STRUCTURES**
Authorized Bonneville Unit, Central Utah Project, Utah (Final Environmental Impact Statement).
W75-10292 8A

**DOMESTIC WASTES**
Treatability of Textile-Domestic Waste Mixtures,
W75-09859 5D

Biodegradation of NTA Detergents in a Wastewater Treatment System,
W75-09920 5D

Analyzing Organics in Dilute Aqueous Solutions,
W75-10350 5A

**DOSE STUDIES**
Human Radiation Dose Studies. A Selected Bibliography.
W75-09890 5A

**DOWNDRAFTS**
On the Possibility of Generating Downdrafts by Introducing a High Concentration of Coarse Aersol Particles in the Atmosphere,
W75-09980 3B

**DRAFT-STORAGE-FREQUENCY RELATIONS**
Evaluation of Reservoir Sites in North Carolina--Regional Relations for Estimating the Reservoir Capacity Needed for a Dependable Water Supply,
W75-10159 4A

**DRAINAGE**
Drainage System Cooperates with Nature,
W75-09942 4A

Management Practices Affecting Quality and Quantity of Irrigation Return Flow,
W75-10019 5G

**DREDGING**
Tred Avon River, Talbot County, Maryland (Final Environmental Impact Statement).
W75-10295 4A

**DRIZZLE**
Salt Drizzles Extracted From Unsaturated Air Layers by Seeding with Hygroscopic Nuclei,
W75-09952 3B

**DROPS (FLUIDS)**
The Position Stability of Large Water Drops Suspended in a Vertical Wind Tunnel,
W75-10053 2B

**DRY CREEK (CALIF)**
Warm Springs Dam and Lake Sonoma Project, Russian River Basin, Sonoma County, California, Part I (Final Environmental Impact Statement).
W75-10298 8A

**DUCHESNE RIVER BASIN (UTAH)**
Estimating Mean Streamflow in the Duchesne River Basin, Utah,
W75-10166 2E

**DUWAMISH RIVER ESTUARY (WASH)**
Numerical Model of the Salt-Wedge Reach of the Duwamish River Estuary, King County, Washington,
W75-10157 5B

**DYE DISPERSION**
Sudden Release of Water from a Long Prismatic Flume,
W75-10017 8B

**DYNAMIC PROGRAMMING**
Planning and Operation of Urban Water Quality Management Systems,
W75-10262 5G

**EARTH DAMS**
Big Hill Lake Creek, Kansas (Final Environmental Impact Statement).
W75-10293 8D

**EARTHQUAKES**
A Model for Earthquakes Near Palisades Reservoir, Southeast Idaho,
W75-10139 8B

**ECOLOGY**
The Geochemical and Biostratigraphic Record of Natural and Pollutional Eutrophication of Minnesota Lakes,
W75-10010 5C

**ECONOMIC EFFICIENCY**
The Benefit-Cost Ratio in Resource Development Planning,
W75-10117 6B

Economic Institutions to Determine Water Quality,
W75-10132 5G

**ECONOMIC IMPACT**
The Economic Impact of a Small Recreation Oriented Reservoir,
W75-09857 6

Primary Economic Impact of the Gulf Intracoastal Waterway in Texas,
W75-10120 6

**ECONOMIC JUSTIFICATION**
Wasting a River,
W75-10116 6

**ECONOMIC PREDICTION**
Wasting a River,
W75-10116 6

**ECONOMICS**
On Physical and Economic Effectiveness of Hail-Suppression Projects,
W75-09995 3

A Computer Simulation Analysis of Surface Water Quality Management Policies Under Dynamic Economic and Hydrologic Conditions,
W75-10124 5

**ECOSYSTEMS**
A Model for Predicting the Effects of Sewage Effluent on Wetland Ecosystems,
W75-09915 5

Fluvial-Estuarine Water Resource Optimization: Microecosystem Simulation of Riverine Estuarine Productivity Relationships,
W75-10099 2

Seagrass Ecosystems. Recommendations for Research Programs.
W75-10106 2

Productivity/Physiology Working Group,
W75-10107 2

Systematic Ecology Working Group,
W75-10108 2

Oceanography,
W75-10111 2

**EDUCATION**
Recommendations for Environmental Engineering Education,
W75-10218 9

**EDWARDS AIR FORCE BASE**
Hydrologic Evaluation of the Haystack Butte Area with Emphasis on Possible Discharge of Class-I Wastes, Edwards Air Force Base, California,
W75-10161

**EFFLUENT CONTROL**
Water Research Center Unravels the Nitric Knot,
W75-10278

**EFFLUENT LIMITATIONS**
Inorganic Chemicals Manufacturing Point Source Category.
W75-10327

**EFFLUENTS**
Cleaning of Petroleum-Industry Effluent,
W75-10200

Dupont De Nemours and Co. v. Train (Action by Chemical Manufacturers to Set Aside Regulations Governing Effluent Discharge of Sulfuric Acid Plants).
W75-10316

am Electric Power Generating Point Source
egory-Proposed Effluent Guidelines and
ndards for Incompatible Pollutants.
5-10323 5G

ned and Preserved Fruits and Vegetables
cessing Point Source Category--Effluent
delines and Standards.
5-10325 5G

uid and Crystalline Cane Sugar Refining
category--Effluent Limitations Guidelines
Proposed Pretreatment Standards.
-10326 5G

ganic Chemicals Manufacturing Point
rce Category.
-10327 5G

troplating Point Source Category; Copper,
el, Chromium and Zinc on Ferrous and
ferrous Materials Subcategory.
-10328 5G

estos Manufacturing Point Source Catego-
Effluent Limitations Guidelines.
-10330 5G

oalloy Manufacturing Point Source Catego-

-10332 5G

llots Point Source Category--Effluent
elines and Standards.
-10333 5G

s Manufacturing Point Source Categories--
ent Guidelines and Standards.
-10334 5G

lers Paper and Board Manufacturing Point
ce Category--Effluent Limitations
elines.
10336 5G

n Electric Power Generating Point Source
ory--Effluent Guidelines and Standards.
10337 5G

Comparison of the Environmental Aspects
clear and Fossil Fuelled Power Stations,
10349 8C

RIC POWER
n Electric Power Generating Point Source
ory--Effluent Guidelines and Standards.
10337 5G

RIC POWERPLANTS
Comparison of the Environmental Aspects
clear and Fossil Fuelled Power Stations,
0349 8C

RICAL CORONAS
Effect of Chaff Seeding on Lightning and
ic Fields of Thunderstorms,
9978 3B

ROCHEMISTRY
mination of Molecular Hydrogen Sulfide,
0025 5A

ROLYSIS
olytic Decomposition of Water,
9881 3E

d for Purifying Waste Water,
9882 5D

atus for Treating Water Containing Impu-

9884 5D

ELECTROLYTES
The Effect of Methyl Mercury on Gill Metabolism and Blood Parameters of Rainbow Trout,
W75-09906 5C

ELECTROMAGNETIC WAVES
On the Possibility of Thunderstorm Suppression by Changing the Non-Equilibrium Crystallization Potentials of Cloud Water,
W75-09976 2B

EMBRYONIC GROWTH STAGE
Toxicity of Selected Pesticides to the Bay Mussel (Mytilus Edulis),
W75-10021 5C

EMINENT DOMAIN
Smith v. City of Cookeville (Action by Landowner Whose Property was Condemned by City for Use in Recreation Development to Enjoin Construction Until Environmental Impact Statement is Filed).
W75-10312 6E

ENERGY
Natural 'Hailcores' and Their Abilities to Estimate the Efficiency of Hail Prevention Systems,
W75-09966 2B

Evolving National Water Policies,
W75-10201 6E

ENERGY TRANSFER
Consumer Ecology Working Group,
W75-10110 2L

ENGINEERING EDUCATION
Recommendations for Environmental Engineering Education,
W75-10218 9A

ENVIRONMENTAL CONTROL
Application of NEPA to EPA's Environmental Regulatory Actvities.
W75-10288 6G

Proposed 1973 Outer Continental Shelf Oil and Gas General Lease-Sale, Offshore Mississippi, Alabama, and Florida, Volume 3. Alternatives to the Proposed Action (Final Environmental Impact Statement).
W75-10291 5G

The Public Trust Doctrine and The California Coastline,
W75-10305 6E

Sierra Club v. Lynn (Action for Declaratory and Injunctive Relief with Respect to Development of New Housing Development).
W75-10309 6G

Smith v. City of Cookeville (Action by Landowner Whose Property was Condemned by City for Use in Recreation Development to Enjoin Construction Until Environmental Impact Statement is Filed).
W75-10312 6E

Ton-Da-Lay, Ltd. v. Diamond (Review of Denial of Application for Water Supply and Sewage Treatment Systems).
W75-10314 6E

ENVIRONMENTAL EFFECTS
Human Radiation Dose Studies. A Selected Bibliography.
W75-09890 5A

A Model for Predicting the Effects of Sewage Effluent on Wetland Ecosystems,
W75-09915 5B

Temperature Effects on Eggs and Fry of Percoid Fishes,
W75-10020 5C

Measuring External Effects of Solid Waste Management,
W75-10024 5B

Geographical Analysis of Oil Spill Potential Associated with Alaskan Oil Production and Transportation Systems,
W75-10121 5G

The Effect of a Fuel Oil Spill on Benthic Invertebrates and Water Quality on the Alaskan Arctic Slope, Happy Valley Creek Near Sagwon, Alaska,
W75-10140 5C

Procedure for Evaluating Environmental Impact,
W75-10164 6G

Issues in Water Resources Impact Assessment,
W75-10222 6B

Application of NEPA to EPA's Environmental Regulatory Actvities.
W75-10288 6G

Big Hill Lake Creek, Kansas (Final Environmental Impact Statement).
W75-10293 8D

Tybee Island Georgia, Beach Erosion Control Project (Final Environmental Impact Statement).
W75-10294 4D

Tred Avon River, Talbot County, Maryland (Final Environmental Impact Statement).
W75-10295 4A

Initial Stage, Garrison Diversion Unit, Pick-Sloan Missouri Basin Program, North Dakota (Final Environmental Impact Statement).
W75-10296 8A

Clayton Lake, Jack Fork Creek, Oklahoma (Final Environmental Impact Statement).
W75-10297 8A

Sierra Club v. Lynn (Action for Declaratory and Injunctive Relief with Respect to Development of New Housing Development).
W75-10309 6G

Authorized Bonneville Unit, Central Utah Project, Utah Appendix A (Final Environmental Impact Statement).
W75-10331 8A

ENVIRONMENTAL ENGINEERING
Statistical Evaluation of Reaeration Prediction Equations,
W75-10211 5G

Effects of Deposit Resuspension on Settling Basin,
W75-10213 5F

Deterministic Model of Dynamic Eutrophic Estuary,
W75-10215 5B

Evaluation of Phosphorus Dynamics in a Watershed,
W75-10217 5B

Recommendations for Environmental Engineering Education,
W75-10218 9A

ENVIRONMENTAL IMPACT
Measuring External Effects of Solid Waste Management,
W75-10024 5B

Procedure for Evaluating Environmental Impact,
W75-10164 6G

ENVIRONMENTAL IMPACT STATEMENT
Application of NEPA to EPA's Environmental Regulatory Actvities.
W75-10288 6G

Legislation Under NEPA: Plaintiffs' Phyrrhic Victories Draw Congressional Fire, Judicial Warnings,
W75-10303 5G

Sierra Club v. Lynn (Action for Declaratory and Injunctive Relief with Respect to Development of New Housing Development).
W75-10309 6G

Smith v. City of Cookeville (Action by Landowner Whose Property was Condemned by City for Use in Recreation Development to Enjoin Construction Until Environmental Impact Statement is Filed).
W75-10312 6E

Scenic Rivers Association of Oklahoma v. Lynn (Suit Seeking Declaratory Judgment that HUD Must Make an Environmental Impact Study Prior to Their Contemplated Actions).
W75-10313 6E

ENVIRONMENTAL IMPACT STATEMENTS
Proposed 1973 Outer Continental Shelf Oil and Gas General Lease-Sale, Offshore Mississippi, Alabama, and Florida, Volume 3. Alternatives to the Proposed Action (Final Environmental Impact Statement).
W75-10291 5G

Authorized Bonneville Unit, Central Utah Project, Utah (Final Environmental Impact Statement).
W75-10292 8A

Tybee Island Georgia, Beach Erosion Control Project (Final Environmental Impact Statement).
W75-10294 4D

Tred Avon River, Talbot County, Maryland (Final Environmental Impact Statement).
W75-10295 4A

Initial Stage, Garrison Diversion Unit, Pick-Sloan Missouri Basin Program, North Dakota (Final Environmental Impact Statement).
W75-10296 8A

Clayton Lake, Jack Fork Creek, Oklahoma (Final Environmental Impact Statement).
W75-10297 8A

Warm Springs Dam and Lake Sonoma Project, Russian River Basin, Sonoma County, California, Part I (Final Environmental Impact Statement).
W75-10298 8A

Warm Springs Dam and Lake Sonoma Project, Russian River Basin, Sonoma County, California. Part II (Final Environmental Impact Statement).
W75-10299 8A

Authorized Bonneville Unit, Central Utah Project, Utah Appendix A (Final Environmental Impact Statement).
W75-10331 8A

ENVIRONMENTAL POLICY
Minutes of the 89th Meeting, (Arkansas-Red-White River Basins Inter-Agency Committee).
W75-10300 4A

ENVIRONMENTAL PROTECTION AGENCY
Federal Viewpoint (Permit Issuance--Administrative and Judicial Review--Observations and Problems),
W75-10302 5G

ENVIRONMENTAL SANITATION
Marine Sanitation Devices--Proposed Certification Procedures and Design and Construction Requirements.
W75-10324 5G

ENZYMES
Toxaphene Inhibition of ATPase Activity in Catfish, Ictalurus Punctatus, Tissues,
W75-09908 5C

Toxicity of DFP and Related Compounds to Squids in Relation to Cholinesterase Inhibition and Detoxifying Enzyme Levels,
W75-09909 5C

Biochemical and Nutritional Interactions Between the Oyster (Crassostera Virginica (Gmelin) and its Environment,
W75-10011 5C

EQUATIONS
An Investigation of the Predictive Ability of Several Evaporation Equations,
W75-10051 2D

A Dimensionless Design Equation for Sewage Lagoons,
W75-10261 5D

EQUIPMENT
Technical Devices for the Artificial Modification of Cloud and Fog,
W75-09982 3B

Anti-Hail Rockets and Shells,
W75-09984 3B

Preliminary Results of Experiments Using Seeding Rockets with Combustible Shells,
W75-09987 3B

ERROR ANALYSIS
Quantitative Error Analysis of Numerical Methods for Partial Differential Equations,
W75-10003 6G

ERTS-1
Evaluation of an ERTS-1 Data Collection Platform Installed in the Alpine Tundra, Colorado,
W75-10055 7B

ESTIMATED BENEFITS
Plan Formulation and Evaluation Studies--Recreation. Vol. III of V. A Preliminary Analysis of Day Use Recreation and Benefit Estimation Models for Selected Reservoirs,
W75-10343 6B

Plan Formulation and Evaluation Studies--Recreation. Vol. V of V. A Generalized Recreation Day Use Planning Model,
W75-10345 6B

ESTIMATING
Plan Formulation and Evaluation Studi Recreation. Vol I of V. Evaluation of Rec tion Use Surveys Procedures,
W75-10342

Plan Formulation and Evaluation Studi Recreation. Vol. III of V. A Preliminary An sis of Day Use Recreation and Benefit Esti tion Models for Selected Reservoirs,
W75-10343

Plan Formulation and Evaluation Studi Recreation. Vol. IV of V. Estimating Rec tional Facility Requirements,
W75-10344

Plan Formulation and Evaluation Studi Recreation. Vol. V of V. A Generalized Rec tion Day Use Planning Model,
W75-10345

ESTUARIES
Identity and Regulation of Nutrients Limi Phytoplankton in the Shallow Estuaries N Beaufort, N.C.,
W75-10084

Fluvial-Estuarine Water Resource Optim tion: Microecosystem Simulation of Ri Estuarine Productivity Relationships,
W75-10099

Chemical and Physical Characteristics of W in Esturies of Texas, October 1970-Septem 1971,
W75-10153

Numerical Model of the Salt-Wedge Reach the Duwamish River Estuary, King Cou Washington,
W75-10157

Deterministic Model of Dynamic Eutro Estuary,
W75-10215

Tred Avon River, Talbot County, Maryl (Final Environmental Impact Statement).
W75-10295

Pamlico River Estuary--Past, Present and ture,
W75-10338

ESTUARINE ENVIRONMENT
Biochemical and Nutritional Interact Between the Oyster (Crassostera Virgi (Gmelin) and its Environment,
W75-10011

Pamlico River Estuary--Past, Present and ture,
W75-10338

EUPHOTIC ZONE
Phosphorus Kinetics in the Euphotic Zon the Chesapeake Bay,
W75-10101

EUTROPHICATION
The Geochemical and Biostratigraphic Re of Natural and Pollutional Eutrophicatio Minnesota Lakes,
W75-10010

The Response of Gymnodinium Breve to nicipal Waste Materials,
W75-10033

Critical Levels of Phosphorus and Nitroge Texas Impoundments,
W75-10072

'he Eutrophication of Lakes in the Okanagan 'alley, British Columbia,
V75-10075 5C

'ield and Laboratory Investigations to Evalute the Influence of Nitrilotriacetic Acid (NTA) n Eutrophication.
V75-10115 5C

**ALUATION**
roject Evaluation in Water Resources: Budget onstraints,
'75-09851 6A

he Economic Impact of a Small Recreation-riented Reservoir,
'75-09857 6B

'ater Resources Development and Wilderness alues: A Study of the Upper Hudson River,
'75-09898 6B

Review of Methods to Evaluate Precipitation odification in North America,
'75-09990 3B

ethods of Estimating Physical and Economic ffectiveness of Weather Modification,
'75-09991 3B

n Evaluation of Extended Area Effects from ttempts to Modify Local Clouds and Cloud ystems,
'75-09993 3B

in Stimulation Experiments: Design and valuation,
'75-09994 7C

n Physical and Economic Effectiveness of il-Suppression Projects,
'75-09995 3B

dar Characteristics of Cumulonimbus Clouds ring Their Natural Development and Artifi-l Seeding,
'75-09996 2B

e Benefit-Cost Ratio in Resource Develop-nt Planning,
'75-10117 6B

**PORATION**
'ects of Irrigation and Row Spacing on apotranspiration and Microclimate of a 'ghum Field,
'5-09853 2D

Investigation of the Predictive Ability of veral Evaporation Equations,
'5-10051 2D

aporation Data in Texas--Compilation Re-t, January 1907-December 1970,
'5-10154 7C

**'OTRANSPIRATION**
ects of Irrigation and Row Spacing on potranspiration and Microclimate of a ghum Field,
'5-09853 2D

dicting Evapotranspiration from Agricul-l Watersheds Under Dry Conditions,
'5-09860 2D

**GLADES NATIONAL PARK (FLA)**
ticides, Polychlorinated Biphenols and vy Metals in Upper Food Chain Levels, rglades National Park and Vicinity,
'5-10080 5C

Distribution of Nitrogen and Phosphorous in the Conservation Areas in South Florida from July 1972 to June 1973,
W75-10160 5B

**EXTENDED AREA EFFECTS**
An Evaluation of Extended Area Effects from Attempts to Modify Local Clouds and Cloud Systems,
W75-09993 3B

**EXTERNALITIES**
A Theoretical and Empirical Approach to Fisheries Economics,
W75-10118 6C

**FACILITIES**
Lack of Promised Federal Funds Hampers Water Cleanup Effort.
W75-10178 5G

**FARM LAGOONS**
Laboratory Simulation of Swine Manure Lagoons,
W75-10137 5D

**FARM WASTES**
Research Status on Effects of Land Application of Animal Wastes,
W75-10022 5B

**FEASIBILITY STUDIES**
Feasibility and Potential of Enhancing Water Recreation Opportunities on High Country Reservoirs-Phase I,
W75-09894 6B

Feasibility of Meso- and Synoptic-Scale Weather Modification from Carbon Particle Seeding,
W75-09957 3B

**FECAL CONTAMINATION**
Fecal Contamination--The Water Analyst's Responsibility Part II,
W75-10258 5A

**FEDERAL GOVERNMENT**
Regulation of Ocean Dumping--One Year Later,
W75-10285 5G

Federal Viewpoint (Permit Issuance--Administrative and Judicial Review--Observations and Problems),
W75-10302 5G

**FEDERAL JURISDICTION**
Evolving National Water Policies,
W75-10201 6E

**FEDERAL-STATE WATER RIGHTS CONFLICTS**
Changing Federal-State Relationships in Water Pollution Control Programs,
W75-10270 5G

**FEDERAL WATER POLLUTION CONTROL ACT**
Industry Viewpoint (Water Quality Control),
W75-09885 5G

Needed: $350 Billion - And a New Needs Survey,
W75-10174 5D

Lack of Promised Federal Funds Hampers Water Cleanup Effort.
W75-10178 5G

Water Pollution Law Draws Flood of Complaints.
W75-10179 5G

Federal Viewpoint (Permit Issuance--Administrative and Judicial Review--Observations and Problems),
W75-10302 5G

The Impact of Secondary Treatment on Wastes Discharged into the Ocean.
W75-10321 5D

Implementation of the Federal Water Pollution Control Act.
W75-10322 5G

**FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972**
Changing Federal-State Relationships in Water Pollution Control Programs,
W75-10270 5G

Dupont De Nemours and Co. v. Train (Action by Chemical Manufacturers to Set Aside Regulations Governing Effluent Discharge of Sulfuric Acid Plants).
W75-10316 6E

The Impact of Secondary Treatment on Wastes Discharged into the Ocean.
W75-10321 5D

Implementation of the Federal Water Pollution Control Act.
W75-10322 5G

Marine Sanitation Devices--Proposed Certification Procedures and Design and Construction Requirements.
W75-10324 5G

**FEED LOTS**
Feedlots Point Source Category--Effluent Guidelines and Standards.
W75-10333 5G

**FEEDLOTS**
Microbiology and Water Quality in a Tributary of Cayuga Lake,
W75-09896 5C

**FERMENTATION**
Calculation of Reaction Mechanisms in Fermentation Basins with Continuous Flow (Zur Berechning von Reaktionsablaeufen in Kontinuierlich Durchstroemten Fermenterbecken),
W75-10267 5D

**FERTILIZATION**
Recycle Sludge to Feed Farms,
W75-10282 5D

**FILTER BEDS**
Water Treatment with Ozone.
W75-09923 5F

**FILTERS**
Vacuuming Waste From Water.
W75-09930 5D

Comparison of Autoclave and Ethylene Oxide-Sterilized Membrane Filters Used in Water Quality Studies,
W75-10048 5A

Liquid Filter Apparatus,
W75-10230 5D

**FILTRATION**
Vacuuming Waste From Water.
W75-09930 5D

Quantitative Large-Volume Sampling Technique,
W75-10031 5A

**FILTRATION**

Filtration of Water With a High Iron Content,
W75-10171 5F

Zeta Potential Controls Direct Filtration Coagulation,
W75-10280 5F

**FINITE ELEMENT ANALYSIS**
Finite Element Modeling of Flow Through Porous Media,
W75-09900 5B

**FISH BEHAVIOR**
Influence of Light Intensity on the Bioenergetics of Channel Catfish,
W75-10100 8I

**FISH DISEASES**
The Response of Gymnodinium Breve to Municipal Waste Materials,
W75-10033 5C

**FISH EGGS**
Temperature Effects on Eggs and Fry of Percoid Fishes,
W75-10020 5C

**FISH FOOD ORGANISMS**
Studies to Determine Methods for Culturing Three Freshwater Zooplankton Species,
W75-10027 5A

**FISH LARVAE**
Temperature Effects on Eggs and Fry of Percoid Fishes,
W75-10020 5C

**FISH MANAGEMENT**
A Theoretical and Empirical Approach to Fisheries Economics,
W75-10118 6C

**FISH MARKING**
Marking Alewife Fry with Biological Stains,
W75-10029 8I

**FISH PHYSIOLOGY**
Phthalate Esters, Heartrate Depressors in the Goldfish,
W75-09902 5C

The Effect of Methyl Mercury on Gill Metabolism and Blood Parameters of Rainbow Trout,
W75-09906 5C

**FISH STOCKING**
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. I. Physical and Chemical Conditions in Lake Water,
W75-10094 5C

**FISH VIRUSES**
Fish Viruses: Buffers and Methods for Plaquing Eight Agents Under Normal Atmosphere,
W75-10257 5C

**FISHERIES**
A Theoretical and Empirical Approach to Fisheries Economics,
W75-10118 6C

Artificial Reefs for Texas.
W75-10119 3E

**FLINT CREEK RESERVOIR (MISS)**
The Economic Impact of a Small Recreation-Oriented Reservoir,
W75-09857 6B

**FLOATS**
Wave Quenching Device,
W75-09871 4A

**FLOCCULATION**
Sewage and Effluent Treating System,
W75-09870 5D

**FLOOD CONTROL**
Hydrologic Data for North Creek, Trinity River Basin, Texas, 1973,
W75-10149 7C

**FLOOD DISCHARGE**
A Technique for Estimating the Magnitude and Frequency of Floods in Maine,
W75-10155 2E

**FLOOD FORECASTING**
A Method for Predicting Flood Water Runoff of the River Steyr (Ein Verfahren zur Vorhersage der Hochwasserabfluesse der Steyr),
W75-09943 4A

A Technique for Estimating the Magnitude and Frequency of Floods in Maine,
W75-10155 2E

**FLOOD FREQUENCY**
A Technique for Estimating the Magnitude and Frequency of Floods in Maine,
W75-10155 2E

**FLOOD PLAIN ZONING**
Applications of Integer and Quadratic Programming to Floodplain Land Use Management,
W75-10008 6F

**FLOOD PREV. ACT**
Hydrologic Data for North Creek, Trinity River Basin, Texas, 1973,
W75-10149 7C

**FLOOD PROTECTION**
Warm Springs Dam and Lake Sonoma Project, Russian River Basin, Sonoma County, California, Part I (Final Environmental Impact Statement).
W75-10298 8A

Warm Springs Dam and Lake Sonoma Project, Russian River Basin, Sonoma County, California, Part I (Final Environmental Impact Statement).
W75-10298 8A

Minutes of the 89th Meeting, (Arkansas-Red-White River Basins Inter-Agency Committee).
W75-10300 4A

**FLOOD ROUTING**
Clayton Lake, Jack Fork Creek, Oklahoma (Final Environmental Impact Statement).
W75-10297 8A

**FLORIDA**
The EML 1973 Florida Area Cumulus Experiment,
W75-09981 3B

The Response of Gymnodinium Breve to Municipal Waste Materials,
W75-10033 5C

Fauna and Flora in Hydraulic Clam Dredge Collections from Florida West and Southeast Coasts,
W75-10079 5C

Activities, Characteristics, and Opinions of Lakefront Residents: Kissimmee River Basin, Florida,
W75-10129 6B

Effects of Lowering Interior Canal Stages Salt-Water Intrusion into the Shallow Aqu in Southeast Palm Beach County, Florida,
W75-10156

Distribution of Nitrogen and Phosphorou the Conservation Areas in South Florida f July 1972 to June 1973,
W75-10160

Effects of Fire on the Plants and Animals Florida Wetland,
W75-10181

Water and Water Problems in the Southv Florida Water Management District and S Possible Solutions,
W75-10207

An Unusual Brown Rot Outbreak in a Flo Citrus Grove Following Sprinkler Irriga With Phytophthora-Infested Water,
W75-10245

Proposed 1973 Outer Continental Shelf Oil Gas General Lease-Sale, Offshore Mississi Alabama, and Florida, Volume 3. Alternat to the Proposed Action (Final Environme Impact Statement).
W75-10291

Rules and Regulations, Southwest W Management District (Florida).
W75-10306

**FLORIDA WATER RESOURCES ACT OF 19**
Rules and Regulations, Southwest W Management District (Florida).
W75-10306

Rules of Central and Southern Flood Cor District, Chapter 16CA, with Commentary.
W75-10307

**FLOW CHARACTERISTICS**
Sudden Release of Water from a I Prismatic Flume,
W75-10017

The Discharge of South Carolina Streams Relates to Link Magnitude,
W75-10134

**FLOW MEASUREMENT**
Measurement of Small Discharges Through Notch Weirs,
W75-10059

New Flowmeter Passes Tests,
W75-10190

**FLOW RATES**
The Magnetic Flowmeter and Its Use in W Water Technology (Der magneti Durchflussmesser und seine Anwendung in Abwassertechnik),
W75-10185

**FLOW RESISTANCE**
Friction Coefficients for Laminar Sheet I Over Rough Surfaces,
W75-10062

**FLOWMETERS**
New Flowmeter Passes Tests,
W75-10190

**FLUCTUATIONS**
A Study of Beach Ground-Water Hydro and Chemistry,
W75-10077

IDIZED-BED INCINERATION
uidized-Bed Incineration of Urban Sludge
ncineration des Boues Urbaines en Lit Flu-
ie),
75-09941 5D

MES
dden Release of Water from a Long
ismatic Flume,
75-10017 8B

ORESCENCE SPECTROSCOPY
timates Using Fluorescence Spectroscopy of
Present State of Petroleum Hydrocarbon
ntamination in the Water Column of the
rthwest Atlantic Ocean,
'5-10233 5A

imates of Oil in Aquatic Sediments by
orescence Spectroscopy,
5-10235 5A

-GRADIENT EQUATIONS
Investigation of the Predictive Ability of
eral Evaporation Equations,
5-10051 2D

I FRACTIONATION
vage Disposal System,
5-09869 5D

I SEPARATION
age Disposal System,
5-09869 5D

ING
cess for Controlling Oil Slicks,
5-09868 5G

ceedings of the World Meteorological Or-
zation/International Association of
eorology and Atmospheric Physics Scien-
Conference on Weather Modification.
-09944 3B

Dispersal - Physical and Technological
ects,
-09945 3B

Method of Fog Modification by Passiva-
of Condensation Nuclei,
-09946 3B

gn of a Modern Thermal Fog Dissipation
em for Airports,
-09947 3B

lems of Radiation Fog Prevention,
09948 3B

Data About the Mechanism of the Artifi-
Dissipation of Supercooled Fog,
09949 3B

SSIPATION
Dispersal - Physical and Technological
cts,
09945 3B

CHAINS
ides, Polychlorinated Biphenols and
y Metals in Upper Food Chain Levels,
lades National Park and Vicinity,
10080 5C

ROCESSING INDUSTRY
l and Crystalline Cane Sugar Refining
tegory--Effluent Limitations Guidelines
roposed Pretreatment Standards.
0326 5G

FOOD PRODUCTION
Irrigation Efficiencies in Producing Calories and Proteins: An Annotated Bibliography,
W75-10076 3F

FORECASTING
Predicting Evapotranspiration from Agricultural Watersheds Under Dry Conditions,
W75-09860 2D

A Model for Predicting the Effects of Sewage Effluent on Wetland Ecosystems,
W75-09915 5B

An Investigation of the Predictive Ability of Several Evaporation Equations,
W75-10051 2D

Forecasting Watershed Pollution Using a Model,
W75-10249 5A

FOREIGN COUNTRIES
Summaries of Foreign Government Environmental Reports.
W75-10289 6G

FOREIGN RESEARCH
Summaries of Foreign Government Environmental Reports.
W75-10289 6G

FOREST FIRES
Theoretical Research into Artificial Stimulation of Precipitation for Fighting Forest Fires,
W75-09956 2B

Results of Experimental and Operational Work on Combating Forest Fires,
W75-09974 3B

FOSSIL FUELS
The Comparison of the Environmental Aspects of Nuclear and Fossil Fuelled Power Stations,
W75-10349 8C

FRANCE
Natural 'Hailcores' and Their Abilities to Estimate the Efficiency of Hail Prevention Systems,
W75-09966 2B

FREEZE-CRYSTALLIZATION
Freeze Crystallization: New Water-Processing Tool,
W75-09927 5D

FREEZE CRYSTALLIZATION PROCESS
Means for and Method of Purifying Contaminated Water,
W75-09864 3A

FROG HABITATS
Effects of Introduced Bullfrogs, Rana Catesbeiana, on the Native Frogs of the San Joaquin Valley, California,
W75-10114 2I

FRONTAL CLOUDS
The Experimental Seeding of Frontal Clouds in Winter in Order to Increase Precipitation,
W75-09960 3B

FWPCA AMENDMENTS OF 1972
Feedlots Point Source Category--Effluent Guidelines and Standards.
W75-10333 5G

Glass Manufacturing Point Source Categories--Effluent Guidelines and Standards.
W75-10334 5G

GAGING STATIONS
Historical Streamflow Summary, British Columbia, to 1973.
W75-10065 7C

Historical Streamflow Summary, Ontario, to 1973.
W75-10066 7C

Historical Streamflow Summary, Alberta, to 1973.
W75-10067 7C

Historical Streamflow Summary, Yukon and Northwest Territories, to 1973.
W75-10068 7C

Historical Streamflow Summary, Manitoba, to 1973.
W75-10069 7C

Historical Streamflow Summary, Saskatchewan, to 1973.
W75-10070 7C

Historical Streamflow Summary, Atlantic Provinces, to 1973.
W75-10071 7C

GARNER VALLEY (CALIF)
Ground-Water Hydrology of Garner Valley, San Jacinto Mountains, California--A Mathematical Analysis of Recharge and Discharge,
W75-10158 2F

GAS CHROMATOGRAPHY
Methods for the Determination of Specific Organic Pollutants in Water and Waste Water,
W75-10032 5A

A Portable Gas Chromatographic Technique to Measure Dissolved Hydrocarbons in Sea Water,
W75-10096 5A

GLC Determination of PPB Levels of Citrate by Conversion to Bromoform,
W75-10191 5A

GAS-LIQUID CONTACT
Characteristics of Gas-Liquid Contact Apparatus in Ozone Treatment for Drinking Water, (In Japanese),
W75-10281 5F

GAS STORAGE
Subsurface Environment--Private Property or Public Domain,
W75-10209 4B

GATES
Transient Control in Lower Sacramento River,
W75-10219 4A

GEOCHEMISTRY
The Geochemical and Biostratigraphic Record of Natural and Pollutional Eutrophication of Minnesota Lakes,
W75-10010 5C

GEOGRAPHICAL REGIONS
Regionalism and the Law of the Sea: The Case of Semi-Enclosed Seas,
W75-10301 6E

GEOLOGIC FORMATIONS
Evaluation of Ground Water Resources: Livermore and Sunol Valleys,
W75-10063 2F

GEORGIA
Tybee Island Georgia, Beach Erosion Control Project (Final Environmental Impact Statement).
W75-10294 4D

Chattahoochee River National Recreation Area, Georgia.
W75-10320 6G

GEOTHERMAL STUDIES
Geothermal Brine Energy to Generate Power,
W75-09863 8C

Geothermal Investigations in Idaho: Part 3, an Evaluation of Thermal Water in the Weiser Area, Idaho,
W75-10147 4B

GLACIATION
Cloud Glaciation by Liquified Propane Spray,
W75-10002 3B

GOLDFISH
Phthalate Esters, Heartrate Depressors in the Goldfish,
W75-09902 5C

GOVERNMENT AGENCIES
Evolving National Water Policies,
W75-10201 6E

GOVERNMENTAL INTERRELATIONS
Georgia County Commissioner Attitudes Toward Water Problems,
W75-09855 6E

GOVERNMENTS
Safety of Dams--Bureau of Reclamation,
W75-10221 8A

GRAB SAMPLING
Routine Surveillance Alternatives for Water Quality Management,
W75-10250 5A

GRANDE RONDE BASIN (ORE)
A Sensitivity Analysis of Simulated River Basin Planning for Capital Budgeting Decisions,
W75-10223 6A

GRASSES
Seagrass Ecosystems. Recommendations for Research Programs.
W75-10106 2L

Productivity/Physiology Working Group,
W75-10107 2L

Systematic Ecology Working Group,
W75-10108 7A

Decomposition Working Group,
W75-10109 2L

Consumer Ecology Working Group,
W75-10110 2L

Oceanography,
W75-10111 2L

GREAT LAKES
Economic Aspects of Precipitation Augmentation Over the Great Lakes,
W75-09992 6B

GREAT SALT LAKE
Hardy Salt Co. v. Southern Pacific Transportation Co. (Suit Seeking Injunctive Relief or Damages for Salinity Changes Resulting from Defendant's Construction in the Great Salt Lake).
W75-10308 6E

GROINS (STRUCTURES)
Tybee Island Georgia, Beach Erosion Control Project (Final Environmental Impact Statement).
W75-10294 4D

GROUND-BASED SEEDING
Ground-Based Cloud Seeding Experiment at Delhi During Winter,
W75-09961 3B

GROUNDWATER
Status of Land Subsidence Due to Ground-Water Withdrawal Along the Mississippi Gulf Coast,
W75-09856 2F

Ground Water Pollution Problems in the Northwestern United States,
W75-10023 5B

Groundwater Pollution by Waste Discharge (La pollution des eaux souterraines par les Decharges),
W75-10042 5B

Filtration of Water With a High Iron Content,
W75-10171 5F

Isotope Hydrology 1974--A Review of the IAEA Symposium on Isotope Techniques in Groundwater Hydrology,
W75-10172 5A

Ground-Water's Role in Water Quality Management,
W75-10180 5G

Report of Committee on Survey of Ground Water Supplies in New England.
W75-10182 4B

Dumps: A Potential Threat to Our Groundwater Supplies,
W75-10184 5B

Subsurface Environment--Private Property or Public Domain,
W75-10209 4B

The Cape Cod Water Program, A Current Analysis,
W75-10283 4B

GROUNDWATER MOVEMENT
Apparatus for Controlling the Level of Subsurface Water,
W75-09880 4B

Aquifer Parameters by a Chemical Tracer Technique: Non Linear Mixing in the Roswell Confined Aquifer,
W75-09893 2F

Effects of Lowering Interior Canal Stages on Salt-Water Intrusion into the Shallow Aquifer in Southeast Palm Beach County, Florida,
W75-10156 4B

GROUNDWATER RECHARGE
Injection-Pipe System for Artificial Recharge,
W75-10142 4B

Ground-Water Hydrology of Garner Valley, San Jacinto Mountains, California--A Mathematical Analysis of Recharge and Discharge,
W75-10158 2F

GROUNDWATER RESOURCES
Evaluation of Ground Water Resources: Livermore and Sunol Valleys,
W75-10063 2F

Ground Water,
W75-10143

Ground-water Discharge from the Edwards a Associated Limestones, San Antonio Ar Texas, 1974,
W75-10146

Water Development for Irrigation Northwestern Kansas,
W75-10152

Hydrologic Reconnaissance of the Wah W Valley Drainage Basin, Millard and Bea Counties, Utah,
W75-10167

Some Applications of Thermal Infra-l Linescan in Water Resources Studies,
W75-10188

GROWTH RATES
Temperature Effects on Eggs and Fry of l coid Fishes,
W75-10020

GULF INTRACOASTAL WATERWAY
Primary Economic Impact of the Gulf tracoastal Waterway in Texas,
W75-10120

GULF OF MEXICO
Chemical and Physical Characteristics of W in Esturies of Texas, October 1970-Septem 1971,
W75-10153

GYMNODINIUM-BREVE
The Response of Gymnodinium Breve to nicipal Waste Materials,
W75-10033

GYMNODYNIUM
The Response of Gymnodinium Breve to nicipal Waste Materials,
W75-10033

HAIL
Proceedings of the World Meteorological ganization/International Association Meteorology and Atmospheric Physics S tific Conference on Weather Modification.
W75-09944

Hail Process Investigation and Hail Sup sion Activities in the U.S.S.R.,
W75-09965

Natural 'Hailcores' and Their Abilities to mate the Efficiency of Hail Preve Systems,
W75-09966

Hailstorms in Japan,
W75-09967

Research into Hail-Forming Processes an Results of Anti-Hail Protection Measur Moldavia,
W75-09968

On the Results of Practical Protection of V ble Agricultural Crops from Hail by the (Zaknigmi) Method (The Results of Five Y Work, 1969-1973),
W75-09969

Simulation of the Natural Process of Hai mation and Its Transformation Under th fluence of Artificial Crystallizaton,
W75-09970

ew of Recent Work on Hail Suppression in aria,
-09971 3B

neering and Operational Aspects of ther Modification,
-09983 3B

Hail Rockets and Shells,
-09984 3B

r Methods and Equipment for Hail ession,
-09985 3B

minary Results of Experiments Using ng Rockets with Combustible Shells,
-09987 3B

ective Cloud Study Results Applied to her Modification,
-09988 2B

e Thermodynamic Criteria for the Intensi- Convective Cloud Development,
-09989 2B

ods of Estimating Physical and Economic tiveness of Weather Modification,
-09991 3B

hysical and Economic Effectiveness of Suppression Projects,
-09995 3B

Characteristics of Cumulonimbus Clouds g Their Natural Development and Artifi- eeding,
-09996 2B

REVENTION
rch into Hail-Forming Processes and the s of Anti-Hail Protection Measures in via,
-09968 2B

UPPRESSION
Results of Practical Protection of Valua- gricultural Crops from Hail by the Thri gmi) Method (The Results of Five Years' 1969-1973),
-09969 3B

tion of the Natural Process of Hail For- and Its Transformation Under the In- e of Artificial Crystallizaton,
-09970 2B

of Recent Work on Hail Suppression in a,
-09971 3B

ail Rockets and Shells,
-09984 3B

Methods and Equipment for Hail sion,
-09985 3B

tive Cloud Study Results Applied to r Modification,
-09988 2B

Characteristics of Cumulonimbus Clouds Their Natural Development and Artifi- ding,
-09996 2B

RES
'Hailcores' and Their Abilities to Esti- he Efficiency of Hail Prevention i,
-09966 2B

HARVESTING
Mechanical Management of Aquatic Vegetation: Analytical Studies of Unit Operations Potentially Useful in their Processing,
W75-09861 4A

HAWAII
The Impact of Secondary Treatment on Wastes Discharged into the Ocean.
W75-10321 5D

HAZARDOUS SUBSTANCES (POLLUTION)
Report to the Congress on Ocean Dumping and Other Man-Induced Changes to Ocean Ecosystems (October 1972 Through December 1973).
W75-10311 5G

HAZARDS
Nitrate in Water, Soil, Plants and Animals,
W75-10083 5C

HEADWATER RESERVOIRS
Siltation Rates and Life Expectancies of Small Headwater Reservoirs in Montana,
W75-09858 2J

HEARTRATE DEPRESSORS
Phthalate Esters, Heartrate Depressors in the Goldfish,
W75-09902 5C

HEAVY METALS
Biochemical and Nutritional Interactions Between the Oyster (Crassostera Virginica (Gmelin) and its Environment,
W75-10011 5C

Pesticides, Polychlorinated Biphenols and Heavy Metals in Upper Food Chain Levels, Everglades National Park and Vicinity,
W75-10080 5C

HEAVY METALS REMOVAL
Heavy Metal Adsorbent.
W75-09934 5D

HERBICIDES
Effect of Asulam in Wildlife Species: Acute Toxicity to Birds and Fish,
W75-09903 5C

Toxicity of Selected Pesticides to the Bay Mussel (Mytilus Edulis),
W75-10021 5C

The Effects of Selected Herbicides on Bacterial Populations in an Aquatic Environment,
W75-10133 5C

HETEORTROPHIC BACTERIA
Water Research Center Unravels the Nitrate Knot,
W75-10278 5D

HETEROTROPHIC BACTERIA
The Effects of Selected Herbicides on Bacterial Populations in an Aquatic Environment,
W75-10133 5C

HIGH COUNTRY RESERVOIRS
Feasibility and Potential of Enhancing Water Recreation Opportunities on High Country Reservoirs-Phase I,
W75-09894 6B

HISTORY
Recent Sedimentary History of Lake Monona, Wisconsin,
W75-10089 5C

Legislative History of the Safe Drinking Water Act,
W75-10186 5G

Preservation and Enhancement of the American Falls at Niagara.
W75-10290 6E

HOT SPRINGS
Carbon-14 Ages of Water From the Arkansas Hot Springs,
W75-10145 2K

HUD
Scenic Rivers Association of Oklahoma v. Lynn (Suit Seeking Declaratory Judgment that HUD Must Make an Environmental Impact Study Prior to Their Contemplated Actions).
W75-10313 6E

HUDSON RIVER
Water Resources Development and Wilderness Values: A Study of the Upper Hudson River,
W75-09898 6B

HURRICANES
The Experimental Program to Modify Hurricanes,
W75-09972 2B

HYDRAULIC DESIGN
Design Implications of Hydraulic Jumps at Sudden Enlargements,
W75-10061 8B

HYDRAULIC JUMP
Design Implications of Hydraulic Jumps at Sudden Enlargements,
W75-10061 8B

HYDRAULIC MODELS
Hydraulic Model Study of a Large-Capacity Settler in a Water Capture System (Badania hydrauliczne modelu duzego osadnika na ujeciu wodociagowym),
W75-10043 5D

Design Implications of Hydraulic Jumps at Sudden Enlargements,
W75-10061 8B

HYDRAULICS
Sudden Release of Water from a Long Prismatic Flume,
W75-10017 8B

Valve Stroking in Separated Pipe Flow,
W75-10210 8B

Transformation of Moody Diagram,
W75-10216 8B

Transient Control in Lower Sacramento River,
W75-10219 4A

Digital Program for Water Network Analysis,
W75-10220 7C

Safety of Dams--Bureau of Reclamation,
W75-10221 8A

HYDROCARBON POLLUTION
How Much 'Reliability' is 'Enough',
W75-10254 5A

HYDRODYNAMICS
Hydrodynamic Levelling of an Off-Shore Tide Gauge,
W75-10060 8B

HYDROGEN ION CONCENTRATION
Importance of Water pH in Accumulation of Inorganic Mercury in Fish,
W75-09904 5A

**HYDROGEN ION CONCENTRATION**

The Recovery of Stream Macrobenthos from Low pH Stress,
W75-10127 5C

**HYDROGEOLOGY**

Evaluation of Ground Water Resources: Livermore and Sunol Valleys,
W75-10063 2F

Ground-Water Hydrology of Garner Valley, San Jacinto Mountains, California--A Mathematical Analysis of Recharge and Discharge,
W75-10158 2F

**HYDROLOGIC DATA**

Hydrologic Data for Urban Studies in the Dallas, Texas Metropolitan Area, 1973,
W75-10148 7C

Hydrologic Data for North Creek, Trinity River Basin, Texas, 1973,
W75-10149 7C

Hydrologic Data for Mountain Creek, Trinity River Basin, Texas, 1973,
W75-10150 7C

Hydrologic Data for Urban Studies in the Austin, Texas Metropolitan Area, 1973,
W75-10151 7C

**HYDROLOGY**

A Study of Beach Ground-Water Hydrology and Chemistry,
W75-10077 2F

**HYDROMETRY**

Surface Water Data, Reference Index, Canada 1974.
W75-10064 7C

Historical Streamflow Summary, British Columbia, to 1973.
W75-10065 7C

Historical Streamflow Summary, Ontario, to 1973.
W75-10066 7C

Historical Streamflow Summary, Alberta, to 1973.
W75-10067 7C

Historical Streamflow Summary, Yukon and Northwest Territories, to 1973.
W75-10068 7C

Historical Streamflow Summary, Manitoba, to 1973.
W75-10069 7C

Historical Streamflow Summary, Saskatchewan, to 1973.
W75-10070 7C

Historical Streamflow Summary, Atlantic Provinces, to 1973.
W75-10071 7C

**HYGROSCOPIC NUCLEI**

On a Method of Fog Modification by Passivation of Condensation Nuclei,
W75-09946 3B

Salt Drizzles Extracted From Unsaturated Air Layers by Seeding with Hygroscopic Nuclei,
W75-09952 3B

**HYRUM RESERVOIR (UTAH)**

The Effects of Artificial Destratification on the Water Quality and Microbial Populations of Hyrum Reservoir,
W75-09897 5C

**ICE NUCLEI**

Preparation and Properties of 'Pure' Silver Iodide Aerosol,
W75-09998 3B

An Ice Nuclei Concentration Benchmark Network,
W75-09999 7A

Ice Nuclei Generator Technology,
W75-10001 3B

An Experimental Study of the Detection of Ice Nuclei on Membrane Filters and Other Substrata,
W75-10052 2B

The Effect of Repeated Activation on Depositional Ice Nuclei,
W75-10056 2B

**IDAHO**

DDT and PCB Levels in Lake Coeur D'Alene, Idaho, Osprey Eggs,
W75-09907 5A

A Model for Earthquakes Near Palisades Reservoir, Southeast Idaho,
W75-10139 8B

Geothermal Investigations in Idaho: Part 3, an Evaluation of Thermal Water in the Weiser Area, Idaho,
W75-10147 4B

**ILLINOIS**

Removal of Pyrotechnic Generated Tracer Placed by Aircraft in a Convective Updraft,
W75-10000 3B

**ILLINOIS RIVER BASIN**

Scenic Rivers Association of Oklahoma v. Lynn (Suit Seeking Declaratory Judgment that HUD Must Make an Environmental Impact Study Prior to Their Contemplated Actions).
W75-10313 6E

**IMPACT PREDICTION**

Issues in Water Resources Impact Assessment,
W75-10222 6B

**IMPERIAL VALLEY (CALIF)**

Sprinkling Cattle for Relief from Heat Stress,
W75-10082 3F

**IMPOUNDMENTS**

The Effects of Authorization for Water Impoundments on Shoreland Transition,
W75-10126 6B

**INCINERATION**

Fluidized-Bed Incineration of Urban Sludge (Incineration des Boues Urbaines en Lit Fludise),
W75-09941 5D

Think Thermal,
W75-10284 5E

**INCOME ANALYSIS**

The Economic Impact of a Small Recreation-Oriented Reservoir,
W75-09857 6B

**INDIANA**

Obstacles to Taming Corporate Polluters: Water Pollution Politics in Gary, Indiana,
W75-10287 5G

**INDUSTRIAL PRODUCTION**

Primary Economic Impact of the Gulf Intracoastal Waterway in Texas,
W75-10120 6B

**INDUSTRIAL WASTES**

Advances in Ammonia and Nitrate Removal
W75-09911

Bibliography on the Application of Reverse mosis to Industrial and Municipal Wastewat
W75-09925

Review of the Canadian Metal Finishing In try: Consumption of Raw Materials and tions for Water Pollution Control.
W75-09926

Freeze Crystallization: New Water-Proces Tool,
W75-09927

Joint Treatment of Pulping and Muni Wastes,
W75-09928

Municipality and Industry Join in Wastev Treatment.
W75-09929

Vacuuming Waste From Water.
W75-09930

Pollution Abatement in the Pharmaceutica dustry,
W75-09931

Recovering Organic Materials from W water,
W75-09932

Tertiary Treatment: Advanced Waste Techniques,
W75-09933

Heavy Metal Adsorbent.
W75-09934

Destruction of Spent Oil-Water Emulsi Using Incandescent Coke Before Quenchir
W75-09935

Membrane Processing in the Metal Fini Industry,
W75-09936

Factors Influencing Reverse Osmosis Reje of Inorganic Solutes from Aqueous Solutic
W75-09937

Underground Liquid Waste Disposal.
W75-09938

Treatment of Aqueous Waste Streams Hydrogen Peroxide to Remove Chlorinate cyanurates Therefrom,
W75-09939

Process for Treating Waste Photog Processing Solutions,
W75-09940

Aqueous Odor Thresholds of Organic tants in Industrial Effluents,
W75-10026

Activated Carbon Treatment of Unble Kraft Effluent for Reuse,
W75-10028

Easing of Environmental Laws,
W75-10173

Arsenic in Sediments on the Continental of Southeast Australia,
W75-10177

Water Pollution Law Draws Flood of plaints.
W75-10179

condary Treatment Design for Combined astewaters, Part II,
75-10199 5D

eaning of Petroleum-Industry Effluent,
75-10200 5D

Concept for Managing Waste,
75-10236 5D

e Davy Jones Garbage Dump,
75-10238 5G

llution Lab Pays Off--Two Ways.
75-10243 5D

llution Control, Next Step, Physi-/Chemical Treatment, Activated Charcoal,
75-10279 5D

rable Slurry Pumps Are Heart of Pollution ntrol Facility at Inland.
75-10340 8C

e an Activated Carbon Plant for Waste ter Treatment,
75-10346 5D

alyzing Organics in Dilute Aqueous Solu-ns,
5-10350 5A

RMATION EXCHANGE
ter Resources Publications Related to the te of Nebraska Third Edition.
5-10015 10C

ARED RADIATION
New Infrared Instrument for Monitoring Oil ns on Water,
5-10044 5A

Infrared Studies of Santa Barbara Channel Spill,
5-10237 5A

BITION
aphene Inhibition of ATPase Activity in fish, Ictalurus Punctatus, Tissues,
5-09908 5C

BITORS
alate Esters, Heartrate Depressors in the dfish,
6-09902 5C

aphene Inhibition of ATPase Activity in Tish, Ictalurus Punctatus, Tissues,
6-09908 5C

icity of DFP and Related Compounds to ds in Relation to Cholinesterase Inhibition Detoxifying Enzyme Levels,
-09909 5C

TION-PIPE SYSTEM
ction-Pipe System for Artificial Recharge,
-10142 4B

TION WELLS
ction-Pipe System for Artificial Recharge,
-10142 4B

urface Environment--Private Property or ic Domain,
-10209 4B

CTIVE RELIEF
ed States v. St. Thomas Beach Resorts, (Action to Enjoin Obstruction to Virgin ds Shoreline by Fences Seaward of the t High Water Line).
10317 6E

INLAND WATERWAYS
Primary Economic Impact of the Gulf Intracoastal Waterway in Texas,
W75-10120 6B

INORGANIC COMPOUNDS
A Model of Inorganic Carbon Limitation in Natural Waters,
W75-10088 5C

Inorganic Chemicals Manufacturing Point Source Category.
W75-10327 5G

Electroplating Point Source Category; Copper, Nickel, Chromium and Zinc on Ferrous and Nonferrous Materials Subcategory.
W75-10328 5G

INPUT-OUTPUT ANALYSIS
Primary Economic Impact of the Gulf Intracoastal Waterway in Texas,
W75-10120 6B

INSECTICIDES
Toxicity of Selected Pesticides to the Bay Mussel (Mytilus Edulis),
W75-10021 5C

INSTITUTIONAL CONSTRAINTS
A Study of the Effects of Water Institutions on Planning and Management of Water Resources in Utah,
W75-10130 6E

INSTITUTIONS
Georgia County Commissioner Attitudes Toward Water Problems,
W75-09855 6E

Economic Institutions to Determine Water Quality,
W75-10132 5G

INSTRUMENTATION
A New Infrared Instrument for Monitoring Oil Films on Water,
W75-10044 5A

An Experimental Study of the Detection of Ice Nuclei on Membrane Filters and Other Substrata,
W75-10052 2B

New Flowmeter Passes Tests,
W75-10190 5D

Interrupted-Sweep Voltammetry for the Identification of Polychlorinated Biphenyls and Naphthalenes,
W75-10268 5A

INTEGER PROGRAMMING
Applications of Integer and Quadratic Programming to Floodplain Land Use Management,
W75-10008 6F

INTERDISCIPLINARY RESEARCH
A Study of Water Resources Research Needs in Montana,
W75-10012 6B

INTERNATIONAL JOINT COMMISSION
Preservation and Enhancement of the American Falls at Niagara.
W75-10290 6E

INTERNATIONAL LAW
Latitudinal Aspects of the Law of the Sea and of Petroleum Production,
W75-09886 6E

IRRIGATION OPERATION AND MAINTENANCE
International Legal Implications of Off-Shore Terminal Facilities,
W75-10286 5G

Regionalism and the Law of the Sea: The Case of Semi-Enclosed Seas,
W75-10301 6E

INTERNATIONAL WATERS
International Legal Implications of Off-Shore Terminal Facilities,
W75-10286 5G

INVESTIGATIONS
Seagrass Ecosystems. Recommendations for Research Programs.
W75-10106 2L

INVESTMENT CRITERIA
Project Evaluation in Water Resources: Budget Constraints,
W75-09851 6A

IOWA
On the Characteristics of Single-Cell Showers,
W75-09997 2B

Discharge Measurements at Low-Flow Partial-Record Stations in Iowa,.
W75-10144 7C

Dew Duration in Central Iowa,
W75-10212 3F

IRON
Filtration of Water With a High Iron Content,
W75-10171 5F

IRON ALLOYS
Electroplating Point Source Category; Copper, Nickel, Chromium and Zinc on Ferrous and Nonferrous Materials Subcategory.
W75-10328 5G

Ferroalloy Manufacturing Point Source Category.
W75-10332 5G

IRRIGATED LAND
Faunal Response to Spray Irrigation of Chlorinated Sewage Effluent,
W75-09899 5D

IRRIGATION
Irrigation Device,
W75-09872 3F

Trickle Irrigation Emitter,
W75-09873 3F

Management Practices Affecting Quality and Quantity of Irrigation Return Flow,
W75-10019 5G

IRRIGATION DESIGN
Irrigation Device,
W75-09872 3F

IRRIGATION EFFECTS
Effects of Irrigation and Row Spacing on Evapotranspiration and Microclimate of a Sorghum Field,
W75-09853 2D

IRRIGATION EFFICIENCY
Irrigation Efficiencies in Producing Calories and Proteins: An Annotated Bibliography,
W75-10076 3F

IRRIGATION OPERATION AND MAINTENANCE
Irrigation Device,
W75-09872 3F

IRRIGATION SYSTEMS
Authorized Bonneville Unit, Central Utah Project, Utah (Final Environmental Impact Statement).
W75-10292 8A

IRRIGATION WELLS
Water Development for Irrigation in Northwestern Kansas,
W75-10152 4B

ISOTOPE HYDROLOGY
Isotope Hydrology 1974--A Review of the IAEA Symposium on Isotope Techniques in Groundwater Hydrology,
W75-10172 5A

ISRAEL
The Role of Solid Precipitation Elements in Natural and Artificial Production of Rain in Israel,
W75-09958 3B

JAPAN
Hailstorms in Japan,
W75-09967 3B

Preliminary Results of Experiments Using Seeding Rockets with Combustible Shells,
W75-09987 3B

JUDICIAL DECISIONS
Legislation Under NEPA: Plaintiffs' Phyrrhic Victories Draw Congressional Fire, Judicial Warnings,
W75-10303 5G

Ton-Da-Lay, Ltd. v. Diamond (Review of Denial of Application for Water Supply and Sewage Treatment Systems).
W75-10314 6E

Sutherland v. Hickory Nut Corp. (Action for Damages Caused by Construction of Roads by Adjacent Property Owner Which Altered Natural Drainage of Mountain Land).
W75-10315 6E

Dupont De Nemours and Co. v. Train (Action by Chemical Manufacturers to Set Aside Regulations Governing Effluent Discharge of Sulfuric Acid Plants).
W75-10316 6E

JURISDICATION
Federal Viewpoint (Permit Issuance--Administrative and Judicial Review--Observations and Problems),
W75-10302 5G

KANSAS
Effects of Irrigation and Row Spacing on Evapotranspiration and Microclimate of a Sorghum Field,
W75-09853 2D

Predicting Evapotranspiration from Agricultural Watersheds Under Dry Conditions,
W75-09860 2D

Use of Lime-Soda Ash Softening Sludge for the Treatment of Municipal Wastewater,
W75-10125 5D

Water Development for Irrigation in Northwestern Kansas,
W75-10152 4B

Big Hill Lake Creek, Kansas (Final Environmental Impact Statement).
W75-10293 8D

KINETICS
Phosphorus Kinetics in the Euphotic Zone of the Chesapeake Bay,
W75-10101 5C

LABORATORY EQUIPMENT
Preparation and Properties of 'Pure' Silver Iodide Aerosol,
W75-09998 3B

An Experimental Study of the Detection of Ice Nuclei on Membrane Filters and Other Substrata,
W75-10052 2B

LABORATORY SIMULATION
Laboratory Simulation of Swine Manure Lagoons,
W75-10137 5D

LABORATORY TESTS
The Effect of Repeated Activation on Depositional Ice Nuclei,
W75-10056 2B

Friction Coefficients for Laminar Sheet Flow Over Rough Surfaces,
W75-10062 8B

Fecal Contamination--The Water Analyst's Responsibility Part II,
W75-10258 5A

LAKE BALATON (HUNGARY)
Effect of Wind Waves and Wind Tides on the Optimum Control of Large Lakes,
W75-10204 4A

LAKE COEUR D'ALENE (IDAHO)
DDT and PCB Levels in Lake Coeur D'Alene, Idaho, Osprey Eggs,
W75-09907 5A

LAKE ERIE
Obstacles to Taming Corporate Polluters: Water Pollution Politics in Gary, Indiana,
W75-10287 5G

LAKE LEVEL REGULATION
Economic Aspects of Precipitation Augmentation Over the Great Lakes,
W75-09992 6B

LAKE MICHIGAN
Fluxes, Residence Times, and Sources of Some Elements to Lake Michigan,
W75-10090 5C

LAKE MONONA (WIS)
Recent Sedimentary History of Lake Monona, Wisconsin,
W75-10089 5C

LAKE ONTARIO
Chlorinated Hydrocarbons in the Lake Ontario Ecosystem, (IFYGL),
W75-10018 5A

LAKE RESTORATION
Survey of Lake Rehabilitation Techniques and Experiences,
W75-10078 5C

Measures for the Restoration and Enhancement of Quality of Freshwater Lakes.
W75-10122 5C

LAKE SEDIMENTS
The Geochemical and Biostratigraphic Record of Natural and Pollutional Eutrophication of Minnesota Lakes,
W75-10010 5C

Recent Sedimentary History of Lake Monona, Wisconsin,
W75-10089 5C

LAKE WABAMUN (ALBERTA)
Preliminary Results of a Study Concerning the Effects of Thermal Pollution on Phytoplanktonic Primary Production in Lake Wabamun, Alberta,
W75-10073 5C

Changes in the Submerged Macrophyte Communities of Lake Wabamum as a Result of Thermal Discharges,
W75-10074 5C

LAKE WARNIAK (POLAND)
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. I. Physical and Chemical Conditions in Lake Water,
W75-10094 5C

LAKE WINGRA (WIS)
An Ecosystem Model for the Pelagic Zone of Lake Wingra,
W75-10092 5C

LAKE WORTH (FLA)
Effects of Lowering Interior Canal Stages on Salt-Water Intrusion into the Shallow Aquifer in Southeast Palm Beach County, Florida,
W75-10156 4B

LAKES
The Eutrophication of Lakes in the Okanagan Valley, British Columbia,
W75-10075 5C

Survey of Lake Rehabilitation Techniques and Experiences,
W75-10078 5C

Recovery of Polluted Lakes. A Swedish Research Program on the Effects of Advanced Waste Water Treatment and Sewage Diversion,
W75-10081 5C

An Ecosystem Model for the Pelagic Zone of Lake Wingra,
W75-10092 5C

Experimentally Increased Fish Stock in the Pond Type Lake Warniak. I. Physical and Chemical Conditions in Lake Water,
W75-10094 5C

Diatoms in Lakes and Lake Sediments as an Index to Environment. Part 2. A Study of Phytoplankton Distribution, Lake Classification, and Trophic Indicators in Minnesota Lakes,
W75-10105 5C

Measures for the Restoration and Enhancement of Quality of Freshwater Lakes.
W75-10122 5C

Effect of Wind Waves and Wind Tides on the Optimum Control of Large Lakes,
W75-10204 4A

LAMELLA SEPARATOR
New Separator May Spur Interest in Sedimentation,
W75-10226 5

LAND CLASSIFICATION
Classification of Freshwater Wetlands in the Glaciated Northeast,
W75-10128 6

lization of Aerial Photographs for Measur- Land Use Changes in Watersheds,
5-10136 4C

) CLEARING
ects of Original Vegetation on Reservoir ter Quality,
5-10014 5C

) DEVELOPMENT
Effects of Authorization for Water Im- ndments on Shoreland Transition,
5-10126 6B

nic Rivers Association of Oklahoma v. n (Suit Seeking Declaratory Judgment that D Must Make an Environmental Impact ly Prior to Their Contemplated Actions).
5-10313 6E

SUBSIDENCE
us of Land Subsidence Due to Ground- er Withdrawal Along the Mississippi Gulf st,
-09856 2F

USE
lications of Integer and Quadratic Pro- mming to Floodplain Land Use Manage- t,
-10008 6F

Effects of Authorization for Water Im- ndments on Shoreland Transition,
-10126 6B

zation of Aerial Photographs for Measur- Land Use Changes in Watersheds,
-10136 4C

ace Waters and the Civil Law Rule,
-10304 6E

TILLS
suring External Effects of Solid Waste agement,
10024 5B

ndwater Pollution by Waste Discharge (La tion des eaux souterraines par les arges),
10042 5B

es: A Potential Threat to Our Ground- Supplies,
10184 5B

ANUM
oitation of Phosphates in Sewage with anum: An Experimental and Modelling ,
10259 5D

L GROWTH STAGE
ity of Selected Pesticides to the Bay Mus- ytilus Edulis),
0021 5C

ING
s of Original Vegetation on Reservoir Quality,
0014 5C

nic Leaching Studies on Pulpwood Bark nes,
0214 5D

ASPECTS
ation Under NEPA: Plaintiffs' Phyrrhic ies Draw Congressional Fire, Judicial ngs,
0303 5G

The Public Trust Doctrine and The California Coastline,
W75-10305 6E

LEGAL REVIEW
Federal Viewpoint (Permit Issuance--Administrative and Judicial Review--Observations and Problems),
W75-10302 5G

Legislation Under NEPA: Plaintiffs' Phyrrhic Victories Draw Congressional Fire, Judicial Warnings,
W75-10303 5G

Dupont De Nemours and Co. v. Train (Action by Chemical Manufacturers to Set Aside Regulations Governing Effluent Discharge of Sulfuric Acid Plants).
W75-10316 6E

LEGISLATION
Easing of Environmental Laws,
W75-10173 5G

Let's Try 90% First and See What Our Quality is Like,
W75-10175 5G

Regional Authorities Take Over Britain's Water/Sewage Systems,
W75-10176 6E

Lack of Promised Federal Funds Hampers Water Cleanup Effort.
W75-10178 5G

Legislative History of the Safe Drinking Water Act,
W75-10186 5G

Subsurface Environment--Private Property or Public Domain,
W75-10209 4B

Changing Federal-State Relationships in Water Pollution Control Programs,
W75-10270 5G

Regulation of Ocean Dumping--One Year Later,
W75-10285 5G

Obstacles to Taming Corporate Polluters: Water Pollution Politics in Gary, Indiana,
W75-10287 5G

Legislation Under NEPA: Plaintiffs' Phyrrhic Victories Draw Congressional Fire, Judicial Warnings,
W75-10303 5G

Report to the Congress on Ocean Dumping and Other Man-Induced Changes to Ocean Ecosystems (October 1972 Through December 1973).
W75-10311 5G

LEHIGH RIVER (PENN)
Project Evaluation in Water Resources: Budget Constraints,
W75-09851 6A

LETHAL LIMIT
Biochemical and Nutritional Interactions Between the Oyster (Crassostera Virginica (Gmelin) and its Environment,
W75-10011 5C

LIABILITY (LEGAL ASPECTS)
Sutherland v. Hickory Nut Corp. (Action for Damages Caused by Construction of Roads by Adjacent Property Owner Which Altered Natural Drainage of Mountain Land).
W75-10315 6E

LIFE CYCLES
Systematic Ecology Working Group,
W75-10108 7A

LIGHT INTENSITY
Influence of Light Intensity on the Bioenergetics of Channel Catfish,
W75-10100 8I

LIGHTNING
Convective Cloud Modification to Reduce Thunderstorm Activity,
W75-09975 3B

Some Questions of Thunderstorm Lightning Control,
W75-09977 2B

The Effect of Chaff Seeding on Lightning and Electric Fields of Thunderstorms,
W75-09978 3B

LIGHTNING SUPPRESSION
The Effect of Chaff Seeding on Lightning and Electric Fields of Thunderstorms,
W75-09978 3B

LIME-SODA ASH PROCESS
Use of Lime-Soda Ash Softening Sludge for the Treatment of Municipal Wastewater,
W75-10125 5D

LIMITING FACTORS
Identity and Regulation of Nutrients Limiting Phytoplankton in the Shallow Estuaries Near Beaufort, N.C.,
W75-10084 5C

A Model of Inorganic Carbon Limitation in Natural Waters,
W75-10088 5C

LINEAR ALKYLATE SULFONATES
Biodegradation of Linear Alkylate Sulfonates in River Model (In Japanese),
W75-10247 5B

LINEAR PROGRAMMING
Project Evaluation in Water Resources: Budget Constraints,
W75-09851 6A

A General Linear Approach to Stream Water Quality Modeling,
W75-09917 5B

A Mathematical Programming Approach to Public Water Project. Portfolio Selection,
W75-10131 6B

Planning and Operation of Urban Water Quality Management Systems,
W75-10262 5G

LIQUEFIED PROPANE
Cloud Glaciation by Liquified Propane Spray,
W75-10002 3B

LIQUID WASTES
Hydrologic Evaluation of the Haystack Butte Area with Emphasis on Possible Discharge of Class-I Wastes, Edwards Air Force Base, California,
W75-10161 5B

LIVERMORE VALLEY (CALIF)
Evaluation of Ground Water Resources: Livermore and Sunol Valleys,
W75-10063 2F

LOCAL GOVERNMENTS
Georgia County Commissioner Attitudes Toward Water Problems,
W75-09855 6E

LONG-TERM PLANNING
A Mathematical Programming Approach to Public Water Project. Portfolio Selection,
W75-10131 6B

LORING AIR FORCE BASE (ME)
Water Pollution Study of Malabeam Lake, Greenlaw Brook and Adjacent Streams on Loring AFB, Maine,
W75-10113 5C

LOS ANGELES COUNTY (CALIF)
Submersible Pumps Make By-Pass Possible,
W75-10276 8C

LOUISIANA
Groundwater Pollution: Problems and Solutions.
W75-10058 5B

LOW FLOW
Discharge Measurements at Low-Flow Partial-Record Stations in Iowa,.
W75-10144 7C

Low-Flow Characteristics of Wisconsin Streams at Sewage-Treatment Plants,
W75-10163 5B

MAGNETIC FLOWMETER
The Magnetic Flowmeter and Its Use in Waste Water Technology (Der magnetische Durchflussmesser und seine Anwendung in der Abwassertechnik),
W75-10185 5A

MAINE
A Technique for Estimating the Magnitude and Frequency of Floods in Maine,
W75-10155 2E

MANAGEMENT
Review of Literature Pertinent to the Aqueous Conversion of Radionuclides to Insoluble Silicates with Selected References and Bibliography (Revised),
W75-09892 5D

Methods to Facilitate Managerial Effectiveness in Municipal Water Systems,
W75-09895 6B

A Computer Simulation Analysis of Surface Water Quality Management Policies Under Dynamic Economic and Hydrologic Conditions,
W75-10124 5D

A Study of the Effects of Water Institutions on Planning and Management of Water Resources in Utah,
W75-10130 6E

Regional Authorities Take Over Britain's Water/Sewage Systems,
W75-10176 6E

Colorado River-Flow Management,
W75-10208 4A

MANGANESE
Filtration of Water With a High Iron Content,
W75-10171 5F

MANITOBA
Historical Streamflow Summary, Manitoba, to 1973.
W75-10069 7C

MANPOWER
Recommendations for Environmental Engineering Education,
W75-10218 9A

MARINE ALGAE
Fauna and Flora in Hydraulic Clam Dredge Collections from Florida West and Southeast Coasts,
W75-10079 5C

North Carolina Marine Algae. III. A Community of Ceramiales (Rhodophyta) on a Glass Sponge From 60 meters,
W75-10087 5C

MARINE ANIMALS
Fauna and Flora in Hydraulic Clam Dredge Collections from Florida West and Southeast Coasts,
W75-10079 5C

MARINE BACTERIA
Microbial Degradation of DDT,
W75-10091 5C

MARINE FISH
A Theoretical and Empirical Approach to Fisheries Economics,
W75-10118 6C

MARINE FISHERIES
Pamlico River Estuary--Past, Present and Future,
W75-10338 2L

MARINE PLANTS
Fauna and Flora in Hydraulic Clam Dredge Collections from Florida West and Southeast Coasts,
W75-10079 5C

Seagrass Ecosystems. Recommendations for Research Programs.
W75-10106 2L

Productivity/Physiology Working Group,
W75-10107 2L

Systematic Ecology Working Group,
W75-10108 7A

Decomposition Working Group,
W75-10109 2L

Consumer Ecology Working Group,
W75-10110 2L

Oceanography,
W75-10111 2L

MARINE PROTECTION
Regulation of Ocean Dumping--One Year Later,
W75-10285 5G

Report to the Congress on Ocean Dumping and Other Man-Induced Changes to Ocean Ecosystems (October 1972 Through December 1973).
W75-10311 5G

MARSHES
A Model for Predicting the Effects of Sewage Effluent on Wetland Ecosystems,
W75-09915 5B

MARYLAND
Effects of Sediment Control on Sediment Transport in the Northwest Branch Anacostia River Basin, Montgomery County, Maryland,
W75-10141 2J

Tred Avon River, Talbot County, Marylanc (Final Environmental Impact Statement).
W75-10295 4A

MASS BALANCE
Evaluation of Phosphorus Dynamics in a Watershed,
W75-10217 5E

MASS TRANSFER
Mass Transfer to Naturally Flowing Streams,
W75-10341 5E

MASSACHUSETTS
The Cape Cod Water Program, A Current Analysis,
W75-10283 4E

MATHEMATICAL MODELS
A Model for Predicting the Effects of Sewage Effluent on Wetland Ecosystems,
W75-09915 5E

A General Linear Approach to Stream Wate Quality Modeling,
W75-09917 5E

Seeding Requirements for Rapid Glaciation o Stimulation of a Mixed Phase Cloud,
W75-09963 3E

A Study of Beach Ground-Water Hydrolog and Chemistry,
W75-10077 2E

A Model of Inorganic Carbon Limitation i Natural Waters,
W75-10088 5C

Statistical Evaluation of Reaeration Predictio Equations,
W75-10211 5C

Effects of Deposit Resuspension on Settlin Basin,
W75-10213 5E

Deterministic Model of Dynamic Eutrophi Estuary,
W75-10215 5

Water Quality Routing of Unsteady River Flo by Finite Element Method,
W75-10252 5

Monitoring: An Environmental State Estim tion Problem,
W75-10255 5

Identification Method in Environment Systems and Its Application to Water Pollutio
W75-10266 5

MATHEMATICAL STUDIES
A Mathematical Programming Approach Public Water Project. Portfolio Selection,
W75-10131 6

MEASUREMENT
The Acquisition of Information During A tempts at Weather Modification,
W75-09986 7

An Ice Nuclei Concentration Benchmark Ne work,
W75-09999 7

Phosphorus Run-Off From the Drainage Bas to Mikolajskie Lake,
W75-10095 5

Measurements of Absolute Scalar Irradian Spectra in Rhode River,
W75-10102 5

ctivity/Physiology Working Group,
7 0107 2L

efagnetic Flowmeter and Its Use in Waste
Technology (Der magnetische
flussmesser und seine Anwendung in der
sertechnik),
7 0185 5A

Liquefaction by Torsional Simple Shear
e,
50231 8D

ANE FILTERS
arison of Autoclave and Ethylene Oxide-
ized Membrane Filters Used in Water
y Studies,
50048 5A

ANE PROCESS
ing Plants Inventory, Report No. 5,
59852 3A

ANE PROCESSES
raphy on the Application of Reverse Os-
o Industrial and Municipal Wastewaters,
59925 5D

rane Processing in the Metal Finishing
ry,
59936 5D

s Influencing Reverse Osmosis Rejection
ganic Solutes from Aqueous Solution,
59937 5D

tion of Phenol from Waste Water by the
Membrane Technique,
5-273 5D

Y
ance of Water pH in Accumulation of
ic Mercury in Fish,
5-904 5A

ect of Methyl Mercury on Gill Metabol-
Blood Parameters of Rainbow Trout,
5-906 5C

urces and Levels of Mercury in the
of a University Campus,
5-049 5A

ILLIC BACTERIA
ects of Selected Herbicides on Bacteri-
ations in an Aquatic Environment,
-133 5C

LISM
ect of Methyl Mercury on Gill Metabol-
Blood Parameters of Rainbow Trout,
-906 5C

hical and Nutritional Interactions
the Oyster (Crassostera Virginica
) and its Environment,
-011 5C

NISHING INDUSTRY
of the Canadian Metal Finishing Indus-
sumption of Raw Materials and Op-
Water Pollution Control.
026 5D

ne Processing in the Metal Finishing
st,
036 5D

LOGICAL DATA
n of an ERTS-1 Data Collection Plat-
talled in the Alpine Tundra, Colorado,
55 7B

METEOROLOGY
Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification.
W75-09944 3B

METHANOL
An Automated Method for Determination of Residual Methanol in Denitrified Effluents,
W75-10047 5D

METHODOLOGY
Fog Dispersal - Physical and Technological Aspects,
W75-09945 3B

On a Method of Fog Modification by Passivation of Condensation Nuclei,
W75-09946 3B

Problems of Radiation Fog Prevention,
W75-09948 3B

A Review of Methods to Evaluate Precipitation Modification in North America,
W75-09990 3B

Color Measurement Methods for Surface Water Receiving Colored Wastes,
W75-10135 5A

Fish Viruses: Buffers and Methods for Plaquing Eight Agents Under Normal Atmosphere,
W75-10257 5C

Plan Formulation and Evaluation Studies--Recreation. Vol. IV of V. Estimating Recreational Facility Requirements,
W75-10344 6B

MICRO-AID
Chemicals Reduce System Odours,
W75-10040 5D

MICROBIAL DEGRADATION
Microbial Degradation of Petroleum,
W75-09862 5G

Microbial Degradation of DDT,
W75-10091 5C

Modeling Microbial Growth in Wastewater Treatment,
W75-10170 5D

MICROBIOLOGY
Microbiology and Water Quality in a Tributary of Cayuga Lake,
W75-09896 5C

MICROECOSYSTEMS
Fluvial-Estuarine Water Resource Optimization: Microecosystem Simulation of River-Estuarine Productivity Relationships,
W75-10099 2L

MICROORGANISMS
Microbial Degradation of Petroleum,
W75-09862 5G

MIKOLAJSKIE LAKE (POLAND)
The Structure and Production of Phytoplankton in Mikolajskie Lake,
W75-10093 5C

Phosphorus Run-Off From the Drainage Basin to Mikolajskie Lake,
W75-10095 5C

MINERAL INDUSTRY
Latitudinal Aspects of the Law of the Sea and of Petroleum Production,
W75-09886 6E

MINING
Subsurface Environment--Private Property or Public Domain,
W75-10209 4B

MINNEAPOLIS-ST PAUL METROPOLITAN AREA (MINN)
Proceedings of Workshop Conference on Identification of Metropolitan Area Water Resources Problems and Associated Research Needs in Minnesota.
W75-10004 6B

Climate of Minnesota - Part VII - Areal Distribution and Probabilities of Precipitation in the Minneapolis-St. Paul Metropolitan Area,
W75-10009 2B

MINNESOTA
Proceedings of Workshop Conference on Identification of Metropolitan Area Water Resources Problems and Associated Research Needs in Minnesota.
W75-10004 6B

Proceedings of Public Workshop Conference on Water Resources Problems and Research Needs in Central Minnesota.
W75-10005 6B

Proceedings of Public Forum on Water Resources Problems and Research Needs in Southwestern Minnesota.
W75-10006 6B

Proceedings of Public Forum on Water Resources Problems in Southeastern Minnesota.
W75-10007 6B

Climate of Minnesota - Part VII - Areal Distribution and Probabilities of Precipitation in the Minneapolis-St. Paul Metropolitan Area,
W75-10009 2B

The Geochemical and Biostratigraphic Record of Natural and Pollutional Eutrophication of Minnesota Lakes,
W75-10010 5C

Asbestos in Drinking Water,
W75-10030 5A

MINNOWS
Importance of Water pH in Accumulation of Inorganic Mercury in Fish,
W75-09904 5A

MISSISSIPPI
The Economic Impact of a Small Recreation-Oriented Reservoir,
W75-09857 6B

Methods to Facilitate Managerial Effectiveness in Municipal Water Systems,
W75-09895 6B

Residential Canals Along the Gulf Coast,
W75-10016 5B

Proposed 1973 Outer Continental Shelf Oil and Gas General Lease-Sale, Offshore Mississippi, Alabama, and Florida, Volume 3. Alternatives to the Proposed Action (Final Environmental Impact Statement).
W75-10291 5G

MISSISSIPPI GULF COAST
Status of Land Subsidence Due to Ground-Water Withdrawal Along the Mississippi Gulf Coast,
W75-09856 2F

MISSOURI
A Computer Comes to Missouri,
W75-10265 5D

MISSOURI RIVER
Initial Stage, Garrison Diversion Unit, Pick-Sloan Missouri Basin Program, North Dakota (Final Environmental Impact Statement).
W75-10296 8A

MIXING
Aquifer Parameters by a Chemical Tracer Technique: Non Linear Mixing in the Roswell Confined Aquifer,
W75-09893 2F

Characterization of Mixing in Aerated Lagoons,
W75-09913 5D

MODEL STUDIES
Effects of Irrigation and Row Spacing on Evapotranspiration and Microclimate of a Sorghum Field,
W75-09853 2D

Predicting Evapotranspiration from Agricultural Watersheds Under Dry Conditions,
W75-09860 2D

Methods to Facilitate Managerial Effectiveness in Municipal Water Systems,
W75-09895 6B

Hydrologic Impact of Planned Unit Developments,
W75-09919 4C

Numerical Simulation of Cloud Seeding Experiments,
W75-09955 2B

Hail Process Investigation and Hail Suppression Activities in the U.S.S.R.,
W75-09965 3B

Simulation of the Natural Process of Hail Formation and Its Transformation Under the Influence of Artificial Crystallizaton,
W75-09970 2B

On the Thermodynamic Criteria for the Intensity of Convective Cloud Development,
W75-09989 2B

Quantitative Error Analysis of Numerical Methods for Partial Differential Equations,
W75-10003 6G

Management Practices Affecting Quality and Quantity of Irrigation Return Flow,
W75-10019 5G

Theoretical Probabilities of Predicted Occurrences and Amounts of Precipitation,
W75-10050 2B

An Ecosystem Model for the Pelagic Zone of Lake Wingra,
W75-10092 5C

Experimental Eutrophication of Terrestrial and Aquatic Ecosystems. First Annual Report of the Upland Recharge Project,
W75-10097 5D

Fluvial-Estuarine Water Resource Optimization: Microecosystem Simulation of River-Estuarine Productivity Relationships,
W75-10099 2L

Educing and Modeling the Functional Relationships Within Sublittoral Salt Marsh Aufwuchs Communities - Inside One of the Black Boxes,
W75-10104 5C

A Theoretical and Empirical Approach to Fisheries Economics,
W75-10118 6C

A Model for Earthquakes Near Palisades Reservoir, Southeast Idaho,
W75-10139 8B

Numerical Model of the Salt-Wedge Reach of the Duwamish River Estuary, King County, Washington,
W75-10157 5B

Reservoir Release Routing Model for the Upper Arkansas River Basin of Colorado,
W75-10165 4A

Biological Wastewater Treatment Model Building Fits and Misfits,
W75-10169 5D

Modeling Microbial Growth in Wastewater Treatment,
W75-10170 5D

Biodegradation of Linear Alkylate Sulfonates in River Model (In Japanese),
W75-10247 5B

Forecasting Watershed Pollution Using a Model,
W75-10249 5A

Monitoring: An Environmental State Estimation Problem,
W75-10255 5A

Planning and Operation of Urban Water Quality Management Systems,
W75-10262 5G

MONITORING
Methods for the Determination of Specific Organic Pollutants in Water and Waste Water,
W75-10032 5A

A New Infrared Instrument for Monitoring Oil Films on Water,
W75-10044 5A

The Sources and Levels of Mercury in the Sewage of a University Campus,
W75-10049 5A

Water Pollution Monitoring System, (In Japanese),
W75-10196 5A

Pollution Lab Pays Off--Two Ways.
W75-10243 5D

Waterway Monitoring System.
W75-10248 7A

Routine Surveillance Alternatives for Water Quality Management,
W75-10250 5A

Monitoring the Quality of Surface Water,
W75-10251 5A

How Much 'Reliability' is 'Enough',
W75-10254 5A

Monitoring: An Environmental State Estim
tion Problem,
W75-10255 5

TV System Gives Automatic Alarm as Wess
Visual Monitoring of Air and Water Pollution.
W75-10263 5

A Computer Comes to Missouri,
W75-10265 5

Water Monitoring is Big Business.
W75-10269 5

Development Progress with Salwico Pollut
Monitoring System.
W75-10272 5

MONITORING SYSTEM DESIGN
Monitoring: An Environmental State Estim
tion Problem,
W75-10255 5

MONTANA
Siltation Rates and Life Expectancies of Sm
Headwater Reservoirs in Montana,
W75-09858

A Study of Water Resources Research Nee
in Montana,
W75-10012

MONTGOMERY COUNTY (MD)
Effects of Sediment Control on Sedim
Transport in the Northwest Branch Anacos
River Basin, Montgomery County, Maryland
W75-10141

MOODY RESISTANCE DIAGRAMS
Transformation of Moody Diagram,
W75-10216

MOUNTAIN CREEK (TEX)
Hydrologic Data for Mountain Creek, Trin
River Basin, Texas, 1973,
W75-10150

MOUNTAINS
The Artificial Modification of Clouds
Precipitation in a Mountainous Region,
W75-09962

Evaluation of an ERTS-1 Data Collection P
form Installed in the Alpine Tundra, Colorad
W75-10055

MULCHING
Mechanical Management of Aquatic Veg
tion: Analytical Studies of Unit Operati
Potentially Useful in their Processing,
W75-09861

MULTI-COST SYSTEM OPTIMIZATION
Optimal Control of Water Pollution in a Ri
Stream,
W75-10206

MULTI-DISCIPLINARY RESEARCH
A Study of Water Resources Research Ne
in Montana,
W75-10012

MULTIOBJECTIVES
Project Evaluation in Water Resources: Bu
Constraints,
W75-09851

MULTIPLE-PURPOSE PROJECTS
A Sensitivity Analysis of Simulated R
Basin Planning for Capital Budgeting D
sions,
W75-10223

PLE-PURPOSE RESERVOIRS
Hill Lake Creek, Kansas (Final Environ-
al Impact Statement).
10293 8D

IPAL WASTES
nces in Ammonia and Nitrate Removal,
09911 5D

graphy on the Application of Reverse Os-
to Industrial and Municipal Wastewaters,
09925 5D

Treatment of Pulping and Municipal
es,
09928 5D

ipality and Industry Join in Wastewater
nent.
09929 5D

zed-Bed Incineration of Urban Sludge
eration des Boues Urbaines en Lit Flu-
09941 5D

esponse of Gymnodinium Breve to Mu-
Waste Materials,
00033 5C

eum Pollutants in Surface and Ground-
as Indicated by the Carbon-14 Activity of
ved Organic Carbon,
00035 5A

f Lime-Soda Ash Softening Sludge for
eatment of Municipal Wastewater,
00125 5D

c in Sediments on the Continental Shelf
theast Australia,
00177 5B

Pollution Law Draws Flood of Com-
00179 5G

Evaluation and Organic Compound
in Municipal Sewage Water (In
se),
00189 5D

vy Jones Garbage Dump,
00238 5G

on Control, Next Step, Physi-
mical Treatment, Activated Charcoal,
00279 5D

pact of Secondary Treatment on Wastes
ged into the Ocean.
00321 5D

AL WATER
s to Facilitate Managerial Effectiveness
cipal Water Systems,
00895 6B

lysis of Runoff in an Urban Area (In
e),
00916 5D

Approach for the Bogota, Columbia,
upply,
00203 3D

uter Comes to Missouri,
00265 5D

of Selected Pesticides to the Bay Mus-
ilus Edulis),
00021 5C

NATIONAL ENVIRONMENTAL POLICY ACT
Application of NEPA to EPA's Environmental Regulatory Actvities.
W75-10288 6G

Legislation Under NEPA: Plaintiffs' Phyrrhic Victories Draw Congressional Fire, Judicial Warnings,
W75-10303 5G

Scenic Rivers Association of Oklahoma v. Lynn (Suit Seeking Declaratory Judgment that HUD Must Make an Environmental Impact Study Prior to Their Contemplated Actions).
W75-10313 6E

NATIONAL HISTORIC PARKS
Chattahoochee River National Recreation Area, Georgia.
W75-10320 6G

NATIONAL HISTORIC SITES
Chattahoochee River National Recreation Area, Georgia.
W75-10320 6G

NATIONAL PARKS
Chattahoochee River National Recreation Area, Georgia.
W75-10320 6G

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
Thermal Discharges--Proposed Procedures for the Imposition of Alternative Effluent Limitations.
W75-10329 5G

Thermal Discharges.
W75-10335 5G

NATIONAL RECREATION AREAS
Chattahoochee River National Recreation Area, Georgia.
W75-10320 6G

NATURAL FLOW DOCTRINE
Sutherland v. Hickory Nut Corp. (Action for Damages Caused by Construction of Roads by Adjacent Property Owner Which Altered Natural Drainage of Mountain Land).
W75-10315 6E

NATURAL RESOURCES
Evolving National Water Policies,
W75-10201 6E

NEBRASKA
Water Resources Publications Related to the State of Nebraska Third Edition.
W75-10015 10C

NEIGHBORHOOD AWARENESS
Sociological Impact of a Flood Control Reservoir, Howard, Pennsylvania,
W75-09854 6B

NERVE-GAS
Toxicity of DFP and Related Compounds to Squids in Relation to Cholinesterase Inhibition and Detoxifying Enzyme Levels,
W75-09909 5C

NET CARBON DIOXIDE EXCHANGE
Effects of Irrigation and Row Spacing on Evapotranspiration and Microclimate of a Sorghum Field,
W75-09853 2D

NETWORK DESIGN
The National Stream Quality Accounting Network (NASQAN)--Some Questions and Answers,
W75-10168 5A

NETWORKS
An Ice Nuclei Concentration Benchmark Network,
W75-09999 7A

Digital Program for Water Network Analysis,
W75-10220 7C

NEVADA
Groundwater Pollution: Problems and Solutions.
W75-10058 5B

NEW BRUNSWICK
Historical Streamflow Summary, Atlantic Provinces, to 1973.
W75-10071 7C

NEW ENGLAND
Report of Committee on Survey of Ground Water Supplies in New England.
W75-10182 4B

NEW MEXICO
Aquifer Parameters by a Chemical Tracer Technique: Non Linear Mixing in the Roswell Confined Aquifer,
W75-09893 2F

NEW YORK
Microbiology and Water Quality in a Tributary of Cayuga Lake,
W75-09896 5C

Water Resources Development and Wilderness Values: A Study of the Upper Hudson River,
W75-09898 6B

Groundwater Pollution: Problems and Solutions.
W75-10058 5B

Operation of Full-Scale Biological Phosphorus Removal Plant,
W75-10194 5D

Disposal of Waste Alum Sludge from Water Treatment Plants,
W75-10195 5D

Ton-Da-Lay, Ltd. v. Diamond (Review of Denial of Application for Water Supply and Sewage Treatment Systems).
W75-10314 6E

NEWFOUNDLAND AND LABRADOR
Historical Streamflow Summary, Atlantic Provinces, to 1973.
W75-10071 7C

NEWTON-RAPHSON METHOD
Digital Program for Water Network Analysis,
W75-10220 7C

NITRATE IONS
A New Direct Ultraviolet Method for the Analysis of Nitrate Ions,
W75-10187 5A

NITRATES
Advances in Ammonia and Nitrate Removal,
W75-09911 5D

Nitrate in Water, Soil, Plants and Animals,
W75-10083 5C

**NITRATES**

A New Direct Ultraviolet Method for the Analysis of Nitrate Ions,
W75-10187 5A

Water Research Center Unravels the Nitrate Knot,
W75-10278 5D

**NITRIFICATION**
A New Direct Ultraviolet Method for the Analysis of Nitrate Ions,
W75-10187 5A

**NITRILOTRIACETIC ACID**
Biodegradation of NTA Detergents in a Wastewater Treatment System,
W75-09920 5D

Copper (II)--Nitrilotriacetate Complexes in Aqueous Solution,
W75-10086 5C

Field and Laboratory Investigations to Evaluate the Influence of Nitrilotriacetic Acid (NTA) on Eutrophication.
W75-10115 5C

**NITROGEN**
Advances in Ammonia and Nitrate Removal,
W75-09911 5D

Effects of Original Vegetation on Reservoir Water Quality,
W75-10014 5C

Distribution of Nitrogen and Phosphorous in the Conservation Areas in South Florida from July 1972 to June 1973,
W75-10160 5B

**NITROGEN REMOVAL**
Austrian Plant Knocks Out Nitrogen,
W75-10225 5D

**NONPOINT POLLUTION SOURCES**
Water Pollution From Nonpoint Sources,
W75-10085 5C

**NORTH AMERICA**
A Review of Methods to Evaluate Precipitation Modification in North America,
W75-09990 3B

**NORTH CAOLINA**
Evaluation of Reservoir Sites in North Carolina--Regional Relations for Estimating the Reservoir Capacity Needed for a Dependable Water Supply,
W75-10159 4A

**NORTH CAROLINA**
Cooperation Combats Oil Spills in North Carolina.
W75-10039 5G

North Carolina Marine Algae. III. A Community of Ceramiales (Rhodophyta) on a Glass Sponge From 60 meters,
W75-10087 5C

The Effects of Authorization for Water Impoundments on Shoreland Transition,
W75-10126 6B

Sutherland v. Hickory Nut Corp. (Action for Damages Caused by Construction of Roads by Adjacent Property Owner Which Altered Natural Drainage of Mountain Land).
W75-10315 6E

Pamlico River Estuary--Past, Present and Future,
W75-10338 2L

**NORTH DAKOTA**
Initial Stage, Garrison Diversion Unit, Pick-Sloan Missouri Basin Program, North Dakota (Final Environmental Impact Statement).
W75-10296 8A

**NORTHEAST U.S.**
Groundwater Pollution: Problems and Solutions.
W75-10058 5B

**NORTHEAST UNITED STATES**
Classification of Freshwater Wetlands in the Glaciated Northeast,
W75-10128 6B

**NORTHWEST TERRITORIES**
Historical Streamflow Summary, Yukon and Northwest Territories, to 1973.
W75-10068 7C

**NOVA SCOTIA**
Historical Streamflow Summary, Atlantic Provinces, to 1973.
W75-10071 7C

**NUCLEAR ENERGY**
The Comparison of the Environmental Aspects of Nuclear and Fossil Fuelled Power Stations,
W75-10349 8C

**NUCLEAR POWERPLANTS**
Beneficial Uses of Waste Heat,
W75-09889 5G

The Comparison of the Environmental Aspects of Nuclear and Fossil Fuelled Power Stations,
W75-10349 8C

**NUCLEATION**
Preparation and Properties of 'Pure' Silver Iodide Aerosol,
W75-09998 3B

An Ice Nuclei Concentration Benchmark Network,
W75-09999 7A

Ice Nuclei Generator Technology,
W75-10001 3B

An Experimental Study of the Detection of Ice Nuclei on Membrane Filters and Other Substrata,
W75-10052 2B

The Effect of Repeated Activation on Depositional Ice Nuclei,
W75-10056 2B

**NUMERICAL ANALYSIS**
Numerical Simulation of Cloud Seeding Experiments,
W75-09955 2B

Quantitative Error Analysis of Numerical Methods for Partial Differential Equations,
W75-10003 6G

**NUTRIENT REMOVAL**
Operation of Full-Scale Biological Phosphorus Removal Plant,
W75-10194 5D

**NUTRIENT REQUIREMENTS**
Irrigation Efficiencies in Producing Calories and Proteins: An Annotated Bibliography,
W75-10076 3F

**NUTRIENTS**
The Effects of Artificial Destratification on the Water Quality and Microbial Populations of Hyrum Reservoir,
W75-09897 5C

Effects of Original Vegetation on Reserv Water Quality,
W75-10014 5

Critical Levels of Phosphorus and Nitrogen Texas Impoundments,
W75-10072 5

Identity and Regulation of Nutrients Limiti Phytoplankton in the Shallow Estuaries Ne Beaufort, N.C.,
W75-10084 5

Phosphorus Run-Off From the Drainage Bas to Mikolajskie Lake,
W75-10095 5

Recycle Sludge to Feed Farms,
W75-10282 5

**OBSTRUCTION TO FLOW**
Sutherland v. Hickory Nut Corp. (Action f Damages Caused by Construction of Roads Adjacent Property Owner Which Altered Nat ral Drainage of Mountain Land).
W75-10315 6

**OCEAN DUMPING**
Regulation of Ocean Dumping--One Ye Later,
W75-10285 5

**OCEANS**
Marine Pollution--Legislation Litigation, U derwriting--Where Are We, Where Away,
W75-09887 5

The Davy Jones Garbage Dump,
W75-10238 5

Regulation of Ocean Dumping--One Ye Later,
W75-10285 5

Report to the Congress on Ocean Dumping a Other Man-Induced Changes to Oce Ecosystems (October 1972 Through Decemb 1973).
W75-10311 5

Ocean Pollution.
W75-10318 5

The Impact of Secondary Treatment on Wast Discharged into the Ocean.
W75-10321 5

**OCTADECANE**
Benthal Decomposition of Adsorbed O tadecane,
W75-10260 5

**ODOR**
Aqueous Odor Thresholds of Organic Poll tants in Industrial Effluents,
W75-10026 5

**ODORS**
Chemicals Reduce System Odours,
W75-10040 5

**OFF-SHORE TERMINAL FACILITIES**
International Legal Implications of Off-Shc Terminal Facilities,
W75-10286 5

**OFFSHORE TIDES**
Hydrodynamic Levelling of an Off-Shore Ti Gauge,
W75-10060 6

**HORE WATER LEVELS**
rodynamic Levelling of an Off-Shore Tide ge,
-10060 8B

Forging of the Union Reconsidered: A orical Refutation of State Sovereignty Over eds,
-09888 6E

**DUSTRY**
Forging of the Union Reconsidered: A orical Refutation of State Sovereignty Over eds,
-09888 6E

national Legal Implications of Off-Shore inal Facilities,
-10286 5G

**OLLUTION**
obial Degradation of Petroleum,
09862 5G

ess for Controlling Oil Slicks,
09868 5G

etector,
09878 5A

try Viewpoint (Water Quality Control),
09885 5G

leum Pollutants in Surface and Ground- as Indicated by the Carbon-14 Activity of lved Organic Carbon,
10035 5A

w Infrared Instrument for Monitoring Oil on Water,
10044 5A

table Gas Chromatographic Technique to ure Dissolved Hydrocarbons in Sea ,
10096 5A

te Detection of Pollution of Water Reser- and Phytoplankton by Optical Methods,
0098 7B

aphical Analysis of Oil Spill Potential As- ed with Alaskan Oil Production and portation Systems,
0121 5G

ng of Petroleum-Industry Effluent,
0200 5D

ates Using Fluorescence Spectroscopy of esent State of Petroleum Hydrocarbon mination in the Water Column of the west Atlantic Ocean,
0233 5A

cept for Managing Waste,
0236 5D

on Lab Pays Off--Two Ways.
0243 5D

l Decomposition of Adsorbed Oc- ne,
0260 5C

Pollution.
0318 5G

**LS**
d and Apparatus for Detecting the ce of an Oil Slick on a Water Surface,
9865 5A

Process for Controlling Oil Slicks,
W75-09868 5G

Oil Detector,
W75-09878 5A

Identification of Crude Oil Leaks at Sea (Identificazione della fonte di spandimenti di petrolio grezzo in mare),
W75-10036 5A

Cooperation Combats Oil Spills in North Carolina.
W75-10039 5G

Geographical Analysis of Oil Spill Potential Associated with Alaskan Oil Production and Transportation Systems,
W75-10121 5G

The Effect of a Fuel Oil Spill on Benthic Invertebrates and Water Quality on the Alaskan Arctic Slope, Happy Valley Creek Near Sagwon, Alaska,
W75-10140 5C

The Infrared Studies of Santa Barbara Channel Oil Spill,
W75-10237 5A

Pollution Lab Pays Off--Two Ways.
W75-10243 5D

Development Progress with Salwico Pollution Monitoring System.
W75-10272 5A

**OIL WASTES**
Estimates of Oil in Aquatic Sediments by Fluorescence Spectroscopy,
W75-10235 5A

Extraction of Petroleum Hydrocarbons from Oil-Contaminated Sediments,
W75-10241 5G

Development Progress with Salwico Pollution Monitoring System.
W75-10272 5A

**OIL-WATER EMULSIONS**
Destruction of Spent Oil-Water Emulsions--Using Incandescent Coke Before Quenching,
W75-09935 5D

**OIL WELLS**
The Infrared Studies of Santa Barbara Channel Oil Spill,
W75-10237 5A

**OILY WATER**
Using Sludge, Oil, and Water Separation for Recycling Water.
W75-10038 5D

**OKLAHOMA**
Clayton Lake, Jack Fork Creek, Oklahoma (Final Environmental Impact Statement).
W75-10297 8A

Scenic Rivers Association of Oklahoma v. Lynn (Suit Seeking Declaratory Judgment that HUD Must Make an Environmental Impact Study Prior to Their Contemplated Actions).
W75-10313 6E

Scenic Rivers Association of Oklahoma v. Lynn (Suit Seeking Declaratory Judgment that HUD Must Make an Environmental Impact Study Prior to Their Contemplated Actions).
W75-10313 6E

Mountain Park Reclamation Project, Oklahoma--Nueces River Project, Texas.
W75-10319 4A

**ON-SITE DATA COLLECTIONS**
On the Characteristics of Single-Cell Showers,
W75-09997 2B

**ONTARIO**
Historical Streamflow Summary, Ontario, to 1973.
W75-10066 7C

**OPEN CHANNEL FLOW**
Sudden Release of Water from a Long Prismatic Flume,
W75-10017 8B

Transient Control in Lower Sacramento River,
W75-10219 4A

**OPERATIONS**
Statistical Analysis of Operational Performance of Some Package Plants,
W75-10256 5D

**OPTIMIZATION**
The Benefit-Cost Ratio in Resource Development Planning,
W75-10117 6B

A Computer Simulation Analysis of Surface Water Quality Management Policies Under Dynamic Economic and Hydrologic Conditions,
W75-10124 5D

Optimal Control of Water Pollution in a River Stream,
W75-10206 5G

**OREGON**
A Sensitivity Analysis of Simulated River Basin Planning for Capital Budgeting Decisions,
W75-10223 6A

**OREM (UTAH)**
Authorized Bonneville Unit, Central Utah Project, Utah Appendix A (Final Environmental Impact Statement).
W75-10331 8A

**ORGANIC COMPOUNDS**
Petroleum Pollutants in Surface and Groundwater as Indicated by the Carbon-14 Activity of Dissolved Organic Carbon,
W75-10035 5A

Energy Evaluation and Organic Compound Index in Municipal Sewage Water (In Japanese),
W75-10189 5D

Biodegradation of Linear Alkylate Sulfonates in River Model (In Japanese),
W75-10247 5B

Analyzing Organics in Dilute Aqueous Solutions,
W75-10350 5A

**ORGANIC MATTER**
Removal of Organic Matter by Activated Carbon Columns,
W75-10197 5D

**ORGANIC WASTES**
Recovering Organic Materials from Wastewater,
W75-09932 5D

**ORGANIC WASTES**

Methods for the Determination of Specific Organic Pollutants in Water and Waste Water,
W75-10032 5A

Energy Evaluation and Organic Compound Index in Municipal Sewage Water (In Japanese),
W75-10189 5D

Analyzing Organics in Dilute Aqueous Solutions,
W75-10350 5A

**OSPREY EGGS**
DDT and PCB Levels in Lake Coeur D'Alene, Idaho, Osprey Eggs,
W75-09907 5A

**OUTFALL SEWERS**
Design of Surface Water Outfalls to Rivers,
W75-10183 5D

**OUTLET WORKS**
Design of Surface Water Outfalls to Rivers,
W75-10183 5D

**OVERLAND FLOW**
Friction Coefficients for Laminar Sheet Flow Over Rough Surfaces,
W75-10062 8B

**OXIDATION**
Filtration of Water With a High Iron Content,
W75-10171 5F

**OXIDATION LAGOONS**
Characterization of Mixing in Aerated Lagoons,
W75-09913 5D

**OXYGEN**
The Effect of Methyl Mercury on Gill Metabolism and Blood Parameters of Rainbow Trout,
W75-09906 5C

Sewage and Effluent Biological Treatment Process.
W75-09924 5D

**OXYGEN TRANSFER RATES**
Mass Transfer to Naturally Flowing Streams,
W75-10341 5D

**OXYGENATION**
Sewage and Effluent Biological Treatment Process.
W75-09924 5D

**OYSTER**
Biochemical and Nutritional Interactions Between the Oyster (Crassostera Virginica (Gmelin) and its Environment,
W75-10011 5C

**OZONE**
Water Treatment with Ozone.
W75-09923 5F

Ozone Technology Gains Support.
W75-10242 5D

Characteristics of Gas-Liquid Contact Apparatus in Ozone Treatment for Drinking Water, (In Japanese),
W75-10281 5F

Ozone Chemistry and Technology-A Review of the Literature: 1961-1974,
W75-10348 5D

**PALISADES RESERVOIR (IDAHO)**
A Model for Earthquakes Near Palisades Reservoir, Southeast Idaho,
W75-10139 8B

**PAMLICO RIVER ESTUARY (NC)**
Pamlico River Estuary--Past, Present and Future,
W75-10338 2L

**PARAQUAT**
The Effects of Selected Herbicides on Bacterial Populations in an Aquatic Environment,
W75-10133 5C

**PARTIAL DIFFERENTIAL EQUATIONS**
Quantitative Error Analysis of Numerical Methods for Partial Differential Equations,
W75-10003 6G

**PASSIVATION**
Problems of Radiation Fog Prevention,
W75-09948 3B

**PATENTS**
Microbial Degradation of Petroleum,
W75-09862 5G

Geothermal Brine Energy to Generate Power,
W75-09863 8C

Means for and Method of Purifying Contaminated Water,
W75-09864 3A

Method and Apparatus for Detecting the Presence of an Oil Slick on a Water Surface,
W75-09865 5A

Free-Grab Device for Collecting Underwater Samples,
W75-09866 7B

Waste Water Treatment Plant with Balanced Load,
W75-09867 5D

Process for Controlling Oil Slicks,
W75-09868 5G

Sewage Disposal System,
W75-09869 5D

Sewage and Effluent Treating System,
W75-09870 5D

Wave Quenching Device,
W75-09871 4A

Irrigation Device,
W75-09872 3F

Trickle Irrigation Emitter,
W75-09873 3F

Process for Treating Water,
W75-09874 5D

Making Active Carbon from Sewage Sludge,
W75-09875 5D

Disposal of Waste Streams Containing Asbestos,
W75-09876 5E

Reverse Osmosis System with Automatic Valve for Module Operation Control,
W75-09877 3A

Oil Detector,
W75-09878 5A

Artificial Reef,
W75-09879 8A

Apparatus for Controlling the Level of Subsurface Water,
W75-09880 4B

Electrolytic Decomposition of Water,
W75-09881

Method for Purifying Waste Water,
W75-09882

Sewage Treatment Tank,
W75-09883

Apparatus for Treating Water Containing Im
rities,
W75-09884

Biological Purification of Waste Water
Sewage.
W75-09921

Aerating Effluent and Keeping Sludge
Suspension.
W75-09922

Water Treatment with Ozone.
W75-09923

Sewage and Effluent Biological Treatm
Process.
W75-09924

Heavy Metal Adsorbent.
W75-09934

Destruction of Spent Oil-Water Emulsio
Using Incandescent Coke Before Quenching
W75-09935

Treatment of Aqueous Waste Streams
Hydrogen Peroxide to Remove Chlorinated
cyanurates Therefrom,
W75-09939

Process for Treating Waste Photograp
Processing Solutions,
W75-09940

Cleaning of Petroleum-Industry Effluent,
W75-10200

Liquid Filter Apparatus,
W75-10230

**PATH OF POLLUTANTS**
A General Linear Approach to Stream W
Quality Modeling,
W75-09917

Research Status on Effects of Land Appl
tion of Animal Wastes,
W75-10022

The Utilization of Tracers in the Study
Control of Water Pollution (Utilizacao de M
cadores no Estudo e Controle de Poluicao
Aguas),
W75-10046

Groundwater Pollution: Problems and S
tions.
W75-10058

Nitrate in Water, Soil, Plants and Animals,
W75-10083

Numerical Model of the Salt-Wedge Reach
the Duwamish River Estuary, King Cou
Washington,
W75-10157

Distribution of Nitrogen and Phosphorous
the Conservation Areas in South Florida f
July 1972 to June 1973,
W75-10160

Evaluation of Phosphorus Dynamics in
Watershed,
W75-10217

nfrared Studies of Santa Barbara Channel
ill,
10237 5A

gradation of Linear Alkylate Sulfonates
er Model (In Japanese),
0247 5B

asting Watershed Pollution Using a
l,
0249 5A

Quality Routing of Unsteady River Flow
ite Element Method,
0252 5B

fication Method in Environmental
ns and Its Application to Water Pollution,
0266 5A

GENIC BACTERIA
ed Temperature Technique for Enumera-
Salmonellae in Sewage,
0045 5D

GENS (PLANTS)
uration in Central Iowa,
0212 3F

C ZONE
osystem Model for the Pelagic Zone of
Vingra,
0092 5C

LVANIA
Evaluation in Water Resources: Budget
aints,
0851 6A

gical Impact of a Flood Control Reser-
loward, Pennsylvania,
0854 6B

l-Water's Role in Water Quality
ement,
0180 5G

ATION
el of One-Dimensional Percolation to a
Table Using a Computer Simulation
ge,
0138 2G

MANCE
cal Analysis of Operational Performance
e Package Plants,
0256 5D

TON
g and Modeling the Functional Relation-
Within Sublittoral Salt Marsh Aufwuchs
nities - Inside One of the Black Boxes,
0104 5C

y Viewpoint (Water Quality Control),
0885 5G

Viewpoint (Permit Issuance--Adminis-
and Judicial Review--Observations and
ns),
0302 5G

and Regulations, Southwest Water
ment District (Florida).
0306 6E

f Central and Southern Flood Control
Chapter 16CA, with Commentary.
0307 6E

Ton-Da-Lay, Ltd. v. Diamond (Review of Denial of Application for Water Supply and Sewage Treatment Systems).
W75-10314 6E

Thermal Discharges--Proposed Procedures for the Imposition of Alternative Effluent Limitations.
W75-10329 5G

Thermal Discharges.
W75-10335 5G

PESTICIDE REMOVAL
Microbial Degradation of DDT,
W75-10091 5C

PESTICIDE RESIDUES
DDT and PCB Levels in Lake Coeur D'Alene, Idaho, Osprey Eggs,
W75-09907 5A

PESTICIDE TOXICITY
Toxicity of Selected Pesticides to the Bay Mussel (Mytilus Edulis),
W75-10021 5C

PESTICIDES
Effect of Asulam in Wildlife Species: Acute Toxicity to Birds and Fish,
W75-09903 5C

Toxaphene Inhibition of ATPase Activity in Catfish, Ictalurus Punctatus, Tissues,
W75-09908 5C

Pesticides, Polychlorinated Biphenols and Heavy Metals in Upper Food Chain Levels, Everglades National Park and Vicinity,
W75-10080 5C

Microbial Degradation of DDT,
W75-10091 5C

Easing of Environmental Laws,
W75-10173 5G

PETROLEUM EFFLUENTS
Petroleum Pollutants in Surface and Groundwater as Indicated by the Carbon-14 Activity of Dissolved Organic Carbon,
W75-10035 5A

PETROLEUM HYDROCARBONS
Extraction of Petroleum Hydrocarbons from Oil-Contaminated Sediments,
W75-10241 5G

PHARMACEUTICAL WASTES
Pollution Abatement in the Pharmaceutical Industry,
W75-09931 5D

Recovering Organic Materials from Wastewater,
W75-09932 5D

PHENOLS
Separation of Phenol from Waste Water by the Liquid Membrane Technique,
W75-10273 5D

PHOSPHATES
Biodegradation of NTA Detergents in a Wastewater Treatment System,
W75-09920 5D

Distribution of Nitrogen and Phosphorous in the Conservation Areas in South Florida from July 1972 to June 1973,
W75-10160 5B

Precipitation of Phosphates in Sewage with Lanthanum: An Experimental and Modelling Study,
W75-10259 5D

PHOSPHORUS
Effects of Original Vegetation on Reservoir Water Quality,
W75-10014 5C

Phosphorus Kinetics in the Euphotic Zone of the Chesapeake Bay,
W75-10101 5C

Operation of Full-Scale Biological Phosphorus Removal Plant,
W75-10194 5D

Evaluation of Phosphorus Dynamics in a Watershed,
W75-10217 5B

PHOSPHORUS REMOVAL
Operation of Full-Scale Biological Phosphorus Removal Plant,
W75-10194 5D

PHOSTRIP
Operation of Full-Scale Biological Phosphorus Removal Plant,
W75-10194 5D

PHOTOMETRY
Color Measurement Methods for Surface Water Receiving Colored Wastes,
W75-10135 5A

PHOTOSYNTHESIS
Growth and Dissipation of Phytoplankton in Chesapeake Bay. III. Inorganic Carbon Requirements of Natural Populations and Laboratory Cultures of Phytoplankton,
W75-10103 5C

PHTHALATE ESTERS
Phthalate Esters, Heartrate Depressors in the Goldfish,
W75-09902 5C

PHYSICAL PROPERTIES
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. I. Physical and Chemical Conditions in Lake Water,
W75-10094 5C

Laboratory Simulation of Swine Manure Lagoons,
W75-10137 5D

PHYTOPHTHORA-CITROPHTHORA
An Unusual Brown Rot Outbreak in a Florida Citrus Grove Following Sprinkler Irrigation With Phytophthora-Infested Water,
W75-10245 3F

PHYTOPLANKTON
Preliminary Results of a Study Concerning the Effects of Thermal Pollution on Phytoplanktonic Primary Production in Lake Wabamun, Alberta,
W75-10073 5C

Identity and Regulation of Nutrients Limiting Phytoplankton in the Shallow Estuaries Near Beaufort, N.C.,
W75-10084 5C

The Structure and Production of Phytoplankton in Mikolajskie Lake,
W75-10093 5C

**PHYTOPLANKTON**

Remote Detection of Pollution of Water Reservoirs and Phytoplankton by Optical Methods,
W75-10098 7B

Growth and Dissipation of Phytoplankton in Chesapeake Bay. III. Inorganic Carbon Requirements of Natural Populations and Laboratory Cultures of Phytoplankton,
W75-10103 5C

**PIGMENTS**

The Geochemical and Biostratigraphic Record of Natural and Pollutional Eutrophication of Minnesota Lakes,
W75-10010 5C

**PILOT PLANTS**

Pilot-Plant Investigations into Partial Pretreatment Systems at Macclesfield,
W75-10229 5D

**PIPE FLOW**

Transformation of Moody Diagram,
W75-10216 8B

**PIPELINES**

Engineering Utility and Sewage Lines in Permafrost Soil,
W75-10192 5D

The Development of a Scheme to Construct Large Diameter Sewage Pumping Mains Across the River Tees and the Tees Railway Marshalling Yard,
W75-10275 5D

**PL 92-500**

Water Pollution Law Draws Flood of Complaints.
W75-10179 5G

**PLANNING**

Water Resources Development and Wilderness Values: A Study of the Upper Hudson River,
W75-09898 6B

Drainage System Cooperates with Nature,
W75-09942 4A

A Study of Water Resources Research Needs in Montana,
W75-10012 6B

The Effects of Authorization for Water Impoundments on Shoreland Transition,
W75-10126 6B

A Study of the Effects of Water Institutions on Planning and Management of Water Resources in Utah,
W75-10130 6E

Total Approach for the Bogota, Columbia, Water Supply,
W75-10203 3D

Objectives of Water Quality Planning,
W75-10205 5G

Water and Water Problems in the Southwest Florida Water Management District and Some Possible Solutions,
W75-10207 3C

**PLAQUE ASSAY**

Fish Viruses: Buffers and Methods for Plaquing Eight Agents Under Normal Atmosphere,
W75-10257 5C

**POLLUTANT FORECASTING**

Forecasting Watershed Pollution Using a Model,
W75-10249 5A

**POLLUTANT IDENTIFICATION**

Method and Apparatus for Detecting the Presence of an Oil Slick on a Water Surface,
W75-09865 5A

Oil Detector,
W75-09878 5A

DDT and PCB Levels in Lake Coeur D'Alene, Idaho, Osprey Eggs,
W75-09907 5A

Chlorinated Hydrocarbons in the Lake Ontario Ecosystem, (IFYGL),
W75-10018 5A

Determination of Molecular Hydrogen Sulfide,
W75-10025 5A

Aqueous Odor Thresholds of Organic Pollutants in Industrial Effluents,
W75-10026 5A

Asbestos in Drinking Water,
W75-10030 5A

Quantitative Large-Volume Sampling Technique,
W75-10031 5A

Methods for the Determination of Specific Organic Pollutants in Water and Waste Water,
W75-10032 5A

A Rational Approach for Predicting the Dissolved Oxygen Profile in Receiving Waters,
W75-10034 5A

Petroleum Pollutants in Surface and Groundwater as Indicated by the Carbon-14 Activity of Dissolved Organic Carbon,
W75-10035 5A

Identification of Crude Oil Leaks at Sea (Identificazione della fonte di spandimenti di petrolio grezzo in mare),
W75-10036 5A

Determination of Trace Quantities of Boron in Surface Water Bodies and in Drinking Water (Spurenbestimmung von Bor in Oberflachengewassern und Trinkwassern),
W75-10041 5A

A New Infrared Instrument for Monitoring Oil Films on Water,
W75-10044 5A

Elevated Temperature Technique for Enumeration of Salmonellae in Sewage,
W75-10045 5D

An Automated Method for Determination of Residual Methanol in Denitrified Effluents,
W75-10047 5D

Comparison of Autoclave and Ethylene Oxide-Sterilized Membrane Filters Used in Water Quality Studies,
W75-10048 5A

The Sources and Levels of Mercury in the Sewage of a University Campus,
W75-10049 5A

Color Measurement Methods for Surface Water Receiving Colored Wastes,
W75-10135 5A

The Magnetic Flowmeter and Its Use in Waste Water Technology (Der magnetische Durchflussmesser und seine Anwendung in der Abwassertechnik),
W75-10185 5A

A New Direct Ultraviolet Method for the Analysis of Nitrate Ions,
W75-10187

Some Applications of Thermal Infra-R Linescan in Water Resources Studies,
W75-10188

Energy Evaluation and Organic Compou Index in Municipal Sewage Water ( Japanese),
W75-10189

GLC Determination of PPB Levels of Citra by Conversion to Bromoform,
W75-10191

Water Pollution Monitoring System, ( Japanese),
W75-10196

The Determination of Benzidine in Was waters,
W75-10232

Estimates Using Fluorescence Spectroscopy the Present State of Petroleum Hydrocarb Contamination in the Water Column of t Northwest Atlantic Ocean,
W75-10233

Estimates of Oil in Aquatic Sediments Fluorescence Spectroscopy,
W75-10235

The Infrared Studies of Santa Barbara Chann Oil Spill,
W75-10237

Applications of Toxicity Testing to Sewag Treatment Processes,
W75-10244

Biodegradation of Linear Alkylate Sulfonat in River Model (In Japanese),
W75-10247

Forecasting Watershed Pollution Using Model,
W75-10249

Routine Surveillance Alternatives for Wat Quality Management,
W75-10250

Monitoring the Quality of Surface Water,
W75-10251

How Much 'Reliability' is 'Enough',
W75-10254

Monitoring: An Environmental State Estim tion Problem,
W75-10255

Fecal Contamination--The Water Analyst Responsibility Part II,
W75-10258

TV System Gives Automatic Alarm as Wess Visual Monitoring of Air and Water Pollution.
W75-10263

Identification Method in Environment Systems and Its Application to Water Pollutio
W75-10266

Interrupted-Sweep Voltammetry for t Identification of Polychlorinated Biphenyls ar Naphthalenes,
W75-10268

Water Monitoring is Big Business.
W75-10269

velopment Progress with Salwico Pollution onitoring System.
75-10272 5A

alyzing Organics in Dilute Aqueous Solu-ns,
75-10350 5A

LUTANTS
ater Pollution From Nonpoint Sources,
75-10085 5C

LUTION ABATEMENT
crobial Degradation of Petroleum,
75-09862 5G

rine Pollution--Legislation Litigation, Un-rwriting--Where Are We, Where Away,
75-09887 5G

llution Abatement in the Pharmaceutical In-stry,
75-09931 5D

ter Pollution Study of Malabeam Lake, eenlaw Brook and Adjacent Streams on Lor- AFB, Maine,
75-10113 5C

eded: $350 Billion - And a New Needs Sur-,
75-10174 5D

t's Try 90% First and See What Our Quality Like,
75-10175 5G

anging Federal-State Relationships in Water lution Control Programs,
5-10270 5G

nk Thermal,
5-10284 5E

LUTION IDENTIFICATION
portance of Water pH in Accumulation of rganic Mercury in Fish,
5-09904 5A

CHLORINATED BIPHENOLS
ticides, Polychlorinated Biphenols and avy Metals in Upper Food Chain Levels, rglades National Park and Vicinity,
5-10080 5C

CHLORINATED BIPHENYLS
ects of PCB (Aroclor 1254) and P, P' DDT Production and Survival of Daphnia Magna uss,
5-09905 5C

T and PCB Levels in Lake Coeur D'Alene, o, Osprey Eggs,
5-09907 5A

orinated Hydrocarbons in the Lake Ontario system, (IFYGL),
5-10018 5A

rrupted-Sweep Voltammetry for the tification of Polychlorinated Biphenyls and hthalenes,
5-10268 5A

earch on Pollution with Polychlorinated henyls and Polychlorinated Terphenyls in age Plants, (In Japanese),
5-10271 5D

CHLORINATED NAPHTHALENES
rrupted-Sweep Voltammetry for the tification of Polychlorinated Biphenyls and hthalenes,
-10268 5A

POLYCHLORINATED TERPHENYLS
Research on Pollution with Polychlorinated Biphenyls and Polychlorinated Terphenyls in Sewage Plants, (In Japanese),
W75-10271 5D

POLYMERS
Recovering Organic Materials from Wastewater,
W75-09932 5D

Zeta Potential Controls Direct Filtration Coagulation,
W75-10280 5F

POTABLE WATER
Asbestos in Drinking Water,
W75-10030 5A

Legislative History of the Safe Drinking Water Act,
W75-10186 5G

Ozone Technology Gains Support.
W75-10242 5D

Characteristics of Gas-Liquid Contact Apparatus in Ozone Treatment for Drinking Water, (In Japanese),
W75-10281 5F

PRE-IMPOUNDMENT
Effects of Original Vegetation on Reservoir Water Quality,
W75-10014 5C

PRE-TREATMENT
Pilot-Plant Investigations into Partial Pretreatment Systems at Macclesfield,
W75-10229 5D

PRECIPITATION (ATMOSPHERIC)
Rapid Inducement of Precipitation by Seeding Stratified Air Layers,
W75-09953 3B

On the Efficient Size and Concentration of Spray Drops for Stimulating Warm Clouds,
W75-09954 3B

Theoretical Probabilities of Predicted Occurrences and Amounts of Precipitation,
W75-10050 2B

PRETREATMENT STANDARDS
Inorganic Chemicals Manufacturing Point Source Category.
W75-10327 5G

PRETREATMENT STANDARDS (EFFLUENT)
Thermal Discharges--Proposed Procedures for the Imposition of Alternative Effluent Limitations.
W75-10329 5G

PRIMARY PRODUCTIVITY
Preliminary Results of a Study Concerning the Effects of Thermal Pollution on Phytoplanktonic Primary Production in Lake Wabamun, Alberta,
W75-10073 5C

Consumer Ecology Working Group,
W75-10110 2L

PRINCE EDWARD ISLAND
Historical Streamflow Summary, Atlantic Provinces, to 1973.
W75-10071 7C

PROBABILITY
Theoretical Probabilities of Predicted Occurrences and Amounts of Precipitation,
W75-10050 2B

PRODUCTIVITY
Identity and Regulation of Nutrients Limiting Phytoplankton in the Shallow Estuaries Near Beaufort, N.C.,
W75-10084 5C

The Structure and Production of Phytoplankton in Mikolajskie Lake,
W75-10093 5C

Fluvial-Estuarine Water Resource Optimization: Microecosystem Simulation of River-Estuarine Productivity Relationships,
W75-10099 2L

Productivity/Physiology Working Group,
W75-10107 2L

PROFESSIONAL ACTIVITIES
Evolving National Water Policies,
W75-10201 6E

PROGRAMS
Review of Recent Work on Hail Suppression in Bulgaria,
W75-09971 3B

PROJECT PLANNING
Project Evaluation in Water Resources: Budget Constraints,
W75-09851 6A

The Benefit-Cost Ratio in Resource Development Planning,
W75-10117 6B

PROPANE
Cloud Glaciation by Liquified Propane Spray,
W75-10002 3B

PROPERTY VALUES
The Effects of Authorization for Water Impoundments on Shoreland Transition,
W75-10126 6B

Activities, Characteristics, and Opinions of Lakefront Residents: Kissimmee River Basin, Florida,
W75-10129 6B

PROTECTION
Report to the Congress on Ocean Dumping and Other Man-Induced Changes to Ocean Ecosystems (October 1972 Through December 1973).
W75-10311 5G

PUBLIC ACCESS
United States v. St. Thomas Beach Resorts, Inc. (Action to Enjoin Obstruction to Virgin Islands Shoreline by Fences Seaward of the Mean High Water Line).
W75-10317 6E

PUBLIC HEALTH
Asbestos in Drinking Water,
W75-10030 5A

Legislative History of the Safe Drinking Water Act,
W75-10186 5G

PUBLIC RIGHTS
United States v. St. Thomas Beach Resorts, Inc. (Action to Enjoin Obstruction to Virgin Islands Shoreline by Fences Seaward of the Mean High Water Line).
W75-10317 6E

PUBLIC TRUST DOCTRINE
The Public Trust Doctrine and The California Coastline,
W75-10305 6E

**PUBLICATIONS**
Water Resources Publications Related to the State of Nebraska Third Edition.
W75-10015 10C

Summaries of Foreign Government Environmental Reports.
W75-10289 6G

**PULP WASTES**
Activated Carbon Treatment of Unbleached Kraft Effluent for Reuse,
W75-10028 5D

Dynamic Leaching Studies on Pulpwood Bark Residues,
W75-10214 5D

**PUMP STATIONS**
Wastewater Lift Station Opens Way to Urban Expansion.
W75-10277 8C

**PUMPING**
Ground-water Discharge from the Edwards and Associated Limestones, San Antonio Area, Texas, 1974,
W75-10146 2F

**PUMPS**
Computer Control of Sewage Works, Progress at Norwich,
W75-10246 5D

Submersible Pumps Make By-Pass Possible,
W75-10276 8C

Wastewater Lift Station Opens Way to Urban Expansion.
W75-10277 8C

**PYROTECHNIC DEVICES**
Removal of Pyrotechnic Generated Tracer Placed by Aircraft in a Convective Updraft,
W75-10000 3B

**QUADRATIC PROGRAMMING**
Applications of Integer and Quadratic Programming to Floodplain Land Use Management,
W75-10008 6F

**QUEBEC**
Historical Streamflow Summary, Ontario, to 1973.
W75-10066 7C

**RADAR**
Radar Methods and Equipment for Hail Supression,
W75-09985 3B

**RADIATION**
On the Possibility of Thunderstorm Suppression by Changing the Non-Equilibrium Crystallization Potentials of Cloud Water,
W75-09976 2B

**RADIO WAVES**
On the Possibility of Thunderstorm Suppression by Changing the Non-Equilibrium Crystallization Potentials of Cloud Water,
W75-09976 2B

**RADIOACTIVE DATING**
Carbon-14 Ages of Water From the Arkansas Hot Springs,
W75-10145 2K

**RADIOACTIVE WASTE DISPOSAL**
Review of Literature Pertinent to the Aqueous Conversion of Radionuclides to Insoluble Silicates with Selected References and Bibliography (Revised),
W75-09892 5D

**RADIOACTIVITY**
Human Radiation Dose Studies. A Selected Bibliography.
W75-09890 5A

Terrestrial and Freshwater Radioecology, a Selected Bibliography,
W75-09891 5A

Radioactivity from SRP Operations in a Downstream Savannah River Swamp,
W75-09901 5B

The Comparison of the Environmental Aspects of Nuclear and Fossil Fuelled Power Stations,
W75-10349 8C

**RADIOACTIVITY EFFECTS**
Human Radiation Dose Studies. A Selected Bibliography.
W75-09890 5A

**RADIOISOTOPES**
Isotope Hydrology 1974--A Review of the IAEA Symposium on Isotope Techniques in Groundwater Hydrology,
W75-10172 5A

**RADIOMETERS**
Equivalent Blackbody Temperature of the Top of a Severe Storm,
W75-10054 2B

**RAILROADS**
Hardy Salt Co. v. Southern Pacific Transportation Co. (Suit Seeking Injunctive Relief or Damages for Salinity Changes Resulting from Defendant's Construction in the Great Salt Lake).
W75-10308 6E

**RAIN**
Proceedings of the World Meteorological Organization/International Association of Meteorology and Atmospheric Physics Scientific Conference on Weather Modification.
W75-09944 3B

**RAINBOW TROUT**
Effect of Asulam in Wildlife Species: Acute Toxicity to Birds and Fish,
W75-09903 5C

The Effect of Methyl Mercury on Gill Metabolism and Blood Parameters of Rainbow Trout,
W75-09906 5C

**RAINFALL**
An Analysis of Runoff in an Urban Area (In Japanese),
W75-09916 5D

Research into Hail-Forming Processes and the Results of Anti-Hail Protection Measures in Moldavia,
W75-09968 2B

Engineering and Operational Aspects of Weather Modification,
W75-09983 3B

On the Characteristics of Single-Cell Showers,
W75-09997 2B

**REAERATION COEFFICIENT**
Statistical Evaluation of Reaeration Prediction Equations,
W75-10211 5G

**RECLAIMED WATER**
Using Sludge, Oil, and Water Separation Recycling Water.
W75-10038

**RECLAMATION**
Safety of Dams--Bureau of Reclamation,
W75-10221

Mountain Park Reclamation Proj Oklahoma--Nueces River Project, Texas.
W75-10319

**RECOVERY (ORGANIC WASTES)**
Recovering Organic Materials from Wa water,
W75-09932

**RECREATION**
The Economic Impact of a Small Recreat Oriented Reservoir,
W75-09857

Feasibility and Potential of Enhancing W Recreation Opportunities on High Cou Reservoirs-Phase I,
W75-09894

Chattahoochee River National Recrea Area, Georgia.
W75-10320

Plan Formulation and Evaluation Studi Recreation. Vol I of V. Evaluation of Rec tion Use Surveys Procedures,
W75-10342

**RECREATION DEMAND**
Feasibility and Potential of Enhancing W Recreation Opportunities on High Cou Reservoirs-Phase I,
W75-09894

Activities, Characteristics, and Opinions Lakefront Residents: Kissimmee River Ba Florida,
W75-10129

Plan Formulation and Evaluation Studi Recreation. Vol. III of V. A Preliminary An sis of Day Use Recreation and Benefit Esti tion Models for Selected Reservoirs,
W75-10343

Plan Formulation and Evaluation Studi Recreation. Vol. IV of V. Estimating Rec tional Facility Requirements,
W75-10344

Plan Formulation and Evaluation Studi Recreation. Vol. V of V. A Generalized Rec tion Day Use Planning Model,
W75-10345

**RECREATION FACILITIES**
Smith v. City of Cookeville (Action by L downer Whose Property was Condemned City for Use in Recreation Development to join Construction Until Environmental Imp Statement is Filed).
W75-10312

Plan Formulation and Evaluation Studi Recreation. Vol. IV of V. Estimating Rec tional Facility Requirements,
W75-10344

**RECREATIONAL FACILITIES**
Sociological Impact of a Flood Control Res voir, Howard, Pennsylvania,
W75-09854

/CLING
ng Sludge, Oil, and Water Separation for
:ycling Water.
5-10038 5D

:ycle Sludge to Feed Farms,
5-10282 5D

'S
ificial Reefs for Texas.
5-10119 3E

ONAL ANALYSIS
ional Authorities Take Over Britain's
ter/Sewage Systems,
5-10176 6E

n Formulation and Evaluation Studies--
reation. Vol. III of V. A Preliminary Analy-
of Day Use Recreation and Benefit Estima-
Models for Selected Reservoirs,
5-10343 6B

n Formulation and Evaluation Studies--
reation. Vol. V of V. A Generalized Recrea-
Day Use Planning Model,
5-10345 6B

ONS
ionalism and the Law of the Sea: The Case
emi-Enclosed Seas,
5-10301 6E

ESSION ANALYSIS
Discharge of South Carolina Streams as it
ites to Link Magnitude,
5-10134 2E

LATION
lication of NEPA to EPA's Environmental
ulatory Actvities.
-10288 6G

ont De Nemours and Co. v. Train (Action
hemical Manufacturers to Set Aside Regu-
ns Governing Effluent Discharge of Sul-
Acid Plants).
-10316 6E

m Electric Power Generating Point Source
gory--Proposed Effluent Guidelines and
dards for Incompatible Pollutants.
-10323 5G

ne Sanitation Devices--Proposed Certifica-
Procedures and Design and Construction
irements.
-10324 5G

ed and Preserved Fruits and Vegetables
essing Point Source Category--Effluent
elines and Standards.
10325 5G

id and Crystalline Cane Sugar Refining
ategory--Effluent Limitations Guidelines
Proposed Pretreatment Standards.
10326 5G

anic Chemicals Manufacturing Point
ce Category.
10327 5G

roplating Point Source Category; Copper,
el, Chromium and Zinc on Ferrous and
errous Materials Subcategory.
10328 5G

nal Discharges--Proposed Procedures for
nposition of Alternative Effluent Limita-
10329 5G

Asbestos Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-10330 5G

Ferroalloy Manufacturing Point Source Category.
W75-10332 5G

Feedlots Point Source Category--Effluent Guidelines and Standards.
W75-10333 5G

Glass Manufacturing Point Source Categories--Effluent Guidelines and Standards.
W75-10334 5G

Thermal Discharges.
W75-10335 5G

Builders Paper and Board Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-10336 5G

Steam Electric Power Generating Point Source Category--Effluent Guidelines and Standards.
W75-10337 5G

REGULATIONS
Easing of Environmental Laws,
W75-10173 5G

REHABILITATION
Survey of Lake Rehabilitation Techniques and Experiences,
W75-10078 5C

REMOTE SENSING
Equivalent Blackbody Temperature of the Top of a Severe Storm,
W75-10054 2B

Evaluation of an ERTS-1 Data Collection Platform Installed in the Alpine Tundra, Colorado,
W75-10055 7B

Remote Detection of Pollution of Water Reservoirs and Phytoplankton by Optical Methods,
W75-10098 7B

Some Applications of Thermal Infra-Red Linescan in Water Resources Studies,
W75-10188 5A

Routine Surveillance Alternatives for Water Quality Management,
W75-10250 5A

REPRODUCTION
Effects of PCB (Aroclor 1254) and P, P' DDT On Production and Survival of Daphnia Magna Strauss,
W75-09905 5C

RESEARCH AND DEVELOPMENT
A Study of Water Resources Research Needs in Montana,
W75-10012 6B

Report to the Congress on Ocean Dumping and Other Man-Induced Changes to Ocean Ecosystems (October 1972 Through December 1973).
W75-10311 5G

RESEARCH NEEDS
A Study of Water Resources Research Needs in Montana,
W75-10012 6B

Research Needs as Related to the Development of Sediment Standards in Rivers,
W75-10013 5G

RESEARCH PRIORITIES
Proceedings of Workshop Conference on Identification of Metropolitan Area Water Resources Problems and Associated Research Needs in Minnesota.
W75-10004 6B

Proceedings of Public Workshop Conference on Water Resources Problems and Research Needs in Central Minnesota.
W75-10005 6B

Proceedings of Public Forum on Water Resources Problems and Research Needs in Southwestern Minnesota.
W75-10006 6B

Proceedings of Public Forum on Water Resources Problems in Southeastern Minnesota.
W75-10007 6B

Research Needs as Related to the Development of Sediment Standards in Rivers,
W75-10013 5G

RESERVOIR CONSTRUCTION
Sociological Impact of a Flood Control Reservoir, Howard, Pennsylvania,
W75-09854 6B

RESERVOIR DESIGN
Evaluation of Reservoir Sites in North Carolina--Regional Relations for Estimating the Reservoir Capacity Needed for a Dependable Water Supply,
W75-10159 4A

RESERVOIR EVAPORATION
Evaluation of Reservoir Sites in North Carolina--Regional Relations for Estimating the Reservoir Capacity Needed for a Dependable Water Supply,
W75-10159 4A

RESERVOIR RELEASES
Reservoir Release Routing Model for the Upper Arkansas River Basin of Colorado,
W75-10165 4A

RESERVOIR SILTING
Siltation Rates and Life Expectancies of Small Headwater Reservoirs in Montana,
W75-09858 2J

RESERVOIR SITES
Siltation Rates and Life Expectancies of Small Headwater Reservoirs in Montana,
W75-09858 2J

RESERVOIR WATER QUALITY
Effects of Original Vegetation on Reservoir Water Quality,
W75-10014 5C

RESERVOIRS
The Effects of Authorization for Water Impoundments on Shoreland Transition,
W75-10126 6B

A Model for Earthquakes Near Palisades Reservoir, Southeast Idaho,
W75-10139 8B

Safety of Dams--Bureau of Reclamation,
W75-10221 8A

Issues in Water Resources Impact Assessment,
W75-10222 6B

Warm Springs Dam and Lake Sonoma Project, Russian River Basin, Sonoma County, Califor-

**RESERVOIRS**

nia, Part I (Final Environmental Impact Statement).
W75-10298 8A

Plan Formulation and Evaluation Studies--Recreation. Vol I of V. Evaluation of Recreation Use Surveys Procedures,
W75-10342 6B

Plan Formulation and Evaluation Studies--Recreation. Vol. III of V. A Preliminary Analysis of Day Use Recreation and Benefit Estimation Models for Selected Reservoirs,
W75-10343 6B

Plan Formulation and Evaluation Studies--Recreation. Vol. IV of V. Estimating Recreational Facility Requirements,
W75-10344 6B

Plan Formulation and Evaluation Studies--Recreation. Vol. V of V. A Generalized Recreation Day Use Planning Model,
W75-10345 6B

**RESOURCE ALLOCATION**
Economic Institutions to Determine Water Quality,
W75-10132 5G

**RETAINING WALLS**
Hydrologic Data for North Creek, Trinity River Basin, Texas, 1973,
W75-10149 7C

**RETURN FLOW**
Management Practices Affecting Quality and Quantity of Irrigation Return Flow,
W75-10019 5G

**REVERSE OSMOSIS**
Reverse Osmosis System with Automatic Valve for Module Operation Control,
W75-09877 3A

Bibliography on the Application of Reverse Osmosis to Industrial and Municipal Wastewaters,
W75-09925 5D

Membrane Processing in the Metal Finishing Industry,
W75-09936 5D

Factors Influencing Reverse Osmosis Rejection of Inorganic Solutes from Aqueous Solution,
W75-09937 5D

**REVIEWS**
Review of Literature Pertinent to the Aqueous Conversion of Radionuclides to Insoluble Silicates with Selected References and Bibliography (Revised),
W75-09892 5D

Rain Enhancement - A Review,
W75-09950 3B

Isotope Hydrology 1974--A Review of the IAEA Symposium on Isotope Techniques in Groundwater Hydrology,
W75-10172 5A

Design for Solvent Recovery,
W75-10239 5D

Ozone Chemistry and Technology-A Review of the Literature: 1961-1974,
W75-10348 5D

**RHINE RIVER (GERMANY)**
Determination of Trace Quantities of Boron in Surface Water Bodies and in Drinking Water (Spurenbestimmung von Bor in Oberflachengewassern und Trinkwassern),
W75-10041 5A

**RHODE RIVER (MD)**
Measurements of Absolute Scalar Irradiance Spectra in Rhode River,
W75-10102 5C

**RHODOPHYTA**
North Carolina Marine Algae. III. A Community of Ceramiales (Rhodophyta) on a Glass Sponge From 60 meters,
W75-10087 5C

**RIPARIAN RIGHTS**
Surface Waters and the Civil Law Rule,
W75-10304 6E

**RIVER BASIN DEVELOPMENT**
A Sensitivity Analysis of Simulated River Basin Planning for Capital Budgeting Decisions,
W75-10223 6A

Initial Stage, Garrison Diversion Unit, Pick-Sloan Missouri Basin Program, North Dakota (Final Environmental Impact Statement).
W75-10296 8A

Minutes of the 89th Meeting, (Arkansas-Red-White River Basins Inter-Agency Committee).
W75-10300 4A

Authorized Bonneville Unit, Central Utah Project, Utah Appendix A (Final Environmental Impact Statement).
W75-10331 8A

**RIVER FLOW**
Water Quality Routing of Unsteady River Flow by Finite Element Method,
W75-10252 5B

**RIVER STEYR (GERMANY)**
A Method for Predicting Flood Water Runoff of the River Steyr (Ein Verfahren zur Vorhersage der Hochwasserabfluesse der Steyr),
W75-09943 4A

**RIVER SYSTEMS**
Optimal Control of Water Pollution in a River Stream,
W75-10206 5G

**RIVER TEES (GREAT BRITAIN)**
The Development of a Scheme to Construct Large Diameter Sewage Pumping Mains Across the River Tees and the Tees Railway Marshalling Yard,
W75-10275 5D

**RIVERS**
Beneficial Uses of Waste Heat,
W75-09889 5G

Fluvial-Estuarine Water Resource Optimization: Microecosystem Simulation of River-Estuarine Productivity Relationships,
W75-10099 2L

River Pollution Control,
W75-10224 6A

Pamlico River Estuary--Past, Present and Future,
W75-10338 2L

**RIVERS AND HARBORS ACT**
Preservation and Enhancement of the American Falls at Niagara.
W75-10290 6E

**ROCKET PROPELLANT WASTES**
Hydrologic Evaluation of the Haystack Bu
Area with Emphasis on Possible Discharge
Class-I Wastes, Edwards Air Force Ba
California,
W75-10161

**ROCKETS**
Preliminary Results of Experiments Us
Seeding Rockets with Combustible Shells,
W75-09987

**ROSWELL (NMEX)**
Aquifer Parameters by a Chemical Tra
Technique: Non Linear Mixing in the Rosw
Confined Aquifer,
W75-09893

**ROUGHNESS (HYDRAULIC)**
Friction Coefficients for Laminar Sheet Fl
Over Rough Surfaces,
W75-10062

**RUNOFF**
An Analysis of Runoff in an Urban Area
Japanese),
W75-09916

A Method for Predicting Flood Water Run
of the River Steyr (Ein Verfahren zur V
hersage der Hochwasserabfluesse der Steyr),
W75-09943

Phosphorus Run-Off From the Drainage Ba
to Mikolajskie Lake,
W75-10095

**SACRAMENTO RIVER (CALIF)**
Transient Control in Lower Sacramento Rive
W75-10219

**SAFE DRINKING WATER ACT**
Legislative History of the Safe Drinking Wa
Act,
W75-10186

**SAFETY**
Safety of Dams--Bureau of Reclamation,
W75-10221

**SAGWON (ALASKA)**
The Effect of a Fuel Oil Spill on Benthic Inv
tebrates and Water Quality on the Alaskan A
tic Slope, Happy Valley Creek Near Sagwo
Alaska,
W75-10140

**SALINE WATER INTRUSION**
Effects of Lowering Interior Canal Stages
Salt-Water Intrusion into the Shallow Aquif
in Southeast Palm Beach County, Florida,
W75-10156

**SALINITY**
Management Practices Affecting Quality a
Quantity of Irrigation Return Flow,
W75-10019

Hardy Salt Co. v. Southern Pacific Transpor
tion Co. (Suit Seeking Injunctive Relief
Damages for Salinity Changes Resulting fr
Defendant's Construction in the Great S
Lake).
W75-10308

**SALMONELLA**
Elevated Temperature Technique for Enume
tion of Salmonellae in Sewage,
W75-10045

**IARSHES**
ng and Modeling the Functional Relation-
Within Sublittoral Salt Marsh Aufwuchs
unities Inside One of the Black Boxes,
0104 5C

**ING**
Grab Device for Collecting Underwater
es,
9866 7B

tector,
9878 5A

itative Large-Volume Sampling
ique,
0031 5A

nination of Trace Quantities of Boron in
e Water Bodies and in Drinking Water
nbestimmung von Bor in Oberflachen-
sern und Trinkwassern),
0041 5A

e Surveillance Alternatives for Water
Management,
0250 5A

**TONIO AREA (TEX)**
d-water Discharge from the Edwards and
ated Limestones, San Antonio Area,
1974,
0146 2F

**RY FILL**
: A Potential Threat to Our Ground-
Supplies,
0184 5B

**NA RIVER (CALIF)**
te of Sediment Discharges, Santa Ana
t Santa Ana and Santa Maria River at
upe, California,
0162 2J

**MARIA RIVER (CALIF)**
te of Sediment Discharges, Santa Ana
t Santa Ana and Santa Maria River at
upe, California,
0162 2J

**CHEWAN**
cal Streamflow Summary,
chewan, to 1973.
070 7C

rature Effects on Eggs and Fry of Per-
shes,
020 5C

**AH RIVER (SC)**
ctivity from SRP Operations in a
ream Savannah River Swamp,
901 5B

**NG**
of Deposit Resuspension on Settling
213 5F

**TER INTRUSION**
Element Modeling of Flow Through
Media,
900 5B

**GS**
s Ecosystems. Recommendations for
h Programs.
106 2L

ivity/Physiology Working Group,
107 2L

Systematic Ecology Working Group,
W75-10108 7A

Decomposition Working Group,
W75-10109 2L

Consumer Ecology Working Group,
W75-10110 2L

Oceanography,
W75-10111 2L

**SEASHORES**
United States v. St. Thomas Beach Resorts, Inc. (Action to Enjoin Obstruction to Virgin Islands Shoreline by Fences Seaward of the Mean High Water Line).
W75-10317 6E

**SEATTLE (WASH)**
Solvent Solves Dewatering.
W75-10037 5D

**SEDIMENT CONTROL**
Effects of Sediment Control on Sediment Transport in the Northwest Branch Anacostia River Basin, Montgomery County, Maryland,
W75-10141 2J

**SEDIMENT DISTRIBUTION**
Research Needs as Related to the Development of Sediment Standards in Rivers,
W75-10013 5G

Arsenic in Sediments on the Continental Shelf of Southeast Australia,
W75-10177 5B

**SEDIMENT LOAD**
Estimate of Sediment Discharges, Santa Ana River at Santa Ana and Santa Maria River at Guadalupe, California,
W75-10162 2J

**SEDIMENT STANDARDS**
Research Needs as Related to the Development of Sediment Standards in Rivers,
W75-10013 5G

**SEDIMENT TRANSPORT**
Effects of Sediment Control on Sediment Transport in the Northwest Branch Anacostia River Basin, Montgomery County, Maryland,
W75-10141 2J

Estimate of Sediment Discharges, Santa Ana River at Santa Ana and Santa Maria River at Guadalupe, California,
W75-10162 2J

**SEDIMENT YIELD**
Estimate of Sediment Discharges, Santa Ana River at Santa Ana and Santa Maria River at Guadalupe, California,
W75-10162 2J

**SEDIMENTATION**
Siltation Rates and Life Expectancies of Small Headwater Reservoirs in Montana,
W75-09858 2J

**SEDIMENTS**
Estimates of Oil in Aquatic Sediments by Fluorescence Spectroscopy,
W75-10235 5A

**SEEDING TECHNIQUES**
Engineering and Operational Aspects of Weather Modification,
W75-09983 3B

**SEEPAGE CONTROL**
Problems with Effluent Seepage Fields,
W75-10274 5D

**SEMI-PERMEABLE MEMBRANES**
Reverse Osmosis System with Automatic Valve for Module Operation Control,
W75-09877 3A

**SENSITIVITY ANALYSIS**
A Sensitivity Analysis of Simulated River Basin Planning for Capital Budgeting Decisions,
W75-10223 6A

**SEPARATION TECHNIQUES**
Mechanical Management of Aquatic Vegetation: Analytical Studies of Unit Operations Potentially Useful in their Processing,
W75-09861 4A

Electrolytic Decomposition of Water,
W75-09881 3E

Solvent Solves Dewatering.
W75-10037 5D

Using Sludge, Oil, and Water Separation for Recycling Water.
W75-10038 5D

New Separator May Spur Interest in Sedimentation,
W75-10226 5D

Separation of Phenol from Waste Water by the Liquid Membrane Technique,
W75-10273 5D

**SEPTIC TANKS**
Problems with Effluent Seepage Fields,
W75-10274 5D

**SETTLING BASINS**
Effects of Deposit Resuspension on Settling Basin,
W75-10213 5F

**SEWAGE**
The Sources and Levels of Mercury in the Sewage of a University Campus,
W75-10049 5A

Recovery of Polluted Lakes. A Swedish Research Program on the Effects of Advanced Waste Water Treatment and Sewage Diversion,
W75-10081 5C

The Development of a Scheme to Construct Large Diameter Sewage Pumping Mains Across the River Tees and the Tees Railway Marshalling Yard,
W75-10275 5D

**SEWAGE DISPOSAL**
Sewage Plan Weds Five Municipalities,
W75-09914 5D

A Model for Predicting the Effects of Sewage Effluent on Wetland Ecosystems,
W75-09915 5B

**SEWAGE EFFLUENTS**
Faunal Response to Spray Irrigation of Chlorinated Sewage Effluent,
W75-09899 5D

The Response of Gymnodinium Breve to Municipal Waste Materials,
W75-10033 5C

**SEWAGE LAGOONS**
A Dimensionless Design Equation for Sewage Lagoons,
W75-10261 5D

SEWAGE TREATMENT
Sewage Disposal System,
W75-09869 5D

Sewage and Effluent Treating System,
W75-09870 5D

Process for Treating Water,
W75-09874 5D

Making Active Carbon from Sewage Sludge,
W75-09875 5D

Sewage Plan Weds Five Municipalities,
W75-09914 5D

An Analysis of Runoff in an Urban Area (In Japanese),
W75-09916 5D

Biological Purification of Waste Water and Sewage.
W75-09921 5D

Sewage and Effluent Biological Treatment Process.
W75-09924 5D

Chemicals Reduce System Odours,
W75-10040 5D

Elevated Temperature Technique for Enumeration of Salmonellae in Sewage,
W75-10045 5D

Needed: $350 Billion - And a New Needs Survey,
W75-10174 5D

Energy Evaluation and Organic Compound Index in Municipal Sewage Water (In Japanese),
W75-10189 5D

Secondary Treatment Design for Combined Wastewaters, Part II,
W75-10199 5D

Dynamic Leaching Studies on Pulpwood Bark Residues,
W75-10214 5D

Applications of Toxicity Testing to Sewage-Treatment Processes,
W75-10244 5D

Computer Control of Sewage Works, Progress at Norwich,
W75-10246 5D

Statistical Analysis of Operational Performance of Some Package Plants,
W75-10256 5D

Precipitation of Phosphates in Sewage with Lanthanum: An Experimental and Modelling Study,
W75-10259 5D

A Dimensionless Design Equation for Sewage Lagoons,
W75-10261 5D

Calculation of Reaction Mechanisms in Fermentation Basins with Continuous Flow (Zur Berechning von Reaktionsablaeufen in Kontinuierlich Durchstroemten Fermenterbecken),
W75-10267 5D

Research on Pollution with Polychlorinated Biphenyls and Polychlorinated Terphenyls in Sewage Plants, (In Japanese),
W75-10271 5D

Recycle Sludge to Feed Farms,
W75-10282 5D

Think Thermal,
W75-10284 5E

The Impact of Secondary Treatment on Wastes Discharged into the Ocean.
W75-10321 5D

SEWAGE TREATMENT TANKS
Sewage Treatment Tank,
W75-09883 5D

SEWER DESIGN
Computerized Sewer Design: New Tool for an Old Problem,
W75-10253 5D

SEWERAGE
Hydraulic Model Study of a Large-Capacity Settler in a Water Capture System (Badania hydrauliczne modelu duzego osadnika na ujeciu wodociagowym),
W75-10043 5D

Engineering Utility and Sewage Lines in Permafrost Soil,
W75-10192 5D

SEWERS
Design of Surface Water Outfalls to Rivers,
W75-10183 5D

Engineering Utility and Sewage Lines in Permafrost Soil,
W75-10192 5D

Computerized Sewer Design: New Tool for an Old Problem,
W75-10253 5D

SHEAR
Soil Liquefaction by Torsional Simple Shear Device,
W75-10231 8D

SHEET FLOW
Friction Coefficients for Laminar Sheet Flow Over Rough Surfaces,
W75-10062 8B

SHORE PROTECTION
Tybee Island Georgia, Beach Erosion Control Project (Final Environmental Impact Statement).
W75-10294 4D

SHORES
Regionalism and the Law of the Sea: The Case of Semi-Enclosed Seas,
W75-10301 6E

SHOWERS
On the Characteristics of Single-Cell Showers,
W75-09997 2B

SILTATION RATES
Siltation Rates and Life Expectancies of Small Headwater Reservoirs in Montana,
W75-09858 2J

SILTING
Siltation Rates and Life Expectancies of Small Headwater Reservoirs in Montana,
W75-09858 2J

SILVER IODIDE
Preparation and Properties of 'Pure' Silver Iodide Aerosol,
W75-09998 3B

SIMULATION ANALYSIS
Predicting Evapotranspiration from Agr tural Watersheds Under Dry Conditions,
W75-09860

Numerical Simulation of Cloud Seeding Ex ments,
W75-09955

A Computer Simulation Analysis of Su Water Quality Management Policies U Dynamic Economic and Hydrologic C tions,
W75-10124

Mean Estimate Deficiencies in Water Qu Studies,
W75-10202

A Sensitivity Analysis of Simulated Basin Planning for Capital Budgeting sions,
W75-10223

River Pollution Control,
W75-10224

SLUDGE DISPOSAL
An Integrated System for Disposal of Slu Originating from Water Softening and Se Treatment in Municipalities,
W75-10123

Use of Lime-Soda Ash Softening Sludge the Treatment of Municipal Wastewater,
W75-10125

Water Research Center Unravels the Ni Knot,
W75-10278

Recycle Sludge to Feed Farms,
W75-10282

Think Thermal,
W75-10284

SLUDGE TREATMENT
Fluidized-Bed Incineration of Urban Sl (Incineration des Boues Urbaines en Lit dise),
W75-09941

Solvent Solves Dewatering.
W75-10037

An Integrated System for Disposal of Slu Originating from Water Softening and Se Treatment in Municipalities,
W75-10123

Use of Lime-Soda Ash Softening Sludge the Treatment of Municipal Wastewater,
W75-10125

Studies Concerning Dewatering of Dige Communal Waste Water Sludges on Sl Drying Beds (Untersuchungen zur Entw serung ausgefaulter kommunaler ab serschlaemme auf Schlammtrockenplaetzen
W75-10228

SNOW
Proceedings of the World Meteorological ganization/International Association Meteorology and Atmospheric Physics S tific Conference on Weather Modification.
W75-09944

SNOW ENHANCEMENT
Snowfall Enhancement,
W75-09959

'ALL
fall Enhancement,
09959 2C

yramid Pilot Cloud-Seeding Project,
09964 3B

L CHANGE
logical Impact of a Flood Control Reser-Howard, Pennsylvania,
09854 6B

Effects of Authorization for Water Im-ments on Shoreland Transition,
0126 6B

IMPACT
ogical Impact of a Flood Control Reser-Howard, Pennsylvania,
9854 6B

VALUES
Effects of Authorization for Water Im-ments on Shoreland Transition,
0126 6B

I CHLORIDE
ary of Observations Indicating Dynamic on Salt Seeding in Warm Cumulus
0057 3B

ONTAMINATION
rch Status on Effects of Land Applica-Animal Wastes,
0022 5B

in Water, Soil, Plants and Animals,
0083 5C

SPOSAL FIELDS
ch Status on Effects of Land Applica-Animal Wastes,
0022 5B

ms with Effluent Seepage Fields,
0274 5D

QUEFICATION
iquefaction by Torsional Simple Shear
0231 5D

OISTURE
el of One-Dimensional Percolation to a Table Using a Computer Simulation
ge,
0138 2G

TER MOVEMENT
ement Practices Affecting Quality and
y of Irrigation Return Flow,
019 5G

ADIATION
ements of Absolute Scalar Irradiance in Rhode River,
102 5C

ONTACT PROCESSES
egrated System for Disposal of Sludges ting from Water Softening and Sewage ent in Municipalities,
123 5D

ASTE MANAGEMENT
ing External Effects of Solid Waste ment,
024 5B

ASTES
ogic Evaluation of the Haystack Butte ith Emphasis on Possible Discharge of Class-I Wastes, Edwards Air Force Base, California,
W75-10161 5B

Dynamic Leaching Studies on Pulpwood Bark Residues,
W75-10214 5D

**SOLIDS-BEARING FLUIDS**
New Flowmeter Passes Tests,
W75-10190 5D

**SOLVENT EXTRACTIONS**
Extraction of Petroleum Hydrocarbons from Oil-Contaminated Sediments,
W75-10241 5G

**SOLVENT RECOVERY**
Design for Solvent Recovery,
W75-10239 5D

**SOLVENTS**
Solvent Solves Dewatering.
W75-10037 5D

**SONOMA COUNTY (CALIF)**
Warm Springs Dam and Lake Sonoma Project, Russian River Basin, Sonoma County, California. Part II (Final Environmental Impact Statement).
W75-10299 8A

**SORGHUM**
Effects of Irrigation and Row Spacing on Evapotranspiration and Microclimate of a Sorghum Field,
W75-09853 2D

**SOUTH CAROLINA**
Radioactivity from SRP Operations in a Downstream Savannah River Swamp,
W75-09901 5B

The Discharge of South Carolina Streams as it Relates to Link Magnitude,
W75-10134 2E

Utilization of Aerial Photographs for Measuring Land Use Changes in Watersheds,
W75-10136 4C

**SOUTH DAKOTA**
Engineering and Operational Aspects of Weather Modification,
W75-09983 3B

**SPECTROMETERS**
Measurements of Absolute Scalar Irradiance Spectra in Rhode River,
W75-10102 5C

**SPECTROSCOPY**
Estimates Using Fluorescence Spectroscopy of the Present State of Petroleum Hydrocarbon Contamination in the Water Column of the Northwest Atlantic Ocean,
W75-10233 5A

Estimates of Oil in Aquatic Sediments by Fluorescence Spectroscopy,
W75-10235 5A

**SPILLWAYS**
Safety of Dams--Bureau of Reclamation,
W75-10221 8A

**SPORT FISHING**
Feasibility and Potential of Enhancing Water Recreation Opportunities on High Country Reservoirs-Phase I,
W75-09894 6B

**SPRINKLER IRRIGATION**
An Unusual Brown Rot Outbreak in a Florida Citrus Grove Following Sprinkler Irrigation With Phytophthora-Infested Water,
W75-10245 3F

**SQUIDS**
Toxicity of DFP and Related Compounds to Squids in Relation to Cholinesterase Inhibition and Detoxifying Enzyme Levels,
W75-09909 5C

**ST. LOUIS BAY (MISS)**
Residential Canals Along the Gulf Coast,
W75-10016 5B

**STABILITY**
The Position Stability of Large Water Drops Suspended in a Vertical Wind Tunnel,
W75-10053 2B

**STANDARDS**
Critical Levels of Phosphorus and Nitrogen in Texas Impoundments,
W75-10072 5C

Feedlots Point Source Category--Effluent Guidelines and Standards.
W75-10333 5G

**STANISLAUS RIVER (CALIF)**
Wasting a River,
W75-10116 6B

**STATE-OF-THE-ART**
Survey of Lake Rehabilitation Techniques and Experiences,
W75-10078 5C

**STATISTICAL METHODS**
Statistical Evaluation of Reaeration Prediction Equations,
W75-10211 5G

**STATISTICAL MODELS**
Biological Wastewater Treatment Model Building Fits and Misfits,
W75-10169 5D

**STEAM**
Steam Electric Power Generating Point Source Category--Effluent Guidelines and Standards.
W75-10337 5G

**STOCHASTIC PROCESSES**
Mean Estimate Deficiencies in Water Quality Studies,
W75-10202 5G

Deterministic Model of Dynamic Eutrophic Estuary,
W75-10215 5B

**STORAGE**
Subsurface Environment--Private Property or Public Domain,
W75-10209 4B

**STORM RUNOFF**
Hydrologic Impact of Planned Unit Developments,
W75-09919 4C

Drainage System Cooperates with Nature,
W75-09942 4A

Evaluation of Phosphorus Dynamics in a Watershed,
W75-10217 5B

STORMS
Natural 'Hailcores' and Their Abilities to Estimate the Efficiency of Hail Prevention Systems,
W75-09966 2B

Equivalent Blackbody Temperature of the Top of a Severe Storm,
W75-10054 2B

STRATIGRAPHY
Recent Sedimentary History of Lake Monona, Wisconsin,
W75-10089 5C

STREAMFLOW
Predicting Evapotranspiration from Agricultural Watersheds Under Dry Conditions,
W75-09860 2D

Historical Streamflow Summary, British Columbia, to 1973.
W75-10065 7C

Historical Streamflow Summary, Ontario, to 1973.
W75-10066 7C

Historical Streamflow Summary, Alberta, to 1973.
W75-10067 7C

Historical Streamflow Summary, Saskatchewan, to 1973.
W75-10070 7C

Historical Streamflow Summary, Atlantic Provinces, to 1973.
W75-10071 7C

Discharge Measurements at Low-Flow Partial-Record Stations in Iowa,.
W75-10144 7C

Colorado River-Flow Management,
W75-10208 4A

STREAMFLOW FORCASTING
The Discharge of South Carolina Streams as it Relates to Link Magnitude,
W75-10134 2E

STREAMFLOW FORECASTING
Estimating Mean Streamflow in the Duchesne River Basin, Utah,
W75-10166 2E

STREAMS
The National Stream Quality Accounting Network (NASQAN)--Some Questions and Answers,
W75-10168 5A

Evaluation of Phosphorus Dynamics in a Watershed,
W75-10217 5B

STREPTOCOCCUS
Fecal Contamination--The Water Analyst's Responsibility Part II,
W75-10258 5A

SUBSURFACE WATERS
Geothermal Brine Energy to Generate Power,
W75-09863 8C

Apparatus for Controlling the Level of Subsurface Water,
W75-09880 4B

SUDDEN ENLARGEMENT CHANNELS
Design Implications of Hydraulic Jumps at Sudden Enlargements,
W75-10061 8B

SUGARCANE
Liquid and Crystalline Cane Sugar Refining Subcategory--Effluent Limitations Guidelines and Proposed Pretreatment Standards.
W75-10326 5G

SUMBERGED PLANTS
Changes in the Submerged Macrophyte Communities of Lake Wabamum as a Result of Thermal Discharges,
W75-10074 5C

SUNOL VALLEY (CALIF)
Evaluation of Ground Water Resources: Livermore and Sunol Valleys,
W75-10063 2F

SURFACE-GROUNDWATER RELATIONSHIPS
Hydrologic Reconnaissance of the Wah Wah Valley Drainage Basin, Millard and Beaver Counties, Utah,
W75-10167 4B

SURFACE WATER
Monitoring the Quality of Surface Water,
W75-10251 5A

SURFACE WATERS
Surface Water Data, Reference Index, Canada 1974.
W75-10064 7C

Surface Waters and the Civil Law Rule,
W75-10304 6E

SURVEYS
Report of Committee on Survey of Ground Water Supplies in New England.
W75-10182 4B

Plan Formulation and Evaluation Studies--Recreation. Vol I of V. Evaluation of Recreation Use Surveys Procedures,
W75-10342 6B

SUSPENDED SOLIDS
New Separator May Spur Interest in Sedimentation,
W75-10226 5D

SWAMPS
Radioactivity from SRP Operations in a Downstream Savannah River Swamp,
W75-09901 5B

SYSTEMS ANALYSIS
Total Approach for the Bogota, Columbia, Water Supply,
W75-10203 3D

Digital Program for Water Network Analysis,
W75-10220 7C

Planning and Operation of Urban Water Quality Management Systems,
W75-10262 5G

TALBOT COUNTY (MD)
Tred Avon River, Talbot County, Maryland (Final Environmental Impact Statement).
W75-10295 4A

TALUS
Preservation and Enhancement of the American Falls at Niagara.
W75-10290 6E

TARGET-CONTROL EVALUATION
On Physical and Economic Effectiveness of Hail-Suppression Projects,
W75-09995 3B

TAUGHANNOCK CREEK (NY)
Microbiology and Water Quality in a Tribut
of Cayuga Lake,
W75-09896

TECHNOLOGY
Survey of Lake Rehabilitation Techniques
Experiences,
W75-10078

TECHNOLOGY TRANSFER
Upgrading Existing Wastewater Treatm
Plants--Case Histories.
W75-10347

TELEVISION SYSTEMS
TV System Gives Automatic Alarm as Wes
Visual Monitoring of Air and Water Pollution
W75-10263

TEMPERATURE
Equivalent Blackbody Temperature of the T
of a Severe Storm,
W75-10054

TENNESSEE
Smith v. City of Cookeville (Action by L
downer Whose Property was Condemned
City for Use in Recreation Development to F
join Construction Until Environmental Imp
Statement is Filed).
W75-10312

TERRESTRIAL HABITATS
Experimental Eutrophication of Terrestrial a
Aquatic Ecosystems. First Annual Report
the Upland Recharge Project,
W75-10097

TERTIARY TREATMENT
Carbon Contact-Filtration: How It Works,
W75-09912

Tertiary Treatment: Advanced Wastewa
Techniques,
W75-09933

Experimental Eutrophication of Terrestrial a
Aquatic Ecosystems. First Annual Report
the Upland Recharge Project,
W75-10097

Largest Advanced Wastewater Treatment Pla
in the U.S. and in the World,
W75-10193

TESTING
Comparison of Autoclave and Ethylene Oxid
Sterilized Membrane Filters Used in Wat
Quality Studies,
W75-10048

TEXAS
Effects of Original Vegetation on Reservo
Water Quality,
W75-10014

Critical Levels of Phosphorus and Nitrogen
Texas Impoundments,
W75-10072

Artificial Reefs for Texas.
W75-10119

Primary Economic Impact of the Gulf I
tracoastal Waterway in Texas,
W75-10120

Ground-water Discharge from the Edwards ar
Associated Limestones, San Antonio Are
Texas, 1974,
W75-10146

drologic Data for Urban Studies in the Dal-
Texas Metropolitan Area, 1973,
5-10148 7C

drologic Data for North Creek, Trinity River
in, Texas, 1973,
5-10149 7C

drologic Data for Mountain Creek, Trinity
er Basin, Texas, 1973,
5-10150 7C

drologic Data for Urban Studies in the
tin, Texas Metropolitan Area, 1973,
5-10151 7C

mical and Physical Characteristics of Water
Esturies of Texas, October 1970-September
1,
5-10153 7C

poration Data in Texas--Compilation Re-
, January 1907-December 1970,
5-10154 7C

ra Club v. Lynn (Action for Declaratory
Injunctive Relief with Respect to Develop-
t of New Housing Development).
5-10309 6G

ntain Park Reclamation Project,
ahoma--Nueces River Project, Texas.
5-10319 4A

Formulation and Evaluation Studies--
reation. Vol. III of V. A Preliminary Analy-
of Day Use Recreation and Benefit Estima-
Models for Selected Reservoirs,
5-10343 6B

**ILE WASTES**
tability of Textile-Domestic Waste Mix-
s,
5-09859 5D

**ES RIVER**
eficial Uses of Waste Heat,
5-09889 5G

**MAL INFRA-RED LINESCAN**
e Applications of Thermal Infra-Red
scan in Water Resources Studies,
5-10188 5A

**MAL POLLUTION**
eficial Uses of Waste Heat,
5-09889 5G

estrial and Freshwater Radioecology, a
cted Bibliography,
5-09891 5A

iminary Results of a Study Concerning the
cts of Thermal Pollution on Phytoplank-
c Primary Production in Lake Wabamun,
rta,
-10073 5C

nges in the Submerged Macrophyte Com-
ities of Lake Wabamum as a Result of
mal Discharges,
-10074 5C

mal Discharges--Proposed Procedures for
Imposition of Alternative Effluent Limita-
s.
-10329 5G

mal Discharges.
-10335 5G

**MAL PROPERTIES**
thermal Brine Energy to Generate Power,
-09863 8C

Geothermal Investigations in Idaho: Part 3, an Evaluation of Thermal Water in the Weiser Area, Idaho,
W75-10147 4B

**THERMAL WATER**
Geothermal Investigations in Idaho: Part 3, an Evaluation of Thermal Water in the Weiser Area, Idaho,
W75-10147 4B

**THUNDERSTORMS**
Dynamic Methods of Convective Cloud Modification by Means of Artificial Vertical Jets,
W75-09973 3B

Convective Cloud Modification to Reduce Thunderstorm Activity,
W75-09975 3B

On the Possibility of Thunderstorm Suppression by Changing the Non-Equilibrium Crystallization Potentials of Cloud Water,
W75-09976 2B

Some Questions of Thunderstorm Lightning Control,
W75-09977 2B

The Effect of Chaff Seeding on Lightning and Electric Fields of Thunderstorms,
W75-09978 3B

Removal of Pyrotechnic Generated Tracer Placed by Aircraft in a Convective Updraft,
W75-10000 3B

**TIDES**
Hydrodynamic Levelling of an Off-Shore Tide Gauge,
W75-10060 8B

**TISSUE ANALYSIS**
Importance of Water pH in Accumulation of Inorganic Mercury in Fish,
W75-09904 5A

Toxaphene Inhibition of ATPase Activity in Catfish, Ictalurus Punctatus, Tissues,
W75-09908 5C

**TOKYO (JAPAN)**
An Analysis of Runoff in an Urban Area (In Japanese),
W75-09916 5D

Water Pollution Monitoring System, (In Japanese),
W75-10196 5A

**TORSIONAL SIMPLE SHEAR DEVICE**
Soil Liquefaction by Torsional Simple Shear Device,
W75-10231 8D

**TOXAPHENE**
Toxaphene Inhibition of ATPase Activity in Catfish, Ictalurus Punctatus, Tissues,
W75-09908 5C

**TOXICANTS**
Toxaphene Inhibition of ATPase Activity in Catfish, Ictalurus Punctatus, Tissues,
W75-09908 5C

Toxicity of DFP and Related Compounds to Squids in Relation to Cholinesterase Inhibition and Detoxifying Enzyme Levels,
W75-09909 5C

**TOXICITY**
Effect of Asulam in Wildlife Species: Acute Toxicity to Birds and Fish,
W75-09903 5C

Effects of PCB (Aroclor 1254) and P, P' DDT On Production and Survival of Daphnia Magna Strauss,
W75-09905 5C

Toxicity of DFP and Related Compounds to Squids in Relation to Cholinesterase Inhibition and Detoxifying Enzyme Levels,
W75-09909 5C

**TOXICITY TESTS**
Comparison of Autoclave and Ethylene Oxide-Sterilized Membrane Filters Used in Water Quality Studies,
W75-10048 5A

Applications of Toxicity Testing to Sewage-Treatment Processes,
W75-10244 5D

**TRACE ELEMENTS**
Determination of Trace Quantities of Boron in Surface Water Bodies and in Drinking Water (Spurenbestimmung von Bor in Oberflachengewassern und Trinkwassern),
W75-10041 5A

Fluxes, Residence Times, and Sources of Some Elements to Lake Michigan,
W75-10090 5C

**TRACERS**
Aquifer Parameters by a Chemical Tracer Technique: Non Linear Mixing in the Roswell Confined Aquifer,
W75-09893 2F

Removal of Pyrotechnic Generated Tracer Placed by Aircraft in a Convective Updraft,
W75-10000 3B

The Utilization of Tracers in the Study and Control of Water Pollution (Utilizacao de Marcadores no Estudo e Controle de Poluicao das Aguas),
W75-10046 5B

Isotope Hydrology 1974--A Review of the IAEA Symposium on Isotope Techniques in Groundwater Hydrology,
W75-10172 5A

**TRANSIENT FLOW**
Colorado River-Flow Management,
W75-10208 4A

**TRANSPIRATION**
Effects of Irrigation and Row Spacing on Evapotranspiration and Microclimate of a Sorghum Field,
W75-09853 2D

**TRANSPORTATION**
Geographical Analysis of Oil Spill Potential Associated with Alaskan Oil Production and Transportation Systems,
W75-10121 5G

**TREATIES**
International Legal Implications of Off-Shore Terminal Facilities,
W75-10286 5G

**TREATMENT FACILITIES**
Desalting Plants Inventory, Report No. 5,
W75-09852 3A

Sewage Plan Weds Five Municipalities,
W75-09914 5D

Largest Advanced Wastewater Treatment Plant in the U.S. and in the World,
W75-10193 5D

**TREATMENT FACILITIES**

Austrian Plant Knocks Out Nitrogen,
W75-10225 5D

A Computer Comes to Missouri,
W75-10265 5D

Upgrading Existing Wastewater Treatment Plants--Case Histories.
W75-10347 5D

**TRESPASS**
United States v. St. Thomas Beach Resorts, Inc. (Action to Enjoin Obstruction to Virgin Islands Shoreline by Fences Seaward of the Mean High Water Line).
W75-10317 6E

**TRICKLE IRRIGATION**
Irrigation Device,
W75-09872 3F

Trickle Irrigation Emitter,
W75-09873 3F

**TRICKLING FILTERS**
Upgrading Existing Wastewater Treatment Plants--Case Histories.
W75-10347 5D

**TRINITY RIVER BASIN (TEX)**
Hydrologic Data for Mountain Creek, Trinity River Basin, Texas, 1973,
W75-10150 7C

**TRISODIUM NITRILOACETATE**
Biodegradation of NTA Detergents in a Wastewater Treatment System,
W75-09920 5D

**TROPHIC LEVEL**
Diatoms in Lakes and Lake Sediments as an Index to Environment. Part 2. A Study of Phytoplankton Distribution, Lake Classification, and Trophic Indicators in Minnesota Lakes,
W75-10105 5C

**TURBULENCE**
Wave Quenching Device,
W75-09871 4A

The Position Stability of Large Water Drops Suspended in a Vertical Wind Tunnel,
W75-10053 2B

**TYBEE ISLAND (GA)**
Tybee Island Georgia, Beach Erosion Control Project (Final Environmental Impact Statement).
W75-10294 4D

**UINTA BASIN (UTAH)**
Authorized Bonneville Unit, Central Utah Project, Utah (Final Environmental Impact Statement).
W75-10292 8A

**ULTRAFILTRATION**
Bibliography on the Application of Reverse Osmosis to Industrial and Municipal Wastewaters,
W75-09925 5D

Membrane Processing in the Metal Finishing Industry,
W75-09936 5D

**ULTRAVIOLET RADIATION**
A New Direct Ultraviolet Method for the Analysis of Nitrate Ions,
W75-10187 5A

**UNBLEACHED KRAFT WASTEWATER TREATMENT**
Activated Carbon Treatment of Unbleached Kraft Effluent for Reuse,
W75-10028 5D

**UNDERGROUND STRUCTURES**
Subsurface Environment--Private Property or Public Domain,
W75-10209 4B

**UNDERGROUND WASTE DISPOSAL**
Disposal of Waste Streams Containing Asbestos,
W75-09876 5E

Underground Liquid Waste Disposal.
W75-09938 5E

Ground Water Pollution Problems in the Northwestern United States,
W75-10023 5B

Hydrologic Evaluation of the Haystack Butte Area with Emphasis on Possible Discharge of Class-I Wastes, Edwards Air Force Base, California,
W75-10161 5B

**UNDERWATER**
Free-Grab Device for Collecting Underwater Samples,
W75-09866 7B

**UNITED STATES**
An Ice Nuclei Concentration Benchmark Network,
W75-09999 7A

Ground Water,
W75-10143 2F

**UNSTEADY FLOW**
Transient Control in Lower Sacramento River,
W75-10219 4A

Water Quality Routing of Unsteady River Flow by Finite Element Method,
W75-10252 5B

**UNTIED STATES**
The National Stream Quality Accounting Network (NASQAN)--Some Questions and Answers,
W75-10168 5A

**URBAN HYDROLOGY**
Hydrologic Impact of Planned Unit Developments,
W75-09919 4C

Hydrologic Data for Urban Studies in the Dallas, Texas Metropolitan Area, 1973,
W75-10148 7C

Hydrologic Data for Urban Studies in the Austin, Texas Metropolitan Area, 1973,
W75-10151 7C

**URBAN RUNOFF**
An Analysis of Runoff in an Urban Area (In Japanese),
W75-09916 5D

Hydrologic Impact of Planned Unit Developments,
W75-09919 4C

Hydrologic Data for Urban Studies in the Dallas, Texas Metropolitan Area, 1973,
W75-10148 7C

Hydrologic Data for Urban Studies in t
Austin, Texas Metropolitan Area, 1973,
W75-10151 7

**URBANIZATION**
Effects of Sediment Control on Sedime
Transport in the Northwest Branch Anacost
River Basin, Montgomery County, Maryland,
W75-10141

**USE RATES**
Plan Formulation and Evaluation Studies
Recreation. Vol I of V. Evaluation of Recre
tion Use Surveys Procedures,
W75-10342 6

**USSR**
Hail Process Investigation and Hail Suppre
sion Activities in the U.S.S.R.,
W75-09965 3

Technical Devices for the Artificial Modific
tion of Cloud and Fog,
W75-09982 3

Anti-Hail Rockets and Shells,
W75-09984 3

Radar Methods and Equipment for Ha
Supression,
W75-09985 3

Convective Cloud Study Results Applied t
Weather Modification,
W75-09988 2

Methods of Estimating Physical and Economi
Effectiveness of Weather Modification,
W75-09991 3

On Physical and Economic Effectiveness o
Hail-Suppression Projects,
W75-09995 3

**USSR (ALAZANI VALLEY)**
Radar Characteristics of Cumulonimbus Cloud
During Their Natural Development and Artif
cial Seeding,
W75-09996 2

**USSR (MOLDAVIA)**
Research into Hail-Forming Processes and th
Results of Anti-Hail Protection Measures i
Moldavia,
W75-09968 2

**UTAH**
The Effects of Artificial Destratification on th
Water Quality and Microbial Populations o
Hyrum Reservoir,
W75-09897 5

A Study of the Effects of Water Institutions o
Planning and Management of Water Resource
in Utah,
W75-10130 6

Estimating Mean Streamflow in the Duchesn
River Basin, Utah,
W75-10166 2

Hydrologic Reconnaissance of the Wah Wa
Valley Drainage Basin, Millard and Beave
Counties, Utah,
W75-10167 4

Authorized Bonneville Unit, Central Utah Pro
ject, Utah (Final Environmental Impact State
ment).
W75-10292 8

Hardy Salt Co. v. Southern Pacific Transporta
tion Co. (Suit Seeking Injunctive Relief o

mages for Salinity Changes Resulting from fendant's Construction in the Great Salt ke).
5-10308 6E

thorized Bonneville Unit, Central Utah Pro-t, Utah Appendix A (Final Environmental pact Statement).
5-10331 8A

-MATIC SLUDGE FILTERS
uuming Waste From Water.
5-09930 5D

ES
ve Stroking in Separated Pipe Flow,
5-10210 8B

TIES
na and Flora in Hydraulic Clam Dredge ections from Florida West and Southeast sts,
5-10079 5C

TATION
cts of Original Vegetation on Reservoir er Quality,
-10014 5C

CITY
den Release of Water from a Long matic Flume,
-10017 8B

A (AUSTRIA)
rian Plant Knocks Out Nitrogen,
-10225 5D

N ISLANDS
ed States v. St. Thomas Beach Resorts, (Action to Enjoin Obstruction to Virgin ds Shoreline by Fences Seaward of the n High Water Line).
-10317 6E

NIA
Recovery of Stream Macrobenthos from pH Stress,
-10127 5C

LITY IMPROVEMENT
Dispersal - Physical and Technological cts,
09945 3B

gn of a Modern Thermal Fog Dissipation em for Airports,
09947 3B

METRIC ANALYSIS
rupted-Sweep Voltammetry for the ification of Polychlorinated Biphenyls and thalenes,
10268 5A

VAH VALLEY (UTAH)
ological Reconnaissance of the Wah Wah y Drainage Basin, Millard and Beaver ties, Utah,
10167 4B

EYE
erature Effects on Eggs and Fry of Per-Fishes,
10020 5C

FOGS
n of a Modern Thermal Fog Dissipation m for Airports,
09947 3B

WARSAW (POLAND)
Hydraulic Model Study of a Large-Capacity Settler in a Water Capture System (Badania hydrauliczne modelu duzego osadnika na ujeciu wodociagowym),
W75-10043 5D

WASHINGTON
Numerical Model of the Salt-Wedge Reach of the Duwamish River Estuary, King County, Washington,
W75-10157 5B

WASTE DISPOSAL
Disposal of Waste Streams Containing Asbestos,
W75-09876 5E

Hydrologic Evaluation of the Haystack Butte Area with Emphasis on Possible Discharge of Class-I Wastes, Edwards Air Force Base, California,
W75-10161 5B

Dumps: A Potential Threat to Our Groundwater Supplies,
W75-10184 5B

Subsurface Environment--Private Property or Public Domain,
W75-10209 4B

A Concept for Managing Waste,
W75-10236 5D

The Davy Jones Garbage Dump,
W75-10238 5G

Precipitation of Phosphates in Sewage with Lanthanum: An Experimental and Modelling Study,
W75-10259 5D

Regulation of Ocean Dumping--One Year Later,
W75-10285 5G

Mass Transfer to Naturally Flowing Streams,
W75-10341 5D

WASTE DISPOSAL WELLS
Disposal of Waste Streams Containing Asbestos,
W75-09876 5E

Ground Water Pollution Problems in the Northwestern United States,
W75-10023 5B

WASTE FIXATION
Review of Literature Pertinent to the Aqueous Conversion of Radionuclides to Insoluble Silicates with Selected References and Bibliography (Revised),
W75-09892 5D

WASTE HEAT
Waste-Heat Steam Runs Evaporative Water Purifier.
W75-10240 5D

WASTE REUSE
Design for Solvent Recovery,
W75-10239 5D

WASTE STORAGE
Review of Literature Pertinent to the Aqueous Conversion of Radionuclides to Insoluble Silicates with Selected References and Bibliography (Revised),
W75-09892 5D

WASTE TREATMENT
Review of Literature Pertinent to the Aqueous Conversion of Radionuclides to Insoluble Silicates with Selected References and Bibliography (Revised),
W75-09892 5D

Laboratory Simulation of Swine Manure Lagoons,
W75-10137 5D

Feedlots Point Source Category--Effluent Guidelines and Standards.
W75-10333 5G

Glass Manufacturing Point Source Categories--Effluent Guidelines and Standards.
W75-10334 5G

WASTE WATER
Activated Carbon Treatment of Unbleached Kraft Effluent for Reuse,
W75-10028 5D

WASTE WATER DISPOSAL
Waste Water Treatment Plant with Balanced Load,
W75-09867 5D

Underground Liquid Waste Disposal.
W75-09938 5E

WASTE WATER IRRIGATION
Faunal Response to Spray Irrigation of Chlorinated Sewage Effluent,
W75-09899 5D

WASTE WATER TREATMENT
Treatability of Textile-Domestic Waste Mixtures,
W75-09859 5D

Waste Water Treatment Plant with Balanced Load,
W75-09867 5D

Sewage Disposal System,
W75-09869 5D

Sewage and Effluent Treating System,
W75-09870 5D

Process for Treating Water,
W75-09874 5D

Making Active Carbon from Sewage Sludge,
W75-09875 5D

Method for Purifying Waste Water,
W75-09882 5D

Sewage Treatment Tank,
W75-09883 5D

Apparatus for Treating Water Containing Impurities,
W75-09884 5D

Water Chlorination Methods,
W75-09910 5F

Advances in Ammonia and Nitrate Removal,
W75-09911 5D

Carbon Contact-Filtration: How It Works,
W75-09912 5D

Characterization of Mixing in Aerated Lagoons,
W75-09913 5D

Sewage Plan Weds Five Municipalities,
W75-09914 5D

## WASTE WATER TREATMENT


Biodegradation of NTA Detergents in a Wastewater Treatment System,
W75-09920 5D

Biological Purification of Waste Water and Sewage.
W75-09921 5D

Sewage and Effluent Biological Treatment Process.
W75-09924 5D

Bibliography on the Application of Reverse Osmosis to Industrial and Municipal Wastewaters,
W75-09925 5D

Review of the Canadian Metal Finishing Industry: Consumption of Raw Materials and Options for Water Pollution Control.
W75-09926 5D

Freeze Crystallization: New Water-Processing Tool,
W75-09927 5D

Joint Treatment of Pulping and Municipal Wastes,
W75-09928 5D

Municipality and Industry Join in Wastewater Treatment.
W75-09929 5D

Vacuuming Waste From Water.
W75-09930 5D

Pollution Abatement in the Pharmaceutical Industry,
W75-09931 5D

Recovering Organic Materials from Wastewater,
W75-09932 5D

Tertiary Treatment: Advanced Wastewater Techniques,
W75-09933 5D

Heavy Metal Adsorbent.
W75-09934 5D

Destruction of Spent Oil-Water Emulsions--Using Incandescent Coke Before Quenching,
W75-09935 5D

Membrane Processing in the Metal Finishing Industry,
W75-09936 5D

Factors Influencing Reverse Osmosis Rejection of Inorganic Solutes from Aqueous Solution,
W75-09937 5D

Treatment of Aqueous Waste Streams with Hydrogen Peroxide to Remove Chlorinated Isocyanurates Therefrom,
W75-09939 5D

Process for Treating Waste Photographic Processing Solutions,
W75-09940 5D

Solvent Solves Dewatering.
W75-10037 5D

Using Sludge, Oil, and Water Separation for Recycling Water.
W75-10038 5D

Chemicals Reduce System Odours,
W75-10040 5D

Hydraulic Model Study of a Large-Capacity Settler in a Water Capture System (Badania hydrauliczne modelu duzego osadnika na ujeciu wodociagowym),
W75-10043 5D

An Automated Method for Determination of Residual Methanol in Denitrified Effluents,
W75-10047 5D

Recovery of Polluted Lakes. A Swedish Research Program on the Effects of Advanced Waste Water Treatment and Sewage Diversion,
W75-10081 5C

Experimental Eutrophication of Terrestrial and Aquatic Ecosystems. First Annual Report of the Upland Recharge Project,
W75-10097 5D

An Integrated System for Disposal of Sludges Originating from Water Softening and Sewage Treatment in Municipalities,
W75-10123 5D

A Computer Simulation Analysis of Surface Water Quality Management Policies Under Dynamic Economic and Hydrologic Conditions,
W75-10124 5D

Biological Wastewater Treatment Model Building Fits and Misfits,
W75-10169 5D

Modeling Microbial Growth in Wastewater Treatment,
W75-10170 5D

Needed: $350 Billion - And a New Needs Survey,
W75-10174 5D

Lack of Promised Federal Funds Hampers Water Cleanup Effort.
W75-10178 5G

The Magnetic Flowmeter and Its Use in Waste Water Technology (Der magnetische Durchflussmesser und seine Anwendung in der Abwassertechnik),
W75-10185 5A

Energy Evaluation and Organic Compound Index in Municipal Sewage Water (In Japanese),
W75-10189 5D

New Flowmeter Passes Tests,
W75-10190 5D

Largest Advanced Wastewater Treatment Plant in the U.S. and in the World,
W75-10193 5D

Operation of Full-Scale Biological Phosphorus Removal Plant,
W75-10194 5D

Disposal of Waste Alum Sludge from Water Treatment Plants,
W75-10195 5D

Removal of Organic Matter by Activated Carbon Columns,
W75-10197 5D

Secondary Treatment Design for Combined Wastewaters, Part II,
W75-10199 5D

Cleaning of Petroleum-Industry Effluent,
W75-10200 5D

Dynamic Leaching Studies on Pulpwood Bark Residues,
W75-10214 5E

Austrian Plant Knocks Out Nitrogen,
W75-10225 5E

New Separator May Spur Interest in Sedimentation,
W75-10226 5E

Evolution of Microflora During Purification Treatment of Urban Water by Activated Sludge (Evolution de la Microflore au Cours D'un Traitement D'Epuration D'eaux Urbaines Par Boues Activees),
W75-10227 5E

Studies Concerning Dewatering of Digested Communal Waste Water Sludges on Sludge Drying Beds (Untersuchungen zur Entwaesserung ausgefaulter kommunaler abwasserschlaemme auf Schlammtrockenplaetzen),
W75-10228 5E

Pilot-Plant Investigations into Partial Pretreatment Systems at Macclesfield,
W75-10229 5E

Liquid Filter Apparatus,
W75-10230 5E

The Determination of Benzidine in Wastewaters,
W75-10232 5A

A Concept for Managing Waste,
W75-10236 5E

Waste-Heat Steam Runs Evaporative Water Purifier.
W75-10240 5E

Applications of Toxicity Testing to Sewage Treatment Processes,
W75-10244 5E

Computer Control of Sewage Works, Progress at Norwich,
W75-10246 5E

Statistical Analysis of Operational Performance of Some Package Plants,
W75-10256 5E

Precipitation of Phosphates in Sewage with Lanthanum: An Experimental and Modelling Study,
W75-10259 5E

A Dimensionless Design Equation for Sewage Lagoons,
W75-10261 5E

California Plant Gets Straight 'A's in Computer Control,
W75-10264 5E

A Computer Comes to Missouri,
W75-10265 5E

Calculation of Reaction Mechanisms in Fermentation Basins with Continuous Flow (Zur Berechnung von Reaktionsablaeufen in Kontinuierlich Durchstroemten Fermenterbecken),
W75-10267 5E

Research on Pollution with Polychlorinated Biphenyls and Polychlorinated Terphenyls in Sewage Plants, (In Japanese),
W75-10271 5E

ation of Phenol from Waste Water by the d Membrane Technique,
10273 5D

ems with Effluent Seepage Fields,
10274 5D

Development of a Scheme to Construct Diameter Sewage Pumping Mains Across River Tees and the Tees Railway halling Yard,
10275 5D

ersible Pumps Make By-Pass Possible,
10276 8C

Research Center Unravels the Nitrate
10278 5D

ion Control, Next Step, Physi-hemical Treatment, Activated Charcoal,
0279 5D

cteristics of Gas-Liquid Contact Ap-s in Ozone Treatment for Drinking . (In Japanese),
0281 5F

le Slurry Pumps Are Heart of Pollution ol Facility at Inland.
0340 8C

Transfer to Naturally Flowing Streams,
0341 5D

an Activated Carbon Plant for Waste Treatment,
0346 5D

ding Existing Wastewater Treatment --Case Histories.
0347 5D

Chemistry and Technology-A Review of erature: 1961-1974,
0348 5D

iology and Water Quality in a Tributary uga Lake,
9896 5C

ALLOCATION (POLICY)
ies, Characteristics, and Opinions of ront Residents: Kissimmee River Basin, a,
0129 6B

ANALYSIS
tative Large-Volume Sampling que,
0031 5A

Monitoring is Big Business.
0269 5A

AUTHORITIES
al Authorities Take Over Britain's Sewage Systems,
0176 6E

BASED RECREATION
lity and Potential of Enhancing Water tion Opportunities on High Country oirs-Phase I,
0894 6B

DISTRIBUTION (APPLIED)
Program for Water Network Analysis,
220 7C

**WATER DISTRICTS**
Regional Authorities Take Over Britain's Water/Sewage Systems,
W75-10176 6E

**WATER HAMMER**
Valve Stroking in Separated Pipe Flow,
W75-10210 8B

**WATER LAW**
A Study of the Effects of Water Institutions on Planning and Management of Water Resources in Utah,
W75-10130 6E

Economic Institutions to Determine Water Quality,
W75-10132 5G

Scenic Rivers Association of Oklahoma v. Lynn (Suit Seeking Declaratory Judgment that HUD Must Make an Environmental Impact Study Prior to Their Contemplated Actions).
W75-10313 6E

**WATER LEVEL FLUCTUATIONS**
Activities, Characteristics, and Opinions of Lakefront Residents: Kissimmee River Basin, Florida,
W75-10129 6B

Effects of Lowering Interior Canal Stages on Salt-Water Intrusion into the Shallow Aquifer in Southeast Palm Beach County, Florida,
W75-10156 4B

**WATER LEVELS**
Apparatus for Controlling the Level of Subsurface Water,
W75-09880 4B

**WATER MANAGEMENT (APPLIED)**
Methods to Facilitate Managerial Effectiveness in Municipal Water Systems,
W75-09895 6B

Regional Authorities Take Over Britain's Water/Sewage Systems,
W75-10176 6E

Mean Estimate Deficiencies in Water Quality Studies,
W75-10202 5G

Water and Water Problems in the Southwest Florida Water Management District and Some Possible Solutions,
W75-10207 3C

Issues in Water Resources Impact Assessment,
W75-10222 6B

Waterway Monitoring System.
W75-10248 7A

Rules and Regulations, Southwest Water Management District (Florida).
W75-10306 6E

Rules of Central and Southern Flood Control District, Chapter 16CA, with Commentary.
W75-10307 6E

**WATER POLICY**
Georgia County Commissioner Attitudes Toward Water Problems,
W75-09855 6E

Evolving National Water Policies,
W75-10201 6E

Rules and Regulations, Southwest Water Management District (Florida).
W75-10306 6E

Rules of Central and Southern Flood Control District, Chapter 16CA, with Commentary.
W75-10307 6E

Alabama's Water Resources Policy.
W75-10310 5G

**WATER POLLUTION**
Industry Viewpoint (Water Quality Control),
W75-09885 5G

Marine Pollution--Legislation Litigation, Underwriting--Where Are We, Where Away,
W75-09887 5G

Beneficial Uses of Waste Heat,
W75-09889 5G

Terrestrial and Freshwater Radioecology, a Selected Bibliography,
W75-09891 5A

Groundwater Pollution: Problems and Solutions.
W75-10058 5B

Nitrate in Water, Soil, Plants and Animals,
W75-10083 5C

Remote Detection of Pollution of Water Reservoirs and Phytoplankton by Optical Methods,
W75-10098 7B

Water Pollution Monitoring System, (In Japanese),
W75-10196 5A

Recommendations for Environmental Engineering Education,
W75-10218 9A

Water Research Center Unravels the Nitrate Knot,
W75-10278 5D

Obstacles to Taming Corporate Polluters: Water Pollution Politics in Gary, Indiana,
W75-10287 5G

Sierra Club v. Lynn (Action for Declaratory and Injunctive Relief with Respect to Development of New Housing Development).
W75-10309 6G

**WATER POLLUTION CONTROL**
Microbial Degradation of Petroleum,
W75-09862 5G

Method and Apparatus for Detecting the Presence of an Oil Slick on a Water Surface,
W75-09865 5A

Process for Controlling Oil Slicks,
W75-09868 5G

Process for Treating Water,
W75-09874 5D

Method for Purifying Waste Water,
W75-09882 5D

Marine Pollution--Legislation Litigation, Underwriting--Where Are We, Where Away,
W75-09887 5G

Microbiology and Water Quality in a Tributary of Cayuga Lake,
W75-09896 5C

Cooperation Combats Oil Spills in North Carolina.
W75-10039 5G

## WATER POLLUTION CONTROL


Recovery of Polluted Lakes. A Swedish Research Program on the Effects of Advanced Waste Water Treatment and Sewage Diversion,
W75-10081 5C

Measures for the Restoration and Enhancement of Quality of Freshwater Lakes.
W75-10122 5C

Needed: $350 Billion - And a New Needs Survey,
W75-10174 5D

Optimal Control of Water Pollution in a River Stream,
W75-10206 5G

Statistical Evaluation of Reaeration Prediction Equations,
W75-10211 5G

Dynamic Leaching Studies on Pulpwood Bark Residues,
W75-10214 5D

River Pollution Control,
W75-10224 6A

Planning and Operation of Urban Water Quality Management Systems,
W75-10262 5G

California Plant Gets Straight 'A's in Computer Control,
W75-10264 5D

Changing Federal-State Relationships in Water Pollution Control Programs,
W75-10270 5G

Development Progress with Salwico Pollution Monitoring System.
W75-10272 5A

Implementation of the Federal Water Pollution Control Act.
W75-10322 5G

Steam Electric Power Generating Point Source Category--Proposed Effluent Guidelines and Standards for Incompatible Pollutants.
W75-10323 5G

Marine Sanitation Devices--Proposed Certification Procedures and Design and Construction Requirements.
W75-10324 5G

Canned and Preserved Fruits and Vegetables Processing Point Source Category--Effluent Guidelines and Standards.
W75-10325 5G

Builders Paper and Board Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-10336 5G


## WATER POLLUTION CONTROL ACT


Obstacles to Taming Corporate Polluters: Water Pollution Politics in Gary, Indiana,
W75-10287 5G


## WATER POLLUTION EFFECTS


The Effects of Selected Herbicides on Bacterial Populations in an Aquatic Environment,
W75-10133 5C

The Effect of a Fuel Oil Spill on Benthic Invertebrates and Water Quality on the Alaskan Arctic Slope, Happy Valley Creek Near Sagwon, Alaska,
W75-10140 5C

Benthal Decomposition of Adsorbed Octadecane,
W75-10260 5C


## WATER POLLUTION SOURCES


Research Status on Effects of Land Application of Animal Wastes,
W75-10022 5B

Ground Water Pollution Problems in the Northwestern United States,
W75-10023 5B

The Response of Gymnodinium Breve to Municipal Waste Materials,
W75-10033 5C

Groundwater Pollution by Waste Discharge (La pollution des eaux souterraines par les Decharges),
W75-10042 5B

The Utilization of Tracers in the Study and Control of Water Pollution (Utilizacao de Marcadores no Estudo e Controle de Poluicao das Aguas),
W75-10046 5B

Groundwater Pollution: Problems and Solutions.
W75-10058 5B

Water Pollution From Nonpoint Sources,
W75-10085 5C

Water Pollution Study of Malabeam Lake, Greenlaw Brook and Adjacent Streams on Loring AFB, Maine,
W75-10113 5C

Dumps: A Potential Threat to Our Groundwater Supplies,
W75-10184 5B

Identification Method in Environmental Systems and Its Application to Water Pollution,
W75-10266 5A


## WATER POLLUTION TREATMENT


Sewage and Effluent Treating System,
W75-09870 5D

Sewage Treatment Tank,
W75-09883 5D

Apparatus for Treating Water Containing Impurities,
W75-09884 5D

Survey of Lake Rehabilitation Techniques and Experiences,
W75-10078 5C

Measures for the Restoration and Enhancement of Quality of Freshwater Lakes.
W75-10122 5C

Liquid Filter Apparatus,
W75-10230 5D

Builders Paper and Board Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-10336 5G


## WATER PURIFICATION


Means for and Method of Purifying Contaminated Water,
W75-09864 3A

Method for Purifying Waste Water,
W75-09882 5D

Apparatus for Treating Water Containing Im rities,
W75-09884

Waste-Heat Steam Runs Evaporative Wa Purifier.
W75-10240

Ozone Technology Gains Support.
W75-10242


## WATER QUALITY


Microbiology and Water Quality in a Tribut of Cayuga Lake,
W75-09896

A General Linear Approach to Stream Wa Quality Modeling,
W75-09917

Proceedings of Public Forum on Wa Resources Problems in Southeastern M nesota.
W75-10007

Determination of Trace Quantities of Boron Surface Water Bodies and in Drinking Wa (Spurenbestimmung von Bor in Oberflach gewassern und Trinkwassern),
W75-10041

Evaluation of Ground Water Resources: Liv more and Sunol Valleys,
W75-10063

Use of Algae, Especially Diatoms, in the sessment of Water Quality,
W75-10112

Measures for the Restoration and Enhancem of Quality of Freshwater Lakes.
W75-10122

Economic Institutions to Determine Wa Quality,
W75-10132

Chemical and Physical Characteristics of Wa in Esturies of Texas, October 1970-Septem 1971,
W75-10153

Hydrologic Reconnaissance of the Wah W Valley Drainage Basin, Millard and Bea Counties, Utah,
W75-10167

The National Stream Quality Accounting N work (NASQAN)--Some Questions and A swers,
W75-10168

Evaluation of Phosphorus Dynamics in Watershed,
W75-10217

Routine Surveillance Alternatives for Wa Quality Management,
W75-10250

The Cape Cod Water Program, A Current A ysis,
W75-10283

Scenic Rivers Association of Oklahoma Lynn (Suit Seeking Declaratory Judgment HUD Must Make an Environmental Imp Study Prior to Their Contemplated Actions).
W75-10313


## WATER QUALITY CONTROL


Reverse Osmosis System with Automatic Va for Module Operation Control,
W75-09877

drologic Evaluation of the Haystack Butte
a with Emphasis on Possible Discharge of
is-I Wastes, Edwards Air Force Base,
fornia,
5-10161 5B

's Try 90% First and See What Our Quality
ike,
5-10175 5G

und-Water's Role in Water Quality
nagement,
-10180 5G

n Estimate Deficiencies in Water Quality
lies,
-10202 5G

ctives of Water Quality Planning,
-10205 5G

ommendations for Environmental En-
ering Education,
-10218 9A

itoring: An Environmental State Estima-
Problem,
-10255 5A

r Monitoring is Big Business.
-10269 5A

h Annual Report, Fiscal Year 1974,
10339 9D

R QUALITY ROUTING
r Quality Routing of Unsteady River Flow
nite Element Method,
10252 5B

R QUALITY STANDARDS
arch Needs as Related to the Development
diment Standards in Rivers,
10013 5G

parison of Autoclave and Ethylene Oxide-
ized Membrane Filters Used in Water
y Studies,
10048 5A

mputer Simulation Analysis of Surface
Quality Management Policies Under
nic Economic and Hydrologic Condi-
0124 5D

Try 90% First and See What Our Quality
e,
0175 5G

ative History of the Safe Drinking Water
0186 5G

Electric Power Generating Point Source
ory--Proposed Effluent Guidelines and
rds for Incompatible Pollutants.
0323 5G

Sanitation Devices--Proposed Certifica-
rocedures and Design and Construction
ements.
0324 5G

d and Preserved Fruits and Vegetables
sing Point Source Category--Effluent
ines and Standards.
0325 5G

and Crystalline Cane Sugar Refining
egory--Effluent Limitations Guidelines
posed Pretreatment Standards.
0326 5G

Inorganic Chemicals Manufacturing Point Source Category.
W75-10327 5G

Electroplating Point Source Category; Copper, Nickel, Chromium and Zinc on Ferrous and Nonferrous Materials Subcategory.
W75-10328 5G

Thermal Discharges--Proposed Procedures for the Imposition of Alternative Effluent Limitations.
W75-10329 5G

Asbestos Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-10330 5G

Ferroalloy Manufacturing Point Source Category.
W75-10332 5G

Feedlots Point Source Category--Effluent Guidelines and Standards.
W75-10333 5G

Glass Manufacturing Point Source Categories--Effluent Guidelines and Standards.
W75-10334 5G

Thermal Discharges.
W75-10335 5G

Builders Paper and Board Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-10336 5G

Steam Electric Power Generating Point Source Category--Effluent Guidelines and Standards.
W75-10337 5G

WATER RESOURCES
Water Resources Publications Related to the State of Nebraska Third Edition.
W75-10015 10C

Objectives of Water Quality Planning,
W75-10205 5G

Safety of Dams--Bureau of Reclamation,
W75-10221 8A

Alabama's Water Resources Policy.
W75-10310 5G

Pamlico River Estuary--Past, Present and Future,
W75-10338 2L

WATER RESOURCES DEVELOPMENT
Water Resources Development and Wilderness Values: A Study of the Upper Hudson River,
W75-09898 6B

Proceedings of Workshop Conference on Identification of Metropolitan Area Water Resources Problems and Associated Research Needs in Minnesota.
W75-10004 6B

Proceedings of Public Workshop Conference on Water Resources Problems and Research Needs in Central Minnesota.
W75-10005 6B

Proceedings of Public Forum on Water Resources Problems and Research Needs in Southwestern Minnesota.
W75-10006 6B

Proceedings of Public Forum on Water Resources Problems in Southeastern Minnesota.
W75-10007 6B

Ground Water,
W75-10143 2F

Evolving National Water Policies,
W75-10201 6E

Minutes of the 89th Meeting, (Arkansas-Red-White River Basins Inter-Agency Committee).
W75-10300 4A

Tenth Annual Report, Fiscal Year 1974,
W75-10339 9D

WATER RESOURCES PROBLEMS
Proceedings of Workshop Conference on Identification of Metropolitan Area Water Resources Problems and Associated Research Needs in Minnesota.
W75-10004 6B

Proceedings of Public Workshop Conference on Water Resources Problems and Research Needs in Central Minnesota.
W75-10005 6B

Proceedings of Public Forum on Water Resources Problems and Research Needs in Southwestern Minnesota.
W75-10006 6B

Proceedings of Public Forum on Water Resources Problems in Southeastern Minnesota.
W75-10007 6B

WATER REUSE
Activated Carbon Treatment of Unbleached Kraft Effluent for Reuse,
W75-10028 5D

Using Sludge, Oil, and Water Separation for Recycling Water.
W75-10038 5D

WATER RIGHTS
Economic Institutions to Determine Water Quality,
W75-10132 5G

WATER SOFTENING
An Integrated System for Disposal of Sludges Originating from Water Softening and Sewage Treatment in Municipalities,
W75-10123 5D

Use of Lime-Soda Ash Softening Sludge for the Treatment of Municipal Wastewater,
W75-10125 5D

WATER SPORTS
Feasibility and Potential of Enhancing Water Recreation Opportunities on High Country Reservoirs-Phase I,
W75-09894 6B

WATER STORAGE
Siltation Rates and Life Expectancies of Small Headwater Reservoirs in Montana,
W75-09858 2J

WATER SUPPLY
Evaluation of Ground Water Resources: Livermore and Sunol Valleys,
W75-10063 2F

Report of Committee on Survey of Ground Water Supplies in New England.
W75-10182 4B

**WATER SUPPLY**

Legislative History of the Safe Drinking Water Act,
W75-10186 5G

Water and Water Problems in the Southwest Florida Water Management District and Some Possible Solutions,
W75-10207 3C

Subsurface Environment--Private Property or Public Domain,
W75-10209 4B

Clayton Lake, Jack Fork Creek, Oklahoma (Final Environmental Impact Statement).
W75-10297 8A

Warm Springs Dam and Lake Sonoma Project, Russian River Basin, Sonoma County, California, Part I (Final Environmental Impact Statement).
W75-10298 8A

Warm Springs Dam and Lake Sonoma Project, Russian River Basin, Sonoma County, California, Part I (Final Environmental Impact Statement).
W75-10298 8A

Mountain Park Reclamation Project, Oklahoma--Nueces River Project, Texas.
W75-10319 4A

**WATER SUPPLY DEVELOPMENT**

Total Approach for the Bogota, Columbia, Water Supply,
W75-10203 3D

Authorized Bonneville Unit, Central Utah Project, Utah (Final Environmental Impact Statement).
W75-10292 8A

Initial Stage, Garrison Diversion Unit, Pick-Sloan Missouri Basin Program, North Dakota (Final Environmental Impact Statement).
W75-10296 8A

Mountain Park Reclamation Project, Oklahoma--Nueces River Project, Texas.
W75-10319 4A

Authorized Bonneville Unit, Central Utah Project, Utah Appendix A (Final Environmental Impact Statement).
W75-10331 8A

Tenth Annual Report, Fiscal Year 1974,
W75-10339 9D

**WATER TABLE**

A Study of Beach Ground-Water Hydrology and Chemistry,
W75-10077 2F

**WATER TABLE DEPTH**

Effect of Water Table Depth on Yield of Cabbage, Squash and Tendergreen,
W75-09918 3F

**WATER TREATMENT**

Water Chlorination Methods,
W75-09910 5F

Water Treatment with Ozone.
W75-09923 5F

Filtration of Water With a High Iron Content,
W75-10171 5F

Disposal of Waste Alum Sludge from Water Treatment Plants,
W75-10195 5D

Zeta Potential Controls Direct Filtration Coagulation,
W75-10280 5F

Characteristics of Gas-Liquid Contact Apparatus in Ozone Treatment for Drinking Water, (In Japanese),
W75-10281 5F

**WATER UTILIZATION**

Ground-water Discharge from the Edwards and Associated Limestones, San Antonio Area, Texas, 1974,
W75-10146 2F

**WATER YIELD**

Ground-water Discharge from the Edwards and Associated Limestones, San Antonio Area, Texas, 1974,
W75-10146 2F

**WATERFALLS**

Preservation and Enhancement of the American Falls at Niagara.
W75-10290 6E

**WATERFOWL**

International Conference on the Conservation of Wetlands and Waterfowl.
W75-10198 6G

**WATERSHED (BASINS)**

Utilization of Aerial Photographs for Measuring Land Use Changes in Watersheds,
W75-10136 4C

**WATERSHED MANAGEMENT**

Hydrologic Data for North Creek, Trinity River Basin, Texas, 1973,
W75-10149 7C

Hydrologic Data for Mountain Creek, Trinity River Basin, Texas, 1973,
W75-10150 7C

Hydrologic Data for Urban Studies in the Austin, Texas Metropolitan Area, 1973,
W75-10151 7C

**WATERSHED MODELS**

Predicting Evapotranspiration from Agricultural Watersheds Under Dry Conditions,
W75-09860 2D

**WATERSHEDS (BASIN)**

Hydrologic Data for Urban Studies in the Austin, Texas Metropolitan Area, 1973,
W75-10151 7C

**WATERSHEDS (BASINS)**

Phosphorus Run-Off From the Drainage Basin to Mikolajskie Lake,
W75-10095 5C

Hydrologic Data for Urban Studies in the Dallas, Texas Metropolitan Area, 1973,
W75-10148 7C

Hydrologic Data for Mountain Creek, Trinity River Basin, Texas, 1973,
W75-10150 7C

Evaluation of Phosphorus Dynamics in a Watershed,
W75-10217 5B

Minutes of the 89th Meeting, (Arkansas-Red-White River Basins Inter-Agency Committee).
W75-10300 4A

**WATERWAY MONITORING SYSTEMS**

Waterway Monitoring System.
W75-10248 7A

**WAVES (WATER)**

Hydrodynamic Levelling of an Off-Shore Ti Gauge,
W75-10060

Effect of Wind Waves and Wind Tides on t Optimum Control of Large Lakes,
W75-10204

**WEATHER MODIFICATION**

Proceedings of the World Meteorological ( ganization/International Association Meteorology and Atmospheric Physics Sci tific Conference on Weather Modification.
W75-09944

Fog Dispersal - Physical and Technologi Aspects,
W75-09945

On a Method of Fog Modification by Passi tion of Condensation Nuclei,
W75-09946

Design of a Modern Thermal Fog Dissipat System for Airports,
W75-09947

Problems of Radiation Fog Prevention,
W75-09948

Some Data About the Mechanism of the Ar cial Dissipation of Supercooled Fog,
W75-09949

Rain Enhancement - A Review,
W75-09950

Results of Seeding Cumulonimbus Clo Aimed at the Modification of Precipitatior the Steppe Part of the Ukraine,
W75-09951

Salt Drizzles Extracted From Unsaturated Layers by Seeding with Hygroscopic Nuclei
W75-09952

Rapid Inducement of Precipitation by Seec Stratified Air Layers,
W75-09953

On the Efficient Size and Concentration Spray Drops for Stimulating Warm Clouds,
W75-09954

Numerical Simulation of Cloud Seeding Exp ments,
W75-09955

Theoretical Research into Artificial Stimula of Precipitation for Fighting Forest Fires,
W75-09956

Feasibility of Meso- and Synoptic-S Weather Modification from Carbon Par Seeding,
W75-09957

The Role of Solid Precipitation Element Natural and Artificial Production of Rai Israel,
W75-09958

Snowfall Enhancement,
W75-09959

The Experimental Seeding of Frontal Clou Winter in Order to Increase Precipitation,
W75-09960

Ground-Based Cloud Seeding Experimen Delhi During Winter,
W75-09961

Artificial Modification of Clouds and
itation in a Mountainous Region,
9962 3B

g Requirements for Rapid Glaciation or
ation of a Mixed Phase Cloud,
9963 3B

ramid Pilot Cloud-Seeding Project,
9964 3B

rocess Investigation and Hail Suppres-
ctivities in the U.S.S.R.,
965 3B

rms in Japan,
967 3B

ch into Hail-Forming Processes and the
of Anti-Hail Protection Measures in
ia,
968 2B

Results of Practical Protection of Valua-
icultural Crops from Hail by the Thri
mi) Method (The Results of Five Years'
969-1973),
969 3B

ion of the Natural Process of Hail For-
and Its Transformation Under the In-
of Artificial Crystallizaton,
970 2B

of Recent Work on Hail Suppression in
,
971 3B

perimental Program to Modify Hur-
72 2B

Methods of Convective Cloud Modifi-
Means of Artificial Vertical Jets,
73 3B

of Experimental and Operational Work
ating Forest Fires,
74 3B

ve Cloud Modification to Reduce
torm Activity,
75 3B

uestions of Thunderstorm Lightning
7 2B

ct of Chaff Seeding on Lightning and
Fields of Thunderstorms,
8 3B

ibility of Using Charged Bubbles in
dification,
9 2B

ssibility of Generating Downdrafts by
g a High Concentration of Coarse
rticles in the Atmosphere,
0 3B

1973 Florida Area Cumulus Experi-
1 3B

Devices for the Artificial Modifica-
ud and Fog,
2 3B

g and Operational Aspects of
Modification,
3B

Anti-Hail Rockets and Shells,
W75-09984 3B

Radar Methods and Equipment for Hail Supression,
W75-09985 3B

The Acquisition of Information During Attempts at Weather Modification,
W75-09986 7B

Preliminary Results of Experiments Using Seeding Rockets with Combustible Shells,
W75-09987 3B

Convective Cloud Study Results Applied to Weather Modification,
W75-09988 2B

A Review of Methods to Evaluate Precipitation Modification in North America,
W75-09990 3B

Methods of Estimating Physical and Economic Effectiveness of Weather Modification,
W75-09991 3B

Economic Aspects of Precipitation Augmentation Over the Great Lakes,
W75-09992 6B

An Evaluation of Extended Area Effects from Attempts to Modify Local Clouds and Cloud Systems,
W75-09993 3B

Rain Stimulation Experiments: Design and Evaluation,
W75-09994 7C

On Physical and Economic Effectiveness of Hail-Suppression Projects,
W75-09995 3B

Radar Characteristics of Cumulonimbus Clouds During Their Natural Development and Artificial Seeding,
W75-09996 2B

On the Characteristics of Single-Cell Showers,
W75-09997 2B

Removal of Pyrotechnic Generated Tracer Placed by Aircraft in a Convective Updraft,
W75-10000 3B

Ice Nuclei Generator Technology,
W75-10001 3B

Cloud Glaciation by Liquified Propane Spray,
W75-10002 3B

Summary of Observations Indicating Dynamic Effect on Salt Seeding in Warm Cumulus Clouds,
W75-10057 3B

**WEBER BASIN (UTAH)**
A Study of the Effects of Water Institutions on Planning and Management of Water Resources in Utah,
W75-10130 6E

**WEIRS**
Measurement of Small Discharges Through V-Notch Weirs,
W75-10059 8B

Transient Control in Lower Sacramento River,
W75-10219 4A

**WELLS**
Apparatus for Controlling the Level of Subsurface Water,
W75-09880 4B

**WETLANDS**
Classification of Freshwater Wetlands in the Glaciated Northeast,
W75-10128 6B

Effects of Fire on the Plants and Animals of a Florida Wetland,
W75-10181 6G

International Conference on the Conservation of Wetlands and Waterfowl.
W75-10198 6G

**WILDERNESS VALUES**
Water Resources Development and Wilderness Values: A Study of the Upper Hudson River,
W75-09898 6B

**WILDLIFE**
Classification of Freshwater Wetlands in the Glaciated Northeast,
W75-10128 6B

**WIND TIDES**
Effect of Wind Waves and Wind Tides on the Optimum Control of Large Lakes,
W75-10204 4A

**WIND TUNNELS**
The Position Stability of Large Water Drops Suspended in a Vertical Wind Tunnel,
W75-10053 2B

**WINDS**
The Experimental Program to Modify Hurricanes,
W75-09972 2B

**WISCONSIN**
Mechanical Management of Aquatic Vegetation: Analytical Studies of Unit Operations Potentially Useful in their Processing,
W75-09861 4A

Recent Sedimentary History of Lake Monona, Wisconsin,
W75-10089 5C

Low-Flow Characteristics of Wisconsin Streams at Sewage-Treatment Plants,
W75-10163 5B

**WITHDRAWAL**
Status of Land Subsidence Due to Ground-Water Withdrawal Along the Mississippi Gulf Coast,
W75-09856 2F

**YUKON TERRITORY**
Historical Streamflow Summary, Yukon and Northwest Territories, to 1973.
W75-10068 7C

**ZETA POTENTIAL**
Zeta Potential Controls Direct Filtration Coagulation,
W75-10280 5F

**ZOOPLANKTON**
Studies to Determine Methods for Culturing Three Freshwater Zooplankton Species,
W75-10027 5A

# AUTHOR INDEX


V, M. T.
Methods and Equipment for Hail
sion,
9985 3B

B. J.
Estimate Deficiencies in Water Quality
s,
0202 5G

E.
tion of Reaction Mechanisms in Fer-
ion Basins with Continuous Flow (Zur
ning von Reaktionsablaeufen in Kon-
ich Durchstroemten Fermenterbecken),
0267 5D

T, P.
'Hailcores' and Their Abilities to Esti-
the Efficiency of Hail Prevention
s,
966 2B

Evaluation and Organic Compound
in Municipal Sewage Water (In
e),
189 5D

A. R.
Viewpoint (Water Quality Control),
385 5G

G. A.
ynamic Levelling of an Off-Shore Tide
960 8H

ollution From Nonpoint Sources,
85 5C

ER, L. M.
lism and the Law of the Sea: The Case
Enclosed Seas,
01 6E

ER, M.
l Degradation of DDT,
91 5C

A.
Nuclei Concentration Benchmark Net-
99 7A

D.
in the Submerged Macrophyte Com-
of Lake Wabamum as a Result of
Discharges,
74 5C

L.
Decomposition of Adsorbed Oc-
0 5C

B.
Release of Water from a Long
Flume,
7 8B

D.
ermal,
4 5E

, J. E.
fluencing Reverse Osmosis Rejection
ic Solutes from Aqueous Solution,
7 5D

ANDRO, M.
Rapid Inducement of Precipitation by Seeding Stratified Air Layers,
W75-09953 3B

Salt Drizzles Extracted From Unsaturated Air Layers by Seeding with Hygroscopic Nuclei,
W75-09952 3B

ANTONELLI, A.
Beneficial Uses of Waste Heat,
W75-09889 5G

ARBABI, M.
A General Linear Approach to Stream Water Quality Modeling,
W75-09917 5B

ARDILL, J.
Regional Authorities Take Over Britain's Water/Sewage Systems,
W75-10176 6E

ARIGA, K.
Apparatus for Treating Water Containing Impurities,
W75-09884 5D

ARTALE, J. V.
Sewage Plan Weds Five Municipalities,
W75-09914 5D

ARTEAGA, F. E.
Evaluation of Reservoir Sites in North Carolina--Regional Relations for Estimating the Reservoir Capacity Needed for a Dependable Water Supply,
W75-10159 4A

ARTEMYEVA, N. D.
Simulation of the Natural Process of Hail Formation and Its Transformation Under the Influence of Artificial Crystallizaton,
W75-09970 2B

ARTSYBASHEV, E. S.
Results of Experimental and Operational Work on Combating Forest Fires,
W75-09974 3B

ASTHANA, K. C.
Transformation of Moody Diagram,
W75-10216 8B

AUKERMAN, R.
Feasibility and Potential of Enhancing Water Recreation Opportunities on High Country Reservoirs-Phase I,
W75-09894 6B

AZAROWICZ, E. N.
Microbial Degradation of Petroleum,
W75-09862 5G

BAILEY, C.
Hire an Activated Carbon Plant for Waste Water Treatment,
W75-10346 5D

BAIRD, R. B.
The Determination of Benzidine in Wastewaters,
W75-10232 5A

BAKER, D. G.
Climate of Minnesota - Part VII - Areal Distribution and Probabilities of Precipitation in the Minneapolis-St. Paul Metropolitan Area,
W75-10009 2B

BAKHANOVA, R. A.
On a Method of Fog Modification by Passivation of Condensation Nuclei,
W75-09946 3B

BALL, J.
Effects of Original Vegetation on Reservoir Water Quality,
W75-10014 5C

BALLARD, J.
Experimental Eutrophication of Terrestrial and Aquatic Ecosystems. First Annual Report of the Upland Recharge Project,
W75-10097 5D

BARRES, M.
Groundwater Pollution by Waste Discharge (La pollution des eaux souterraines par les Decharges),
W75-10042 5B

BARRY, R. G.
Evaluation of an ERTS-1 Data Collection Platform Installed in the Alpine Tundra, Colorado,
W75-10055 7B

BARTH, C. L.
Laboratory Simulation of Swine Manure Lagoons,
W75-10137 5D

BARTISHVILI, I. T.
On the Results of Practical Protection of Valuable Agricultural Crops from Hail by the Thri (Zaknigmi) Method (The Results of Five Years' Work, 1969-1973),
W75-09969 3B

BARTON, C. A.
Joint Treatment of Pulping and Municipal Wastes,
W75-09928 5D

BAU, J.
The Utilization of Tracers in the Study and Control of Water Pollution (Utilizacao de Marcadores no Estudo e Controle de Poluicao das Aguas),
W75-10046 5B

BEDINGER, M. S.
Carbon-14 Ages of Water From the Arkansas Hot Springs,
W75-10145 2K

Ground Water,
W75-10143 2F

BELAND, F. A.
Interrupted-Sweep Voltammetry for the Identification of Polychlorinated Biphenyls and Naphthalenes,
W75-10268 5A

BELICK, F. M.
California Plant Gets Straight 'A's in Computer Control,
W75-10264 5D

BELL, J. B.
Comparison of Autoclave and Ethylene Oxide-Sterilized Membrane Filters Used in Water Quality Studies,
W75-10048 5A

BENEDEK, A.
Pollution Control, Next Step, Physical/Chemical Treatment, Activated Charcoal,
W75-10279 5D

BENEDICK, A. H.
Dynamic Leaching Studies on Pulpwood Bark Residues,
W75-10214 5D

BENNETT, M.
Applications of Toxicity Testing to Sewage-Treatment Processes,
W75-10244 5D

BERQUIST, R. J.
Irrigation Efficiencies in Producing Calories and Proteins: An Annotated Bibliography,
W75-10076 3F

BERTHOUEX, P. M.
Biological Wastewater Treatment Model Building Fits and Misfits,
W75-10169 5D

BIBILASHVILI, N. SH.
Anti-Hail Rockets and Shells,
W75-09984 3B

BIGGLEY, W. H.
Measurements of Absolute Scalar Irradiance Spectra in Rhode River,
W75-10102 5C

BJORK, R. G.
GLC Determination of PPB Levels of Citrate by Conversion to Bromoform,
W75-10191 5A

BLOIS, R. S.
Measurement of Small Discharges Through V-Notch Weirs,
W75-10059 8B

BOEHM, R.
Studies Concerning Dewatering of Digested Communal Waste Water Sludges on Sludge Drying Beds (Untersuchungen zur Entwaesserung ausgefaulter kommunaler abwasserschlaemme auf Schlammtrockenplaetzen),
W75-10228 5D

BOERI, G.
Beneficial Uses of Waste Heat,
W75-09889 5G

BOES, M.
Calculation of Reaction Mechanisms in Fermentation Basins with Continuous Flow (Zur Berechning von Reaktionsablaeufen in Kontinuierlich Durchstroemten Fermenterbecken),
W75-10267 5D

BOEV, P.
On the Thermodynamic Criteria for the Intensity of Convective Cloud Development,
W75-09989 2B

BOGARDI, I.
Effect of Wind Waves and Wind Tides on the Optimum Control of Large Lakes,
W75-10204 4A

BOOTS, E. R.
Artificial Reef,
W75-09879 8A

BORLASE, W. J.
Chemicals Reduce System Odours,
W75-10040 5D

BORN, S. M.
Survey of Lake Rehabilitation Techniques and Experiences,
W75-10078 5C

BORTLESON, G. C.
Recent Sedimentary History of Lake Monona, Wisconsin,
W75-10089 5C

BOURTON, J.
Applications of Toxicity Testing to Sewage-Treatment Processes,
W75-10244 5D

BOUSH, G. M.
Importance of Water pH in Accumulation of Inorganic Mercury in Fish,
W75-09904 5A

BOYLE, W. C.
Biological Wastewater Treatment Model Building Fits and Misfits,
W75-10169 5D

Chlorinated Hydrocarbons in the Lake Ontario Ecosystem, (IFYGL),
W75-10018 5A

BRADLEY, C. C.
A Study of Water Resources Research Needs in Montana,
W75-10012 6B

BRAY, D. T.
Reverse Osmosis System with Automatic Valve for Module Operation Control,
W75-09877 3A

BRECHER, L. E.
Electrolytic Decomposition of Water,
W75-09881 3E

BRERETON, N. R.
Some Applications of Thermal Infra-Red Linescan in Water Resources Studies,
W75-10188 5A

BREWER, J. W.
Monitoring: An Environmental State Estimation Problem,
W75-10255 5A

BRIER, G. W.
An Evaluation of Extended Area Effects from Attempts to Modify Local Clouds and Cloud Systems,
W75-09993 3B

BRILL, E. L.
Oil Detector,
W75-09878 5A

BRILTZ, R. P.
Sewage and Effluent Treating System,
W75-09870 5D

BROWN, L. C.
Statistical Evaluation of Reaeration Prediction Equations,
W75-10211 5G

BROWN, R. E.
Geographical Analysis of Oil Spill Potential Associated with Alaskan Oil Production and Transportation Systems,
W75-10121 5G

Plan Formulation and Evaluation Studies--Recreation. Vol I of V. Evaluation of Recreation Use Surveys Procedures,
W75-10342 6B

Plan Formulation and Evaluation Studies--Recreation. Vol. III of V. A Preliminary Analysis of Day Use Recreation and Benefit Estimation Models for Selected Reservoirs,
W75-10343 6B

Plan Formulation and Evaluation Studies Recreation. Vol. IV of V. Estimating Recre tional Facility Requirements,
W75-10344 6

Plan Formulation and Evaluation Studies Recreation. Vol. V of V. A Generalized Recre tion Day Use Planning Model,
W75-10345 6

BROWNELL, L. E.
Review of Literature Pertinent to the Aqueo Conversion of Radionuclides to Insoluble Si icates with Selected References and Biblio raphy (Revised),
W75-09892 5

BUCKNER, H. D.
Hydrologic Data for Mountain Creek, Trini River Basin, Texas, 1973,
W75-10150 7

BUJKOV, M. V.
Methods of Estimating Physical and Econom Effectiveness of Weather Modification,
W75-09991 3

BURBY, R. J.
The Effects of Authorization for Water Ir poundments on Shoreland Transition,
W75-10126 6

BURFORD, M. G.
Let's Try 90% First and See What Our Quali is Like,
W75-10175 5

BURRELL, D. C.
Oceanography,
W75-10111 2

BURTSEV, I. I.
Hail Process Investigation and Hail Suppre sion Activities in the U.S.S.R.,
W75-09965 3

BUSH, R. F.
Methods to Facilitate Managerial Effectivene in Municipal Water Systems,
W75-09895 6

BUTLIN, J. A.
A Theoretical and Empirical Approach Fisheries Economics,
W75-10118 6

BUZNIKOV, A. A.
Remote Detection of Pollution of Water Res voirs and Phytoplankton by Optical Methods,
W75-10098

BYRD, J. F.
Joint Treatment of Pulping and Municip Wastes,
W75-09928

CABELLI, V. J.
Quantitative Large-Volume Sampl Technique,
W75-10031

CAHILL, T. H.
Evaluation of Phosphorus Dynamics in Watershed,
W75-10217

CAHN, R. P.
Separation of Phenol from Waste Water by Liquid Membrane Technique,
W75-10273

...S, J. JR.
...Recovery of Stream Macrobenthos from ...pH Stress,
...-10127 5C

...BELL, R. J.
...ns for and Method of Purifying Con...nated Water,
...09864 3A

...ON, R. H.
...ment of Aqueous Waste Streams with ...ogen Peroxide to Remove Chlorinated Iso...rates Therefrom,
...09939 5D

...LLO, L. A.
...nd Water Pollution Problems in the ...western United States,
...10023 5B

...EY, H. R.
...ment of Aqueous Waste Streams with ...gen Peroxide to Remove Chlorinated Iso...rates Therefrom,
...09939 5D

...NON, S. A. JR.
...iew of Methods to Evaluate Precipitation ...ication in North America,
...09990 3B

...ERJEE, R. N.
...d-Based Cloud Seeding Experiment at ...During Winter,
...09961 3B

... R. T.
... Element Modeling of Flow Through ... Media,
...09900 5B

...MISINOFF, P. N.
...y Treatment: Advanced Wastewater ...ques,
...09933 5D

...E. S. K.
...al of Organic Matter by Activated Car...olumns,
...0197 5D

...Y.
...Pollution From Nonpoint Sources,
...0085 5C

...ON, A.
...ry of Polluted Lakes. A Swedish ...ch Program on the Effects of Advanced ...Water Treatment and Sewage Diversion,
...0081 5C

...J. M.
...ion of an ERTS-1 Data Collection Plat...stalled in the Alpine Tundra, Colorado,
...0055 7B

...M. S. III.
...Approach for the Bogota, Columbia, ...Supply,
...0203 3D

..., J.
...ental Eutrophication of Terrestrial and ... Ecosystems. First Annual Report of ...and Recharge Project,
...0097 5D

...D.
...g National Water Policies,
...0201 6E

COHEN, J. L.
Changing Federal-State Relationships in Water Pollution Control Programs,
W75-10270 5G

COHON, J.
Project Evaluation in Water Resources: Budget Constraints,
W75-09851 6A

COLWELL, R. R.
Extraction of Petroleum Hydrocarbons from Oil-Contaminated Sediments,
W75-10241 5G

CONGDON, C. F.
Desalting Plants Inventory, Report No. 5,
W75-09852 3A

CONNER, J. R.
Activities, Characteristics, and Opinions of Lakefront Residents: Kissimmee River Basin, Florida,
W75-10129 6B

COOPER, D. C.
Fluvial-Estuarine Water Resource Optimization: Microecosystem Simulation of River-Estuarine Productivity Relationships,
W75-10099 2L

COPELAND, B. J.
Pamlico River Estuary--Past, Present and Future,
W75-10338 2L

CORLEW, M. W.
Color Measurement Methods for Surface Water Receiving Colored Wastes,
W75-10135 5A

COTTON, P.
Computer Control of Sewage Works, Progress at Norwich,
W75-10246 5D

COX, G. V.
The Davy Jones Garbage Dump,
W75-10238 5G

COX, J. A.
The Sources and Levels of Mercury in the Sewage of a University Campus,
W75-10049 5A

COX, R. A.
The Sources and Levels of Mercury in the Sewage of a University Campus,
W75-10049 5A

COX, W. E.
Subsurface Environment--Private Property or Public Domain,
W75-10209 4B

CRANE, D. A.
Plan Formulation and Evaluation Studies--Recreation. Vol I of V. Evaluation of Recreation Use Surveys Procedures,
W75-10342 6B

CROCKER, B.
Effects of Original Vegetation on Reservoir Water Quality,
W75-10014 5C

CROWTHER, R. F.
Applications of Toxicity Testing to Sewage-Treatment Processes,
W75-10244 5D

CRUFF, R. W.
Estimating Mean Streamflow in the Duchesne River Basin, Utah,
W75-10166 2E

D'ARAGON, P.
Sewage Treatment Tank,
W75-09883 5D

DALE, J.
Estimates Using Fluorescence Spectroscopy of the Present State of Petroleum Hydrocarbon Contamination in the Water Column of the Northwest Atlantic Ocean,
W75-10233 5A

DANEKER, J. R.
New Flowmeter Passes Tests,
W75-10190 5D

DANIEL, D. L.
The Economic Impact of a Small Recreation-Oriented Reservoir,
W75-09857 6B

DAVIDSON, J. M.
Water Pollution Study of Malabeam Lake, Greenlaw Brook and Adjacent Streams on Loring AFB, Maine,
W75-10113 5C

DAVIES, P. J.
Arsenic in Sediments on the Continental Shelf of Southeast Australia,
W75-10177 5B

DAVIS, G. E.
Pesticides, Polychlorinated Biphenols and Heavy Metals in Upper Food Chain Levels, Everglades National Park and Vicinity,
W75-10080 5C

DAVIS, G. H.
Procedure for Evaluating Environmental Impact,
W75-10164 6G

DENNIS, A. S.
Engineering and Operational Aspects of Weather Modification,
W75-09983 3B

DERJAGUIN, B. V.
Problems of Radiation Fog Prevention,
W75-09948 3B

DESAIAH, D.
Toxaphene Inhibition of ATPase Activity in Catfish, Ictalurus Punctatus, Tissues,
W75-09908 5C

DESROSIERS, P. E.
Pollution Abatement in the Pharmaceutical Industry,
W75-09931 5D

DETTBARN, W. D.
Toxicity of DFP and Related Compounds to Squids in Relation to Cholinesterase Inhibition and Detoxifying Enzyme Levels,
W75-09909 5C

DEWALLE, F. B.
Removal of Organic Matter by Activated Carbon Columns,
W75-10197 5D

DINEVITCH, L. A.
Research into Hail-Forming Processes and the Results of Anti-Hail Protection Measures in Moldavia,
W75-09968 2B

DINGLE, A. N.


DINGLE, A. N.
Removal of Pyrotechnic Generated Tracer Placed by Aircraft in a Convective Updraft,
W75-10000 3B

DIXON, K. R.
A Model for Predicting the Effects of Sewage Effluent on Wetland Ecosystems,
W75-09915 5B

DJACHUK, V. A.
Some Questions of Thunderstorm Lightning Control,
W75-09977 2B

DJOURAEV, A. D.
Convective Cloud Study Results Applied to Weather Modification,
W75-09988 2B

DOIG, M. T. III
The Response of Gymnodinium Breve to Municipal Waste Materials,
W75-10033 5C

DOMINICK, T. F.
A Study of Beach Ground-Water Hydrology and Chemistry,
W75-10077 2F

DONACHIE, R. P.
Digital Program for Water Network Analysis,
W75-10220 7C

DONDERO, N.
Microbiology and Water Quality in a Tributary of Cayuga Lake,
W75-09896 5C

DONNELLY, T. G.
The Effects of Authorization for Water Impoundments on Shoreland Transition,
W75-10126 6B

DORSHAW, S. A.
International Legal Implications of Off-Shore Terminal Facilities,
W75-10286 5G

DOUGHERTY, J. P.
Evaporation Data in Texas--Compilation Report, January 1907-December 1970,
W75-10154 7C

DOWNING, R. A.
Some Applications of Thermal Infra-Red Linescan in Water Resources Studies,
W75-10188 5A

DREW, J. W.
Design for Solvent Recovery,
W75-10239 5D

DRIELS, M.
Valve Stroking in Separated Pipe Flow,
W75-10210 8B

DRURY, D. D.
The Effects of Artificial Destratification on the Water Quality and Microbial Populations of Hyrum Reservoir,
W75-09897 5C

DUCKSTEIN, L.
Effect of Wind Waves and Wind Tides on the Optimum Control of Large Lakes,
W75-10204 4A

DUNST, R. C.
Survey of Lake Rehabilitation Techniques and Experiences,
W75-10078 5C

DURBIN, T. J.
Ground-Water Hydrology of Garner Valley, San Jacinto Mountains, California--A Mathematical Analysis of Recharge and Discharge,
W75-10158 2F

DUTKA, B. J.
Comparison of Autoclave and Ethylene Oxide-Sterilized Membrane Filters Used in Water Quality Studies,
W75-10048 5A

EASTMAN, J. B.
Economic Institutions to Determine Water Quality,
W75-10132 5G

EIKEL, M. A.
The Public Trust Doctrine and The California Coastline,
W75-10305 6E

EL-RAMLY, N. A.
Desalting Plants Inventory, Report No. 5,
W75-09852 3A

EL-SAHRAGTY, M. M.
Planning and Operation of Urban Water Quality Management Systems,
W75-10262 5G

ELLIS, J. R. B.
Geothermal Brine Energy to Generate Power,
W75-09863 8C

ELTSOV, V. A.
Convective Cloud Study Results Applied to Weather Modification,
W75-09988 2B

ELZINGA, J.
A General Linear Approach to Stream Water Quality Modeling,
W75-09917 5B

EMERY, K. O.
Latitudinal Aspects of the Law of the Sea and of Petroleum Production,
W75-09886 6E

ERON, R. E.
Sewage Disposal System,
W75-09869 5D

ERSHOV, V. A.
Problems of Radiation Fog Prevention,
W75-09948 3B

ESAIAS, W. E.
Measurements of Absolute Scalar Irradiance Spectra in Rhode River,
W75-10102 5C

EWING, R. L.
Computerized Sewer Design: New Tool for an Old Problem,
W75-10253 5D

FACY, L.
Fog Dispersal - Physical and Technological Aspects,
W75-09945 3B

FARWELL, S. O.
Interrupted-Sweep Voltammetry for the Identification of Polychlorinated Biphenyls and Naphthalenes,
W75-10268 5A

FAULKENDER, C. R.
Joint Treatment of Pulping and Municipal Wastes,
W75-09928 5D

FELLER, S. M.
Tertiary Treatment: Advanced Wastewater Techniques,
W75-09933 5D

FENCHEL, T.
Decomposition Working Group,
W75-10109 2L

FEREBEE, R. N.
The Effects of Selected Herbicides on Bacterial Populations in an Aquatic Environment,
W75-10133 5C

FICKE, J. F.
The National Stream Quality Accounting Network (NASQAN)--Some Questions and Answers,
W75-10168 5A

FIEBERG, D.
The Magnetic Flowmeter and Its Use in Waste Water Technology (Der magnetische Durchflussmesser und seine Anwendung in der Abwassertechnik),
W75-10185 5A

FIRTH, F. M.
The Development of a Scheme to Construct Large Diameter Sewage Pumping Mains Across the River Tees and the Tees Railway Marshalling Yard,
W75-10275 5D

FISCHER, J. R.
Quantitative Large-Volume Sampling Technique,
W75-10031 5A

FITZGERALD, G. P.
Shortcut Methods Test Algicides,
W75-10234 5G

FONTES, J. C.
Isotope Hydrology 1974--A Review of the IAEA Symposium on Isotope Techniques in Groundwater Hydrology,
W75-10172 5A

FORD, H. T.
Extraction of Petroleum Hydrocarbons from Oil-Contaminated Sediments,
W75-10241 5G

FORD, R. S.
Evaluation of Ground Water Resources: Livermore and Sunol Valleys,
W75-10063 2F

FORSBERG, C.
Recovery of Polluted Lakes. A Swedish Research Program on the Effects of Advanced Waste Water Treatment and Sewage Diversion
W75-10081 5C

FRANCIS, A. A.
Phthalate Esters, Heartrate Depressors in the Goldfish,
W75-09902 5C

FRANK, W. M.
Feasibility of Meso- and Synoptic-Scale Weather Modification from Carbon Particle Seeding,
W75-09957 3

FRITZ, P.
Isotope Hydrology 1974--A Review of the IAEA Symposium on Isotope Techniques in Groundwater Hydrology,
W75-10172 5

1, P. O.
ffect of Methyl Mercury on Gill Metabol-
id Blood Parameters of Rainbow Trout,
9906 5C

E.
t Evaluation in Water Resources: Budget
raints,
9851 6A

RA, K.
gradation of Linear Alkylate Sulfonates
er Model (In Japanese),
0247 5B

, N.
clei Generator Technology,
0001 3B

N, A. I.
of Seeding Cumulonimbus Clouds
at the Modification of Precipitation in
ppe Part of the Ukraine,
9951 3B

A.
ole of Solid Precipitation Elements in
l and Artificial Production of Rain in
9958 3B

ONSKI, I. I.
ail Rockets and Shells,
9984 3B

ONSKY, I. I.
tive Cloud Modification to Reduce
rstorm Activity,
975 3B

rocess Investigation and Hail Suppres-
tivities in the U.S.S.R.,
965 3B

h into Hail-Forming Processes and the
of Anti-Hail Protection Measures in
ia,
968 2B

al Devices for the Artificial Modifica-
Cloud and Fog,
982 3B

M. A.
of Asulam in Wildlife Species: Acute
to Birds and Fish,
903 5C

, M. M.
Contamination--The Water Analyst's
ibility Part II,
58 5A

), G.
A Potential Threat to Our Ground-
pplies,
84 5B

. F. JR.
nal Approach for Predicting the Dis-
xygen Profile in Receiving Waters,
34 5A

RT, R. A.
cts of Artificial Destratification on the
uality and Microbial Populations of
eservoir,
77 5C

W. A.
w Characteristics of Wisconsin
at Sewage-Treatment Plants,
63 5B

GEER, R. D.
Interrupted-Sweep Voltammetry for the Identification of Polychlorinated Biphenyls and Naphthalenes,
W75-10268 5A

GEMMELL, R. S.
Mean Estimate Deficiencies in Water Quality Studies,
W75-10202 5G

GENTRY, R. C.
The Experimental Program to Modify Hurricanes,
W75-09972 2B

GESSLER, J.
Research Needs as Related to the Development of Sediment Standards in Rivers,
W75-10013 5G

GIBBS, K. C.
Activities, Characteristics, and Opinions of Lakefront Residents: Kissimmee River Basin, Florida,
W75-10129 6B

GIENTKE, F. J.
Transient Control in Lower Sacramento River,
W75-10219 4A

GILEAD, G.
Irrigation Device,
W75-09872 3F

GIVENS, R. L.
Sprinkling Cattle for Relief from Heat Stress,
W75-10082 3F

GLANTZ, P. J.
Faunal Response to Spray Irrigation of Chlorinated Sewage Effluent,
W75-09899 5D

GLEESON, T. A.
Theoretical Probabilities of Predicted Occurrences and Amounts of Precipitation,
W75-10050 2B

GLOVER, R. E.
Colorado River-Flow Management,
W75-10208 4A

GODCHARLES, M. F.
Fauna and Flora in Hydraulic Clam Dredge Collections from Florida West and Southeast Coasts,
W75-10079 5C

GODORAGE, G. G.
Anti-Hail Rockets and Shells,
W75-09984 3B

GOLDSMITH, R. L.
Membrane Processing in the Metal Finishing Industry,
W75-09936 5D

GOLET, F. C.
Classification of Freshwater Wetlands in the Glaciated Northeast,
W75-10128 6B

GONZALEZ, J.
Total Approach for the Bogota, Columbia, Water Supply,
W75-10203 3D

GORDON, D. C. JR.
Estimates Using Fluorescence Spectroscopy of the Present State of Petroleum Hydrocarbon Contamination in the Water Column of the Northwest Atlantic Ocean,
W75-10233 5A

GORHAM, E.
The Geochemical and Biostratigraphic Record of Natural and Pollutional Eutrophication of Minnesota Lakes,
W75-10010 5C

GORHAM, P. R.
Changes in the Submerged Macrophyte Communities of Lake Wabamum as a Result of Thermal Discharges,
W75-10074 5C

GORSKI, T.
Phosphorus Run-Off From the Drainage Basin to Mikolajskie Lake,
W75-10095 5C

GOURISHANKAR, V.
Optimal Control of Water Pollution in a River Stream,
W75-10206 5G

GRAFFMAN, V. G.
Determination of Trace Quantities of Boron in Surface Water Bodies and in Drinking Water (Spurenbestimmung von Bor in Oberflachengewassern und Trinkwassern),
W75-10041 5A

GRANT, L. O.
An Evaluation of Extended Area Effects from Attempts to Modify Local Clouds and Cloud Systems,
W75-09993 3B

GRAY, D. A.
Safety of Dams--Bureau of Reclamation,
W75-10221 8A

GRAY, T. N.
Effect of Water Table Depth on Yield of Cabbage, Squash and Tendergreen,
W75-09918 3F

GRAY, W. M.
Feasibility of Meso- and Synoptic-Scale Weather Modification from Carbon Particle Seeding,
W75-09957 3B

GREEN, M. B.
Applications of Toxicity Testing to Sewage-Treatment Processes,
W75-10244 5D

GREER, E.
Obstacles to Taming Corporate Polluters: Water Pollution Politics in Gary, Indiana,
W75-10287 5G

GRIGORENKO, I. N.
Problems of Radiation Fog Prevention,
W75-09948 3B

GRUNINGER, R. M.
Disposal of Waste Alum Sludge from Water Treatment Plants,
W75-10195 5D

GUBIN, P. A.
Results of Experimental and Operational Work on Combating Forest Fires,
W75-09974 3B

GUDUSHAURI, SH. L.
On the Results of Practical Protection of Valuable Agricultural Crops from Hail by the Thri

**GUDUSHAURI, SH. L.**

(Zaknigmi) Method (The Results of Five Years' Work, 1969-1973),
W75-09969 3B

**GUTKNECHT, D.**
A Method for Predicting Flood Water Runoff of the River Steyr (Ein Verfahren zur Vorhersage der Hochwasserabfluesse der Steyr),
W75-09943 4A

**HAARHOFF, F. E.**
Easing of Environmental Laws,
W75-10173 5G

**HAHL, D. C.**
Chemical and Physical Characteristics of Water in Esturies of Texas, October 1970-September 1971,
W75-10153 7C

**HAIG, G. A.**
Design of Surface Water Outfalls to Rivers,
W75-10183 5D

**HAILE, C. L.**
Chlorinated Hydrocarbons in the Lake Ontario Ecosystem, (IFYGL),
W75-10018 5A

**HAIR, J. F. JR.**
Methods to Facilitate Managerial Effectiveness in Municipal Water Systems,
W75-09895 6B

**HAMBLETON, F. E.**
Pilot-Plant Investigations into Partial Pretreatment Systems at Macclesfield,
W75-10229 5D

**HAMILTON, G. S.**
Design of Surface Water Outfalls to Rivers,
W75-10183 5D

**HAMMING, M. C.**
Extraction of Petroleum Hydrocarbons from Oil-Contaminated Sediments,
W75-10241 5G

**HAMPTON, B. B.**
Hydrologic Data for Urban Studies in the Dallas, Texas Metropolitan Area, 1973,
W75-10148 7C

**HANKS, R. J.**
Management Practices Affecting Quality and Quantity of Irrigation Return Flow,
W75-10019 5G

**HANSEN, W. J.**
Plan Formulation and Evaluation Studies--Recreation. Vol. III of V. A Preliminary Analysis of Day Use Recreation and Benefit Estimation Models for Selected Reservoirs,
W75-10343 6B

Plan Formulation and Evaluation Studies--Recreation. Vol. V of V. A Generalized Recreation Day Use Planning Model,
W75-10345 6B

**HARGRAVE, B. R.**
Estimates of Oil in Aquatic Sediments by Fluorescence Spectroscopy,
W75-10235 5A

**HART, R. D.**
Dynamic Leaching Studies on Pulpwood Bark Residues,
W75-10214 5D

**HARTMANN, L.**
Calculation of Reaction Mechanisms in Fermentation Basins with Continuous Flow (Zur Berechnung von Reaktionsablaeufen in Kontinuierlich Durchstroemten Fermenterbecken),
W75-10267 5D

**HARTOG, C. DEN**
Systematic Ecology Working Group,
W75-10108 7A

**HAUSHILD, W. L.**
Numerical Model of the Salt-Wedge Reach of the Duwamish River Estuary, King County, Washington,
W75-10157 5B

**HAWKINSON, R. O.**
The National Stream Quality Accounting Network (NASQAN)--Some Questions and Answers,
W75-10168 5A

**HEALY, K. H.**
Problems with Effluent Seepage Fields,
W75-10274 5D

**HEID, A. S.**
Needed: $350 Billion - And a New Needs Survey,
W75-10174 5D

**HEIL, D. C.**
Waste Water Treatment Plant with Balanced Load,
W75-09867 5D

**HERRICKS, E. E.**
The Recovery of Stream Macrobenthos from Low pH Stress,
W75-10127 5C

**HEYDE, M. E.**
Factors Influencing Reverse Osmosis Rejection of Inorganic Solutes from Aqueous Solution,
W75-09937 5D

**HICKS, J. R.**
Cloud Glaciation by Liquified Propane Spray,
W75-10002 3B

**HIGGINS, R. P.**
Legislation Under NEPA: Plaintiffs' Phyrrhic Victories Draw Congressional Fire, Judicial Warnings,
W75-10303 5G

**HILLS, E. E.**
Evaluation of Ground Water Resources: Livermore and Sunol Valleys,
W75-10063 2F

**HIRS, G.**
Liquid Filter Apparatus,
W75-10230 5D

**HIZHNJAK, A. N.**
Some Data About the Mechanism of the Artificial Dissipation of Supercooled Fog,
W75-09949 3B

**HO, C. L.**
A Study of Beach Ground-Water Hydrology and Chemistry,
W75-10077 2F

**HOBBIE, J. E.**
Pamlico River Estuary--Past, Present and Future,
W75-10338 2L

**HOBBS, P. V.**
The Artificial Modification of Clouds a Precipitation in a Mountainous Region,
W75-09962 3

**HOLLMAN, K. W.**
Methods to Facilitate Managerial Effectivene in Municipal Water Systems,
W75-09895 6

**HOLMSTROM, B. K.**
Low-Flow Characteristics of Wiscon Streams at Sewage-Treatment Plants,
W75-10163

**HOLY, Z. J.**
The Comparison of the Environmental Aspe of Nuclear and Fossil Fuelled Power Station
W75-10349

**HOOVER, T. B.**
Determination of Molecular Hydrogen Sulfid
W75-10025

**HOSKIN, F. C. G.**
Toxicity of DFP and Related Compounds Squids in Relation to Cholinesterase Inhibit and Detoxifying Enzyme Levels,
W75-09909

**HUBBARD, E. F.**
Evaluation of Reservoir Sites in No Carolina--Regional Relations for Estimating Reservoir Capacity Needed for a Dependa Water Supply,
W75-10159

**HUBBARD, K. G.**
Numerical Simulation of Cloud Seeding Exp ments,
W75-09955

**HUGES, J. L.**
Hydrologic Evaluation of the Haystack B Area with Emphasis on Possible Discharg Class-I Wastes, Edwards Air Force B California,
W75-10161

**HULT, A.**
Filtration of Water With a High Iron Conte
W75-10171

**HULTMAN, B.**
Modeling Microbial Growth in Wastew Treatment,
W75-10170

**HUSID, S. B.**
Results of Seeding Cumulonimbus Cl Aimed at the Modification of Precipitatio the Steppe Part of the Ukraine,
W75-09951

**HYDEN, J. W.**
A Computer Simulation Analysis of Su Water Quality Management Policies U Dynamic Economic and Hydrologic C tions,
W75-10124

**IAMMARTINO, N. R.**
Freeze Crystallization: New Water-Proce Tool,
W75-09927

**IKEDA, S.**
Identification Method in Environm Systems and Its Application to Water Poll
W75-10266

, S.
er Pollution Monitoring System, (In nese),
-10196 5A

I, A. M.
tification of Crude Oil Leaks at Sea
tificazione della fonte di spandimenti di lio grezzo in mare),
10036 5A

O.
ficial Uses of Waste Heat,
09889 5G

ATO, P.
ation of Phosphorus Dynamics in a rshed,
10217 5B

M, B.
t of Asulam in Wildlife Species: Acute city to Birds and Fish,
09903 5C

, K.
ratus for Treating Water Containing Impu-
09884 5D

SHI, I.
Liquefaction by Torsional Simple Shear ce,
10231 8D

, H.
es for Treating Waste Photographic ssing Solutions,
09940 5D

W. C.
a and Flora in Hydraulic Clam Dredge ctions from Florida West and Southeast ts,
10079 5C

IAN, A. P.
nvestigation of the Predictive Ability of al Evaporation Equations,
10051 2D

ON, M. J.
parison of Autoclave and Ethylene Oxide-ized Membrane Filters Used in Water ty Studies,
10048 5A

, D. W.
odel of Inorganic Carbon Limitation in al Waters,
10088 5C

NS, E. D.
r Development for Irrigation in nwestern Kansas,
10152 4B

NS, R. L.
Determination of Benzidine in Waste-s,
10232 5A

, B. M.
ing Alewife Fry with Biological Stains,
10029 8I

, J. E.
ng Requirements for Rapid Glaciation or lation of a Mixed Phase Cloud,
09963 3B

JOHNSON, D. R.
DDT and PCB Levels in Lake Coeur D'Alene, Idaho, Osprey Eggs,
W75-09907 5A

JOHNSON, H. E.
Effects of PCB (Aroclor 1254) and P, P' DDT On Production and Survival of Daphnia Magna Strauss,
W75-09905 5C

JOHNSON, W. E.
Use of Lime-Soda Ash Softening Sludge for the Treatment of Municipal Wastewater,
W75-10125 5D

JOHNSTON, H. K.
Bibliography on the Application of Reverse Osmosis to Industrial and Municipal Wastewaters,
W75-09925 5D

JOLLEY, R. L.
Analyzing Organics in Dilute Aqueous Solutions,
W75-10350 5A

JONES, B. F.
Carbon-14 Ages of Water From the Arkansas Hot Springs,
W75-10145 2K

JONES, C. E.
Computer Control of Sewage Works, Progress at Norwich,
W75-10246 5D

JUDKINS, J. F. JR.
Treatability of Textile-Domestic Waste Mixtures,
W75-09859 5D

KACHURIN, L. G.
On the Possibility of Thunderstorm Suppression by Changing the Non-Equilibrium Crystallization Potentials of Cloud Water,
W75-09976 2B

Simulation of the Natural Process of Hail Formation and Its Transformation Under the Influence of Artificial Crystallizaton,
W75-09970 2B

KALOV, KH. M.
On the Possibility of Generating Downdrafts by Introducing a High Concentration of Coarse Aersol Particles in the Atmosphere,
W75-09980 3B

KAMLET, K. S.
Regulation of Ocean Dumping--One Year Later,
W75-10285 5G

KANEMASU, E. T.
Effects of Irrigation and Row Spacing on Evapotranspiration and Microclimate of a Sorghum Field,
W75-09853 2D

KANUGA, K. K.
Ground-Based Cloud Seeding Experiment at Delhi During Winter,
W75-09961 3B

KAPOOR, R. K.
Ground-Based Cloud Seeding Experiment at Delhi During Winter,
W75-09961 3B

KAPPE, S. E.
Waste Water Treatment Plant with Balanced Load,
W75-09867 5D

KARMOV, N. I.
On the Possibility of Thunderstorm Suppression by Changing the Non-Equilibrium Crystallization Potentials of Cloud Water,
W75-09976 2B

KARTSIVADZE, A. I.
Anti-Hail Rockets and Shells,
W75-09984 3B

Hail Process Investigation and Hail Suppression Activities in the U.S.S.R.,
W75-09965 3B

Radar Characteristics of Cumulonimbus Clouds During Their Natural Development and Artificial Seeding,
W75-09996 2B

Radar Methods and Equipment for Hail Supression,
W75-09985 3B

Simulation of the Natural Process of Hail Formation and Its Transformation Under the Influence of Artificial Crystallizaton,
W75-09970 2B

KASEMIR, H. W.
The Effect of Chaff Seeding on Lightning and Electric Fields of Thunderstorms,
W75-09978 3B

KATZ, S.
Analyzing Organics in Dilute Aqueous Solutions,
W75-10350 5A

KAUL, J. L.
Applications of Integer and Quadratic Programming to Floodplain Land Use Management,
W75-10008 6F

KAWAMURA, K.
Energy Evaluation and Organic Compound Index in Municipal Sewage Water (In Japanese),
W75-10189 5D

KAY, G. H.
Asbestos in Drinking Water,
W75-10030 5A

KEADY, D. M.
Status of Land Subsidence Due to Ground-Water Withdrawal Along the Mississippi Gulf Coast,
W75-09856 2F

KEENEY, M.
Biochemical and Nutritional Interactions Between the Oyster (Crassostera Virginica (Gmelin) and its Environment,
W75-10011 5C

KEIZER, P. D.
Estimates Using Fluorescence Spectroscopy of the Present State of Petroleum Hydrocarbon Contamination in the Water Column of the Northwest Atlantic Ocean,
W75-10233 5A

KENMIR, J. E.
Submersible Pumps Make By-Pass Possible,
W75-10276 8C

KERNER, J. W.
Recovering Organic Materials from Wastewater,
W75-09932 5D

KERNODLE, D. R.
The Effect of a Fuel Oil Spill on Benthic Invertebrates and Water Quality on the Alaskan Arctic Slope, Happy Valley Creek Near Sagwon, Alaska,
W75-10140 5C

KHARE, M.
Microbiology and Water Quality in a Tributary of Cayuga Lake,
W75-09896 5C

KHORGUANI, V. G.
On the Possibility of Generating Downdrafts by Introducing a High Concentration of Coarse Aersol Particles in the Atmosphere,
W75-09980 3B

KIKUCHI, T.
Consumer Ecology Working Group,
W75-10110 2L

KIMMEL, L. V.
Geographical Analysis of Oil Spill Potential Associated with Alaskan Oil Production and Transportation Systems,
W75-10121 5G

KINDLE, C. H.
Review of Literature Pertinent to the Aqueous Conversion of Radionuclides to Insoluble Silicates with Selected References and Bibliography (Revised),
W75-09892 5D

KING, L. G.
Management Practices Affecting Quality and Quantity of Irrigation Return Flow,
W75-10019 5G

KING, T. G.
A Model of One-Dimensional Percolation to a Water Table Using a Computer Simulation Language,
W75-10138 2G

KINSKY, A. M.
Plan Formulation and Evaluation Studies--Recreation. Vol I of V. Evaluation of Recreation Use Surveys Procedures,
W75-10342 6B

KIRBY, T. H.
Pilot-Plant Investigations into Partial Pretreatment Systems at Macclesfield,
W75-10229 5D

KITCHELL, J. F.
An Ecosystem Model for the Pelagic Zone of Lake Wingra,
W75-10092 5C

KLEIN, D. H.
Fluxes, Residence Times, and Sources of Some Elements to Lake Michigan,
W75-10090 5C

KLEMENT, A. W. JR.
Terrestrial and Freshwater Radioecology, a Selected Bibliography,
W75-09891 5A

KOCH, R. B.
Toxaphene Inhibition of ATPase Activity in Catfish, Ictalurus Punctatus, Tissues,
W75-09908 5C

KOENST, W. M.
Temperature Effects on Eggs and Fry of Percoid Fishes,
W75-10020 5C

KOIKE, K.
Biodegradation of Linear Alkylate Sulfonates in River Model (In Japanese),
W75-10247 5B

KONDRATYEV, K. A.
Remote Detection of Pollution of Water Reservoirs and Phytoplankton by Optical Methods,
W75-10098 7B

KONIZESKI, R.
Siltation Rates and Life Expectancies of Small Headwater Reservoirs in Montana,
W75-09858 2J

KONTOR, J. S.
New Flowmeter Passes Tests,
W75-10190 5D

KOONCE, J. F.
An Ecosystem Model for the Pelagic Zone of Lake Wingra,
W75-10092 5C

KOPP, F. J.
Numerical Simulation of Cloud Seeding Experiments,
W75-09955 2B

KORNIENKO, E. E.
Methods of Estimating Physical and Economic Effectiveness of Weather Modification,
W75-09991 3B

Results of Seeding Cumulonimbus Clouds Aimed at the Modification of Precipitation in the Steppe Part of the Ukraine,
W75-09951 3B

KOWASE, T.
Research on Pollution with Polychlorinated Biphenyls and Polychlorinated Terphenyls in Sewage Plants, (In Japanese),
W75-10271 5D

KRADEL, D. C.
Faunal Response to Spray Irrigation of Chlorinated Sewage Effluent,
W75-09899 5D

KRASNOVSKAYA, L. I.
Some Data About the Mechanism of the Artificial Dissipation of Supercooled Fog,
W75-09949 3B

KRASTANOV, L.
Review of Recent Work on Hail Suppression in Bulgaria,
W75-09971 3B

KRAUSE, K. S.
Objectives of Water Quality Planning,
W75-10205 5G

KRESSER, W.
A Method for Predicting Flood Water Runoff of the River Steyr (Ein Verfahren zur Vorhersage der Hochwasserabfluesse der Steyr),
W75-09943 4A

KRIEBEL, A. R.
Method and Apparatus for Detecting the Presence of an Oil Slick on a Water Surface,
W75-09865 5A

KROLL, C. G.
Estimate of Sediment Discharges, Santa Ana River at Santa Ana and Santa Maria River at Guadalupe, California,
W75-10162 2J

KROON, D. J.
Monitoring the Quality of Surface Water,
W75-10251

KRUTCHKOFF, R. G.
Deterministic Model of Dynamic Eutro... Estuary,
W75-10215

KUEHNAST, E. L.
Climate of Minnesota - Part VII - Areal ...tribution and Probabilities of Precipitatio... the Minneapolis-St. Paul Metropolitan Area
W75-10009

KUREJKO, I. A.
Results of Seeding Cumulonimbus Cl... Aimed at the Modification of Precipitatio... the Steppe Part of the Ukraine,
W75-09951

KURGIN, YU. S.
Problems of Radiation Fog Prevention,
W75-09948

KUZEL, P.
Determination of Trace Quantities of Bor... Surface Water Bodies and in Drinking W... (Spurenbestimmung von Bor in Oberflac... gewassern und Trinkwassern),
W75-10041

KYROS, P. N.
Legislative History of the Safe Drinking W... Act,
W75-10186

LAAK, R.
Problems with Effluent Seepage Fields,
W75-10274

LAGESS, T. F.
Disposal of Waste Streams Cont... Asbestos,
W75-09876

LAND, L. F.
Effects of Lowering Interior Canal Stag... Salt-Water Intrusion into the Shallow A... in Southeast Palm Beach County, Florida,
W75-10156

LANG, E. W.
Activated Carbon Treatment of Unble... Kraft Effluent for Reuse,
W75-10028

LANGER, G.
An Experimental Study of the Detection ... Nuclei on Membrane Filters and Othe... strata,
W75-10052

LARSEN, T. B.
A Dimensionless Design Equation for S... Lagoons,
W75-10261

LARSON, J. S.
Classification of Freshwater Wetlands Glaciated Northeast,
W75-10128

LAUGHLIN, W. C. JR.
Think Thermal,
W75-10284

LAWSON, R. L.
Optimal Control of Water Pollution in ... Stream,
W75-10206

LEY, S. M.
ological Impact of a Flood Control Reser-, Howard, Pennsylvania,
-09854 6B

RMAN, P. B.
ation Abatement in the Pharmaceutical In-ry,
-09931 5D

. R.
on Contact-Filtration: How It Works,
-09912 5D

. F.
rinated Hydrocarbons in the Lake Ontario ystem, (IFYGL),
-10018 5A

cal Levels of Phosphorus and Nitrogen in s Impoundments,
-10072 5C

lodel of Inorganic Carbon Limitation in ral Waters,
-10088 5C

nt Sedimentary History of Lake Monona, consin,
-10089 5C

. J.
ing and Modeling the Functional Relation-s Within Sublittoral Salt Marsh Aufwuchs munities - Inside One of the Black Boxes,
-10104 5C

. M.
city of Selected Pesticides to the Bay Mus-Mytilus Edulis),
-10021 5C

RE, V.
fer Parameters by a Chemical Tracer nique: Non Linear Mixing in the Roswell ined Aquifer,
-09893 2F

V, B. N.
Experimental Seeding of Frontal Clouds in er in Order to Increase Precipitation,
-09960 3B

RMAN, R. D.
Potential Controls Direct Filtration Coagu-n,
-10280 5F

LD, N. JR.
urement of Small Discharges Through V-h Weirs,
-10059 8B

, G. V.
ation of Full-Scale Biological Phosphorus oval Plant,
10194 5D

, L. M.
mic Methods of Convective Cloud Modifi-n by Means of Artificial Vertical Jets,
-09973 3B

, M. A.
titative Large-Volume Sampling nique,
10031 5A

).
ting of Petroleum-Industry Effluent,
10200 5D

LI, N. N.
Separation of Phenol from Waste Water by the Liquid Membrane Technique,
W75-10273 5D

LICHTENBERG, J. J.
Methods for the Determination of Specific Organic Pollutants in Water and Waste Water,
W75-10032 5A

LIGON, J. T.
Utilization of Aerial Photographs for Measuring Land Use Changes in Watersheds,
W75-10136 4C

LILLARD, D. A.
Aqueous Odor Thresholds of Organic Pollutants in Industrial Effluents,
W75-10026 5A

LIM, H. S.
Bibliography on the Application of Reverse Osmosis to Industrial and Municipal Wastewaters,
W75-09925 5D

LINDAHL, P. C.
The Sources and Levels of Mercury in the Sewage of a University Campus,
W75-10049 5A

LINOWIECKI, A. G.
How Much 'Reliability' is 'Enough',
W75-10254 5A

LINS, T. W.
Status of Land Subsidence Due to Ground-Water Withdrawal Along the Mississippi Gulf Coast,
W75-09856 2F

LIU, D. H. W.
Toxicity of Selected Pesticides to the Bay Mussel (Mytilus Edulis),
W75-10021 5C

LIVINGSTON, R. K.
Reservoir Release Routing Model for the Upper Arkansas River Basin of Colorado,
W75-10165 4A

LOFGREEN, G. P.
Sprinkling Cattle for Relief from Heat Stress,
W75-10082 3F

LOFTUS, M. E.
Growth and Dissipation of Phytoplankton in Chesapeake Bay. III. Inorganic Carbon Requirements of Natural Populations and Laboratory Cultures of Phytoplankton,
W75-10103 5C

LOMINADZE, V. P.
On the Results of Practical Protection of Valuable Agricultural Crops from Hail by the Thri (Zaknigmi) Method (The Results of Five Years' Work, 1969-1973),
W75-09969 3B

LONG, C. C.
Surface Waters and the Civil Law Rule,
W75-10304 6E

LONG, E. E.
Surface Waters and the Civil Law Rule,
W75-10304 6E

LOUCKS, O. L.
An Ecosystem Model for the Pelagic Zone of Lake Wingra,
W75-10092 5C

LUCKEY, R. R.
Reservoir Release Routing Model for the Upper Arkansas River Basin of Colorado,
W75-10165 4A

LUNDQUIST, G. L.
The Sources and Levels of Mercury in the Sewage of a University Campus,
W75-10049 5A

LYDICK, J. D.
How Much 'Reliability' is 'Enough',
W75-10254 5A

MACCORMICK, A. J. A.
An Ecosystem Model for the Pelagic Zone of Lake Wingra,
W75-10092 5C

MAGALHAES, L. E. DE M.
Design Implications of Hydraulic Jumps at Sudden Enlargements,
W75-10061 8B

MAJOR, D. C.
Project Evaluation in Water Resources: Budget Constraints,
W75-09851 6A

MAKI, A. W.
Effects of PCB (Aroclor 1254) and P, P' DDT On Production and Survival of Daphnia Magna Strauss,
W75-09905 5C

MARANDO, V. L.
Georgia County Commissioner Attitudes Toward Water Problems,
W75-09855 6E

MARSH, P. S.
Siltation Rates and Life Expectancies of Small Headwater Reservoirs in Montana,
W75-09858 2J

MARTER, W. L.
Radioactivity from SRP Operations in a Downstream Savannah River Swamp,
W75-09901 5B

MARTIN, D. B.
Studies to Determine Methods for Culturing Three Freshwater Zooplankton Species,
W75-10027 5A

MARTIN, D. F.
The Response of Gymnodinium Breve to Municipal Waste Materials,
W75-10033 5C

MASSELLI, J. W.
Let's Try 90% First and See What Our Quality is Like,
W75-10175 5G

MASSELLI, N. W.
Let's Try 90% First and See What Our Quality is Like,
W75-10175 5G

MATSCHE, N. F.
Austrian Plant Knocks Out Nitrogen,
W75-10225 5D

MATSUMVRA, F.
Importance of Water pH in Accumulation of Inorganic Mercury in Fish,
W75-09904 5A

MAUDLIN, V. H.
Disposal of Waste Streams Containing Asbestos,
W75-09876 5E

MCBRYDE, W. A. E.
Copper (II)--Nitrilotriacetate Complexes in Aqueous Solution,
W75-10086 5C

MCCOURT, L. J.
Copper (II)--Nitrilotriacetate Complexes in Aqueous Solution,
W75-10086 5C

MCCUEN, R. H.
Hydrologic Impact of Planned Unit Developments,
W75-09919 4C

MCDONALD, E. F.
Influence of Light Intensity on the Bioenergetics of Channel Catfish,
W75-10100 8I

MCELROY, A. D.
Water Pollution From Nonpoint Sources,
W75-10085 5C

MCHOSE, J. C.
Marine Pollution--Legislation Litigation, Underwriting--Where Are We, Where Away,
W75-09887 5G

MCKEOWN, J. J.
Dynamic Leaching Studies on Pulpwood Bark Residues,
W75-10214 5D

MCLAUGHLIN, M. E.
Process for Treating Water,
W75-09874 5D

MCLEAN, D. H.
A Study of the Effects of Water Institutions on Planning and Management of Water Resources in Utah,
W75-10130 6E

MCMILLAN, C.
Productivity/Physiology Working Group,
W75-10107 2L

MCROY, C. P.
Productivity/Physiology Working Group,
W75-10107 2L

MCWHORTER, J. C.
Sudden Release of Water from a Long Prismatic Flume,
W75-10017 8B

MEDALIEV, H. H.
On the Possibility of Thunderstorm Suppression by Changing the Non-Equilibrium Crystallization Potentials of Cloud Water,
W75-09976 2B

MELNYK, P. B.
Precipitation of Phosphates in Sewage with Lanthanum: An Experimental and Modelling Study,
W75-10259 5D

MELQUIST, W. E.
DDT and PCB Levels in Lake Coeur D'Alene, Idaho, Osprey Eggs,
W75-09907 5A

MENDLOWITZ, M. A.
Equivalent Blackbody Temperature of the Top of a Severe Storm,
W75-10054 2B

MENGARELLI, M. Q.
Monitoring the Quality of Surface Water,
W75-10251 5A

MESIAH, R. N.
Treatment of Aqueous Waste Streams with Hydrogen Peroxide to Remove Chlorinated Isocyanurates Therefrom,
W75-09939 5D

MESSMAN, H. C.
Making Active Carbon from Sewage Sludge,
W75-09875 5D

METLER, W.
Effect of Wind Waves and Wind Tides on the Optimum Control of Large Lakes,
W75-10204 4A

MICHEL, H. L.
Sewage Plan Weds Five Municipalities,
W75-09914 5D

MIELKE, P. W. JR.
An Evaluation of Extended Area Effects from Attempts to Modify Local Clouds and Cloud Systems,
W75-09993 3B

MILAM, E. E.
Methods to Facilitate Managerial Effectiveness in Municipal Water Systems,
W75-09895 6B

MILLER, D. W.
Ground Water Pollution Problems in the Northwestern United States,
W75-10023 5B

MILLER, R.
New Separator May Spur Interest in Sedimentation,
W75-10226 5D

MILLER, R. L.
Activated Carbon Treatment of Unbleached Kraft Effluent for Reuse,
W75-10028 5D

MILOY, J.
Primary Economic Impact of the Gulf Intracoastal Waterway in Texas,
W75-10120 6B

MIMURA, S.
Research on Pollution with Polychlorinated Biphenyls and Polychlorinated Terphenyls in Sewage Plants, (In Japanese),
W75-10271 5D

MINEGISHI, T.
Method for Purifying Waste Water,
W75-09882 5D

MINTON, P.
Design Implications of Hydraulic Jumps at Sudden Enlargements,
W75-10061 8B

MIRANDA, S. W.
Process for Controlling Oil Slicks,
W75-09868 5G

MITCHELL, R. N.
Hydrologic Data for Urban Studies in the Austin, Texas Metropolitan Area, 1973,
W75-10151 7C

MIYAMOTO, S.
Identification Method in Environmental Systems and Its Application to Water Pollution,
W75-10266 5A

MOORE, E. J.
Apparatus for Controlling the Level of Subsurface Water,
W75-09880 4B

MOORE, J. C.
A New Direct Ultraviolet Method for the A[illegible]ysis of Nitrate Ions,
W75-10187

MOORE, J. W.
An Integrated System for Disposal of Sl[illegible] Originating from Water Softening and Se[illegible] Treatment in Municipalities,
W75-10123

MOORE, S. F.
Monitoring: An Environmental State Es[illegible]tion Problem,
W75-10255

MORI, Y.
An Analysis of Runoff in an Urban Are[illegible] Japanese),
W75-09916

MORRILL, R. A.
A Technique for Estimating the Magnitud[illegible] Frequency of Floods in Maine,
W75-10155

MORRIS, R. B.
The Forging of the Union Reconsidere[illegible] Historical Refutation of State Sovereignty [illegible] Seabeds,
W75-09888

MORRISON, S. R.
Sprinkling Cattle for Relief from Heat Str[illegible]
W75-10082

MOSS, O. H.
Joint Treatment of Pulping and Mur[illegible] Wastes,
W75-09928

MOYER, K. A.
Water Chlorination Methods,
W75-09910

MOYLE, P. B.
Effects of Introduced Bullfrogs, [illegible] Catesbeiana, on the Native Frogs of th[illegible] Joaquin Valley, California,
W75-10114

MROCHEK, J. E.
Analyzing Organics in Dilute Aqueous [illegible] tions,
W75-10350

MUCCIARDI, A. N.
Forecasting Watershed Pollution Us[illegible] Model,
W75-10249

MUCHNIK, V. M.
Some Questions of Thunderstorm Lig[illegible] Control,
W75-09977

MUELLER, G.
Plan Formulation and Evaluation St[illegible] Recreation. Vol. IV of V. Estimating F[illegible] tional Facility Requirements,
W75-10344

MUNEMIYA, I.
Energy Evaluation and Organic Con[illegible] Index in Municipal Sewage Wat[illegible] Japanese),
W75-10189

MURAOKA, K.
Water Quality Routing of Unsteady Rive[illegible] by Finite Element Method,
W75-10252

PHY, J. S.
one Chemistry and Technology-A Review of Literature: 1961-1974,
5-10348 5D

PHY, K. L.
aracterization of Mixing in Aerated goons,
5-09913 5D

PHY, L. S.
earch Status on Effects of Land Application of Animal Wastes,
5-10022 5B

TY, BH. V.
und-Based Cloud Seeding Experiment at hi During Winter,
5-09961 3B

ELWHITE, C. C.
Automated Method for Determination of idual Methanol in Denitrified Effluents,
5-10047 5D

CARNI, V. M.
ss Transfer to Naturally Flowing Streams,
5-10341 5D

ASAO, T.
paratus for Treating Water Containing Impu-es,
5-09884 5D

O, M.
ects of Deposit Resuspension on Settling in,
5-10213 5F

ATSUJI, K.
ter Quality Routing of Unsteady River Flow Finite Element Method,
5-10252 5B

GHTON, J.
ter Research Center Unravels the Nitrate ot,
5-10278 5D

MAN, J. W.
: Effect of a Fuel Oil Spill on Benthic Invertrates and Water Quality on the Alaskan Arc- Slope, Happy Valley Creek Near Sagwon, ska,
5-10140 5C

AZ, A.
dicting Evapotranspiration from Agricul-al Watersheds Under Dry Conditions,
5-09860 2D

EN, J. W.
ter Pollution From Nonpoint Sources,
5-10085 5C

Y, W. P.
Mathematical Programming Approach to blic Water Project. Portfolio Selection,
5-10131 6B

ON, C. A.
orado River-Flow Management,
5-10208 4A

LES, M. E.
lization of Aerial Photographs for Measur- Land Use Changes in Watersheds,
5-10136 4C

MAN, J.
n Stimulation Experiments: Design and aluation,
5-09994 7C

NICHOLS, S. A.
Survey of Lake Rehabilitation Techniques and Experiences,
W75-10078 5C

NICKERSON, R. D.
Making Active Carbon from Sewage Sludge,
W75-09875 5D

NONNEMACHER, G.
Determination of Trace Quantities of Boron in Surface Water Bodies and in Drinking Water (Spurenbestimmung von Bor in Oberflachengewassern und Trinkwassern),
W75-10041 5A

NORGAARD, R. B.
Wasting a River,
W75-10116 6B

NOSLER, H.
Determination of Trace Quantities of Boron in Surface Water Bodies and in Drinking Water (Spurenbestimmung von Bor in Oberflachengewassern und Trinkwassern),
W75-10041 5A

NOTON, L.
Preliminary Results of a Study Concerning the Effects of Thermal Pollution on Phytoplanktonic Primary Production in Lake Wabamun, Alberta,
W75-10073 5C

NOVOTNY, J. F.
Studies to Determine Methods for Culturing Three Freshwater Zooplankton Species,
W75-10027 5A

NURUTDINOV, R. G.
Cleaning of Petroleum-Industry Effluent,
W75-10200 5D

O'CONNER, D. V.
The Effect of Methyl Mercury on Gill Metabolism and Blood Parameters of Rainbow Trout,
W75-09906 5C

OBA, K.
Biodegradation of Linear Alkylate Sulfonates in River Model (In Japanese),
W75-10247 5B

OGDEN, J. C.
Pesticides, Polychlorinated Biphenols and Heavy Metals in Upper Food Chain Levels, Everglades National Park and Vicinity,
W75-10080 5C

OKAMOTO, Y.
Research on Pollution with Polychlorinated Biphenyls and Polychlorinated Terphenyls in Sewage Plants, (In Japanese),
W75-10271 5D

OMOTO, Y.
Hailstorms in Japan,
W75-09967 3B

Preliminary Results of Experiments Using Seeding Rockets with Combustible Shells,
W75-09987 3B

ORGILL, M. M.
Geographical Analysis of Oil Spill Potential Associated with Alaskan Oil Production and Transportation Systems,
W75-10121 5G

ORR, J. R.
Ozone Chemistry and Technology-A Review of the Literature: 1961-1974,
W75-10348 5D

ORTOLANO, L.
Issues in Water Resources Impact Assessment,
W75-10222 6B

ORVILLE, H. D.
Numerical Simulation of Cloud Seeding Experiments,
W75-09955 2B

OSGOOD, J. O.
Ground-Water's Role in Water Quality Management,
W75-10180 5G

OSWALT, T. W.
An Unusual Brown Rot Outbreak in a Florida Citrus Grove Following Sprinkler Irrigation With Phytophthora-Infested Water,
W75-10245 3F

OZAWA, Y.
Preliminary Results of Experiments Using Seeding Rockets with Combustible Shells,
W75-09987 3B

PABST, M. E.
Water Development for Irrigation in Northwestern Kansas,
W75-10152 4B

PARKER, G. G.
Water and Water Problems in the Southwest Florida Water Management District and Some Possible Solutions,
W75-10207 3C

PARRY, B. T.
Wasting a River,
W75-10116 6B

PATALAS, K.
The Eutrophication of Lakes in the Okanagan Valley, British Columbia,
W75-10075 5C

PATRICK, R.
Use of Algae, Especially Diatoms, in the Assessment of Water Quality,
W75-10112 5A

PAUL, S. K.
Ground-Based Cloud Seeding Experiment at Delhi During Winter,
W75-09961 3B

PAULSON, O. L. JR.
Residential Canals Along the Gulf Coast,
W75-10016 5B

PAVELIS, G. A.
The Benefit-Cost Ratio in Resource Development Planning,
W75-10117 6B

PEARCE, D. N.
Trickle Irrigation Emitter,
W75-09873 3F

PEARSON, F. J. JR.
Carbon-14 Ages of Water From the Arkansas Hot Springs,
W75-10145 2K

PECAN, E. V.
Experimental Eutrophication of Terrestrial and Aquatic Ecosystems. First Annual Report of the Upland Recharge Project,
W75-10097 5D

PEIL, K. M.
A Rational Approach for Predicting the Dissolved Oxygen Profile in Receiving Waters,
W75-10034 5A

PENMAN, A.
Chemicals Reduce System Odours,
W75-10040 5D

PERES, J. M.
Consumer Ecology Working Group,
W75-10110 2L

PERRAS, J. P.
A Portable Gas Chromatographic Technique to Measure Dissolved Hydrocarbons in Sea Water,
W75-10096 5A

PESSONEY, G. F.
Residential Canals Along the Gulf Coast,
W75-10016 5B

PETERS, C. R.
Factors Influencing Reverse Osmosis Rejection of Inorganic Solutes from Aqueous Solution,
W75-09937 5D

PETERSEN, P. L.
Geographical Analysis of Oil Spill Potential Associated with Alaskan Oil Production and Transportation Systems,
W75-10121 5G

PETROV, R.
On the Thermodynamic Criteria for the Intensity of Convective Cloud Development,
W75-09989 2B

PETROZOLIN, W.
Hydraulic Model Study of a Large-Capacity Settler in a Water Capture System (Badania hydrauliczne modelu duzego osadnika na ujeciu wodociagowym),
W75-10043 5D

PFUDERER, P.
Phthalate Esters, Heartrate Depressors in the Goldfish,
W75-09902 5C

PHELPS, H. O.
Friction Coefficients for Laminar Sheet Flow Over Rough Surfaces,
W75-10062 8B

PHILLIPS, C.
Primary Economic Impact of the Gulf Intracoastal Waterway in Texas,
W75-10120 6B

PHILLIPS, G. A.
Estimates of Oil in Aquatic Sediments by Fluorescence Spectroscopy,
W75-10235 5A

PHIRKE, P. M.
Elevated Temperature Technique for Enumeration of Salmonellae in Sewage,
W75-10045 5D

PIERSON, F. W.
An Investigation of the Predictive Ability of Several Evaporation Equations,
W75-10051 2D

PIPER, H. W.
Hydrologic Impact of Planned Unit Developments,
W75-09919 4C

PIPES, W. O.
Recommendations for Environmental Engineering Education,
W75-10218 9A

PITT, W. W. JR.
Analyzing Organics in Dilute Aqueous Solutions,
W75-10350 5A

PITTS, D. E.
Equivalent Blackbody Temperature of the Top of a Severe Storm,
W75-10054 2B

PLACE, A.
Growth and Dissipation of Phytoplankton in Chesapeake Bay. III. Inorganic Carbon Requirements of Natural Populations and Laboratory Cultures of Phytoplankton,
W75-10103 5C

PLANK, R. D.
A Computer Comes to Missouri,
W75-10265 5D

POC, M. M.
Preparation and Properties of 'Pure' Silver Iodide Aerosol,
W75-09998 3B

POLUEKTOVA, L. P.
On Physical and Economic Effectiveness of Hail-Suppression Projects,
W75-09995 3B

PORCELLA, D. B.
The Effects of Artificial Destratification on the Water Quality and Microbial Populations of Hyrum Reservoir,
W75-09897 5C

POWERS, J. J.
Aqueous Odor Thresholds of Organic Pollutants in Industrial Effluents,
W75-10026 5A

POWERS, W. L.
Effects of Irrigation and Row Spacing on Evapotranspiration and Microclimate of a Sorghum Field,
W75-09853 2D

Research Status on Effects of Land Application of Animal Wastes,
W75-10022 5B

POZDNYAKOV, D. V.
Remote Detection of Pollution of Water Reservoirs and Phytoplankton by Optical Methods,
W75-10098 7B

PRYCH, E. A.
Numerical Model of the Salt-Wedge Reach of the Duwamish River Estuary, King County, Washington,
W75-10157 5B

PRYOR, A. W.
Geothermal Brine Energy to Generate Power,
W75-09863 8C

PUGH, D. T.
Hydrodynamic Levelling of an Off-Shore Tide Gauge,
W75-10060 8B

PUNTENNEY, J. L.
Recycle Sludge to Feed Farms,
W75-10282 5D

QUIMBY, M. C.
Fish Viruses: Buffers and Methods for Plaquing Eight Agents Under Normal Atmosphere,
W75-10257 5C

RADA, E. L.
Irrigation Efficiencies in Producing Calorie and Proteins: An Annotated Bibliography,
W75-10076

RADKE, L. F.
The Artificial Modification of Clouds a Precipitation in a Mountainous Region,
W75-09962

RAINEY, W. T.
Analyzing Organics in Dilute Aqueous Sol tions,
W75-10350

RAMACHANDRA MURTY, A. S.
Summary of Observations Indicating Dynan Effect on Salt Seeding in Warm Cumul Clouds,
W75-10057

RAMANA MURTY, BH. V.
Summary of Observations Indicating Dynan Effect on Salt Seeding in Warm Cumu Clouds,
W75-10057

RAMATHAN, R.
Measuring External Effects of Solid Wa Management,
W75-10024

RAMM, W.
Measuring External Effects of Solid Wa Management,
W75-10024

RANCOURT, K. L.
On the Characteristics of Single-Cell Showe
W75-09997

RAPPMUND, R. A.
Ground-water Discharge from the Edwards Associated Limestones, San Antonio Ar Texas, 1974,
W75-10146

RATZLAFF, K. W.
Chemical and Physical Characteristics of W in Esturies of Texas, October 1970-Septem 1971,
W75-10153

REDEKOPP, A. B.
Pollution Control, Next Step, Phy cal/Chemical Treatment, Activated Charcoa
W75-10279

REDNER, J. A.
Submersible Pumps Make By-Pass Possible
W75-10276

REEDER, H. O.
Injection-Pipe System for Artificial Recharg
W75-10142

REESER, W. K.
Equivalent Blackbody Temperature of the of a Severe Storm,
W75-10054

REETZ, G. R.
Water Resources Development and Wilder Values: A Study of the Upper Hudson Riv
W75-09898

RENN, C. E.
Biodegradation of NTA Detergents in a Wa water Treatment System,
W75-09920

YNOLDS, D. E.
he Discharge of South Carolina Streams as it elates to Link Magnitude,
/75-10134 2E

YNOLDS, J. E.
ctivities, Characteristics, and Opinions of akefront Residents: Kissimmee River Basin, lorida,
/75-10129 6B

IERE, J.
volution of Microflora During Purification reatment of Urban Water by Activated Sludge Evolution de la Microflore au Cours D'un raitement D'Epuration D'eaux Urbaines Par oues Activees),
/75-10227 5D

BERTS, H. H.
Study of Beach Ground-Water Hydrology nd Chemistry,
/75-10077 2F

BERTSON, W. B.
esticides, Polychlorinated Biphenols and eavy Metals in Upper Food Chain Levels, verglades National Park and Vicinity,
/75-10080 5C

DGERS, J.
n Experimental Study of the Detection of Ice uclei on Membrane Filters and Other Sub-rata,
/75-10052 2B

MANEK, W. H.
ederal Viewpoint (Permit Issuance--Administrative and Judicial Review--Observations and roblems),
/75-10302 5G

SSFELDER, A.
ree-Grab Device for Collecting Underwater amples,
/75-09866 7B

THENBACHER, H.
aunal Response to Spray Irrigation of hlorinated Sewage Effluent,
/75-09899 5D

ULLEAU, M.
reparation and Properties of 'Pure' Silver odide Aerosol,
/75-09998 3B

BIN, M.
etroleum Pollutants in Surface and Ground-ater as Indicated by the Carbon-14 Activity of issolved Organic Carbon,
/75-10035 5A

SSELL, E. E.
tatus of Land Subsidence Due to Ground-Vater Withdrawal Along the Mississippi Gulf oast,
/75-09856 2F

SSELL, T. W. F.
lass Transfer to Naturally Flowing Streams,
/75-10341 5D

BAK, J. I.
hosphorus Run-Off From the Drainage Basin o Mikolajskie Lake,
/75-10095 5C

DING, S-O.
ecovery of Polluted Lakes. A Swedish esearch Program on the Effects of Advanced Vaste Water Treatment and Sewage Diversion,
/75-10081 5C

SALUKVADZE, T. G.
Radar Characteristics of Cumulonimbus Clouds During Their Natural Development and Artificial Seeding,
W75-09996 2B

SANDERS, J. I.
Colorado River-Flow Management,
W75-10208 4A

SAVAGE, E. S.
Advances in Ammonia and Nitrate Removal,
W75-09911 5D

SAWARAGI, Y.
Identification Method in Environmental Systems and Its Application to Water Pollution,
W75-10266 5A

SAX, R. I.
The EML 1973 Florida Area Cumulus Experiment,
W75-09981 3B

SCHLEICHER, D.
A Model for Earthquakes Near Palisades Reservoir, Southeast Idaho,
W75-10139 8B

SCHLEUSENER, R. A.
Engineering and Operational Aspects of Weather Modification,
W75-09983 3B

SCHMALENSEE, R.
Measuring External Effects of Solid Waste Management,
W75-10024 5B

SCHMIDT, T. W.
Pesticides, Polychlorinated Biphenols and Heavy Metals in Upper Food Chain Levels, Everglades National Park and Vicinity,
W75-10080 5C

SCHNEIDER, C. W.
North Carolina Marine Algae. III. A Community of Ceramiales (Rhodophyta) on a Glass Sponge From 60 meters,
W75-10087 5C

SCHOFIELD, W. R.
Deterministic Model of Dynamic Eutrophic Estuary,
W75-10215 5B

SCHROEDER, G. J.
DDT and PCB Levels in Lake Coeur D'Alene, Idaho, Osprey Eggs,
W75-09907 5A

SCHULTZ, V.
Terrestrial and Freshwater Radioecology, a Selected Bibliography,
W75-09891 5A

SCHWING, J. E.
Recycle Sludge to Feed Farms,
W75-10282 5D

SCHWINN, D. E.
Largest Advanced Wastewater Treatment Plant in the U.S. and in the World,
W75-10193 5D

SCOTT, E. L.
Rain Stimulation Experiments: Design and Evaluation,
W75-09994 7C

SCOTT, W. D.
The Acquisition of Information During Attempts at Weather Modification,
W75-09986 7B

SEBASTIAN, F. P.
Think Thermal,
W75-10284 5E

SELIGER, H. H.
Growth and Dissipation of Phytoplankton in Chesapeake Bay. III. Inorganic Carbon Requirements of Natural Populations and Laboratory Cultures of Phytoplankton,
W75-10103 5C

Measurements of Absolute Scalar Irradiance Spectra in Rhode River,
W75-10102 5C

SELLERS, J. H.
Methods to Facilitate Managerial Effectiveness in Municipal Water Systems,
W75-09895 6B

SELVAM, A. M.
Summary of Observations Indicating Dynamic Effect on Salt Seeding in Warm Cumulus Clouds,
W75-10057 3B

SEREGIN, YU. A.
Technical Devices for the Artificial Modification of Cloud and Fog,
W75-09982 3B

SERPOLAY, R.
Rapid Inducement of Precipitation by Seeding Stratified Air Layers,
W75-09953 3B

Salt Drizzles Extracted From Unsaturated Air Layers by Seeding with Hygroscopic Nuclei,
W75-09952 3B

SHAW, R. H.
Dew Duration in Central Iowa,
W75-10212 3F

SHERIF, M. A.
Soil Liquefaction by Torsional Simple Shear Device,
W75-10231 8D

SHEVALDINA, T. I.
Some Data About the Mechanism of the Artificial Dissipation of Supercooled Fog,
W75-09949 3B

SHIBA, S.
Effects of Deposit Resuspension on Settling Basin,
W75-10213 5F

SHIMAMURA, I.
Process for Treating Waste Photographic Processing Solutions,
W75-09940 5D

SHISHKIN, N. S.
Results of Experimental and Operational Work on Combating Forest Fires,
W75-09974 3B

Theoretical Research into Artificial Stimulation of Precipitation for Fighting Forest Fires,
W75-09956 2B

SIDOROV, A. I,
Results of Experimental and Operational Work on Combating Forest Fires,
W75-09974 3B

**SIDOROV, A. I,**

Technical Devices for the Artificial Modification of Cloud and Fog,
W75-09982 3B

**SILAYEV, A. V.**
On a Method of Fog Modification by Passivation of Condensation Nuclei,
W75-09946 3B

**SILIN, S. A.**
Technical Devices for the Artificial Modification of Cloud and Fog,
W75-09982 3B

**SILVERMAN, B. A.**
Design of a Modern Thermal Fog Dissipation System for Airports,
W75-09947 3B

**SIMPSON, J.**
The EML 1973 Florida Area Cumulus Experiment,
W75-09981 3B

**SINGH, M. G.**
River Pollution Control,
W75-10224 6A

**SINNOT, J. A.**
The Cape Cod Water Program, A Current Analysis,
W75-10283 4B

**SKOVRONEK, H. S.**
Pollution Abatement in the Pharmaceutical Industry,
W75-09931 5D

**SLADE, R. M. JR.**
Hydrologic Data for North Creek, Trinity River Basin, Texas, 1973,
W75-10149 7C

**SMALL, M.**
Experimental Eutrophication of Terrestrial and Aquatic Ecosystems. First Annual Report of the Upland Recharge Project,
W75-10097 5D

**SMALLWOOD, D.**
Measuring External Effects of Solid Waste Management,
W75-10024 5B

**SMIRNOV, V. V.**
The Possibility of Using Charged Bubbles in Cloud Modification,
W75-09979 2B

**SMITH, C. N.**
Secondary Treatment Design for Combined Wastewaters, Part II,
W75-10199 5D

**SMITH, L. L. JR.**
Temperature Effects on Eggs and Fry of Percoid Fishes,
W75-10020 5C

**SMITH, S. A.**
Survey of Lake Rehabilitation Techniques and Experiences,
W75-10078 5C

**SPATZIERER, G.**
Austrian Plant Knocks Out Nitrogen,
W75-10225 5D

**SPIKER, E. C.**
Petroleum Pollutants in Surface and Groundwater as Indicated by the Carbon-14 Activity of Dissolved Organic Carbon,
W75-10035 5A

**SPODNIEWSKA, I.**
The Structure and Production of Phytoplankton in Mikolajskie Lake,
W75-10093 5C

**SPREUER, H.**
Calculation of Reaction Mechanisms in Fermentation Basins with Continuous Flow (Zur Berechning von Reaktionsablaeufen in Kontinuierlich Durchstroemten Fermenterbecken),
W75-10267 5D

**SPYERS-DURAN, P.**
The Effect of Repeated Activation on Depositional Ice Nuclei,
W75-10056 2B

**STAFFORD, D. B.**
Utilization of Aerial Photographs for Measuring Land Use Changes in Watersheds,
W75-10136 4C

**STALEVICH, D. D.**
Theoretical Research into Artificial Stimulation of Precipitation for Fighting Forest Fires,
W75-09956 2B

**STANKOV, R. N.**
Anti-Hail Rockets and Shells,
W75-09984 3B

**STANTCHEV, K.**
On the Thermodynamic Criteria for the Intensity of Convective Cloud Development,
W75-09989 2B

Review of Recent Work on Hail Suppression in Bulgaria,
W75-09971 3B

**STANWOOD, D. A.**
Wave Quenching Device,
W75-09871 4A

**STEEN, J. A.**
Quantitative Error Analysis of Numerical Methods for Partial Differential Equations,
W75-10003 6G

**STEINHORN, I.**
The Role of Solid Precipitation Elements in Natural and Artificial Production of Rain in Israel,
W75-09958 3B

**STEPHENS, J. C.**
Hydrologic Reconnaissance of the Wah Wah Valley Drainage Basin, Millard and Beaver Counties, Utah,
W75-10167 4B

**STEVENS, B. W.**
Recovering Organic Materials from Wastewater,
W75-09932 5D

**STONER, J. D.**
Numerical Model of the Salt-Wedge Reach of the Duwamish River Estuary, King County, Washington,
W75-10157 5B

**STOUT, G. E.**
Economic Aspects of Precipitation Augmentation Over the Great Lakes,
W75-09992 6B

**STOW, C. D.**
The Position Stability of Large Water Drops Suspended in a Vertical Wind Tunnel,
W75-10053 2B

**STOYANOV, S.**
Simulation of the Natural Process of Hail F
mation and Its Transformation Under the
fluence of Artificial Crystallizaton,
W75-09970

**SUGYAMA, T.**
Biodegradation of Linear Alkylate Sulfon
in River Model (In Japanese),
W75-10247

**SUMIN, JU. P.**
Results of Experimental and Operational W
on Combating Forest Fires,
W75-09974

**SWIFT, W. H.**
Geographical Analysis of Oil Spill Potential
sociated with Alaskan Oil Production
Transportation Systems,
W75-10121

**SY, S. H.**
Mechanical Management of Aquatic Ve
tion: Analytical Studies of Unit Opera
Potentially Useful in their Processing,
W75-09861

**TABATA, N.**
Characteristics of Gas-Liquid Contact
paratus in Ozone Treatment for Drin
Water, (In Japanese),
W75-10281

**TAFT, J. L.**
Phosphorus Kinetics in the Euphotic Zon
the Chesapeake Bay,
W75-10101

**TAKAHASHI, Y.**
On the Efficient Size and Concentratio
Spray Drops for Stimulating Warm Clouds
W75-09954

**TAKAMATSU, T.**
Carbon Contact-Filtration: How It Works,
W75-09912

Effects of Deposit Resuspension on Se
Basin,
W75-10213

**TAMALET, M.**
Fluidized-Bed Incineration of Urban S
(Incineration des Boues Urbaines en Lit
dise),
W75-09941

**TANAKA, M.**
Apparatus for Treating Water Containing
rities,
W75-09884

**TANNER, R. D.**
Zeta Potential Controls Direct Filtration C
lation,
W75-10280

**TARAPCHAK, S. J.**
Diatoms in Lakes and Lake Sediments
Index to Environment. Part 2. A Stu
Phytoplankton Distribution, Lake Clas
tion, and Trophic Indicators in Min
Lakes,
W75-10105

**TARNAY, A. G.**
Operation of Full-Scale Biological Phosp
Removal Plant,
W75-10194

**DR, W. R.**
phorus Kinetics in the Euphotic Zone of Chesapeake Bay,
-10101 5C

**MA, T.**
aratus for Treating Water Containing Impu-
-09884 5D

**, M.**
lation of the Natural Process of Hail For-on and Its Transformation Under the In-ce of Artificial Crystallizaton,
-09970 2B

**R, J. P.**
ncept for Managing Waste,
-10236 5D

**ER, G. W.**
ity and Regulation of Nutrients Limiting oplankton in the Shallow Estuaries Near fort, N.C.,
-10084 5C

**, T. L.**
ew of Literature Pertinent to the Aqueous ersion of Radionuclides to Insoluble Sil-s with Selected References and Bibliog-y (Revised),
-09892 5D

**AS, C.**
obiology and Water Quality in a Tributary ayuga Lake,
-09896 5C

**, W. G.**
vated Carbon Treatment of Unbleached t Effluent for Reuse,
-10028 5D

**INS, J. M.**
Theoretical and Empirical Approach to eries Economics,
-10118 6C

**L, G. J.**
ration of Full-Scale Biological Phosphorus oval Plant,
-10194 5D

**R, G. K.**
est Advanced Wastewater Treatment Plant e U.S. and in the World,
-10193 5D

**OV, V. P.**
ning of Petroleum-Industry Effluent,
-10200 5D

**S-C.**
ortance of Water pH in Accumulation of ganic Mercury in Fish,
-09904 5A

**HIYA, Y.**
earch on Pollution with Polychlorinated enyls and Polychlorinated Terphenyls in age Plants, (In Japanese),
-10271 5D

**UNOV, V. V.**
Physical and Economic Effectiveness of -Suppression Projects,
-09995 3B

**ING, T.**
Infrared Studies of Santa Barbara Channel Spill,
-10237 5A

**TU, K. W.**
Quantitative Error Analysis of Numerical Methods for Partial Differential Equations,
W75-10003 6G

**TURVEY, L. G. S.**
Statistical Analysis of Operational Performance of Some Package Plants,
W75-10256 5D

**UCHEVATKINA, T. S.**
Theoretical Research into Artificial Stimulation of Precipitation for Fighting Forest Fires,
W75-09956 2B

**UEDA, Y.**
Effects of Deposit Resuspension on Settling Basin,
W75-10213 5F

**UTTORMARK, P. D.**
Survey of Lake Rehabilitation Techniques and Experiences,
W75-10078 5C

**VALI, G.**
Cloud Glaciation by Liquified Propane Spray,
W75-10002 3B

**VAN DER LEEDEN, F.**
Ground Water Pollution Problems in the Northwestern United States,
W75-10023 5B

**VAN KIRK, F. N.**
California Plant Gets Straight 'A's in Computer Control,
W75-10264 5D

**VANDERGRIFT, A. E.**
Water Pollution From Nonpoint Sources,
W75-10085 5C

**VAUGHAN, H. C.**
On the Characteristics of Single-Cell Showers,
W75-09997 2B

**VEITH, G. D.**
Chlorinated Hydrocarbons in the Lake Ontario Ecosystem, (IFYGL),
W75-10018 5A

**VELTMAN, J. A.**
Drainage System Cooperates with Nature,
W75-09942 4A

**VERHOFF, F. H.**
Evaluation of Phosphorus Dynamics in a Watershed,
W75-10217 5B

**VICHNEVETSKY, R.**
Quantitative Error Analysis of Numerical Methods for Partial Differential Equations,
W75-10003 6G

**VOGL, R. J.**
Effects of Fire on the Plants and Animals of a Florida Wetland,
W75-10181 6G

**VOIT, F. YA.,**
Results of Seeding Cumulonimbus Clouds Aimed at the Modification of Precipitation in the Steppe Part of the Ukraine,
W75-09951 3B

**VOLKOVITSKII, O. A.**
The Possibility of Using Charged Bubbles in Cloud Modification,
W75-09979 2B

**VULFSON, N. I.**
Dynamic Methods of Convective Cloud Modification by Means of Artificial Vertical Jets,
W75-09973 3B

**WALKER, J. D.**
Extraction of Petroleum Hydrocarbons from Oil-Contaminated Sediments,
W75-10241 5G

**WALKER, W. R.**
Subsurface Environment--Private Property or Public Domain,
W75-10209 4B

**WALLER, B. G.**
Distribution of Nitrogen and Phosphorous in the Conservation Areas in South Florida from July 1972 to June 1973,
W75-10160 5B

**WALLINGFORD, G. W.**
Research Status on Effects of Land Application of Animal Wastes,
W75-10022 5B

**WALTERS, A. H.**
Nitrate in Water, Soil, Plants and Animals,
W75-10083 5C

**WARBURTON, J. A.**
The Pyramid Pilot Cloud-Seeding Project,
W75-09964 3B

**WARD, R. C.**
Routine Surveillance Alternatives for Water Quality Management,
W75-10250 5A

**WARMAN, J. C.**
Tenth Annual Report, Fiscal Year 1974,
W75-10339 9D

**WARNER, J.**
Rain Enhancement - A Review,
W75-09950 3B

**WEBSTER, R. G.**
The Sources and Levels of Mercury in the Sewage of a University Campus,
W75-10049 5A

**WEDDLE, B.**
Dumps: A Potential Threat to Our Groundwater Supplies,
W75-10184 5B

**WEICKMANN, H.**
Snowfall Enhancement,
W75-09959 2C

**WEILER, P. R.**
An Ecosystem Model for the Pelagic Zone of Lake Wingra,
W75-10092 5C

**WEINSTEIN, A. I.**
Design of a Modern Thermal Fog Dissipation System for Airports,
W75-09947 3B

**WEISS, S. F.**
The Effects of Authorization for Water Impoundments on Shoreland Transition,
W75-10126 6B

**WELDON, C.**
Effects of Original Vegetation on Reservoir Water Quality,
W75-10014 5C

WELLS, G. R.
A Sensitivity Analysis of Simulated River Basin Planning for Capital Budgeting Decisions,
W75-10223 6A

WHITEHEAD, R. L.
Geothermal Investigations in Idaho: Part 3, an Evaluation of Thermal Water in the Weiser Area, Idaho,
W75-10147 4B

WHITESIDE, J. O.
An Unusual Brown Rot Outbreak in a Florida Citrus Grove Following Sprinkler Irrigation With Phytophthora-Infested Water,
W75-10245 3F

WILKINS, B.
A Study of Beach Ground-Water Hydrology and Chemistry,
W75-10077 2F

WILLETTS, D. G.
Applications of Toxicity Testing to Sewage-Treatment Processes,
W75-10244 5D

WILLIAMS, D. C. JR.
The Economic Impact of a Small Recreation-Oriented Reservoir,
W75-09857 6B

WILLIAMS, W. S.
The Public Trust Doctrine and The California Coastline,
W75-10305 6E

WILLIAMSON, R. E.
Effect of Water Table Depth on Yield of Cabbage, Squash and Tendergreen,
W75-09918 3F

WILLIS, C. E.
Applications of Integer and Quadratic Programming to Floodplain Land Use Management,
W75-10008 6F

WILSON, A. W.
Characterization of Mixing in Aerated Lagoons,
W75-09913 5D

WOLF, K.
Fish Viruses: Buffers and Methods for Plaquing Eight Agents Under Normal Atmosphere,
W75-10257 5C

WOOD, G. W.
Faunal Response to Spray Irrigation of Chlorinated Sewage Effluent,
W75-09899 5D

WOODLEY, W. L.
The EML 1973 Florida Area Cumulus Experiment,
W75-09981 3B

WOODWARD, M. C.
The Position Stability of Large Water Drops Suspended in a Vertical Wind Tunnel,
W75-10053 2B

WOODWELL, G. M.
Experimental Eutrophication of Terrestrial and Aquatic Ecosystems. First Annual Report of the Upland Recharge Project,
W75-10097 5D

WRIGHT, D. E.
A New Infrared Instrument for Monitoring Oil Films on Water,
W75-10044 5A

WRIGHT, H. E. JR.
The Geochemical and Biostratigraphic Record of Natural and Pollutional Eutrophication of Minnesota Lakes,
W75-10010 5C

WRIGHT, J. A.
A New Infrared Instrument for Monitoring Oil Films on Water,
W75-10044 5A

WU, C. K.
Electrolytic Decomposition of Water,
W75-09881 3E

YAMAZAKI, K.
Research on Pollution with Polychlorinated Biphenyls and Polychlorinated Terphenyls in Sewage Plants, (In Japanese),
W75-10271 5D

YASTREBOV, A. L.
Engineering Utility and Sewage Lines in Permafrost Soil,
W75-10192 5D

YORKE, T. H.
Effects of Sediment Control on Sediment Transport in the Northwest Branch Anacostia River Basin, Montgomery County, Maryland,
W75-10141 2J

YOUNG, H. W.
Geothermal Investigations in Idaho: Part 3, an Evaluation of Thermal Water in the Weiser Area, Idaho,
W75-10147 4B

YOUNG, R. A.
Tertiary Treatment: Advanced Wastewater Techniques,
W75-09933 5D

ZACHWIEJA, J.
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. I. Physical and Chemical Conditions in Lake Water,
W75-10094 5C

ZAITCHENKO, N. M.
Research into Hail-Forming Processes and the Results of Anti-Hail Protection Measures in Moldavia,
W75-09968 2B

ZATSEPINA, L. P.
Convective Cloud Modification to Reduce Thunderstorm Activity,
W75-09975 3B

ZIMIN, B. I.
Convective Cloud Modification to Reduce Thunderstorm Activity,
W75-09975 3B

ZOLOTAREV, I. A.
Problems of Radiation Fog Prevention,
W75-09948 3B

ZOVNE, J. J.
Predicting Evapotranspiration from Agricultural Watersheds Under Dry Conditions,
W75-09860 2D

# ORGANIZATIONAL INDEX


HUS UNIV. (DENMARK). LAB. OF LOGY.
composition Working Group,
75-10109 2L

OR, INC., CAMBRIDGE, MASS. WALDEN EARCH DIV.
embrane Processing in the Metal Finishing dustry,
75-09936 5D

DEMY OF NATURAL SCIENCES OF ADELPHIA, PA. DEPT. OF LIMNOLOGY.
e of Algae, Especially Diatoms, in the Assment of Water Quality,
75-10112 5A

PTRONICS, INC., MCLEAN, VA.
recasting Watershed Pollution Using a odel,
75-10249 5A

ICULTURAL RESEARCH AND CATIONAL CENTER, LAKE ALFRED,
Unusual Brown Rot Outbreak in a Florida trus Grove Following Sprinkler Irrigation ith Phytophthora-Infested Water,
75-10245 3F

ICULTURAL RESEARCH SERVICE, EIGH, N.C.
ffect of Water Table Depth on Yield of abbage, Squash and Tendergreen,
75-09918 3F

FORCE CAMBRIDGE RESEARCH LABS., SCOM AFB, MASS.
esign of a Modern Thermal Fog Dissipation ystem for Airports,
75-09947 3B

PRODUCTS AND CHEMICALS, INC., ENTOWN, PA.
eterministic Model of Dynamic Eutrophic stuary,
75-10215 5B

ADEMIYA NAUK GRUZINSKOI SSR, LIS. INSTITUT GEOFIZIKI.
adar Characteristics of Cumulonimbus Clouds uring Their Natural Development and Artifial Seeding,
75-09996 2B

ADEMIYA NAUK SSSR, MOSCOW. TITUT FIZICHESKOI KHIMII.
roblems of Radiation Fog Prevention,
75-09948 3B

ABAMA DEVELOPMENT OFFICE, NTGOMERY.
labama's Water Resources Policy.
75-10310 5G

ASKA UNIV., COLLEGE. INST. OF MARINE ENCE.
ceanography,
75-10111 2L

BERTA UNIV., EDMONTON. DEPT. OF TANY.
hanges in the Submerged Macrophyte Comunities of Lake Wabamum as a Result of hermal Discharges,
75-10074 5C

BERTA UNIV., EDMONTON. DEPT. OF CTRICAL ENGINEERING.
ptimal Control of Water Pollution in a River tream,
75-10206 5G

ALBERTA UNIV., EDMONTON. DEPT. OF ZOOLOGY.
Preliminary Results of a Study Concerning the Effects of Thermal Pollution on Phytoplanktonic Primary Production in Lake Wabamun, Alberta,
W75-10073 5C

AMAKUSA MARINE BIOLOGICAL LAB., TOMIOKA (JAPAN).
Consumer Ecology Working Group,
W75-10110 2L

AMERICAN FALLS INTERNATIONAL BOARD, BUFFALO, N.Y.
Preservation and Enhancement of the American Falls at Niagara.
W75-10290 6E

AMERICAN SOCIETY OF CIVIL ENGINEERS, NEW YORK. TASK COMMITTEE ON UNDERGROUND LIQUID WASTE DISPOSAL.
Underground Liquid Waste Disposal.
W75-09938 5E

ARIZONA UNIV., TUCSON. BUREAU OF BUSINESS RESEARCH.
Effect of Wind Waves and Wind Tides on the Optimum Control of Large Lakes,
W75-10204 4A

ARKANSAS-WHITE-RED BASINS INTER-AGENCY COMMITTEE, WICHITA, KANS.
Minutes of the 89th Meeting, (Arkansas-Red-White River Basins Inter-Agency Committee).
W75-10300 4A

ARMY ENGINEER DISTRICT, SACRAMENTO, CALIF.
Plan Formulation and Evaluation Studies--Recreation. Vol I of V. Evaluation of Recreation Use Surveys Procedures,
W75-10342 6B

Plan Formulation and Evaluation Studies--Recreation. Vol. III of V. A Preliminary Analysis of Day Use Recreation and Benefit Estimation Models for Selected Reservoirs,
W75-10343 6B

Plan Formulation and Evaluation Studies--Recreation. Vol. IV of V. Estimating Recreational Facility Requirements,
W75-10344 6B

Plan Formulation and Evaluation Studies--Recreation. Vol. V of V. A Generalized Recreation Day Use Planning Model,
W75-10345 6B

ARMY ENGINEER DISTRICT, SAN FRANCISCO, CALIF.
Warm Springs Dam and Lake Sonoma Project, Russian River Basin, Sonoma County, California, Part I (Final Environmental Impact Statement).
W75-10298 8A

Warm Springs Dam and Lake Sonoma Project, Russian River Basin, Sonoma County, California. Part II (Final Environmental Impact Statement).
W75-10299 8A

ARMY ENGINEER DISTRICT, SAVANNAH, GA.
Tybee Island Georgia, Beach Erosion Control Project (Final Environmental Impact Statement).
W75-10294 4D

ARMY ENGINEER DISTRICT, TULSA, OKLA.
Big Hill Lake Creek, Kansas (Final Environmental Impact Statement).
W75-10293 8D

Clayton Lake, Jack Fork Creek, Oklahoma (Final Environmental Impact Statement).
W75-10297 8A

ARMY ENGINEERING DISTRICT, BALTIMORE, MD.
Tred Avon River, Talbot County, Maryland (Final Environmental Impact Statement).
W75-10295 4A

ATLANTIC RICHFIELD HANFORD CO., RICHLAND, WASH.
Review of Literature Pertinent to the Aqueous Conversion of Radionuclides to Insoluble Silicates with Selected References and Bibliography (Revised),
W75-09892 5D

AUBURN UNIV., ALA. DEPT. OF CIVIL ENGINEERING.
Treatability of Textile-Domestic Waste Mixtures,
W75-09859 5D

AUBURN UNIV., ALA. WATER RESOURCES RESEARCH INST.
Tenth Annual Report, Fiscal Year 1974,
W75-10339 9D

AUCKLAND UNIV. (NEW ZEALAND). DEPT. OF PHYSICS.
The Position Stability of Large Water Drops Suspended in a Vertical Wind Tunnel,
W75-10053 2B

BAKER HYDRO, INC., IRVINE, CALIF. (ASSIGNEE)
Wave Quenching Device,
W75-09871 4A

BATTELLE-PACIFIC NORTHWEST LABS., RICHLAND, WASH.
Geographical Analysis of Oil Spill Potential Associated with Alaskan Oil Production and Transportation Systems,
W75-10121 5G

BEDFORD INST., DARTMOUTH (NOVA SCOTIA).
Estimates of Oil in Aquatic Sediments by Fluorescence Spectroscopy,
W75-10235 5A

BEDFORD INST., DARTMOUTH (NOVA SCOTIA). MARINE ECOLOGY LAB.
Estimates Using Fluorescence Spectroscopy of the Present State of Petroleum Hydrocarbon Contamination in the Water Column of the Northwest Atlantic Ocean,
W75-10233 5A

BIOSPHERICS, INC., ROCKVILLE, MD.
Operation of Full-Scale Biological Phosphorus Removal Plant,
W75-10194 5D

BIOTEKNIKA INTERNATIONAL INC., ALEXANDRIA, VA. (ASSIGNEE).
Microbial Degradation of Petroleum,
W75-09862 5G

BOYLE ENGINEERING, SANTA ANA, CALIF.
Computerized Sewer Design: New Tool for an Old Problem,
W75-10253 5D

**BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF CIVIL ENGINEERING.**
Dynamic Leaching Studies on Pulpwood Bark Residues,
W75-10214 5D

**BROOKHAVEN NATIONAL LAB., UPTON, N.Y.**
Experimental Eutrophication of Terrestrial and Aquatic Ecosystems. First Annual Report of the Upland Recharge Project,
W75-10097 5D

**BULGARIAN ACADEMY OF SCIENCES, SOFIA. INST. OF GEOPHYSICS.**
Review of Recent Work on Hail Suppression in Bulgaria,
W75-09971 3B

**BULGARIAN HYDROMETEOROLOGICAL SERVICE, SOFIA.**
On the Thermodynamic Criteria for the Intensity of Convective Cloud Development,
W75-09989 2B

**BUREAU OF LAND MANAGEMENT, WASHINGTON, D.C.**
Proposed 1973 Outer Continental Shelf Oil and Gas General Lease-Sale, Offshore Mississippi, Alabama, and Florida, Volume 3. Alternatives to the Proposed Action (Final Environmental Impact Statement).
W75-10291 5G

**BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS, CANBERRA (AUSTRALIA).**
Arsenic in Sediments on the Continental Shelf of Southeast Australia,
W75-10177 5B

**BUREAU OF RECLAMATION, BILLINGS, MONT. UPPER MISSOURI REGION.**
Initial Stage, Garrison Diversion Unit, Pick-Sloan Missouri Basin Program, North Dakota (Final Environmental Impact Statement).
W75-10296 8A

**BUREAU OF RECLAMATION, DENVER COLO.**
Colorado River-Flow Management,
W75-10208 4A

**BUREAU OF RECLAMATION, DENVER, COLO. ENGINEERING AND RESEARCH CENTER.**
Safety of Dams--Bureau of Reclamation,
W75-10221 8A

**BUREAU OF RECLAMATION, SACRAMENTO, CALIF. APPLICATIONS BRANCH.**
Transient Control in Lower Sacramento River,
W75-10219 4A

**BUREAU OF RECLAMATION, WASHINGTON, D.C.**
Authorized Bonneville Unit, Central Utah Project, Utah (Final Environmental Impact Statement).
W75-10292 8A

Authorized Bonneville Unit, Central Utah Project, Utah Appendix A (Final Environmental Impact Statement).
W75-10331 8A

**BUREAU OF SPORT FISHERIES AND WILDLIFE, KEARNEYSVILLE, W. VA. EASTERN FISH DISEASE LAB.**
Fish Viruses: Buffers and Methods for Plaquing Eight Agents Under Normal Atmosphere,
W75-10257 5C

**CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO.**
Evaluation of Ground Water Resources: Livermore and Sunol Valleys,
W75-10063 2F

**CALIFORNIA STATE UNIV., LOS ANGELES. DEPT. OF BIOLOGY.**
Effects of Fire on the Plants and Animals of a Florida Wetland,
W75-10181 6G

**CALIFORNIA UNIV., BERKELEY. COLL. OF NATURAL RESOURCES.**
Wasting a River,
W75-10116 6B

**CALIFORNIA UNIV., BERKELEY. STATISTICAL LAB.**
Rain Stimulation Experiments: Design and Evaluation,
W75-09994 7C

**CALIFORNIA UNIV., DAVIS. DEPT. OF AGRICULTURAL ECONOMICS.**
Sprinkling Cattle for Relief from Heat Stress,
W75-10082 3F

**CALIFORNIA UNIV., DAVIS. DEPT. OF ANIMAL PHYSIOLOGY.**
Effects of Introduced Bullfrogs, Rana Catesbeiana, on the Native Frogs of the San Joaquin Valley, California,
W75-10114 2I

**CALIFORNIA UNIV., DAVIS. DEPT. OF CHEMICAL ENGINEERING.**
An Investigation of the Predictive Ability of Several Evaporation Equations,
W75-10051 2D

**CALIFORNIA UNIV., DAVIS. DEPT. OF MECHANICAL ENGINEERING.**
Monitoring: An Environmental State Estimation Problem,
W75-10255 5A

**CALIFORNIA UNIV., LOS ANGELES. SCHOOL OF PUBLIC HEALTH.**
Irrigation Efficiencies in Producing Calories and Proteins: An Annotated Bibliography,
W75-10076 3F

**CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).**
Comparison of Autoclave and Ethylene Oxide-Sterilized Membrane Filters Used in Water Quality Studies,
W75-10048 5A

**CAPITAL CONTROLS CO., INC., COLMAR.**
Water Chlorination Methods,
W75-09910 5F

**CENTRAL AEROLOGICAL OBSERVATORY, MOSCOW (USSR).**
Some Data About the Mechanism of the Artificial Dissipation of Supercooled Fog,
W75-09949 3B

Research into Hail-Forming Processes and the Results of Anti-Hail Protection Measures in Moldavia,
W75-09968 2B

Convective Cloud Modification to Reduce Thunderstorm Activity,
W75-09975 3B

Technical Devices for the Artificial Modification of Cloud and Fog,
W75-09982 3B

**CENTRAL AND SOUTHERN FLORIDA FLO CONTROL DISTRICT, WEST PALM BEAC**
Rules of Central and Southern Flood Co District, Chapter 16CA, with Commentary
W75-10307

**CENTRAL PUBLIC HEALTH ENGINEERIN RESEARCH INST., NAGPUR (INDIA). DIV. MICROBIOLOGY.**
Elevated Temperature Technique for Enu tion of Salmonellae in Sewage,
W75-10045

**CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, GRENOBLE (FRANCE). LABORATOIRE DE GLACIOLOGIE.**
Natural 'Hailcores' and Their Abilities to mate the Efficiency of Hail Preve Systems,
W75-09966

**CENTRE NATIONAL DE LA RECHERECH SCIENTIFIGUE, BELLEVUE (FRANCE). LABORATOIRE DE METEOROLOGIE DYNAMIGUE.**
Preparation and Properties of 'Pure' Iodide Aerosol,
W75-09998

**CH2M/HILL, DENVER, COLO.**
Recycle Sludge to Feed Farms,
W75-10282

**CHEM-PRO EQUIPMENT CORP., FAIRFI N.J.**
Design for Solvent Recovery,
W75-10239

**CHEMVIRON S.A., BRUSSELS (BELGIUM TECHNICAL DEPT.**
Hire an Activated Carbon Plant for Water Treatment,
W75-10346

**CHEVRON RESEARCH CO., SAN FRANCI CALIF. (ASSIGNEE).**
Geothermal Brine Energy to Generate Po
W75-09863

**CHIBA UNIV. (JAPAN). RESEARCH INST. CHEMOBIODYNAMICS.**
Biodegradation of Linear Alkylate Sulf in River Model (In Japanese),
W75-10247

**CHICAGO UNIV., ILL. CLOUD PHYSICS**
The Effect of Repeated Activation on D tional Ice Nuclei,
W75-10056

**CINCINNATI UNIV., OHIO.**
The Infrared Studies of Santa Barbara C Oil Spill,
W75-10237

**CITY COLL., NEW YORK. DEPT. OF BIOLOGY.**
Educing and Modeling the Functional Re ships Within Sublittoral Salt Marsh Au Communities - Inside One of the Black B
W75-10104

**CLEMSON UNIV., S.C. DEPT. OF AGRICULTURAL ENGINEERING.**
Laboratory Simulation of Swine Lagoons,
W75-10137

A Model of One-Dimensional Percolati Water Table Using a Computer Simu Language,
W75-10138

(EMSON UNIV., S.C. DEPT. OF CIVIL IGINEERING.
Utilization of Aerial Photographs for Measuring Land Use Changes in Watersheds,
W75-10136 4C

(EMSON UNIV., S.C. DEPT. OF ONOMICS.
Economic Institutions to Determine Water Quality,
W75-10132 5G

(EMSON UNIV., S.C. DEPT. OF ECTRICAL AND COMPUTER IGINEERING.
A Computer Simulation Analysis of Surface Water Quality Management Policies Under Dynamic Economic and Hydrologic Conditions,
W75-10124 5D

(EMSON UNIV., S.C. DEPT. OF VIRONMENTAL SYSTEMS ENGINEERING.
Color Measurement Methods for Surface Water Receiving Colored Wastes,
W75-10135 5A

(EMSON UNIV., S.C. DEPT. OF CROBIOLOGY.
The Effects of Selected Herbicides on Bacterial Populations in an Aquatic Environment,
W75-10133 5C

AST GUARD, WASHINGTON, D.C.
Marine Sanitation Devices--Proposed Certification Procedures and Design and Construction Requirements.
W75-10324 5G

LD REGIONS RESEARCH AND GINEERING LAB., HANOVER, N.H.
Cloud Glaciation by Liquified Propane Spray,
W75-10002 3B

LORADO STATE UNIV., FORT COLLINS.
Feasibility of Meso- and Synoptic-Scale Weather Modification from Carbon Particle Seeding,
W75-09957 3B

An Evaluation of Extended Area Effects from Attempts to Modify Local Clouds and Cloud Systems,
W75-09993 3B

LORADO STATE UNIV., FORT COLLINS. PT. OF AGRICULTURAL ENGINEERING.
Routine Surveillance Alternatives for Water Quality Management,
W75-10250 5A

LORADO STATE UNIV., FORT COLLINS. PT. OF CIVIL ENGINEERING.
Research Needs as Related to the Development of Sediment Standards in Rivers,
W75-10013 5G

LORADO STATE UNIV., FORT COLLINS. PT. OF RECREATION RESOURCES.
Feasibility and Potential of Enhancing Water Recreation Opportunities on High Country Reservoirs-Phase I,
W75-09894 6B

LORADO UNIV., BOULDER. INST. OF CTIC AND ALPINE RESEARCH.
Evaluation of an ERTS-1 Data Collection Platform Installed in the Alpine Tundra, Colorado,
W75-10055 7B

COLUMBIA UNIV., N.Y. SCHOOL OF LAW.
The Forging of the Union Reconsidered: A Historical Refutation of State Sovereignty Over Seabeds,
W75-09888 6E

COMBUSTION ENGINEERING, INC., WINDSOR, CONN. (ASSIGNEE)
Making Active Carbon from Sewage Sludge,
W75-09875 5D

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, EPPING (AUSTRALIA). DIV. OF CLOUD PHYSICS.
Rain Enhancement - A Review,
W75-09950 3B

CONNECTICUT UNIV., STORRS. DEPT. OF CIVIL ENGINEERING.
Problems with Effluent Seepage Fields,
W75-10274 5D

CORNELL UNIV., ITHACA, N.Y.
Microbiology and Water Quality in a Tributary of Cayuga Lake,
W75-09896 5C

Microbial Degradation of DDT,
W75-10091 5C

Planning and Operation of Urban Water Quality Management Systems,
W75-10262 5G

CORNELL UNIV., ITHACA, N.Y., WATER RESOURCES AND MARINE SCIENCES CENTER.
Water Resources Development and Wilderness Values: A Study of the Upper Hudson River,
W75-09898 6B

DELAWARE UNIV., NEWARK. DEPT. OF CHEMICAL ENGINEERING.
Mass Transfer to Naturally Flowing Streams,
W75-10341 5D

DENVER RESEARCH INST., COLO.
Ice Nuclei Generator Technology,
W75-10001 3B

DEPARTMENT OF THE ENVIRONMENT, HALIFAX, (NOVA SCOTIA). FISHERIES SERVICE.
Marking Alewife Fry with Biological Stains,
W75-10029 8I

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WASTE WATER TECHNOLOGY CENTRE.
Bibliography on the Application of Reverse Osmosis to Industrial and Municipal Wastewaters,
W75-09925 5D

DEPARTMENT OF WATER AFFAIRS, PRETORIA (SOUTH AFRICA).
Statistical Analysis of Operational Performance of Some Package Plants,
W75-10256 5D

DESALINATION SYSTEMS, INC., ESCONDIDO, CALIF. (ASSIGNEE)
Reverse Osmosis System with Automatic Valve for Module Operation Control,
W75-09877 3A

DOW CHEMICAL CO., MIDLAND, MICH. (ASSIGNEE)
Disposal of Waste Streams Containing Asbestos,
W75-09876 5E

DRAVO CORP., PITTSBURGH, PA.
Advances in Ammonia and Nitrate Removal,
W75-09911 5D

DU PONT DE NEMOURS (E.I.) AND CO., AIKEN, S.C. SAVANNAH RIVER LAB.
Radioactivity from SRP Operations in a Downstream Savannah River Swamp,
W75-09901 5B

DUKE UNIV., DURHAM, N.C. DEPT. OF BOTANY.
North Carolina Marine Algae. III. A Community of Ceramiales (Rhodophyta) on a Glass Sponge From 60 meters,
W75-10087 5C

ECOLE NATIONALE SUPERIEURE AGRONOMIQUE DE GRIGNON (FRANCE). LABORATOIRE DE RECHERCHES DE LA CHAIRE DE MICROBIOLOGIE.
Evolution of Microflora During Purification Treatment of Urban Water by Activated Sludge (Evolution de la Microflore au Cours D'un Traitement D'Epuration D'eaux Urbaines Par Boues Activees),
W75-10227 5D

ECONOMIC DEVELOPMENT CORP., NEWFANE, VT. (ASSIGNEE)
Process for Treating Water,
W75-09874 5D

ECONOMIC RESEARCH SERVICE, WASHINGTON, D.C.
The Benefit-Cost Ratio in Resource Development Planning,
W75-10117 6B

EDINBURGH UNIV. (SCOTLAND). DEPT. OF MECHANICAL ENGINEERING.
Valve Stroking in Separated Pipe Flow,
W75-10210 8B

EMPRESA DE AQUEDUCTO Y ALCANTARILLADO, BOGOTA (COLOMBIA).
Total Approach for the Bogota, Columbia, Water Supply,
W75-10203 3D

ENVIRONMENTAL HEALTH LAB., KELLY AFB, TEX.
Water Pollution Study of Malabeam Lake, Greenlaw Brook and Adjacent Streams on Loring AFB, Maine,
W75-10113 5C

ENVIRONMENTAL PROTECTION AGENCY, ATHENS, GA. SOUTHEAST ENVIRONMENTAL RESEARCH LAB.
Determination of Molecular Hydrogen Sulfide,
W75-10025 5A

ENVIRONMENTAL PROTECTION AGENCY, CHICAGO, ILL. ENFORCEMENT DIV.
Federal Viewpoint (Permit Issuance--Administrative and Judicial Review--Observations and Problems),
W75-10302 5G

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.
Measures for the Restoration and Enhancement of Quality of Freshwater Lakes.
W75-10122 5C

Application of NEPA to EPA's Environmental Regulatory Actvities.
W75-10288 6G

Summaries of Foreign Government Environmental Reports.
W75-10289 6G

**ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.**

Steam Electric Power Generating Point Source Category--Proposed Effluent Guidelines and Standards for Incompatible Pollutants.
W75-10323 5G

Canned and Preserved Fruits and Vegetables Processing Point Source Category--Effluent Guidelines and Standards.
W75-10325 5G

Liquid and Crystalline Cane Sugar Refining Subcategory--Effluent Limitations Guidelines and Proposed Pretreatment Standards.
W75-10326 5G

Inorganic Chemicals Manufacturing Point Source Category.
W75-10327 5G

Electroplating Point Source Category; Copper, Nickel, Chromium and Zinc on Ferrous and Nonferrous Materials Subcategory.
W75-10328 5G

Thermal Discharges--Proposed Procedures for the Imposition of Alternative Effluent Limitations.
W75-10329 5G

Asbestos Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-10330 5G

Ferroalloy Manufacturing Point Source Category.
W75-10332 5G

Feedlots Point Source Category--Effluent Guidelines and Standards.
W75-10333 5G

Glass Manufacturing Point Source Categories--Effluent Guidelines and Standards.
W75-10334 5G

Thermal Discharges.
W75-10335 5G

Builders Paper and Board Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-10336 5G

Steam Electric Power Generating Point Source Category--Effluent Guidelines and Standards.
W75-10337 5G

**ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF SOLID WASTE MANAGEMENT PROGRAMS.**

Dumps: A Potential Threat to Our Groundwater Supplies,
W75-10184 5B

**ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. TECHNOLOGY TRANSFER STAFF.**

Upgrading Existing Wastewater Treatment Plants--Case Histories.
W75-10347 5D

**ENVIRONMENTAL PROTECTION AGENCY, WEST KINGSTON, R. I. NORTHEAST WATER SUPPLY RESEARCH LAB.**

Quantitative Large-Volume Sampling Technique,
W75-10031 5A

**ENVIRONMENTAL PROTECTION SERVICE, OTTAWA (ONTARIO). WATER POLLUTION CONTROL DIRECTORATE.**

Review of the Canadian Metal Finishing Industry: Consumption of Raw Materials and Options for Water Pollution Control.
W75-09926 5D

**ENVIROTECH CORP., MENLO PARK, CALIF.**

Think Thermal,
W75-10284 5E

**ESTABLISSEMENT D'ETUDES ET DE RECHERCHES METEOROLOGIQUES, PARIS (FRANCE).**

Fog Dispersal - Physical and Technological Aspects,
W75-09945 3B

**EVERGLADES NATIONAL PARK, HOMESTEAD, FLA. DIV. OF NATURAL SCIENCE AND RESOURCE MANAGEMENT STUDIES.**

Pesticides, Polychlorinated Biphenols and Heavy Metals in Upper Food Chain Levels, Everglades National Park and Vicinity,
W75-10080 5C

**EXXON RESEARCH AND ENGINEERING CO., LINDEN, N.J.**

Separation of Phenol from Waste Water by the Liquid Membrane Technique,
W75-10273 5D

**FISH AND WILDLIFE SERVICE, YANKTON, SOUTH DAKOTA, NORTH CENTRAL RESERVOIR INVESTIGATIONS.**

Studies to Determine Methods for Culturing Three Freshwater Zooplankton Species,
W75-10027 5A

**FISHERIES RESEARCH BOARD OF CANADA, WINNIPEG (MANITOBA). FRESHWATER INST.**

The Eutrophication of Lakes in the Okanagan Valley, British Columbia,
W75-10075 5C

**FLORIDA DEPT. OF NATURAL RESOURCES, ST. PETERSBURG. MARINE RESEARCH LAB.**

Fauna and Flora in Hydraulic Clam Dredge Collections from Florida West and Southeast Coasts,
W75-10079 5C

**FLORIDA STATE UNIV., TALLAHASSEE. DEPT. OF METEOROLOGY.**

Theoretical Probabilities of Predicted Occurrences and Amounts of Precipitation,
W75-10050 2B

**FLORIDA UNIV., GAINESVILLE. INST. OF FOOD AND AGRICULTURAL SCIENCES.**

Activities, Characteristics, and Opinions of Lakefront Residents: Kissimmee River Basin, Florida,
W75-10129 6B

**FMC CORP., NEW YORK. (ASSIGNEE).**

Treatment of Aqueous Waste Streams with Hydrogen Peroxide to Remove Chlorinated Isocyanurates Therefrom,
W75-09939 5D

**FORD MOTOR CO., DEARBORN, MICH. SCIENTIFIC RESEARCH STAFF.**

Factors Influencing Reverse Osmosis Rejection of Inorganic Solutes from Aqueous Solution,
W75-09937 5D

**FRANKLIN INST. RESEARCH LABS., PHILADELPHIA, PA. SCIENCE INFORMATION SERVICES DEPT.**

Ozone Chemistry and Technology-A Review the Literature: 1961-1974,
W75-10348

**FUJI PHOTO FILM CO., LTD., KANAGAWA (JAPAN). (ASSIGNEE)**

Process for Treating Waste Photograph Processing Solutions,
W75-09940

**GENERAL SIGNAL CORP., WEST WARWIC R.I.**

New Flowmeter Passes Tests,
W75-10190

**GEOLOGICAL SURVEY, ANCHORAGE, ALASKA.**

The Effect of a Fuel Oil Spill on Benthic In tebrates and Water Quality on the Alaskan tic Slope, Happy Valley Creek Near Sag Alaska,
W75-10140

**GEOLOGICAL SURVEY, AUGUSTA, MAIN**

A Technique for Estimating the Magnitude Frequency of Floods in Maine,
W75-10155

**GEOLOGICAL SURVEY, AUSTIN, TEX.**

Hydrologic Data for Urban Studies in the las, Texas Metropolitan Area, 1973,
W75-10148

Hydrologic Data for North Creek, Trinity Basin, Texas, 1973,
W75-10149

Hydrologic Data for Mountain Creek, Tr River Basin, Texas, 1973,
W75-10150

Hydrologic Data for Urban Studies in Austin, Texas Metropolitan Area, 1973,
W75-10151

Chemical and Physical Characteristics of in Esturies of Texas, October 1970-Septe 1971,
W75-10153

**GEOLOGICAL SURVEY, BOISE, IDAHO.**

Geothermal Investigations in Idaho: Part Evaluation of Thermal Water in the Area, Idaho,
W75-10147

**GEOLOGICAL SURVEY, COLLEGE PARK MD.**

Effects of Sediment Control on Sed Transport in the Northwest Branch Ana River Basin, Montgomery County, Maryl
W75-10141

**GEOLOGICAL SURVEY, DENVER, COLO**

A Model for Earthquakes Near Pal Reservoir, Southeast Idaho,
W75-10139

Ground Water,
W75-10143

Reservoir Release Routing Model f Upper Arkansas River Basin of Colorado
W75-10165

**GEOLOGICAL SURVEY, IOWA CITY, IO**

Discharge Measurements at Low-Flow Record Stations in Iowa,.
W75-10144

)LOGICAL SURVEY, LAWRENCE, KANS.
'ater Development for Irrigation in orthwestern Kansas,
'75-10152 4B

)LOGICAL SURVEY, MADISON, WIS.
'ow-Flow Characteristics of Wisconsin treams at Sewage-Treatment Plants,
'75-10163 5B

)LOGICAL SURVEY, MENLO PARK, LIF.
'round-Water Hydrology of Garner Valley, an Jacinto Mountains, California--A Mathe- atical Analysis of Recharge and Discharge,
'75-10158 2F

'ydrologic Evaluation of the Haystack Butte rea with Emphasis on Possible Discharge of lass-I Wastes, Edwards Air Force Base, alifornia,
'75-10161 5B

'stimate of Sediment Discharges, Santa Ana iver at Santa Ana and Santa Maria River at uadalupe, California,
'75-10162 2J

)LOGICAL SURVEY, RALEIGH, N.C.
'valuation of Reservoir Sites in North arolina--Regional Relations for Estimating the eservoir Capacity Needed for a Dependable 'ater Supply,
'75-10159 4A

)LOGICAL SURVEY, RESTON, VA.
etroleum Pollutants in Surface and Ground- ater as Indicated by the Carbon-14 Activity of issolved Organic Carbon,
'75-10035 5A

arbon-14 Ages of Water From the Arkansas ot Springs,
'75-10145 2K

he National Stream Quality Accounting Net- ork (NASQAN)--Some Questions and An- wers,
'75-10168 5A

)LOGICAL SURVEY, SALT LAKE CITY, AH.
'stimating Mean Streamflow in the Duchesne iver Basin, Utah,
'75-10166 2E

'ydrologic Reconnaissance of the Wah Wah alley Drainage Basin, Millard and Beaver ounties, Utah,
'75-10167 4B

)LOGICAL SURVEY, SAN ANTONIO, TEX.
'round-water Discharge from the Edwards and ssociated Limestones, San Antonio Area, exas, 1974,
'75-10146 2F

)LOGICAL SURVEY, ST. PAUL, MINN.
njection-Pipe System for Artificial Recharge,
'75-10142 4B

)LOGICAL SURVEY, TACOMA, WASH.
ecent Sedimentary History of Lake Monona, 'isconsin,
'75-10089 5C

'umerical Model of the Salt-Wedge Reach of ie Duwamish River Estuary, King County, 'ashington,
'75-10157 5B

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.
Effects of Lowering Interior Canal Stages on Salt-Water Intrusion into the Shallow Aquifer in Southeast Palm Beach County, Florida,
W75-10156 4B

Distribution of Nitrogen and Phosphorous in the Conservation Areas in South Florida from July 1972 to June 1973,
W75-10160 5B

GEOLOGICAL SURVEY, WASHINGTON, D.C.
Procedure for Evaluating Environmental Impact,
W75-10164 6G

GEORGIA UNIV., ATHENS.
A Mathematical Programming Approach to Public Water Project. Portfolio Selection,
W75-10131 6B

GEORGIA UNIV., ATHENS. DEPT. OF FOOD SCIENCE.
Aqueous Odor Thresholds of Organic Pollutants in Industrial Effluents,
W75-10026 5A

GEORGIA UNIV., ATHENS. DEPT. OF POLITICAL SCIENCE.
Georgia County Commissioner Attitudes Toward Water Problems,
W75-09855 6E

GERAGHTY AND MILLER, PORT WASHINGTON, N.Y.
Ground Water Pollution Problems in the Northwestern United States,
W75-10023 5B

GIDROMETEOROLOGICHESKII INSTITUT, LENINGRAD (USSR).
Simulation of the Natural Process of Hail Formation and Its Transformation Under the Influence of Artificial Crystallizaton,
W75-09970 2B

GIDROMETEOROLOGICHESKII INSTITUT, LENINGRAD (USSR). HIGH-ALTITUDE GEOPHYSICS INST.
Hail Process Investigation and Hail Suppression Activities in the U.S.S.R.,
W75-09965 3B

Anti-Hail Rockets and Shells,
W75-09984 3B

Radar Methods and Equipment for Hail Supression,
W75-09985 3B

GIDROMETEOROLOGICHESKII NAUCHNO-ISSLEDOVATELSKII TSENTR, LENINGRAD (USSR).
Theoretical Research into Artificial Stimulation of Precipitation for Fighting Forest Fires,
W75-09956 2B

Results of Experimental and Operational Work on Combating Forest Fires,
W75-09974 3B

GLAUS, PYLE, SCHOMER, BURNS AND DEHAVEN, AKRON, OHIO.
New Separator May Spur Interest in Sedimentation,
W75-10226 5D

GULF WASTE DISPOSAL AUTHORITY, HOUSTON, TEX.
A Concept for Managing Waste,
W75-10236 5D

HAILE SELLASSIE I UNIV., ADDIS ABABA (ETHIOPIA). DEPT. OF CIVIL ENGINEERING.
Transformation of Moody Diagram,
W75-10216 8B

HAMPSHIRE COLL. AMHERST, MASS. DEPT. OF POLITICAL SCIENCE.
Obstacles to Taming Corporate Polluters: Water Pollution Politics in Gary, Indiana,
W75-10287 5G

HAWAII UNIV., HONOLULU. COLL. OF BUSINESS ADMINISTRATION.
Desalting Plants Inventory, Report No. 5,
W75-09852 3A

HEBREW UNIV., JERUSALEM (ISRAEL). DEPT. OF ATMOSPHERIC SCIENCES.
The Role of Solid Precipitation Elements in Natural and Artificial Production of Rain in Israel,
W75-09958 3B

HOPE COLL., HOLLAND, MICH. DEPT. OF CHEMISTRY.
Fluxes, Residence Times, and Sources of Some Elements to Lake Michigan,
W75-10090 5C

HOUSE, WASHINGTON, D.C.
Legislative History of the Safe Drinking Water Act,
W75-10186 5G

HYDROMATION FILTER CO., LIVONIA, MICH. (ASSIGNEE)
Liquid Filter Apparatus,
W75-10230 5D

IBM FEDERAL SYSTEMS DIV., GAITHERSBURG, MD.
A General Linear Approach to Stream Water Quality Modeling,
W75-09917 5B

IDAHO STATE UNIV., POCATELLO. COLL. OF BUSINESS.
A Sensitivity Analysis of Simulated River Basin Planning for Capital Budgeting Decisions,
W75-10223 6A

IDAHO UNIV., MOSCOW. DEPT. OF BIOLOGICAL SCIENCES.
DDT and PCB Levels in Lake Coeur D'Alene, Idaho, Osprey Eggs,
W75-09907 5A

ILLINOIS STATE WATER SURVEY, URBANA.
Economic Aspects of Precipitation Augmentation Over the Great Lakes,
W75-09992 6B

ILLINOIS STATE WATER SURVEY, URBANA. ATMOSPHERIC SCIENCES SECTION.
A Review of Methods to Evaluate Precipitation Modification in North America,
W75-09990 3B

ILLINOIS TOOL WORKS LTD., SLOUGH (ENGLAND). (ASSIGNEE)
Trickle Irrigation Emitter,
W75-09873 3F

ILLINOIS UNIV., URBANA. DEPT. OF CIVIL ENGINEERING.
Removal of Organic Matter by Activated Carbon Columns,
W75-10197 5D

INSTITUT PRIKLADNOI GEOFIZIKI, MOSCOW (USSR).
Dynamic Methods of Convective Cloud Modification by Means of Artificial Vertical Jets,
W75-09973 3B

INSTITUTE FOR POLICY ANALYSIS, LA JOLLA, CALIF.
Measuring External Effects of Solid Waste Management,
W75-10024 5B

INSTITUTE OF EXPERIMENTAL METEOROLOGY, OBNINSK (USSR).
The Possibility of Using Charged Bubbles in Cloud Modification,
W75-09979 2B

On Physical and Economic Effectiveness of Hail-Suppression Projects,
W75-09995 3B

INSTITUTE OF OCEANOGRAPHIC SCIENCES, TAUNTON (ENGLAND).
Hydrodynamic Levelling of an Off-Shore Tide Gauge,
W75-10060 8B

INSTITUTE OF TROPICAL METEOROLOGY, POONA (INDIA).
Ground-Based Cloud Seeding Experiment at Delhi During Winter,
W75-09961 3B

Summary of Observations Indicating Dynamic Effect on Salt Seeding in Warm Cumulus Clouds,
W75-10057 3B

INSTYTUT RYBACTWA SRODLADOWEGO, GIZYCKO (POLAND). LAKE FIELD STATION.
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. I. Physical and Chemical Conditions in Lake Water,
W75-10094 5C

INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA (AUSTRIA).
Beneficial Uses of Waste Heat,
W75-09889 5G

IOWA STATE UNIV., AMES.
On the Characteristics of Single-Cell Showers,
W75-09997 2B

IOWA STATE UNIV., AMES. DEPT. OF AGRONOMY.
Dew Duration in Central Iowa,
W75-10212 3F

JAPAN METEOROLOGICAL AGENCY, TOKYO. AEROLOGICAL OBSERVATORY.
On the Efficient Size and Concentration of Spray Drops for Stimulating Warm Clouds,
W75-09954 3B

JOHNS HOPKINS UNIV., BALTIMORE, MD.
Biodegradation of NTA Detergents in a Wastewater Treatment System,
W75-09920 5D

JOHNS HOPKINS UNIV., BALTIMORE, MD. CHESAPEAKE BAY INST.
Phosphorus Kinetics in the Euphotic Zone of the Chesapeake Bay,
W75-10101 5C

JOHNS HOPKINS UNIV., BALTIMORE, MD. MCCOLLUM-PRATT INST.
Measurements of Absolute Scalar Irradiance Spectra in Rhode River,
W75-10102 5C

Growth and Dissipation of Phytoplankton in Chesapeake Bay. III. Inorganic Carbon Requirements of Natural Populations and Laboratory Cultures of Phytoplankton,
W75-10103 5C

KANSAS STATE UNIV., MANHATTAN.
Research Status on Effects of Land Application of Animal Wastes,
W75-10022 5B

KANSAS STATE UNIV., MANHATTAN. DEPT. OF CIVIL ENGINEERING.
Predicting Evapotranspiration from Agricultural Watersheds Under Dry Conditions,
W75-09860 2D

KANSAS STATE UNIV., MANHATTAN EVAPOTRANSPIRATION LAB.
Effects of Irrigation and Row Spacing on Evapotranspiration and Microclimate of a Sorghum Field,
W75-09853 2D

KANSAS UNIV., LAWRENCE. DEPT. OF CIVIL ENGINEERING.
An Integrated System for Disposal of Sludges Originating from Water Softening and Sewage Treatment in Municipalities,
W75-10123 5D

Use of Lime-Soda Ash Softening Sludge for the Treatment of Municipal Wastewater,
W75-10125 5D

KANSAS WATER RESOURCES BOARD, TOPEKA.
Objectives of Water Quality Planning,
W75-10205 5G

KAPPE ASSOCIATES, INC., ROCKVILLE, MD. (ASSIGNEE).
Waste Water Treatment Plant with Balanced Load,
W75-09867 5D

KYOTO UNIV. (JAPAN). DEPT. OF APPLIED MATHEMATICS AND PHYSICS.
Identification Method in Environmental Systems and Its Application to Water Pollution,
W75-10266 5A

KYOTO UNIV. (JAPAN). DEPT. OF CHEMICAL ENGINEERING.
Effects of Deposit Resuspension on Settling Basin,
W75-10213 5F

LE NICKEL S.A., PARIS (FRANCE); AND CENTRE NATIONAL POUR L'EXPLOITATION DES OCEANS, PARIS (FRANCE). (ASSIGNEE).
Free-Grab Device for Collecting Underwater Samples,
W75-09866 7B

LEUPOLD AND STEVENS, INC., BEAVERTON, OREG.
Measurement of Small Discharges Through V-Notch Weirs,
W75-10059 8B

LILLICK, MCHOSE, WHEAT, ADAMS, AND CHARLES, LOS ANGELES, CALIF.
Marine Pollution--Legislation Litigation, Underwriting--Where Are We, Where Away,
W75-09887 5G

LONG AND ALDRIDGE, ATLANTA, GA.
Surface Waters and the Civil Law Rule,
W75-10304 6E

LOS ANGELES COUNTY SANITATION DISTRICT, WHITTIER, CALIF.
Submersible Pumps Make By-Pass Possible,
W75-10276

LOS ANGELES COUNTY SANITATION DISTRICT, WHITTIER, CALIF. SAN JOSE CREEK WATER QUALITY LAB.
The Determination of Benzidine in Wastewaters,
W75-10232

LOTHIANS RIVER PURIFICATION BOARD (SCOTLAND).
Design of Surface Water Outfalls to Rivers,
W75-10183

LOUISIANA STATE UNIV., BATON ROUGE. COASTAL STUDIES INST.
A Study of Beach Ground-Water Hydrology and Chemistry,
W75-10077

LYNDON B. JOHNSON SPACE CENTER. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, HOUSTON, TEX.
Equivalent Blackbody Temperature of the T of a Severe Storm,
W75-10054

MALCOLM PIRNIE, INC., PARAMUS, N.J.
Disposal of Waste Alum Sludge from W Treatment Plants,
W75-10195

MARYLAND UNIV., COLLEGE PARK. DEP OF CHEMISTRY.
Biochemical and Nutritional Interact Between the Oyster (Crassostera Virgi (Gmelin) and its Environment,
W75-10011

MARYLAND UNIV., COLLEGE PARK. DEP OF CIVIL ENGINEERING.
Hydrologic Impact of Planned Unit Deve ments,
W75-09919

MARYLAND UNIV., COLLEGE PARK. DEP OF MICROBIOLOGY.
Extraction of Petroleum Hydrocarbons f Oil-Contaminated Sediments,
W75-10241

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF CIVIL ENGINEERING.
Project Evaluation in Water Resources: Bu Constraints,
W75-09851

MASSACHUSETTS STATE GEOLOGY OFF BOSTON.
The Cape Cod Water Program, A Current ysis,
W75-10283

MASSACHUSETTS UNIV., AMHERST. DEI OF FOOD AND RESOURCE ECONOMICS.
Applications of Integer and Quadratic gramming to Floodplain Land Use Ma ment,
W75-10008

MASSACHUSETTS UNIV., AMHERST. DEI OF FORESTRY AND WILDLIFE MANAGEMENT.
Classification of Freshwater Wetlands i Glaciated Northeast,
W75-10128

AND BAKER LTD., DAGENHAM
LAND).
ect of Asulam in Wildlife Species: Acute
icity to Birds and Fish,
-09903 5C

LL UNIV., MONTREAL (QUEBEC).
OF CIVIL ENGINEERING AND
ED MECHANICS.
n Estimate Deficiencies in Water Quality
lies,
-10202 5G

ASTER UNIV., HAMILTON, (ONTARIO).
ipitation of Phosphates in Sewage with
thanum: An Experimental and Modelling
ly,
-10259 5D

ution Control, Next Step, Physi-
Chemical Treatment, Activated Charcoal,
-10279 5D

ASTER UNIV., HAMILTON (ONTARIO).
OF CHEMICAL ENGINEERING.
racterization of Mixing in Aerated
oons,
-09913 5D

IGAN STATE UNIV., EAST LANSING.
Effect of Methyl Mercury on Gill Metabol-
and Blood Parameters of Rainbow Trout,
-09906 5C

IGAN STATE UNIV., EAST LANSING.
OF FISHERIES AND WILDLIFE.
cts of PCB (Aroclor 1254) and P, P' DDT
Production and Survival of Daphnia Magna
uss,
-09905 5C

IGAN UNIV., ANN ARBOR.
Model for Predicting the Effects of Sewage
uent on Wetland Ecosystems,
-09915 5B

noval of Pyrotechnic Generated Tracer
ed by Aircraft in a Convective Updraft,
-10000 3B

VEST RESEARCH INST., KANSAS CITY,

er Pollution From Nonpoint Sources,
-10085 5C

ESOTA AGRICULTURAL EXPERIMENT
ION, ST. PAUL.
nate of Minnesota - Part VII - Areal Dis-
ution and Probabilities of Precipitation in
Minneapolis-St. Paul Metropolitan Area,
-10009 2B

ESOTA UNIV., MINNEAPOLIS.
oms in Lakes and Lake Sediments as an
ex to Environment. Part 2. A Study of
toplankton Distribution, Lake Classifica-
, and Trophic Indicators in Minnesota
es,
-10105 5C

ESOTA UNIV., MINNEAPOLIS. DEPT. OF
NY.
Geochemical and Biostratigraphic Record
Natural and Pollutional Eutrophication of
nesota Lakes,
-10010 5C

ESOTA UNIV., ST. PAUL. DEPT. OF
MOLOGY, FISHERIES AND WILDLIFE.
perature Effects on Eggs and Fry of Per-
Fishes,
-10020 5C

MINNESOTA UNIV., ST. PAUL. WATER RESOURCES RESEARCH CENTER.
Proceedings of Workshop Conference on Identification of Metropolitan Area Water Resources Problems and Associated Research Needs in Minnesota.
W75-10004 6B

Proceedings of Public Workshop Conference on Water Resources Problems and Research Needs in Central Minnesota.
W75-10005 6B

Proceedings of Public Forum on Water Resources Problems and Research Needs in Southwestern Minnesota.
W75-10006 6B

Proceedings of Public Forum on Water Resources Problems in Southeastern Minnesota.
W75-10007 6B

MISSISSIPPI STATE UNIV., MISSISSIPPI STATE. BUREAU OF BUSINESS AND ECONOMIC RESEARCH.
Methods to Facilitate Managerial Effectiveness in Municipal Water Systems,
W75-09895 6B

MISSISSIPPI STATE UNIV., MISSISSIPPI STATE. DEPT. OF AGRICULTURAL AND BIOLOGICAL ENGINEERING.
Sudden Release of Water from a Long Prismatic Flume,
W75-10017 8B

MISSISSIPPI STATE UNIV., MISSISSIPPI STATE. DEPT. OF BIOCHEMISTRY.
Toxaphene Inhibition of ATPase Activity in Catfish, Ictalurus Punctatus, Tissues,
W75-09908 5C

MISSISSIPPI STATE UNIV., MISSISSIPPI STATE. DEPT. OF GEOLOGY AND GEOGRAPHY.
Status of Land Subsidence Due to Ground-Water Withdrawal Along the Mississippi Gulf Coast,
W75-09856 2F

MISSOURI UNIV., COLUMBIA.
Influence of Light Intensity on the Bioenergetics of Channel Catfish,
W75-10100 8I

MOBIL OIL CORP., NEW YORK.
Industry Viewpoint (Water Quality Control),
W75-09885 5G

MONTANA STATE UNIV., BOZEMAN. DEPT. OF CHEMISTRY.
Interrupted-Sweep Voltammetry for the Identification of Polychlorinated Biphenyls and Naphthalenes,
W75-10268 5A

MONTANA STATE UNIV., BOZEMAN. DEPT. OF GEOLOGY.
A Study of Water Resources Research Needs in Montana,
W75-10012 6B

MONTANA UNIV., MISSOULA. SCHOOL OF FORESTRY.
Siltation Rates and Life Expectancies of Small Headwater Reservoirs in Montana,
W75-09858 2J

MORETRENCH AMERICAN CORP., ROCKAWAY, N.J. (ASSIGNEE)
Apparatus for Controlling the Level of Subsurface Water,
W75-09880 4B

MOZAMBIQUE UNIV., LOURENCO MARQUES. DEPT. OF CIVIL ENGINEERING.
Design Implications of Hydraulic Jumps at Sudden Enlargements,
W75-10061 8B

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH, BOULDER, COLO.
An Experimental Study of the Detection of Ice Nuclei on Membrane Filters and Other Substrata,
W75-10052 2B

NATIONAL ENVIRONMENTAL RESEARCH CENTER, CINCINNATI, OHIO. METHODS DEVELOPMENT AND QUALITY ASSURANCE RESEARCH LAB.
Methods for the Determination of Specific Organic Pollutants in Water and Waste Water,
W75-10032 5A

NATIONAL ENVIRONMENTAL RESEARCH CENTER, EDISON, N.J. INDUSTRIAL WASTE TREATMENT RESEARCH LAB.
Pollution Abatement in the Pharmaceutical Industry,
W75-09931 5D

NATIONAL HURRICANE RESEARCH LAB., CORAL GABLES, FLA.
The Experimental Program to Modify Hurricanes,
W75-09972 2B

NATIONAL MARINE FISHERIES SERVICE, BEAUFORT, N.C. ATLANTIC ESTUARINE FISHERIES CENTER.
Identity and Regulation of Nutrients Limiting Phytoplankton in the Shallow Estuaries Near Beaufort, N.C.,
W75-10084 5C

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BOULDER, COLO. ATMOSPHERIC PHYSICS AND CHEMISTRY LAB.
Snowfall Enhancement,
W75-09959 2C

The Effect of Chaff Seeding on Lightning and Electric Fields of Thunderstorms,
W75-09978 3B

An Ice Nuclei Concentration Benchmark Network,
W75-09999 7A

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, CORAL GABLES, FLA. EXPERIMENTAL METEOROLOGY LAB.
The EML 1973 Florida Area Cumulus Experiment,
W75-09981 3B

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, WASHINGTON, D.C.
Report to the Congress on Ocean Dumping and Other Man-Induced Changes to Ocean Ecosystems (October 1972 Through December 1973).
W75-10311 5G

NATIONAL RESEARCH CENTER FOR DISASTER PREVENTION, TOKYO (JAPAN).
Hailstorms in Japan,
W75-09967 3B

NATIONAL RESEARCH CENTER FOR DISASTER PREVENTION, TOKYO (JAPAN).
Preliminary Results of Experiments Using Seeding Rockets with Combustible Shells, W75-09987 3B

NATIONAL WILDLIFE FEDERATION, WASHINGTON, D.C.
Regulation of Ocean Dumping--One Year Later, W75-10285 5G

NEBRASKA UNIV., LINCOLN. WATER RESOURCES RESEARCH INST.
Water Resources Publications Related to the State of Nebraska Third Edition. W75-10015 10C

NEVADA UNIV., RENO. DESERT RESEARCH INST.
The Pyramid Pilot Cloud-Seeding Project, W75-09964 3B

NEW ENGLAND WATER WORKS ASSOCIATION, BOSTON (MASS).
Report of Committee on Survey of Ground Water Supplies in New England. W75-10182 4B

NEW MEXICO INST. OF MINING AND TECHNOLOGY, SOCORRO. DEPT. OF GEOSCIENCE.
Aquifer Parameters by a Chemical Tracer Technique: Non Linear Mixing in the Roswell Confined Aquifer, W75-09893 2F

NEW MEXICO UNIV., ALBUQUERQUE.
A Dimensionless Design Equation for Sewage Lagoons, W75-10261 5D

NEW SOUTH WALES UNIV., KENSINGTON (AUSTRALIA). SCHOOL OF NUCLEAR ENGINEERING.
The Comparison of the Environmental Aspects of Nuclear and Fossil Fuelled Power Stations, W75-10349 8C

NIJMEGEN UNIV. (NETHERLANDS). LAB. OF AQUATIC ECOLOGY.
Systematic Ecology Working Group, W75-10108 7A

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF ZOOLOGY.
Pamlico River Estuary--Past, Present and Future, W75-10338 2L

NORTH CAROLINA UNIV., CHAPEL HILL. CENTER FOR URBAN AND REGIONAL STUDIES.
The Effects of Authorization for Water Impoundments on Shoreland Transition, W75-10126 6B

NORTHWESTERN UNIV., EVANSTON, ILL. DEPT. OF CIVIL ENGINEERING.
Recommendations for Environmental Engineering Education, W75-10218 9A

NOVA UNIV., DANIA, FLA. PHYSICAL OCEANOGRAPHIC LAB.
A Portable Gas Chromatographic Technique to Measure Dissolved Hydrocarbons in Sea Water, W75-10096 5A

OAK RIDGE NATIONAL LAB., TENN.
Phthalate Esters, Heartrate Depressors in the Goldfish, W75-09902 5C
Analyzing Organics in Dilute Aqueous Solutions, W75-10350 5A

OKLAHOMA STATE UNIV., STILLWATER. SCHOOL OF CIVIL ENGINEERING.
A Rational Approach for Predicting the Dissolved Oxygen Profile in Receiving Waters, W75-10034 5A

ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO. POLLUTION CONTROL BRANCH.
Asbestos in Drinking Water, W75-10030 5A

OSAKA UNIV, (JAPAN). DEPT. OF CIVIL ENGINEERING.
Water Quality Routing of Unsteady River Flow by Finite Element Method, W75-10252 5B

PACIFIC NORTHWEST WATER LAB., CORVALLIS, OREG.
Field and Laboratory Investigations to Evaluate the Influence of Nitrilotriacetic Acid (NTA) on Eutrophication. W75-10115 5C

PARIS-6 UNIV. (FRANCE). LABORATOIRE DE GEOLOGIE DYNAMIQUE.
Isotope Hydrology 1974--A Review of the IAEA Symposium on Isotope Techniques in Groundwater Hydrology, W75-10172 5A

PARSONS, BRINCKERHOFF, QUADE AND DOUGLAS, INC., NEW YORK.
Sewage Plan Weds Five Municipalities, W75-09914 5D

PENNSYLVANIA DEPT. OF ENVIRONMENTAL RESOURCES, HARRISBURG. BUREAU OF WATER QUALITY MANAGEMENT.
Ground-Water's Role in Water Quality Management, W75-10180 5G

PENNSYLVANIA STATE UNIV., INST. FOR RESEARCH ON LAND AND WATER RESOURCES. UNIVERSITY PARK.
Sociological Impact of a Flood Control Reservoir, Howard, Pennsylvania, W75-09854 6B

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. SCHOOL OF FOREST RESOURCES.
Faunal Response to Spray Irrigation of Chlorinated Sewage Effluent, W75-09899 5D

PFIZER (CHAS.) AND CO., INC., GROTON, CONN.
GLC Determination of PPB Levels of Citrate by Conversion to Bromoform, W75-10191 5A

PHILIPS GLOEILAMPENFABRIEKEN N.V., EINDHOVEN (NETHERLANDS).
Monitoring the Quality of Surface Water, W75-10251 5A

PITTSBURGH UNIV., PA. HEALTH LAW PROGRAM.
Changing Federal-State Relationships in Water Pollution Control Programs, W75-10270 5G

POLISH ACADEMY OF SCIENCES, WARSAW. DEPT. OF HYDROBIOLOGY.
The Structure and Production of Phytoplankton in Mikolajskie Lake, W75-10093 5C
Phosphorus Run-Off From the Drainage I to Mikolajskie Lake, W75-10095

PROCTER AND GAMBLE CO., CINCINNA OHIO. ENVIRONMENTAL CONTROL SECTION.
Joint Treatment of Pulping and Mun Wastes, W75-09928

RAYTHEON CO., PORTSMOUTH, R.I.
The Davy Jones Garbage Dump, W75-10238

RHODE ISLAND UNIV., KINGSTON.
Regionalism and the Law of the Sea: The of Semi-Enclosed Seas, W75-10301

ROHM AND HAAS CO., PHILADELPHIA,
Recovering Organic Materials from W water, W75-09932

ROYAL INST. OF TECH., STOCKHOLM (SWEDEN). DEPT. OF WATER CHEMISTR
Modeling Microbial Growth in Waste Treatment, W75-10170

RUTGERS - THE STATE UNIV., NEW BRUNSWICK. N.J.
Benthal Decomposition of Adsorbed tadecane, W75-10260

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J. DEPT. OF COMPUTER SCIENCE.
Quantitative Error Analysis of Num Methods for Partial Differential Equation W75-10003

SAINT JOHN'S COLL., CAMBRIDGE (ENGLAND).
River Pollution Control, W75-10224

SAINT PAUL WATER DEPT., MINN.
Fecal Contamination--The Water An Responsibility Part II, W75-10258

SAINT REGIS PAPER CO., PENSACOLA, RESEARCH AND DEVELOPMENT CENTI
Activated Carbon Treatment of Unbl Kraft Effluent for Reuse, W75-10028

SAN DIEGO STATE UNIV., CALIF.
The Public Trust Doctrine and The Cal Coastline, W75-10305

SAN JOSE-SANTA CLARA WATER POLLUTION CONTROL PLANT, SAN JO CALIF.
California Plant Gets Straight 'A's in Co Control, W75-10264

SEELYE, STEVENSON, VALUE, AND KNECHT, NEW YORK.
Carbon Contact-Filtration: How It Work W75-09912

SOUTH CAROLINA UNIV., COLUMBIA. OF GEOLOGY.
The Discharge of South Carolina Strea Relates to Link Magnitude, W75-10134

DAKOTA SCHOOL OF MINES AND
OLOGY, RAPID CITY. INST. OF
PHERIC SCIENCES.
erical Simulation of Cloud Seeding Experi-
s,
09955 2B

neering and Operational Aspects of
her Modification,
09983 3B

ERN ILLINOIS UNIV., CARBONDALE.
OF CHEMISTRY AND BIOCHEMISTRY.
Sources and Levels of Mercury in the
ge of a University Campus,
10049 5A

WEST FLORIDA WATER
GEMENT DISTRICT, BROOKSVILLE.
r and Water Problems in the Southwest
la Water Management District and Some
ble Solutions,
10207 3C

and Regulations, Southwest Water
gement District (Florida).
10306 6E

FIELD WATER DEPT., MO.
mputer Comes to Missouri,
10265 5D

EAZIATSKII NAUCHNO-
OVATELSKII
METEOROLOGICHESKII INSTITUT,
ENT (USSR).
ective Cloud Study Results Applied to
her Modification,
09988 2B

ORD RESEARCH INST., MENLO PARK,

ity of Selected Pesticides to the Bay Mus-
(ytilus Edulis),
10021 5C

ORD UNIV., CALIF. DEPT. OF CIVIL
EERING.
s in Water Resources Impact Assessment,
10222 6B

EY DENKI KABUSHIKI KAISHA,
) (JAPAN); AND KABUSHIKI KAISHA
JAPAX KENKYUSHO, KANAGAWA
). (ASSIGNEES)
ratus for Treating Water Containing Impu-

09884 5D

UNIV. OF NEW YORK, ALBANY.
PHERIC SCIENCES RESEARCH
R.
ng Requirements for Rapid Glaciation or
lation of a Mixed Phase Cloud,
09963 3B

UNIV., OF NEW YORK, BUFFALO.
TY OF ENGINEERING AND APPLIED
ES.
Element Modeling of Flow Through
s Media,
09900 5B

NS AND WHELER, CAZENOVIA, N.Y.
st Advanced Wastewater Treatment Plant
U.S. and in the World,
0193 5D

G HOUSE, SUNNINGDALE
ND).
e in Water, Soil, Plants and Animals,
0083 5C

TECHNICAL INFORMATION CENTER (AEC), OAK RIDGE, TENN.
Human Radiation Dose Studies. A Selected Bibliography.
W75-09890 5A

TECHNISCHE HOCHSCHULE, VIENNA (AUSTRIA). INSTITUT FUER WASSERVERSORGUNG ABWASSER REINIGUNG UND GEWASSERSCHUTS.
Austrian Plant Knocks Out Nitrogen,
W75-10225 5D

TEL-AVIV UNIV. (ISRAEL). DEPT. OF ENVIRONMENTAL SCIENCES.
The Acquisition of Information During Attempts at Weather Modification,
W75-09986 7B

TEXAS A AND M UNIV., COLLEGE STATION. INDUSTRIAL ECONOMICS RESEARCH DIV.
Artificial Reefs for Texas.
W75-10119 3E

TEXAS A AND M UNIV., COLLEGE STATION. WATER RESOURCES INST.
Effects of Original Vegetation on Reservoir Water Quality,
W75-10014 5C

TEXAS ENGINEERING EXPERIMENT STATION, COLLEGE STATION.
Primary Economic Impact of the Gulf Intracoastal Waterway in Texas,
W75-10120 6B

TEXAS UNIV. AT AUSTIN. DEPT. OF BOTANY.
Productivity/Physiology Working Group,
W75-10107 2L

TEXAS UNIV., DALLAS. INST. FOR ENVIRONMENTAL STUDIES.
Critical Levels of Phosphorus and Nitrogen in Texas Impoundments,
W75-10072 5C

A Model of Inorganic Carbon Limitation in Natural Waters,
W75-10088 5C

TEXAS WATER DEVELOPMENT BOARD, AUSTIN.
Evaporation Data in Texas--Compilation Report, January 1907-December 1970,
W75-10154 7C

TRENT RIVER AUTHORITY (ENGLAND).
Applications of Toxicity Testing to Sewage-Treatment Processes,
W75-10244 5D

TRI-COUNTY CONSERVANCY OF THE BRANDYWINE, CHADDS FORD, PA. ENVIRONMENTAL PROGRAMS.
Evaluation of Phosphorus Dynamics in a Watershed,
W75-10217 5B

TUFTS UNIV., MEDFORD, MASS. DEPT. OF CIVIL ENGINEERING.
Statistical Evaluation of Reaeration Prediction Equations,
W75-10211 5G

UKRAINSKII NAUCHNO-ISSLEDOVATELSKII GIDROMETEOROLOGICHESKII INSTITUT, KIEV (USSR).
On a Method of Fog Modification by Passivation of Condensation Nuclei,
W75-09946 3B

Results of Seeding Cumulonimbus Clouds Aimed at the Modification of Precipitation in the Steppe Part of the Ukraine,
W75-09951 3B

The Experimental Seeding of Frontal Clouds in Winter in Order to Increase Precipitation,
W75-09960 3B

Some Questions of Thunderstorm Lightning Control,
W75-09977 2B

Methods of Estimating Physical and Economic Effectiveness of Weather Modification,
W75-09991 3B

UNIVERSITE DE BRETAGNE-OCCIDENTALE, BREST (FRANCE).
Salt Drizzles Extracted From Unsaturated Air Layers by Seeding with Hygroscopic Nuclei,
W75-09952 3B

Rapid Inducement of Precipitation by Seeding Stratified Air Layers,
W75-09953 3B

UNIVERSITY OF SOUTH FLORIDA, TAMPA. DEPT. OF CHEMISTRY.
The Response of Gymnodinium Breve to Municipal Waste Materials,
W75-10033 5C

UNIVERSITY OF SOUTHERN MISSISSIPPI, HATTIESBURG. BUREAU OF BUSINESS RESEARCH.
The Economic Impact of a Small Recreation-Oriented Reservoir,
W75-09857 6B

UNIVERSITY OF SOUTHERN MISSISSIPPI, HATTIESBURG. DEPT. OF GEOLOGY.
Residential Canals Along the Gulf Coast,
W75-10016 5B

UNIVERSITY OF THE WEST INDIES, KINGSTON (JAMAICA).
Friction Coefficients for Laminar Sheet Flow Over Rough Surfaces,
W75-10062 8B

UPPSALA UNIV. (SWEDEN). ALGAL ASSAY LAB.
Recovery of Polluted Lakes. A Swedish Research Program on the Effects of Advanced Waste Water Treatment and Sewage Diversion,
W75-10081 5C

UTAH CENTER FOR WATER RESOURCES RESEARCH, LOGAN.
The Effects of Artificial Destratification on the Water Quality and Microbial Populations of Hyrum Reservoir,
W75-09897 5C

UTAH STATE UNIV., LOGAN. DEPT. OF AGRICULTURAL AND IRRIGATION ENGINEERING.
Management Practices Affecting Quality and Quantity of Irrigation Return Flow,
W75-10019 5G

UTAH STATE UNIV., LOGAN. DEPT. OF CIVIL ENGINEERING.
A Study of the Effects of Water Institutions on Planning and Management of Water Resources in Utah,
W75-10130 6E

VANDERBILT UNIV., NASHVILLE, TENN. DEPT. OF PHARMACOLOGY.
Toxicity of DFP and Related Compounds to Squids in Relation to Cholinesterase Inhibition and Detoxifying Enzyme Levels,
W75-09909 5C

VIAK A.B., VALLINGBY (SWEDEN).
Filtration of Water With a High Iron Content,
W75-10171 5F

VICTORIA UNIV. OF MANCHESTER (ENGLAND). DEPT. OF AGRICULTURAL ECONOMICS.
A Theoretical and Empirical Approach to Fisheries Economics,
W75-10118 6C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF BIOLOGY.
The Recovery of Stream Macrobenthos from Low pH Stress,
W75-10127 5C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. WATER RESOURCES RESEARCH CENTER.
Subsurface Environment--Private Property or Public Domain,
W75-10209 4B

VYSOKOGORNYI GEOFIZICHESKII INSTITUT, NALCHIK (USSR).
On the Possibility of Thunderstorm Suppression by Changing the Non-Equilibrium Crystallization Potentials of Cloud Water,
W75-09976 2B

On the Possibility of Generating Downdrafts by Introducing a High Concentration of Coarse Aersol Particles in the Atmosphere,
W75-09980 3B

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF ZOOLOGY.
Terrestrial and Freshwater Radioecology, a Selected Bibliography,
W75-09891 5A

WASHINGTON UNIV., SEATTLE. DEPT. OF ATMOSPHERIC SCIENCES.
The Artificial Modification of Clouds and Precipitation in a Mountainous Region,
W75-09962 3B

WASHINGTON UNIV., SEATTLE. DEPT. OF CIVIL ENGINEERING.
Soil Liquefaction by Torsional Simple Shear Device,
W75-10231 8D

WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
An Automated Method for Determination of Residual Methanol in Denitrified Effluents,
W75-10047 5D

WATER RESEARCH ASSOCIATION, MARLOW (ENGLAND).
Some Applications of Thermal Infra-Red Linescan in Water Resources Studies,
W75-10188 5A

WATER RESEARCH ASSOCIATION, MARLOW(ENGLAND). ECONOMICS GROUP.
Digital Program for Water Network Analysis,
W75-10220 7C

WATER RESOURCES COUNCIL, WASHINGTON, D.C.
Evolving National Water Policies,
W75-10201 6E

WATER SURVEY OF CANADA, OTTAWA (ONTARIO).
Surface Water Data, Reference Index, Canada 1974.
W75-10064 7C

Historical Streamflow Summary, British Columbia, to 1973.
W75-10065 7C

Historical Streamflow Summary, Ontario, to 1973.
W75-10066 7C

Historical Streamflow Summary, Alberta, to 1973.
W75-10067 7C

Historical Streamflow Summary, Yukon and Northwest Territories, to 1973.
W75-10068 7C

Historical Streamflow Summary, Manitoba, to 1973.
W75-10069 7C

Historical Streamflow Summary, Saskatchewan, to 1973.
W75-10070 7C

Historical Streamflow Summary, Atlantic Provinces, to 1973.
W75-10071 7C

WATERLOO UNIV., ONTARIO. DEPT. OF CHEMISTRY.
Copper (II)--Nitrilotriacetate Complexes in Aqueous Solution,
W75-10086 5C

WESLEYAN UNIV., MIDDLETOWN, CONN. INDUSTRIAL WASTE LAB.
Let's Try 90% First and See What Our Quality is Like,
W75-10175 5G

WESTINGHOUSE ELECTRIC CORP., PITTSBURGH, PA. (ASSIGNEE)
Electrolytic Decomposition of Water,
W75-09881 3E

WINNIPEG WATERWORKS, WASTE, AND DISPOSAL DIV. (MANITOBA).
Chemicals Reduce System Odours,
W75-10040 5D

WISCONSIN DEPT. OF NATURAL RESOURCES, MADISON.
Survey of Lake Rehabilitation Techniques and Experiences,
W75-10078 5C

WISCONSIN UNIV., MADISON.
An Ecosystem Model for the Pelagic Zone of Lake Wingra,
W75-10092 5C

Shortcut Methods Test Algicides,
W75-10234 5G

WISCONSIN UNIV., MADISON. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Biological Wastewater Treatment Model Building Fits and Misfits,
W75-10169 5D

WISCONSIN UNIV., MADISON. DEPT. OF ENTOMOLOGY.
Importance of Water pH in Accumulation of Inorganic Mercury in Fish,
W75-09904 5A

WISCONSIN UNIV., MADISON. DEPT. OF MECHANICAL ENGINEERING.
Mechanical Management of Aquatic Vege tion: Analytical Studies of Unit Operatic Potentially Useful in their Processing,
W75-09861

WISCONSIN UNIV., MADISON. WATER CHEMISTRY PROGRAM.
Chlorinated Hydrocarbons in the Lake Onta Ecosystem, (IFYGL),
W75-10018

WOODLAND DEVELOPMENT CORP., HOUSTON, TEX.
Drainage System Cooperates with Nature,
W75-09942

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
Latitudinal Aspects of the Law of the Sea of Petroleum Production,
W75-09886

WORLD METEOROLOGICAL ORGANIZATION, GENEVA (SWITZERLAND
Proceedings of the World Meteorological ganization/International Association Meteorology and Atmospheric Physics Sc tific Conference on Weather Modification.
W75-09944

WRIGHT AND WRIGHT, INC., NEWTON CENTER, MASS.
A New Infrared Instrument for Monitoring Films on Water,
W75-10044

ZAKAVKAZSKII NAUCHNO-ISSLEDOVATELSKII GIDROMETEOROLOGICHESKII INSTITUT TIFLIS (USSR).
On the Results of Practical Protection of Va ble Agricultural Crops from Hail by the (Zaknigmi) Method (The Results of Five Ye Work, 1969-1973),
W75-09969

# ACCESSION NUMBER INDEX


W75-09851 6A
W75-09852 3A
W75-09853 2D
W75-09854 6B
W75-09855 6E
W75-09856 2F
W75-09857 6B
W75-09858 2J
W75-09859 5D
W75-09860 2D
W75-09861 4A
W75-09862 5G
W75-09863 8C
W75-09864 3A
W75-09865 5A
W75-09866 7B
W75-09867 5D
W75-09868 5G
W75-09869 5D
W75-09870 5D
W75-09871 4A
W75-09872 3F
W75-09873 3F
W75-09874 5D
W75-09875 5D
W75-09876 5E
W75-09877 3A
W75-09878 5A
W75-09879 8A
W75-09880 4B
W75-09881 3E
W75-09882 5D
W75-09883 5D
W75-09884 5D
W75-09885 5G
W75-09886 6E
W75-09887 5G
W75-09888 6E
W75-09889 5G
W75-09890 5A
W75-09891 5A
W75-09892 5D
W75-09893 2F
W75-09894 6B
W75-09895 6B
W75-09896 5C
W75-09897 5C
W75-09898 6B
W75-09899 5D
W75-09900 5B
W75-09901 5B
W75-09902 5C
W75-09903 5C
W75-09904 5A
W75-09905 5C
W75-09906 5C
W75-09907 5A
W75-09908 5C
W75-09909 5C
W75-09910 5F
W75-09911 5D
W75-09912 5D
W75-09913 5D
W75-09914 5D
W75-09915 5B
W75-09916 5D
W75-09917 5B
W75-09918 3F
W75-09919 4C
W75-09920 5D
W75-09921 5D
W75-09922 5D
W75-09923 5F
W75-09924 5D
W75-09925 5D
W75-09926 5D
W75-09927 5D
W75-09928 5D
W75-09929 5D
W75-09930 5D
W75-09931 5D
W75-09932 5D
W75-09933 5D
W75-09934 5D
W75-09935 5D
W75-09936 5D
W75-09937 5D
W75-09938 5E
W75-09939 5D
W75-09940 5D
W75-09941 5D
W75-09942 4A
W75-09943 4A
W75-09944 3B
W75-09945 3B
W75-09946 3B
W75-09947 3B
W75-09948 3B
W75-09949 3B
W75-09950 3B
W75-09951 3B
W75-09952 3B
W75-09953 3B
W75-09954 3B
W75-09955 2B
W75-09956 2B
W75-09957 3B
W75-09958 3B
W75-09959 2C
W75-09960 3B
W75-09961 3B
W75-09962 3B
W75-09963 3B
W75-09964 3B
W75-09965 3B
W75-09966 2B
W75-09967 3B
W75-09968 2B
W75-09969 3B
W75-09970 2B
W75-09971 3B
W75-09972 2B
W75-09973 3B
W75-09974 3B
W75-09975 3B
W75-09976 2B
W75-09977 2B
W75-09978 3B
W75-09979 2B
W75-09980 3B
W75-09981 3B
W75-09982 3B
W75-09983 3B
W75-09984 3B
W75-09985 3B
W75-09986 7B
W75-09987 3B
W75-09988 2B
W75-09989 2B
W75-09990 3B
W75-09991 3B
W75-09992 6B
W75-09993 3B
W75-09994 7C
W75-09995 3B
W75-09996 2B
W75-09997 2B
W75-09998 3B
W75-09999 7A
W75-10000 3B
W75-10001 3B
W75-10002 3B
W75-10003 6G
W75-10004 6B
W75-10005 6B
W75-10006 6B
W75-10007 6B
W75-10008 6F
W75-10009 2B
W75-10010 5C
W75-10011 5C
W75-10012 6B
W75-10013 5G
W75-10014 5C
W75-10015 10C
W75-10016 5B
W75-10017 8B
W75-10018 5A
W75-10019 5G
W75-10020 5C
W75-10021 5C
W75-10022 5B
W75-10023 5B
W75-10024 5B
W75-10025 5A
W75-10026 5A
W75-10027 5A
W75-10028 5D
W75-10029 8I
W75-10030 5A
W75-10031 5A
W75-10032 5A
W75-10033 5C
W75-10034 5A
W75-10035 5A
W75-10036 5A
W75-10037 5D
W75-10038 5D
W75-10039 5G
W75-10040 5D
W75-10041 5A
W75-10042 5B
W75-10043 5D
W75-10044 5A
W75-10045 5D
W75-10046 5B
W75-10047 5D
W75-10048 5A
W75-10049 5A
W75-10050 2B
W75-10051 2D
W75-10052 2B
W75-10053 2B
W75-10054 2B
W75-10055 7B
W75-10056 2B
W75-10057 3B
W75-10058 5B
W75-10059 8B
W75-10060 8B
W75-10061 8B
W75-10062 8B
W75-10063 2F
W75-10064 7C
W75-10065 7C
W75-10066 7C
W75-10067 7C
W75-10068 7C
W75-10069 7C
W75-10070 7C
W75-10071 7C
W75-10072 5C
W75-10073 5C
W75-10074 5C
W75-10075 5C
W75-10076 3F
W75-10077 2F
W75-10078 5C
W75-10079 5C
W75-10080 5C
W75-10081 5C
W75-10082 3F
W75-10083 5C
W75-10084 5C
W75-10085 5C
W75-10086 5C
W75-10087 5C
W75-10088 5C
W75-10089 5C
W75-10090 5C
W75-10091 5C
W75-10092 5C
W75-10093 5C
W75-10094 5C
W75-10095 5C
W75-10096 5A
W75-10097 5D
W75-10098 7B
W75-10099 2L
W75-10100 8I
W75-10101 5C
W75-10102 5C
W75-10103 5C
W75-10104 5C
W75-10105 5C
W75-10106 2L
W75-10107 2L
W75-10108 7A
W75-10109 2L
W75-10110 2L
W75-10111 2L
W75-10112 5A
W75-10113 5C
W75-10114 2I
W75-10115 5C
W75-10116 6B
W75-10117 6B
W75-10118 6C
W75-10119 3E
W75-10120 6B
W75-10121 5G
W75-10122 5C
W75-10123 5D
W75-10124 5D
W75-10125 5D
W75-10126 6B
W75-10127 5C
W75-10128 6B
W75-10129 6B
W75-10130 6E
W75-10131 6B
W75-10132 5G
W75-10133 5C
W75-10134 2E
W75-10135 5A
W75-10136 4C
W75-10137 5D
W75-10138 2G
W75-10139 8B
W75-10140 5C
W75-10141 2J
W75-10142 4B
W75-10143 2F
W75-10144 7C
W75-10145 2K
W75-10146 2F
W75-10147 4B
W75-10148 7C
W75-10149 7C
W75-10150 7C
W75-10151 7C
W75-10152 4B
W75-10153 7C
W75-10154 7C
W75-10155 2E
W75-10156 4B
W75-10157 5B
W75-10158 2F
W75-10159 4A
W75-10160 5B
W75-10161 5B
W75-10162 2J

W75-10163 5B
W75-10164 6G
W75-10165 4A
W75-10166 2E
W75-10167 4B
W75-10168 5A
W75-10169 5D
W75-10170 5D
W75-10171 5F
W75-10172 5A
W75-10173 5G
W75-10174 5D
W75-10175 5G
W75-10176 6E
W75-10177 5B
W75-10178 5G
W75-10179 5G
W75-10180 5G
W75-10181 6G
W75-10182 4B
W75-10183 5D
W75-10184 5B
W75-10185 5A
W75-10186 5G
W75-10187 5A
W75-10188 5A
W75-10189 5D
W75-10190 5D
W75-10191 5A
W75-10192 5D
W75-10193 5D
W75-10194 5D
W75-10195 5D
W75-10196 5A
W75-10197 5D
W75-10198 6G
W75-10199 5D
W75-10200 5D
W75-10201 6E
W75-10202 5G
W75-10203 3D
W75-10204 4A
W75-10205 5G
W75-10206 5G
W75-10207 3C
W75-10208 4A
W75-10209 4B
W75-10210 8B
W75-10211 5G
W75-10212 3F
W75-10213 5F
W75-10214 5D
W75-10215 5B
W75-10216 8B
W75-10217 5B
W75-10218 9A
W75-10219 4A
W75-10220 7C
W75-10221 8A
W75-10222 6B
W75-10223 6A
W75-10224 6A
W75-10225 5D
W75-10226 5D
W75-10227 5D
W75-10228 5D
W75-10229 5D
W75-10230 5D
W75-10231 8D
W75-10232 5A
W75-10233 5A
W75-10234 5G
W75-10235 5A
W75-10236 5D
W75-10237 5A
W75-10238 5G
W75-10239 5D
W75-10240 5D
W75-10241 5G
W75-10242 5D
W75-10243 5D
W75-10244 5D
W75-10245 3F
W75-10246 5D
W75-10247 5B
W75-10248 7A
W75-10249 5A
W75-10250 5A
W75-10251 5A
W75-10252 5B
W75-10253 5D
W75-10254 5A
W75-10255 5A
W75-10256 5D
W75-10257 5C
W75-10258 5A
W75-10259 5D
W75-10260 5C
W75-10261 5D
W75-10262 5G
W75-10263 5A
W75-10264 5D
W75-10265 5D
W75-10266 5A
W75-10267 5D
W75-10268 5A
W75-10269 5A
W75-10270 5G
W75-10271 5D
W75-10272 5A
W75-10273 5D
W75-10274 5D
W75-10275 5D
W75-10276 8C
W75-10277 8C
W75-10278 5D
W75-10279 5D
W75-10280 5F
W75-10281 5F
W75-10282 5D
W75-10283 4B
W75-10284 5E
W75-10285 5G
W75-10286 5G
W75-10287 5G
W75-10288 6G
W75-10289 6G
W75-10290 6E
W75-10291 5G
W75-10292 8A
W75-10293 8D
W75-10294 4D
W75-10295 4A
W75-10296 8A
W75-10297 8A
W75-10298 8A
W75-10299 8A
W75-10300 4A
W75-10301 6E
W75-10302 5G
W75-10303 5G
W75-10304 6E
W75-10305 6E
W75-10306 6E
W75-10307 6E
W75-10308 6E
W75-10309 6G
W75-10310 5G
W75-10311 5G
W75-10312 6E
W75-10313 6E
W75-10314 6E
W75-10315 6E
W75-10316 6E
W75-10317 6E
W75-10318 5G
W75-10319 4A
W75-10320 6G
W75-10321 5D
W75-10322 5G
W75-10323 5G
W75-10324 5G
W75-10325 5G
W75-10326 5G
W75-10327 5G
W75-10328 5G
W75-10329 5G
W75-10330 5G
W75-10331 8A
W75-10332 5G
W75-10333 5G
W75-10334 5G
W75-10335 5G
W75-10336 5G
W75-10337 5G
W75-10338 2L
W75-10339 9D
W75-10340 8C
W75-10341 5D
W75-10342 6B
W75-10343 6B
W75-10344 6B
W75-10345 6B
W75-10346 5D
W75-10347 5D
W75-10348 5D
W75-10349 8C
W75-10350 5A

# ABSTRACT SOURCES

| RCE | ACCESSION NUMBER | TOTAL |
|---|---|---|
| CENTERS OF COMPETENCE | | |
| Cornell University, Policy Models for Water Resources Systems | W75-10201--10211<br>10213--10224 | 23 |
| ERDA Oak Ridge National Laboratory, Nuclear Radiation and Safety | W75-09889--09892<br>09901, 10349 | 6 |
| Franklin Institute (FIRL), Municipal Wastewater Treatment Technology | W75-09910--09917<br>09919--09943<br>10030--10032<br>10034--10049<br>10169--10180<br>10182--10197<br>10199--10200<br>10225--10244<br>10246--10256<br>10258--10284<br>10340--10341<br>10346--10348<br>10350 | 146 |
| Illinois State Water Survey, Hydrology | W75-09944--10002<br>10050--10071 | 81 |
| University of Florida, Eastern U. S. Water Law | W75-09885--09888<br>10285--10339 | 59 |
| University of Wisconsin, Eutrophication | W75-10072--10113<br>10115, 10122 | 44 |
| University of Wisconsin, Water Resources Economics | W75-10116--10121<br>10342--10345 | 10 |
| STATE WATER RESOURCES RESEARCH INSTITUTES | W75-09853--09861<br>09893--09899<br>10003--10017<br>10123--10138 | 47 |
| OTHER | | |
| BioSciences Information Service | W75-09918, 10029<br>10033, 10114<br>10181, 10198<br>10212, 10245<br>10257 | 9 |

| SOURCE | ACCESSION NUMBER | TOTL |
|---|---|---|
| C. OTHER (CONTINUED) | | |
| Effects of Pollutants on Aquatic Life (Katz) | W75-09902--09909 | 8 |
| Environmental Protection Agency | W75-10018--10028 | 1 |
| Ocean Engineering Information Service (Patents) | W75-09862--09884 | 3 |
| Office of Water Research and Technology | W75-09851--09852<br>09900 | 3 |
| U. S. Geological Survey | W75-10139--10168 | 0 |

☆ U. S. GOVERNMENT PRINTING OFFICE : 1975 O - 210-951/(8)

# CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey and the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

**Supported by the Environmental Protection Agency in cooperation with WRSIC**

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

## Subject Fields

- 1 NATURE OF WATER
- 2 WATER CYCLE
- 3 WATER SUPPLY AUGMENTATION AND CONSERVATION
- 4 WATER QUANTITY MANAGEMENT AND CONTROL
- 5 WATER QUALITY MANAGEMENT AND PROTECTION
- 6 WATER RESOURCES PLANNING
- 7 RESOURCES DATA
- 8 ENGINEERING WORKS
- 9 MANPOWER, GRANTS, AND FACILITIES
- 10 SCIENTIFIC AND TECHNICAL INFORMATION

## INDEXES

- SUBJECT INDEX
- AUTHOR INDEX
- ORGANIZATIONAL INDEX
- ACCESSION NUMBER INDEX
- ABSTRACT SOURCES

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

OFFICIAL BUSINESS

PRINTED MATTER

AN EQUAL OPPORTUNITY EMPLOYER

POSTAGE AND FEES PAID
U S DEPARTMENT OF COMMERCE
COM 211

John Littlewood
Documents Division
220 D Library
Champaign

33391
8

# SELECTED WATER RESOURCES ABSTRACTS

THE LIBRARY OF THE
NOV 20 1975
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

VOLUME 8, NUMBER 21
NOVEMBER 1, 1975

-10351 -- W75-10850
DEN: SWRABW

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

SELECTED WATER RESOURCES ABSTRACTS is available to Federal agencies, contractors, or grantees in water resources upon request to: Manager, Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior, Washington, D. C. 20240.

SELECTED WATER RESOURCES ABSTRACTS is also available on subscription from the National Technical Information Service. Annual subscription rates are: To the SWRA Journal, $75 ($95 foreign); to the Journal & Annual Index, $100 ($125 foreign); to the Annual Index only, $50 ($65 foreign). Certain documents abstracted in this journal can be purchased from the NTIS at prices indicated in the entry. Prepayment is required.

# SELECTED
# WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior

**VOLUME 8, NUMBER 21**
NOVEMBER 1, 1975

W75-10351 -- W75-10850

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

# FOREWORD

**Selected Water Resources Abstracts,** a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

**Selected Water Resources Abstracts** is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

## CONTENTS

FOREWORD_____iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

**01** NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

**02** WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

**03** WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

**04** WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

**05** WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

**06** WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

**07** RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

**08** ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

**09** MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

**10** SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

# SELECTED WATER RESOURCES ABSTRACTS

## WATER CYCLE

### A. General

**EMOVAL OF PERIODICITIES BY DIF-RENCING AND MONTHYL MEAN SUB-RACTION,**
rdue Univ., Lafayette, Ind. School of Civil En-neering.
L. Kavvas, and J. W. Delleur.
ailable from the National Technical Informa-n Service, Springfield, Va. 22161, as PB-243 5, $3.75 in paper copy, $2.25 in microfiche. 974). 23 p, 4 fig, 5 ref. OWRT B-036-IND(4).

scriptors: *Time series analysis, Stochastic ocesses, Time lag, Statistical methods, Hydro-aphs, Hydrologic aspects, Mathematical odels, Seasonal, Monthly.
entifiers: *Hydrological sequences, eriodicity, ARMA models, Spectral density, asonal differencing, Non-seasonal differencing.

e spectral representation of periodic hydrologic e series has both a continuous and a discrete rt which represent the periodic and stationary ndom components, respectively. With this presentation, seasonal and non-seasonal dif-encing and manthly mean subtraction methods the removal of the periodic component were alyzed for the case of monthly series. It is own both analytically and by an exapmple that asonal differencing removes and nonseasonal ferencing effectively reduces the periodicity in t covariance function. However, both kinds of ferencing greatly distort the original spectrum, oing out the original spectral contribution at the gin and greatly reducing it near the origin. The t to the distorted spectrum by ARMA models th few parameters is almost impossible and the ted models are impractical for hydrologic simu-lion since they either yield an infinite variance or undefined at the spectral origin. Subtraction of nthly means completely removes the periodici-in the covariance but introduces a different type nonstationarity which is negligible for practical poses.
5-10352

**ND USE SIMULATION MODEL OF THE SU-LPINE CONIFEROUS FOREST ZONE,**
rest Service (USDA), Fort Collins, Colo. Rocky untain Forest and Range Experiment Station.
primary bibliographic entry see Field 3B.
5-10404

**COMORPHIC PROCESSES IN POLAR SERTS,**
rizona State Univ., Tempe. Dept. of Geology.
primary bibliographic entry see Field 2C.
5-10456

**OCEEDINGS SYMPOSIUM ON STATISTI-CL HYDROLOGY.**
ricultural Research Service, Washington, D.C.
sale by the Superintendent of Documents, U. Government Printing Office, Washington, D. 20402 - Price $3.70. Symposium held at rizona University, Tucson, August 31-Sep-ber 2, 1971. Miscellaneous Publication No. 5, U.S. Department of Agriculture, Washing-D.C., Agricultural Research Service, June 4. 386 p.

criptors: *Conferences, *Hydrology, tistical models, *Model studies, *Stochastic esses, Statistics, Mathematical studies, hematical models, Statistical methods, Rain-Runoff, Sediment transport, Data processing, ervoirs, Markov processes, Floods, Simula-analysis, Least squares method, Regression ysis, Precipitation(Atmospheric), Thun-derstorms, Streamflow, Spatial distribution, Temporal distribution, Analytical techniques.

The symposium objective was to generate cooperation and facilitate discussions between hydrologists and statisticians on the application of probabilistic and statistical methodologies to hydrologic problems. General topics covered included preparation of stochastic models of rainfall, runoff, and sediment; estimation of extreme values; and optimization of hydrologic modeling techniques. (See also W75-10508 thru W75-10531) (Humphreys-ISWS)
W75-10507

**SOME PROBLEMS IN PURE AND APPLIED STOCHASTIC HYDROLOGY,**
Toronto Univ. (Ontario). Dept. of Mechanical Engineering; and Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
V. Klemes.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No. 1275, p 2-15, June 1974. 8 fig, 1 tab, 19 ref.

Descriptors: *Hydrology, *Statistical models, *Runoff, *Reservoir storage, Storage, Statistics, Probability, Distribution, Frequency curves, Model studies, Reservoirs, Streamflow, Analytical techniques, Statistical methods, Stochastic processes.
Identifiers: *Distribution functions, Distribution models, Skewness.

Because the aim of pure hydrology is the understanding of the behavior of hydrologic phenomena, it is necessary that stochastic models of hydrologic processes be physically founded. Several examples were presented of how probabilistic description of the mechanism of runoff formation leads to physically justified runoff distribution models. For some applied purposes, the numerical values of parameters seem to be much more important than the forms of models, and the physical justifiability of a model seems to be irrelevant. However, a physically sound concept of a model can, at least to some extent, compensate for the inaccuracy of parameter estimates resulting from small sample sizes of available empirical data. This was illustrated by an example relating various runoff distribution models to stationary solution of the storage equation. Usefulness of stationary solution as a basis for optimization of a single storage reservoir was challenged and optimization on regional basis was advocated. (See also W75-10507) (Sims-ISWS)
W75-10508

**MULTISITE STREAMFLOW SIMULATION OF TRUCKEE RIVER, NEVADA,**
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2E.
W75-10509

**GENERAL ASPECTS OF MULTIVARIATE ANALYSIS WITH APPLICATIONS TO SOME PROBLEMS IN HYDROLOGY,**
Agricultural Research Service, Chickasha, Okla.
D. G. DeCoursey, and R. B. Deal.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No. 1275, p 47-68, June 1974. 10 fig, 10 tab, 11 ref.

Descriptors: *Hydrology, *Regression analysis, *Correlation analysis, *Oklahoma, Mathematical studies, Runoff, Statistical methods, Rainfall, Data processing, Streamflow, Analytical techniques.
Identifiers: *Multivariate analysis, Discriminant analysis, Canonical regression.

Hydrologic data are collected at many sites throughout the world to provide estimates of rainfall, volumes of runoff, peak rates of flow, and other events. These events are caused by the interaction of such factors as the climatic sequences and the topographic and geologic features of the watersheds. The events themselves are also very highly related, that is, storm volumes and peak rates of flow. Therefore, the analysis of these data becomes a classic example of a multivariate problem in both the input and response characteristics. Twelve independent or causative variables and 37 dependent or hydrologic response characteristics from 90 runoff measuring sites in Oklahoma were analyzed. Conventional multiple regression, stepwise regression, and components regression were compared in the development of prediction equations. Several variations of components regression, some of which use factor analysis, were presented. A variation of the classical multiple discriminant analysis was used to find regions of similar hydrologic response. The regions for some hydrologic variables were geographically contiguous, whereas others were not. Classical canonical correlation was used to find sets of causative and response variables that are related. The concept was used as a base for showing that it is possible to develop prediction equations for various hydrologic characteristics that retain the observed intercorrelation of the hydrologic characteristics. The prediction equations were all based on the same set of independent variables. (See also W75-10507) (Sims-ISWS)
W75-10510

**STATISTICAL TOLERANCE LIMITS FOR A PEARSON TYPE III DISTRIBUTION,**
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-10511

**A MODEL OF STATISTICAL ERRORS IN ESTIMATING STREAMFLOW FROM CONTINUOUS-STAGE RECORDS,**
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2E.
W75-10512

**A PRECIPITATION DATA SIMULATOR USING A SECOND ORDER AUTOREGRESSIVE SCHEME,**
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2B.
W75-10513

**CROSS SPECTRA OF SHORT-DURATION RAINFALL,**
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 2B.
W75-10514

**HOURLY RAINFALL GENERATION FOR A NETWORK,**
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 2B.
W75-10515

**STOCHASTIC GENERATION OF THE OCCURRENCE, PATTERN, AND LOCATION OF MAXIMUM AMOUNT OF DAILY RAINFALL,**
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 2B.
W75-10516

**COMMENTS ON THE STATISTICAL DISTRIBUTION OF RAINFALL PER PERIOD UNDER VARIOUS TRANSFORMATIONS,**
Georgia Univ., Athens. Computer Center.
For primary bibliographic entry see Field 2B.
W75-10517

**A STOCHASTIC MODEL FOR DAILY RAINFALL DATA SYNTHESIS,**
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 2B.
W75-10518

**STOCHASTIC MODELS OF SPATIAL AND TEMPORAL DISTRIBUTION OF THUNDERSTORM RAINFALL,**
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2B.
W75-10519

**STOCHASTIC MODEL OF DAILY RAINFALL,**
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W75-10520

**AN EVENT-BASED STOCHASTIC MODEL OF AREAL RAINFALL AND RUNOFF,**
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2B.
W75-10521

**RESEARCH IN STOCHASTIC MODELS FOR BEDLOAD TRANSPORT,**
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-10522

**USE OF AUTOREGRESSIVE RUNOFF MODELS IN RESERVOIR STUDIES,**
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-10523

**A STOCHASTIC MODEL OF SEDIMENT YIELD FOR EPHEMERAL STREAMS,**
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 2J.
W75-10524

**STATISTICAL INFERENCE ON STREAMFLOW PROCESSES WITH MARKOVIAN CHARACTERISTICS,**
Arizona Univ., Tucson. Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W75-10525

**DISPERSION OF CONTAMINATED BEDLOAD PARTICLES,**
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-10526

**A NOTE ON MIXED DISTRIBUTIONS IN HYDROLOGY,**
State Univ. of New York, Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 2E.
W75-10527

**DEVELOPING REGIONAL STOCHASTIC DATA BASES,**
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 2E.
W75-10528

**STATISTICAL MODEL OF SHORT-DURATION PRECIPITATION EVENTS,**
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W75-10529

**RECURRENCE INTERVALS OF ANNUAL MINIMUM STREAMFLOWS,**
Keystone Junior Coll., LaPlume, Pa. Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W75-10530

**A TWO-DISTRIBUTION METHOD FOR FITTING MIXED DISTRIBUTIONS IN HYDROLOGY,**
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2E.
W75-10531

**PHYSICAL MODEL STUDY OF CIRCULATION PATTERNS IN LAKE ONTARIO,**
State Univ. of New York, Buffalo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W75-10537

**PEDOLOGIC COVER OF THE WATERSHED OF THE PORECKA RIVER,**
Institute for Soil Research, Belgrade (Yugoslavia).
D. M. Tanasijevic.
Available from the National Technical Information Service, Springfield, Va 22161 as TT 73-56020, $4.25 in paper copy, $2.25 in microfiche. TT 73-56020, Report 1974. 62 p, 10 fig, 30 tab, 22 ref, 1 map. Translated from Pedoloski Pokrivac Sliva Porecke Reke, 1970.

Descriptors: *Soils, *Watersheds(Basins), *Pedocals, *Foreign countries, *Soil investigations, Climates, Vegetation, Data collections, Land use, Soil texture, Soil chemical properties, Soil physical properties, Brown soils, Acidic soils, Leaching, Chemical analysis, Alluvium, Productivity, Forests, Topography.
Identifiers: *Yugoslavia(Porecka River).

The Porecka River watershed comprises a narrow region in northeastern Serbia. It follows the dislocation line of the Porecka River and its tributaries, the Crnajka and Saska. The trapezoidal watershed of about 60,000 ha runs north-south and is divided into a narrow area of river terraces, stream banks, and dry gulches, and then hillocks, hummocks, hills, heights, and mountain peaks, which together with the other pedogenetic factors influenced the composition, development, and condition of the soils. Data was presented on geological composition, climate, vegetation, hydrography, and physical-chemical properties of the watershed soils. It was concluded that: (1) the pedological cover of the watershed is very heterogeneous, both in the types, sub-types, and varieties of soil, and in all other physical-chemical properties; (2) all soil formations are pre-eminently subject to processes of acidification and leaching; (3) deforested areas, especially cultivated areas, except riverside alluvial flats, are subject to erosion processes; (4) all the soils have more or less low economic-productive potential for intensive agricultural exploitation; (5) from the standpoint of exploitation, the total area of the watershed is naturally predetermined for pasture-meadow and forest production, except insignificant tracts along river courses that may be employed for crop-farming; (6) certain soils may in part be used for plantations; and (7) the primary task is to preserve developed soils by nuturing th grass-forest cover and attenuation of erosio processes. (Humphreys-ISWS)
W75-10551

**WAVE CLIMATE MODEL OF THE MID-AT LANTIC SHELF AND SHORELINE (VIRGINIA SEA), MODEL DEVELOPMENT, SHEL GEOMORPHOLOGY, AND PRELIMINAR RESULTS,**
Virginia Inst. of Marine Science, Gloucester Poi
For primary bibliographic entry see Field 2L.
W75-10552

**PROGRESS IN AUSTRALIAN HYDROLOG** 1965-1974.
Compiled by the Australian National Com.missi for UNESCO. Australian Government Publishi Service, Canberra, 1974. 103 p.

Descriptors: *Hydrology, *Australia, *Resear and development, *Reviews, Evaporatio Watersheds(Basins), Flood forecasting, Clo seeding, Rivers, Groundwater, Water treatme Hydrologic data, Legal aspects, Training.

Twenty-one articles by specialist authors presented with an introduction briefly describi as background, the Australian environment in re tion to water resources. Each article provides introductory review of a selected topic, emphas ing recent advances made in Australian studi The topics include: rainfall modification; evapo tion; catchment studies, flood forecasting river morphology; groundwater explorati development and conjunctive use; water tre ment; data collection, handling and mappi water planning, law and administration; and tra ing in hydrology. (CSIRO)
W75-10646

**NEW CONCEPTS IN SUBURBAN DRAINA IN FLORIDA,**
Diaz, Seckinger and Associates, Inc., Tampa, F
For primary bibliographic entry see Field 4A.
W75-10793

## 2B. Precipitation

**OPERATIONAL VALUE OF WEATHER INF MATION IN RELATION TO SOIL MANA MENT CHARACTERISTICS,**
Purdue Univ., Lafayette, Ind. Agricultural Exp ment Station.
For primary bibliographic entry see Field 2G.
W75-10367

**SOME ASPECTS OF CLIMATOLOGY POLAR BARRENS,**
Calgary Univ., Alberta. Dept. of Geography.
For primary bibliographic entry see Field 2C.
W75-10454

**A CLIMATOLOGICAL ANALYSIS OF NOR POLAR DESERT AREAS,**
Colorado Univ., Boulder. Dept. of Geogra and Colorado Univ., Boulder. Inst. of Arctic Alpine Research.
For primary bibliographic entry see Field 2C.
W75-10455

**A PRECIPITATION DATA SIMULATOR US A SECOND ORDER AUTOREGRESS SCHEME,**
North Carolina State Univ., Raleigh. Dept Biological and Agricultural Engineering.
E. H. Wiser.
In: Proceedings Symposium on Statis Hydrology, Arizona University, Tucson, Au 31-September 2, 1971. Miscellaneous Publica No 1275, p 120-134, June 1974. 10 fig, 5 tab, 5 r

)escriptors: *Precipitation(Atmospheric), Rainfall disposition, *North Carolina, *Model tudies, *Simulation analysis, Spatial distribution, nalytical techniques, Rainfall, Regression analy-is, Statistical models, Simulated rainfall, Vatersheds(Basins), Hydrology, Meteorology.
Identifiers: *Swannanoa River, Autoregression nalysis.

was assumed that for fixed weather conditions, ie negative binomial distribution can be used to t the observed distribution of precipitation mounts. Varying weather conditions were then terpreted as changing the values of the parame-r of the distribution. Weather conditions vary in quasi-oscillatory manner which may be escribed by a second-order autoregressive heme (SOARS). The SOARS was used to enerate a 'Storminess' parameter, which varies rough time in the desired manner. Rate and rection of weather movement were also simu-ted to produce simultaneous values of the rameter at as many points as required. These lues were converted by functions for each point to the parameters of the negative binomial dis-bution from which point rainfall amounts were btained at each point. Use of the simulator was monstrated with data for several North Carolina ations, and the process of fitting the parameters as described. (See also W75-10507) (Sims-ISWS)
75-10513

**ROSS SPECTRA OF SHORT-DURATION AINFALL,**
gricultural Research Service, Beltsville, Md. ydrograph Lab.
M. Hershfield, and B. Levy.
Proceedings Symposium on Statistical ydrology, Arizona University, Tucson, August -September 2, 1971. Miscellaneous Publication o 1275, p 135-146, June 1974. 17 fig, 1 ref.

escriptors: *Rainfall, *Watersheds(Basins), ariability, Distribution patterns, Correlation alysis, Frequency, Meteorology, Hydrology, me series analysis, Statistical methods.
entifiers: *Cross-spectral analysis, Short-dura-n rainfall, Power spectra.

examine the relative direction of the incremen-movements of rainfall during major storms, oss-spectral analysis was performed on time se-s composed of 15-minute increments from one jor storm for three nearby stations at each of ee different watersheds. A similar analysis was rformed with data from a fourth watershed by ng a 2-year series of daily data. The daily data pear to occur randomly with time whereas the minute spectra all show considerable per-tence as measured by the large amount of vari-e that is explained by the lower frequencies. nen rainfall is associated with thunderstorm ac-ity, as in the Cherokee, Oklahoma, example, re are only small differences in rainfall charac-istics at the three stations which are separated less than one-quarter of a mile. Similar results re obtained for nonthunderstorm rainfall when gage separation is about two miles. Con-erably more experimentation has to be per-med with storms of long duration and incre-nts of various lengths in order to determine the ative movement of rainfall with time. (See also 5-10507) (Sims-ISWS)
5-10514

**URLY RAINFALL GENERATION FOR A TWORK,**
drocomp, Inc., Palo Alto, Calif.
D. Franz.
Proceedings Symposium on Statistical drology, Arizona University, Tucson, August September 2, 1971. Miscellaneous Publication 1275, p 147-153, June 1974. 15 ref.

criptors: *Rainfall, *Model studies, tworks, Statistical models, Markov processes, Stochastic processes, Probability, Mathematics, Precipitation(Atmospheric), Urban hydrology, Streamflow, Hydrology, Distribution patterns, Rainfall disposition.
Identifiers: *Hourly.

Generation of synthetic, hourly rainfall data for a network of stations was investigated because existing monthly streamflow models are inadequate for many purposes and because watershed models are available to accurately predict streamflow given the hourly rainfall on the watershed. The use of synthetic rainfall with a watershed model should give more detailed traces of synthetic streamflow than the monthly total flows obtained from currently available stochastic streamflow models. The storm model is based on the multivariate normal distribution. Persistence is incorportated in the model by including the rainfall in the current and previous hours as variables. A fractional power tranformation is used to transform the observed distribution to normal at each station. The finite probability of zero rainfall is simulated by setting all values below a predetermined cutoff to zero before computing the inverse transformation in the generating process. The estimation of the storm model parameters is complicated by the presence of zeros in the data. Nonlinear least squares is used to estimate the transformation constant as well as the mean and variance of the tranformed data at each station in each of four seasons. The covariance matrix for the transformed variables is estimated by applying the relation between bivariate normal variates to the conditional cumulative distribution function of each pair of variables. The interstorm model consists of empirically defined distributions of interstorm length for 50 period in a year to closely approximate the annual variation of interstorm characteristics. (See also W75-10507) (Sims-ISWS)
W75-10515

**STOCHASTIC GENERATION OF THE OCCURRENCE, PATTERN, AND LOCATION OF MAXIMUM AMOUNT OF DAILY RAINFALL,**
Agricultural Research Service, Chickasha, Okla.
A. D. Nicks.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 154-171, June 1974. 9 fig, 10 tab, 12 ref.

Descriptors: *Rainfall, *Model studies, *Stochastic processes, *Oklahoma, Markov processes, Average, Probable maximum precipitation, Probability, Mathematics, Precipitation(Atmospheric), Networks, Distribution patterns, Rainfall disposition, Watersheds(Basins), Hydrology, Meteorology.
Identifiers: Daily.

A four-stage stochastic generation technique was used to synthesize the daily rainfall for a 1500-square-mile area in central Oklahoma. Synthetic records of up to 9 years were generated at 168 locations of an existing raingage network. Spatial patterns of rainfall for input to a hydrologic model were constructed by stochastically generating: (1) the occurrence or nonoccurrence of rainfall on each day, (2) the location of the central or maximum amount within the area, (3) the maximum amount, and (4) the pattern rainfall over the 1500-square-mile area corresponding to the central amount. Tests were presented for the representativeness and consistency of generated data including means, extremes, and frequency of occurrence in both time and spatial distribution. (See also W75-10507) (Sims-ISWS)
W75-10516

**COMMENTS ON THE STATISTICAL DISTRIBUTION OF RAINFALL PER PERIOD UNDER VARIOUS TRANSFORMATIONS,**
Georgia Univ., Athens. Computer Center.
P. M. Skees, and L. R. Shenton.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 172-196, June 1974. 4 fig, 13 tab, 51 ref. US DOD IPR-19-8-8001.

Descriptors: *Rainfall, *Distribution patterns, *Frequency curves, *Frequency analysis, Statistics, Temporal distribution, Statistical methods, Precipitation(Atmospheric), Climatology, Meteorology, Storms.
Identifiers: *Gamma distributions, *Transformations, Skewness, Kurtosis, Weekly, Daily, Hourly.

The statistical distribution of rainfall amounts over relatively long periods (months, years) has received considerable attention in the literature; generally, satisfactory fits are achieved for selected locations and seasons by using well known models such as the gamma, logarithmic normal, and normal distributions. For moderate to small intervals of observations (weeks, days, hours), satisfactory distributional models are much more difficult to find, although more observations are available. Considerable skewness in rainfall distributions arises because of the relatively numerous occurrences of 'no-rain' days; if these are omitted, one source of heterogeneity is removed. Amounts of rainfall on 'wet' days can still, over short periods, be very skewed, and over 100 transformations designed to eliminate this lack of symmetry were considered. About 30 locations in the southeastern United States were studied, and periods of observations were days, hours, and 'storms' periods. In most cases, the total number of observations involved were those included in 10-year records for 1955-1964. The models tried were the gamma, censored gamma, and generalized gamma distributions. Because considerable data analysis was involved, simple criteria were used for accepting or rejecting models. For example, moment methods of estimation and sample values of the skewness and kurtosis were used to judge departures from the gamma and normal distributions. (See also W75-10507) (Sims-ISWS)
W75-10517

**A STOCHASTIC MODEL FOR DAILY RAINFALL DATA SYNTHESIS,**
Central and Southern Florida Flood Control District, West Palm Beach.
N. N. Khanal, and R. L. Hamrick.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 197-210, June 1974. 4 fig, 12 tab, 10 ref, 1 append.

Descriptors: *Rainfall, *Synthesis, *Model studies, *Stochastic processes, Markov processes, Mathematical models, Climatology, Simulation analysis, Probability, Statistics, Temporal distribution, Statistical models, Statistical methods, Meteorology.
Identifiers: *Markov chain model, Daily.

A simple mathematical model was set up to synthesize daily rainfall values observed at a point. The synthesized daily rainfall values should be suitable for use in the Watershed Systems Model prepared in-house by the Flood Control District engineers. A first-order Markov Chain Model was proposed to do this. Statistical comparison was made between the historical and the synthesized daily rainfall values and they fit fairly well. (See also W75-10507) (Sims-ISWS)
W75-10518

**STOCHASTIC MODELS OF SPATIAL AND TEMPORAL DISTRIBUTION OF THUNDERSTORM RAINFALL,**
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
H. B. Osborn, L. J. Lane, and R. S. Kagan.

In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 211-231, June 1974. 7 fig, 1 tab, 22 ref, 1 append.

Descriptors: *Rainfall, *Thunderstorms, *Model studies, *Southwest U.S., *Arizona, Statistical models, Stochastic processes, *Spatial distribution, *Temporal distribution, Water sheds(Basins), Networks, Synthesis, Simulation analysis, Mathematical models.
Identifiers: *Walnut Gulch Watershed(Ariz).

A simplified stochastic model based on air mass thunderstorm rainfall data from the 58-square-mile Walnut Gulch Experimental Watershed in southeastern Arizona is being developed at the Southwest Watershed Research Center, Tucson, Arizona. Records from the 95 raingage network on this watershed provide valuable information on air mass thunderstorm rainfall in the southwestern United States. Probability distributions are being used to model random variables - number of cells, spatial distribution of the cells, and cell center depths - of thunderstorms in a summer rainy season. A computer program produces synthetic thunderstorm rainfall based on these distributional assumptions. The synthetic data are compared, with respect to storm center depths and isohyetal map characteristics, with data from the dense raingage network on Walnut Gulch. The daily and hourly chances of occurrence of seasonal air mass thunderstorm rainfall are modeled. Efforts are being made to model the temporal distribution of rainfall from individual cells within the air mass thunderstorm. Finally, the question of model transferability to other regions and locations is tied to defining regional meteorology and local topography. (See also W75-10507) (Sims-ISWS)
W75-10519

**STOCHASTIC MODEL OF DAILY RAINFALL,**
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
P. Todorovic, and D. Woolhiser.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 232-246, June 1974. 6 fig, 1 tab, 5 ref, 2 append.

Descriptors: *Rainfall, *Stochastic processes, Model studies, Markov processes, Temporal distribution, Statistics, Statistical models, Computer programs, Precipitation(Atmospheric).
Identifiers: *Markov chain model, Daily, Central limit theorem.

An application of stochastic processes for description and analysis of daily values of precipitation was presented. The total amount of precipitation S(n) during an n-day period is a discrete parameter stochastic process such that S(n) is greater than or equal to 0 and S(n + 1) is greater than or equal to S(n). The most general form of the distribution function, mathmatical expectation, and variance of S(n) were determined. The following special cases for the sequence of daily rainfall occurrences were considered: (1) sequence of independent identically distributed random variables, (2) sequence of independent random variables, and (3) markov chain. In addition, assuming that certain regularity conditions hold, it was proved that S(n) is asymptotically normal. The first passage time of S(n) and the corresponding distribution function were also considered. Numerical examples for cases 1 and 3 were presented, assuming that the daily rainfall amounts are exponentially distributed. The computer program for the Markov chain model was presented in an appendix. (See also W75-10507) (Sims-ISWS)
W75-10520

**AN EVENT-BASED STOCHASTIC MODEL OF AREAL RAINFALL AND RUNOFF,**
Arizona Univ., Tucson. Dept. of Watershed Management.
M. M. Fogel, L. Duckstein, and J. L. Sanders.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publicantion No 1275, p 247-261, June 1974. 8 fig, 1 tab, 16 ref. OWRT A-020-ARIZ(10).

Descriptors: *Rainfall, *Runoff, *Model studies, *Stochastic processes, Areal, Statistical models, Probability, Frequency curves, Rainfall-runoff relationships, Precipitation(Atmospheric), Meteorology, Hydrology.
Identifiers: Point rainfall.

A stochastic model of rainfall was developed to obtain runoff sequences on watersheds where the maximum events are most likely to be the result of thunderstorms. Runoff-producing rainfall events for a watershed were defined as a function of minimum levels of point measurements. The causal factors of a point measurement, given the occurrence of an event over a watershed, were the magnitude, location, and pattern of that areal event. It was found that the probability distribution function of point rainfall is geometric. Random variables representing precipitation at several points were then convoluted to yield mean areal values of rainfall whose distribution is negative binomial. Chicago and New Orleans data seem to validate the model developed in Tucson. A table describing seasonal rainfall combinations was used to generate possible annual sets of events. Corresponding likely sets of runoff amounts were then obtained by using both a simple linear rainfall-runoff relationship and the Soil Conservation Service formula for estimating runoff. A study of the frequency distribution of annual number and duration of runoff events with the use of an independent set of data provided a further validation of the proposed model. (See also W75-10507) (Sims-ISWS)
W75-10521

**STATISTICAL MODEL OF SHORT-DURATION PRECIPITATION EVENTS,**
Iowa State Univ., Ames. Dept. of Civil Engineering.
T. A. Austin, and B. J. Claborn.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 356-365, June 1974. 4 fig, 7 tab, 7 ref.

Descriptors: *Precipitation(Atmospheric), *Mathematical models, *Rainfall, *Texas, Runoff, Rainfall-runoff relationships, Monte Carlo method, Simulation analysis, Model studies, Storms, Meteorology, Climatology, Hydrology.
Identifiers: *Lubbock(Tex), Short-duration precipitation.

A mathematical model of short-duration precipitation events was presented. The model assumed these short-duration events were random in nature and could be described by a set of stationary probability distribution functions. The model described the storm depth, duration, and the time interval since the occurrence of the last storm event. In addition, a procedure for distributing the rainfall depth during the storm was proposed. The model is useful in providing stochastic inputs to rainfall-runoff models in order to evaluate the runoff from a variety of storm and antecedent conditions. Data from Lubbock, Texas were used to calibrate and verify the model. The means and standard deviations of the generated sequences were statistically indistinguishable from the means and standard deviation of the historical data. (See also W75-10507) (Sims-ISWS)
W75-10529

**ERROR ANALYSIS OF DOBSON SP TROPHOTOMETER MEASUREMENTS THE TOTAL ATMOSPHERIC OZONE C TENT,**
National Aeronautics and Space Administra
Wallops Island, Va. Wallops Station
For primary bibliographic entry see Field 7B.
W75-10545

**ANALOG TEMPERATURE RECORDS FRO LINEARIZED THERMISTOR NETWORK,**
Forest Service (USDA), Fort Collins, Colo. R
Mountain Forest and Range Experiment Stati
For primary bibliographic entry see Field 7B.
W75-10650

**ENVIRONMENTAL PROBLEMS ASSOCIA WITH THE USE OF COOLING TOWERS,**
Purdue Univ., Lafayette, Ind. School of Civi
gineering.
For primary bibliographic entry see Field 5D.
W75-10671

**PRIORITY PROBLEMS FOR MODIFYING MULUS PRECIPITATION,**
Colorado State Univ., Fort Collins. Dept. o
mospheric Science.
For primary bibliographic entry see Field 3B.
W75-10774

## 2C. Snow, Ice, and Frost

**WATERSHED MANAGEMENT IN THE RO MOUNTAIN SUBALPINE ZONE: THE ST OF OUR KNOWLEDGE,**
Forest Service (USDA), Fort Collins, Colo. F
Mountain Forest and Range Experiment Stat
For primary bibliographic entry see Field 3B.
W75-10405

**SOME ASPECTS OF CLIMATOLOGY POLAR BARRENS,**
Calgary Univ., Alberta. Dept. of Geography.
M. B. Giovinetto.
In: Polar Deserts and Modern Man. T. L. S and J. H. Zumberge, eds. University of A Press, Tucson, p 3-22, 1974. 17 fig, 8 tab, 62 r

Descriptors: *Arctic, Antarctic, *Glaci *Arid climates, *Semiarid climates, Fourier sis, Surface melt runoff, Attenuation, Pre tion, Solar radiation, Advection, Snow cov bedo, Cloud cover, Water vapor, Wind ve Percolation, Condensation.
Identifiers: Sachs Harbor.

The following climatic characteristics of ic barrens are discussed: (1) the attenuation of air-temperatures and (2) the relatively small bility of annual precipitation. Surface heat i latitude barren areas is described. An ha analysis of air temperature for stations in th tic and Antarctic is made comparing the w and coldest months as influenced by snow a surface melt runoff and subsurface temper Variations of potential insolation explain th of increasing temperature amplitude ratios w creasing latitude; amplitude ratios are sm the Arctic than the Antarctic at a given la Poleward from the subtropics, and for regu crements in latitudes, the decrease of the inc radiation rate is greater than that of the ou radiation rate. At 70 degrees latitude, atmos sensible heat transport - by meridional circu and eddy fluxes - is an order of magnitude than the contributions of latent heat flu oceanic energy fluxes. Cloud cover as rel upper air and surface inversions is disc Precipitation and accumulation in ice free b are determined using glaciological data fr jacent glaciated areas. (Michael-Arizona)
W75-10454

CLIMATOLOGICAL ANALYSIS OF NORTH OLAR DESERT AREAS,
olorado Univ., Boulder. Dept. of Geography; d Colorado Univ., Boulder. Inst. of Arctic and lpine Research.
. J. Bovis, and R. G. Barry.
: Polar Deserts and Modern Man, T. L. Smiley d J. H. Zumberge, eds. University of Arizona ess, Tucson, p 23-31, 1974. 4 fig, 7 tab, 21 ref.

escriptors: *Arctic, *Temperature, Precipitation, *Evaporation, *Runoff, Percolation, Cloud cover, Isotherm radiation, Aldo, Permafrost, Arid climates, Semiarid climates, Polar regions.
entifiers: *Polar deserts.

eans of estimating moisture balance in the Arctic e examined. The limits of polar desert as defined soil and vegetation criteria are statistically sted with reference to climatic data. At 48 Arctic ations the following variables were determined mean annual temperature; (2) mean July temrature; (3) annual temperature range; (4) mean nual precipitation; (5) mean number of days th precipitation per annum; (6) summer ecipitation (June, July and August); and (7) ean cloud cover. Resulting figures indicate that serts and non deserts may be statistically parated when a discriminant function is used th the given input variables. Four methods of timating annual evaporation are presented of nich three included a mean annual net radiation rm. Factors utilized to compute evaporation inude solar radiation, annual runoff, annual ecipitation, percolation losses, oceanicity, and turation. The distribution of world deserts and mideserts are shown according to the Budyko tional index of dryness, the Thornwaite-Mather oisture index, and the Turc evaporation formula. Michael-Arizona)
75-10455

EOMORPHIC PROCESSES IN POLAR ESERTS,
izona State Univ., Tempe. Dept. of Geology.
L. Pewe.
: Polar Deserts and Modern Man, T. L. Smiley d J. H. Zumberge, eds., University of Arizona ess, Tucson, p 33-52, 1974. 20 fig, 63 ref.

escriptors: *Permafrost, *Geothermal studies, rozen ground, *Snow, Engineering structures, nstruction, Saline soil, Alaska, Canada, Antarca, Air temperature, Runoff, Quaternary period, egetation, Radioactive dating, Solifluction, Surce drainage, Alluvial fans, Ephemeral streams, ines, *Polar regions.

e differences between polar deserts, (defined as cier-free terrestrial areas where mean annual ecipitation is less than 25 cm and the mean temrature for the warmest month of the year is less an 10C.) and temperate-tropic deserts are cussed in relation to the differences in omorphic processes. Differences are (1) cold rsus hot environments, (2) precipitation in solid her than liquid form, (3) precipitation concented in annual spring runoff in the cold desert, d (4) most soil moisture in the polar desert is in solid state as ice. The limitation of man's acities in polar desert areas is attributed to the esence of permafrost. This layer of permafrost, increase in thickness annually. Its distribution affected by snow, vegetation cover, topogphy, and bodies of water. The content of ground in permafrost greatly affects human life in the rth and provides evidence concerning past clites beyond the range possible by geothermal culations. The causes and formation of ice dges are described, some wedges dated by diocarbon analysis appear to be from 3,000 to 000 years old. Geomorphic features related to rmafrost include soil flowage, surface microre- patterns which cause beaded drainage patns, and uneven land formation. Features comn to polar and temperate-tropic deserts include sand dunes, ventifacts and taffoni. Modern man's adaptation attempts to accommodate polar desert conditions are discussed, including the difficulties encountered in construction engineering. (Michael-Arizona)
W75-10456

GEOLOGICAL AND LIMNOLOGICAL FACTORS OF COLD DESERTS,
Geological Survey, Reston, Va.
W. E. Davies.
In: Polar Deserts and Modern Man, T. L. Smiley and J. H. Zumberge, eds., University of Arizona Press, Tucson, p 53-61, 1974. 7 fig, 20 ref.

Descriptors: Hydrology, *Limnology, *Ice cover, *Snow, *Glaciers, *Deserts, Melting, Underflow, Surface drainage, Ice, Arctic, Rivers, Turbidity, *Water quality, Heat budget, Lake ice, Salinity, Silts, Snow fall, Leaching, Seawater, Currents(Water), Permafrost, Evaporation, Ablation, Meltwater, Sodium, Magnesium, Calcium chloride, Calcium sulfate, Sodium chloride, Calcium carbonate, Stratification, Polar regions.

The phenomenon of the hydrologic regimen in the Arctic deserts with permanent freshwater lakes and large well-developed river basins but with precipitation less than 6 cm annually is discussed. In the High Arctic the major sources for runoff are melt of glacier ice and melt of ground ice. Lag runoff from accumulation of winter snow is a major source of water in small stream basins that are independent of glaciers. Large streams in the northern cold deserts are supplied by runoff from melting glaciers. During the twentieth century, this source of water has been operating at a deficit, with more runoff than accumulation, resulting in some dramatic changes in glaciers and in the margins of ice sheets. Polar lakes are classified in three divisions; lakes with large quantities of material suspended in water, frequently supporting perennial ice; lakes containing clear water, most of which are fed by snow melt and are clear of ice in July and August and which, in areas where aridity is maximum, have a high salt content which increases with evaporation and proximity to marine salt terraces; and shallow lakes occupying elongated basins where erosion occurs during melt periods due to wind-generated wave and current action. Ice free land within the cold desert of Antarctica occurs in relatively small regions. Ablation is high in these areas, precipitation amounting to 6 to 12 cm annually, most in the form of snow. Most lakes in the dry valleys of this region are saline. (Michael-Arizona)
W75-10457

SOILS OF THE HIGH ARCTIC LANDSCAPES,
Rutgers - the State Univ., New Brunswick, N.J.
J. C. F. Tedrow.
In: Polar Deserts and Modern Man, T. L. Smiley and J. H. Zumberge, eds. University of Arizona Press, Tucson, p 63-69, 1974. 11 fig, 1 tab, 36 ref.

Descriptors: *Polar regions, *Soils, *Soil classification, *Soil physical properties, *Antarctic, *Arctic, Sierozems, Tundra, Streams, Sands, Silts, Saline soils, Frozen soils, Frost action, Erosion, Soil erosion, Thawing, Meltwater, Bogs, Floodplain, Solifluction.
Identifiers: Subpolar, Desert pavement, Hummocky ground, Rockland.

Major genetic soils within the polar zone are discussed. Polar desert soils have a desert pavement surface with free, almost xeric drainage. This soil is usually neutral but commonly alkaline in reaction. Hummocky-ground soils, influenced in size and shape by erosion, contain a mixture of humic substances and organic material, and frequently are mineral-stained. Polar desert-tundra interjacence soils have a superabundance of moisture during the spring and early summer thaw period. During the dry season, the soils become hard, with salts efflorescing on the surface. Tundra soils are usually mildly acid, but sometimes alkaline when the low-lying tundra soils dry out. Soil distribution is influenced by textural composition; loams and silts are present in low-lying areas; and rockland, frost shattered areas, rocky talus slopes, floodplains and gravel bars are present throughout the High Arctic. On steep slopes, solifluction processes have obliterated or deformed many of the genetic soil features. Antarctic soils are classified as (1) ahumic soils, (2) evaporite soils, (3) protoranker, and (4) ornithogenic. (Michael-Arizona)
W75-10458

APPLICATION OF LOW-LATITUDE MICROBIAL ECOLOGY TO HIGH-LATITUDE DESERTS,
Jet Propulsion Lab., Pasadena, Calif.
R. E. Cameron.
In: Polar Deserts and Modern Man, T. L. Smiley and J. H. Zumberge, eds., University of Arizona Press, Tucson, p 71-90, 1974. 21 fig, 8 tab, 65 ref.

Descriptors: *Polar regions, *Soil microbiology, Ecology, Soil texture, Chemical properties, Physical properties, Chemical reactions, Latitudinal studies, Antarctic, Laboratory analyses, Environment, Biology, Chemical analysis.

Field techniques and laboratory analyses in the study of desert microbial ecology are described. Environmental and ecological features, as well as biotic factors and previous data collected are important in the selection of sampling sites. Aerobiological monitoring is used to make comparisons between distributions, abundances, and kinds of aerial propagules and soil microbiota. Methods to determine soil physical and chemical properties are described and results obtained on world arid-zone soils are presented. Properties described include texture, color, moisture content, redox potential and pH, electrical conductivity, cation and anion content, organic carbon content, organic nitrogen, cation exchange capacity, buffer capacity, moisture constants and thermoluminescence. Lower cation exchange and buffer capacity exist in the polar desert soils. Electrical conductivity varied depending upon the quantity and nature of salts in the soil. Abundances and types of microbes in arid-zone soils and their metabolic activity are described. Aerobic and microaerophilic bacteria are in highest abundance in desert regions, but the Antarctic polar desert has the fewest recoverable numbers of microorganisms. The Antarctic desert can be used to study soil microbial ecology at its least complex level in terms of gradients of the physical and chemical environment of the soil, terrain and microclimate at increasing latitude and altitude. Gradients range from uninhabitable to increasingly favorable environments; these conditions are summarized. The hygrothermal regime is the most important factor. (Garrettson-Arizona)
W75-10459

PROCESSES AND COSTS IMPOSED BY ENVIRONMENTAL STRESS,
Alaska Univ., College. Inst. of Social, Economic, and Government Research.
A. R. Tussing.
In: Polar Deserts and Modern Man, T. L. Smiley and J. H. Zumberge, eds., University of Arizona Press, Tucson, p 105-113, 1974. 6 tab, 51 ref.

Descriptors: *Polar regions, *Temperatures, *Ice fog, *Ice, *Freezing, Biology, Productivity, Economics, Mining, Arctic, Costs, Transportation, Pipeline, Oil, Gas, Fossil fuels, Alaska.

The stress imposed by man's works upon the polar environment and the stress imposed by the environment upon human activity are reported. Biotic productivity on land and in both fresh and salt water tends to be low causing the plant and animal resource potential to be of little significance commercially. The greatest cost for economic development has been expenditures for

construction, mineral exploration, transportation, and human habitation. The polar region is increasingly seen as a natural asset to non-Arctic man, and alteration of its wilderness status as constituting a cost to humanity. The cost of living index indicates rental costs for a moderate income family in Anchorage were 213 percent of the U.S. urban average. The formation of 'ice-fog' at temperatures below -30 deg C. forces man to consume more primary energy and invest in greater amounts of heating materials. Another powerful influence on costs is the fact that polar regions are being developed with equipment, building methods, and materials largely developed for radically different environments. Man-hour physical productivity is widely reported to be lower in Arctic and Sub-Arctic environments. The loss of man's effectiveness under conditions of dry cold with no wind was negligible down to about -18 deg C; performance fell to nearly zero at about -34 deg C. (Garrettson-Arizona)
W75-10461

**REVIEW OF DEVELOPMENT OF ARCTIC RESOURCES,**
Arctic Inst. of North America, Montreal (Quebec).
J. C. Reed.
In: Polar Deserts and Modern Man, T. L. Smiley, and J. H. Zumberge, eds., University of Arizona Press, Tucson, p 115-118, 1974. 10 ref.

Descriptors: *Arctic, *Resources, *Resources allocation, *Resources development, Oil, Gas, Clays, Sands, Gravels, Gold, Transportation, Communication.
Identifiers: *Bering Sea.

The historical development of Arctic resources is described. Resources are listed as renewable, nonrenewable, and nonexpendable. Three major factors inhibiting Arctic development are (1) lack of adequate transportation systems, (2) limitations of communication systems, and (3) inadequacies of a supply of reliable labor. Renewable resources are the plants and animals from the land and sea. Nonrenewable resources are (1) non-metals like sand, gravel, clay, fluorspar, and crushed stone, (2) the metallic ores, (3) coal, and (4) oil and gas. Examples of nonexpendable resources are scenery, open tundra, midnight sun, the ice-flecked Arctic ocean, and sport fishing. (Garrettson-Arizona)
W75-10462

**RESOURCE DEVELOPMENT IN CANADA'S HIGH ARCTIC,**
G. Jacobsen.
In: Polar Deserts and Modern Man, T. L. Smiley and J. H. Zumberge, eds., University of Arizona Press, Tucson, p 119-121, 1974.

Descriptors: *Canada, *Arctic, *Pollutants, *Resources development, Wildlife, Oil, Natural gas, Oil spills, Fossil fuel, Domestic wastes, Recreation, Mining, Pipelines.
Identifiers: Renewable resources, Nonrenewable resources.

The development of renewable and nonrenewable resources in the high polar regions of Canada is discussed. The only renewable resource which is exported is furs. Another renewable resource is the enormous empty space which will be a great asset for recreation and leisure activities. Nonrenewable resources under exploration are oil, gas, and minerals. The Canadian High Arctic will become a major supplier of fossil fuel energy. Major factors thought to affect rapid development of resources are lack of ambition due to a highly taxed welfare society, and changes in social structure and way of living. A serious environmental hazard is pollution resulting from sewage and garbage disposal from permanent Arctic settlements. Another pollution hazard is oil spills resulting from tanker damage and oil pipeline breaks. (Garrettson-Arizona)
W75-10463

**LARGE SCALE LABORATORY DIRECT SHEAR TESTS ON ICE,**
Alberta Univ., Edmonton. Dept. of Civil Engineering.
W. D. Roggensack.
Canadian Geotechnical Journal, Vol 12, No 2, p 169-178, May 1975. 9 fig, 2 tab, 10 ref.

Descriptors: *Ice, *Lake ice, *Shear strength, Mechanical properties, Strength, Shear, Strength of materials, On-site tests, On-site investigations, Equipment, Testing procedures, Failure(Mechanics), Laboratory equipment, Laboratory tests, Civil engineering, Mechanical engineering.

The results of a series of large-scale direct shear tests performed on lake ice were presented. Test specimens were oriented with the principal stresses acting in the plane of the ice sheet, approximately normal to the long axes of the columnar crystals. Sample dimensions were large in comparison with mean crystal diameter, reducing the possibility of deviations introduced by size effects. Although a number of assumptions were made concerning stress conditions at failure, results for uniform, artificially 'seeded' test pond ice indicated a failure mechanism that was frictional and consistent with triaxial test data reported elsewhere. Post-peak shear resulted in the formation of a distinct failure zone that also displayed a frictional response. The direct shear test described is robust and simple, does not require elaborate sample preparation, and may present an alternative method of strength determination for ice mechanics problems where the shear box configuration duplicates field stress conditions and constraints. (Sims-ISWS)
W75-10502

**SNOW CREEP: ITS ENGINEERING PROBLEMS AND SOME TECHNIQUES AND RESULTS OF ITS INVESTIGATION,**
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
W. H. Mathews, and J. R. Mackay.
Canadian Geotechnical Journal, Vol 12, No 2, p 187-198, May 1975. 9 fig, 9 ref.

Descriptors: *Snowpacks, Movement, *Pressure, *Canada, Snow, Mechanical properties, Mountains, Slopes, Density stratification, Surveys, Elastic deformation, On-site investigations, Equipment, Engineering.
Identifiers: *Snow creep.

Aspects of the slow creep of the snow pack on mountain slopes in southern British Columbia were investigated. Studied particularly were (1) the rate of slip of the basal layer of snow on its substratum, (2) the pressures applied by the creeping snow pack on some stationary obstacles, and (3) the regional and the year-to-year variations of such pressures. Simple, relatively inexpensive equipment and methods were developed to explore these problems. These indicate, for example, basal creep velocities up to 90 cm per winter season on very steep slopes, and pressures in the order of 0.5 kg/sq cm under extreme conditions. These studies led to guidelines for future site investigations of areas subject to snow creep. (Sims-ISWS)
W75-10503

**THE INFLUENCE SURFACE METHOD FOR FLOATING ICE PLATES,**
Ballistic Missile Defense Systems Command Field Office, Madison, N.J.
W. T. Palmer.
Canadian Geotechnical Journal, Vol 12, No 2, p 224-234, May 1975. 6 fig, 25 ref.

Descriptors: *Ice, *Floating, *Loads(Forces), Lake ice, Mechanical properties, Youngs modulus, Bearing strength, Theoretical analysis, Engineering, Graphical analysis, Numerical analysis. Identifiers. *Floating ice plates, Bending ments, Influence functions.

In order to simplify the calculations of ben moments in floating ice plates subjected to sl moving loads or static loads of short duration fluence functions for infinite plates floating liquid were derived and then presented graphi in the form of influence charts. The prese charts and analyses were based on the el theory of plates. It was shown how to use charts in practice. Two numerical examples presented. (Sims-ISWS)
W75-10504

**TOWARD AN ICE-FREE ARCTIC OCEAN,**
Washington Univ., Seattle. Dept. of Ocea raphy.
K. Aagaard, and L. K. Coachman.
EOS, Transactions American Geophysical U Vol 56, No 7, p 484-486, July 1975. 2 fig. ONR Contract N00014-67-A-0103-0021

Descriptors: *Sea ice, *Arctic Ocean, *River lation, *Diversion, Melting, Salinity, Alterati flow, Oceans, Rivers, Temperature, Che properties, Weather, Oceanography.

The strong salinity stratification of the A Ocean prevents substantial ice-free conditio winter by suppressing convection and reducin ward heat flux from Atlantic Ocean water. conditions would be significantly altered i sensitive southern Eurasian Basin if sugg diversions of western Siberian rivers were ac plished. In the extreme case of the Yenisei an Ob', which are both diverted southward, absence of possible feedback mechanisms of the halocline over nearly 1,000,000 sq km Eurasian Basin would be swept out of the A Ocean by the prevailing currents within 2-3 The likely results would be (1) prolonged ic conditions because of deep-reaching free co tion in the ocean; (2) release of large amou heat from the warm Atlantic water to th mosphere during the cold months; and (3) tion of quite saline water into close proximity the sea surface, both on and off the shelf, le to deep-water formation within the Arctic O Even partial and limited restriction of the ent of fresh water into the Kara Sea may contrib significant ways toward realization of the firs results. (Sims-ISWS)
W75-10532

**FLOATING GLACIAL ICE CAPS IN THE TIC OCEAN,**
Lamont-Doherty Geological Observa Palisades, N.Y.
W. S. Broecker.
Science, Vol 188, No 4193, p 1116-1118, Ju 1975. 1 fig, 15 ref. NSF Grant GA-27546.

Descriptors: *Sea ice, *Arctic Ocean, *Gla Ice-water interfaces, Climatology, Paleoclim gy, Ice jams, Cold regions, Isotope studies.
Identifiers: *Ice thickness, Ice caps.

Two arguments were presented, one in fa the existence of thicker ice in the Arctic during glacial time, and the other in favor of fledged Arctic ice cap. The first was based Greenland air temperature record obtained isotopic studies of the Camp Century ice cor second was based on the oxygen isotope rec benthic foraminifera from a deep Pacific core. (Sims-ISWS)
W75-10533

**GLACIER-FLOW PATTERNS AND ORIGIN OF LATE WISCONSINAN TIL THE SOUTHERN ROCKY MOUN TRENCH, BRITISH COLUMBIA,**
British Columbia Univ., Vancouver. De Geological Sciences.
J. J. Clague.

logical Society of America Bulletin, Vol 86, 5, p 721-731, June 1975. 10 fig, 1 tab, 59 ref.

criptors: *Glaciers, *Geomorphology, *Till, nada, Glacial sediments, Glacial drift, Glacial , Sediments, Rocky Mountain region, Stratig- y, Geologic history, Quaternary period, iology.
tifiers: *Rocky Mountain Trench(British mbia), Till fabric, Till composition.

Wisconsinan glacier-flow patterns and till sis in the southern Rocky Mountain Trench, sh Columbia, were determined by studying al landforms, till fabric, and till composition. ajor shift in the pattern of glacier flow oc- d near the end of glaciation; tributary glaciers scent with the trunk glacier in the Trench ded, and side valleys were invaded by the glacier. Final recession of the trunk glacier rred with no major halts and without stagna- of the terminus. Till associated with drumlins e Trench accumulated by lodgement of parti- due to subglacial pressure melting against a r substratum. Fabric results from the lower of the younger till sheet suggest either com- patterns of ice flow similar to those at junc- of many modern valley glaciers, or mass ment of supraglacial till associated with an stadial interval within the late Wisconsinan ation. Compositional analysis is relatively in- tive as an indicator of short-lived ice-flow uations in the southern Trench. Rather, till position reflects the dominant pattern of ice during glaciation: a south- to south-east flow- unk glacier augmented by coalescent tributa- aciers. Most pebbles and fine-grained sand in ills of the Trench are of local origin. Local ituents decrease in relative amounts away the mouths of tributary valleys where they erived. These decreasing gradients result lar- from progressive deposition and dilution. -ISWS)
10539

**RAULICS AND MECHANICS OF RIVER AMS,**
Univ., Iowa City. Inst. of Hydraulic arch.
rimary bibliographic entry see Field 8B.
10556

**GS ALONG THE TRANS-ALASKA LINE ROUTE,**
gical Survey, Anchorage, Alaska.
Sloan, C. Zenone, and L. R. Mayo.
file report 75-87, 1975. 39 p, 32 fig, 8 ref.

iptors: *Ice, *Alaska, *Pipelines, *Oil, Con- ion, Roads, Airports, Ice loads, Melt water, plains, Erosion, Data collections, Maps, photography.
fiers: *Trans-Alaska pipeline route, Icing ef-

cation and extent of icings observed during inters, 1969 to 1974, along the trans-Alaska ne route are shown on a series of maps and graphs. Large flood-plain icings occur in the d river channels of the Sagavanirktok, n, Dietrich, and Delta Rivers. Numerous stream and hillside icings also occur along peline route. Construction of the pipeline, pumping stations, and training structures isplace some existing icings and will create cings. Icings may cause problems such as ng and erosion when they form on or near peline, roads, and other pipeline facilities. lard-USGS)
0592

**IBULL PREDICTION OF THE TENSILE NGTH-VOLUME RELATIONSHIP OF**
Service (USDA), Fort Collins, Colo. Rocky ain Forest and Range Experiment Station.
R. A. Sommerfeld.
Journal of Geophysical Research, Vol 79, No 23, p 3353-3356, August 10, 1974. 3 fig, 1 tab, 15 ref.

Descriptors: Avalanches, *Tensile strength, *Snow management, Slabs, Forecasting.
Identifiers: *Weibull prediction, Slab failure.

A comparison of previous work and data presented here show that the brittle tensile strength of snow varies with sample volume. If the hypothesis that snow has a predictable minimum tensile strength and that volume larger than 1 cubic meter exhibit the minimum strength could be verified, predictions of slab failure might be greatly simplified. (Forest Service)
W75-10651

**AVALANCHE WARNINGS: CONTENT AND DISSEMINATION,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
A. Judson.
Research Note RM-291, June 1975. 8 p, 2 fig.

Descriptors: *Avalanche, Snow management, Warning systems, Communications, Radio communication systems, Networks.
Identifiers: Avalanche information dissemination.

Snow avalanche warnings are an effective method of alerting the public to unusually dangerous avalanche conditions. An effective warning message conveys a sense of urgency, and should have an official and authoritative source. The message must be simple, clear, and concise. Warnings are transmitted through the National Weather Service's communications network to the media and public. Timely release of bulletins elicits good media coverage. (Forest Service)
W75-10653

**AVALANCHE PROTECTION IN SWITZERLAND.**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 8C.
W75-10656

**THE SNOWY TORRENTS: AVALANCHE ACCIDENTS IN THE UNITED STATES 1967-71,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
K. Williams.
General Technical Report, RM-8, March, 1975. 190 p.

Descriptors: *Avalanches, *Accidents, Snow management, Safety, United States, Safety factors.
Identifiers: *Avalanche safety, Avalanche accidents.

This compilation of 76 avalanche accident reports teaches by example, both good and bad. Commentaries will help those who spend time in the mountains in winter how to avoid getting caught in an avalanche, or if caught, how to survive. (Forest Service)
W75-10657

**SNOW AVALANCHE SITES: THEIR IDENTIFICATION AND EVALUATION,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
M. Martinelli, Jr.
Agriculture Information Bulletin 360, 1974, 27 p. 28 fig, 13 ref.

Descriptors: *Avalanches, Building, Construction, Safety, *Safety factors, *Snow management, Sites.
Identifiers: *Avalanche sites.

Avalanches in mountain areas threaten lives and damage property. Persons who plan to build new facilities or expand or relocate old ones should know how to recognize potentially dangerous sites. This bulletin describes and illustrates avalanche-prone areas and recommends a checklist to help evaluate field evidence of avalanche activity. (Forest Service)
W75-10659

**WATER-YIELD IMPROVEMENT FROM ALPINE AREAS: THE STATUS OF OUR KNOWLEDGE,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W75-10660

**NEW ENGINEERING CRITERIA FOR SNOW FENCE SYSTEMS,**
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
R. D. Tabler.
Transportation Research Record 506, p 65-78 (1974). Transportation Research Board/National Research Council, Washington, D.C. 13 fig, 1 tab, 9 ref.

Descriptors: *Snowpacks, *Windbreaks, *Snow management, Snow removal, *Blizzards, Engineering structures, *Design criteria, Shelterbelts, Roads, Water yield improvement, Barriers, Roadbanks, Highways, *Wyoming.
Identifiers: *Snow fences, Snow control, Snow protection, Blowing snow.

New engineering criteria have been used to design a snow control system that is unusually effective in preventing drifts, improving visibility, and reducing formation of road ice. This paper describes these criteria and the research results on which they are based. A method for estimating the amount of blowing snow is used to determine the height and number of rows of fencing required at each site. Design and capacity of the new Wyoming Highway Department standard-plan fence is given. Tall (3.8m) fences have been used in preference to shorter ones because experience has shown taller structures to be more efficient in trapping snow and to have a much lower construction cost per unit of storage. Terrain can be used to greatly increase the capacity of snow fences -- capacity is increased about 15-20% for each 0.017 rad of downslope behind a fence and about 15% for each 0.017 rad of upslope in the approach zone. Because wind sweeping around fences ends reduces storage capacity significantly over a distance from the ends of 12 times the height, length of fences should be at least 30 times their height, and staggered barriers should be overlapped at least 8 times their height. (Forest Service)
W75-10692

**NEW SNOW FENCE DESIGN CONTROLS DRIFTS, IMPROVES VISIBILITY, REDUCES ROAD ICE,**
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
R. D. Tabler.
In: Annual Transportation Engineering Conference (Colorado University, Denver, February 1973) Proceedings 46, p 16-27. 10 fig, 3 ref.

Descriptors: *Snowpacks, *Snow management, Snow removal, *Blizzards, Engineering structures, Highways, *Windbreaks, *Highway icing, Roads, Barriers, Roadbanks, Shelterbelts, *Wyoming, Design.
Identifiers: *Snow fences, Snow control, Snow protection, Blowing snow.

An extensive snow fence system has been built to control blowing and drifting snow on Interstate Highway 80 in southeastern Wyoming, using

recent research results to determine best height, number of rows, and optimum location of the fences. This paper provides photographic documentation of the dramatic improvement in visibility and ice formation behind the new fences, and the exceptionally effective control of drifting snow. (Forest Service)
W75-10693

**ESTIMATING THE TRANSPORT AND EVAPORATION OF BLOWING SNOW,**
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
R. D. Tabler.
In: Symposium on Snow Management on the Great Plains (Bismarck, North Dakota, July 29, 1975), Great Plains Agricultural Council Publication 73, p 85-104. 6 fig, 2 tab, 8 ref.

Descriptors: *Sublimation, *Evaporation, *Snow management, *Snowpacks, Water yield improvement, *Blizzards, Vegetation effects, Shelterbelts, Windbreaks, Brush, Barriers, Watershed management, Snow removal, Mathematical models, Particle size, Range management, *Wyoming.
Identifiers: *Blowing snow, Snow accumulation, Snow control, Snow fences.

Complexity of the physical processes does not permit the transport and evaporation of windblown snow to be estimated from a purely theoretical analysis. This paper describes a simplified conceptual model based on the maximum distance that a particle can travel before complete evaporation, and derived from consideration of the consequences of a non-uniform particle size distribution. Model predictions agree well with snow accumulations measured at numerous sites in southeast Wyoming over several years. Results indicate a significant portion of the winter's precipitation is lost to in-transit evaporation on sites where snowfall is relocated by wind. An example is given of how this model can be used to assess effects of land management practices on the transport and evaporation of blowing snow. (Forest Service)
W75-10695

**GEOTHERMAL CHANNEL AND HARBOR ICE CONTROL SYSTEM,**
For primary bibliographic entry see Field 4A.
W75-10734

## 2D. Evaporation and Transpiration

**CANOPY WEIGHT DISTRIBUTION AFFECTS WINDSPEED AND TEMPERATURE IN A LODGEPOLE PINE FOREST,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W75-10654

**ESTIMATING THE TRANSPORT AND EVAPORATION OF BLOWING SNOW,**
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W75-10695

**EFFECTIVENESS OF PRECIPITATION IN A MOUNTAIN MEADOW,**
Agricultural Research Service, Fort Collins, Colo.
E. G. Kruse, and H. R. Haise.
In: Agricultural and Urban Considerations In Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 627-646, 1974. 9 fig, 3 tab.

Descriptors: *Evapotranspiration, *Grasses, *Precipitation(Atmospheric), *Irrigation, *Colorado, Rainfall, Runoff, Evaporimeters, Humidity, Solar radiation, Evaporation pans, Storms, Water table, Temperature, Mountains, Wind velocity, Water utilization.
Identifiers: *Meadow grasses, *Gunnison(Col), Meadow irrigation, Sunken tanks, ET tanks, Precipitation effectiveness.

Evapotranspiration was measured during three seasons at each of two locations in high mountain meadows in Colorado. Sunken ET tanks with native vegetation and with the water table maintained near the surface were used to obtain the measurements. Class A pan evaporation, total solar radiation, temperature, humidity, and wind speed were measured daily. Evapotranspiration varied from 59.6 to 70.5 cm (23.5 to 27.8 inches). Measured ET averaged about 82% of evaporation. During two seasons, the effectiveness of precipitation in reducing the demand for irrigation water was determined by sheltering two of the ET tanks during storms while the other tanks were left unprotected. Small storms, less than 0.50 cm (0.20 inch), averaged about 50% effective in reducing irrigation water demand. The effectiveness of all rainfall received during the growing season was 75%. (See also W75-10769) (Roberts-ISWS)
W75-10799

## 2E. Streamflow and Runoff

**PROCEEDINGS SYMPOSIUM ON STATISTICAL HYDROLOGY.**
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 2A.
W75-10507

**SOME PROBLEMS IN PURE AND APPLIED STOCHASTIC HYDROLOGY,**
Toronto Univ. (Ontario). Dept. of Mechanical Engineering; and Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 2A.
W75-10508

**MULTISITE STREAMFLOW SIMULATION OF TRUCKEE RIVER, NEVADA,**
Nevada Univ., Reno. Desert Research Inst.
V. L. Gupta, and J. W. Fordham.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication 1275, p 26-46, June 1974. 15 fig, 4 tab, 11 ref.

Descriptors: *Simulation analysis, *Streamflow, *Model studies, *Rivers, *Nevada, Runoff, Stream gages, Statistical models, Mathematical models, Analytical techniques, Monthly, Temporal distribution, Frequency, Hydrology.

The problems associated with conducting sequential simulation studies of monthly streamflow were discussed. Focus was on a configuration of six gaging stations in the Truckee River System. The concepts of simulation were structured in such a manner that both the serial and cross correlations of the station-to-station dependence was preserved. The results were investigated by comparing the statistical properties of the simulated sequences and the historic flow inputs. Some of these properties include mean, standard deviation, and skewness; correlograms; and frequency distributions. Lack of meaningful agreement in the statistics of historic and simulated sequences for Tahoe inflow, particularly for the low flow regime, is attributable to the use of a blanket 'Log-Pearson Type III distribution' for all stations, for all seasons, and for each month. Tahoe inflow is predominantly a consequence of the precipitation on the large body of water. Lag time and the frequency distribution of precipitation and streamflow are distinctly different. Consequently, postulating the same parent distribution has led to
crepancies. Smoothing and truncating the
coefficients as advocated by the method us
partially responsible for the lack of agree
between historic and simulated sequences.
also W75-10507) (Sims-ISWS)
W75-10509

**GENERAL ASPECTS OF MULTIVARI ANALYSIS WITH APPLICATIONS TO S PROBLEMS IN HYDROLOGY,**
Agricultural Research Service, Chickasha, Ok
For primary bibliographic entry see Field 2A.
W75-10510

**STATISTICAL TOLERANCE LIMITS FO PEARSON TYPE III DISTRIBUTION,**
Georgia Inst. of Tech., Atlanta. School of Engineering.
J. R. Wallace, and D. G. Fontane.
In: Proceedings Symposium on Stati Hydrology, Arizona University, Tucson, A 31-September 2, 1971. Miscellaneous Public No 1275, p 69-77, June 1974. 5 fig, 1 tab, 10 ref

Descriptors: *Statistics, *Flood frequ *Flood recurrence interval, Statistical met Probability, Hydrology, Floods, Frequ curves, Mathematical studies.
Identifiers: *Pearson Type III distribu *Statistical tolerance limits.

Flood frequency analysis is a statistical predi of future events. From a sample of flood specified recurrence interval floods can be mated. Because these specified recurrence val floods are determined from a sample possible floods, they can be expected to v the future. Statistical tolerance limits prov means of estimating the range of future var in a specified recurrence interval flood. Me for determining statistical tolerance limits f Pearson Type III distribution, which form basis for flood frequency analyses perform federal agencies, have not been ava Development of tolerance limits depends determination of tolerance factors. A theo approach to the development of tolerance f for the Pearson Type III distribution w tempted but was not sucessful. A num technique was then tried. By simulation digital computer, samples from a person Ty distribution were generated. A set of emp tolerance factors was developed directly fr generated data. These tolerance factors several expected characteristics: the fact crease with skew, probability, and populatio portion, and decrease with sample size. (Se W75-10507) (Sims-ISWS)
W75-10511

**A MODEL OF STATISTICAL ERRORS IN MATING STREAMFLOW FROM CON OUS-STAGE RECORDS,**
Forest Service (USDA), Berkeley, Calif.
Southwest Forest and Range Experiment St
R. B. Thomas.
In: Proceedings Symposium on Sta Hydrology, Arizona University, Tucson, 31-September 2, 1971. Miscellaneous Publ No 1275, p 84-96, June 1974. 3 fig, 3 tab, 4 re

Descriptors: *Streamflow, *Statistics, discharge relations, Discharge(Water), tions, Hydrographs, Stream gages, Dis measurement, Statistical methods, Model s Hydrology.
Identifiers: *Statistical errors, Variance.

Determining discharge from continuou streamflow records is subject to several sou error. When a power function is used as model, one error source is estimating para for the model. The hydrograph is divided in ries of 'intervals' by selecting data points

hydrograph is assumed to be linear during interval, discharge could be calculated if the model parameters were known. The errors w as a result of using estimates of these eters were discussed. Approximate estima- or bias and standard error in estimating inter- d daily flow were developed. Consequences model and results of applying these estima- n actual streamflow records were reported. lso W75-10507) (Sims-ISWS)
0512

VENT-BASED STOCHASTIC MODEL OF L RAINFALL AND RUNOFF,
na Univ., Tucson. Dept. of Watershed gement.
imary bibliographic entry see Field 2B.
0521

OF AUTOREGRESSIVE RUNOFF MODELS SERVOIR STUDIES,
ngton Univ., Seattle. Dept. of Civil En- ing.
urges.
Proceedings Symposium on Statistical ology, Arizona University, Tucson, August tember 2, 1971. Miscellaneous Publication 75, p 287-294, June 1974. 4 fig, 14 ref.

iptors: *Reservoirs, *Runoff, *Model stu- *Regression analysis, Reservoir storage, voir operation, Statistical models, Markov ses, Hydrology, Storage, Inflow.
fiers: *Autoregressive runoff models.

roblem of determining an adequate model to te streamflow volumes for use in a reservoir etermination study was examined from a s analysis viewpoint. A brief history of ru- odels used in reservoir studies was given to te how available data and technology have ced the degree of model sophistication em- . A simple annual Markov model was used ustrate problems associated with the nics of generation, particularly with respect adequacy of Monte Carlo sampling, to en- rocedural accuracy. The sensitivity of reser- torage requirements to slight changes in parameter values illustrates parameter where even the simplest stochastic runoff s are critically limited by input data uncer- s. For such cases, the end product of an ion study can be extremely uncertain. There is a limit to the advances that can be made ngineering hydrology by considering hed runoff as a stochastic process. When variability is large, more realistic stream- olume models can be constructed by model- cipitation as a stochastic process and rout- chastically generated precipitation through ministic watershed model thus more accu- reflecting the complex interactions that within the watershed. (See also W75-10507) SWS)
0523

STICAL INFERENCE ON STREAMFLOW ESSES WITH MARKOVIAN CHARAC- TICS,
a Univ., Tucson. Dept. of Mathematics.
enny, C. C. Kisiel, and S. L. Yakowitz.
roceedings Symposium on Statistical ogy, Arizona University, Tucson, August ember 2, 1971. Miscellaneous Publication 5, p 309-322, June 1974. 27 ref OWRT A- IZ(2).

tors: *Streamflow, *Model studies, v processes, *Statistical models, tic processes, Simulation analysis, s, Hydrographs, Statistics, Hydrology.
ers: Markov chain models.

l of certain streamflows was formulated in f a random process which is a function of a Markov process with stationary transition probability. This process was approximated by a higher order Markov process with stationary transition probabilities. By using streamflow data from measuring stations in Arizona, the model was applied to study questions about changes in the frequency of moderately long wet and dry periods, prediction of streamflow behavior using only past streamflow records, long range trends of streamflow, and other problems. Some questions about approximating the model by higher order Markov processes were raised but not satisfactorily answered. (See als W75-10507) (Sims-ISWS)
W75-10525

**A NOTE ON MIXED DISTRIBUTIONS IN HYDROLOGY,**
State Univ. of New York, Syracuse. Coll. of Environmental Science and Forestry.
R. H. Hawkins.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 336-344, June 1974. 6 fig, 1 tab, 16 ref, 1 append.

Descriptors: *Frequency curves, *Hydrology, *Mathematical models, Hydrologic data, Probability, Analytical techniques, Floods, Flood peak, Streamflow, Snowmelt, Pollutants, Distribution, Distribution patterns.
Identifiers: *Curve fitting, *Mixed distributions.

The use of mixed distributions in hydrology was explored, and a decomposition technique through the method of moments was reviewed and further developed. The distinction between mixed distributions and mixed variables in hydrology and drawn and illustrated. Several hydrologic records were decomposed and the resultant frequency distributions were compared against the customary Pearson-III. The use of a mixed distribution model in the place of the currently used distributions was not demonstrated. (See also W75-10507) (Sims-ISWS)
W75-10527

**DEVELOPING REGIONAL STOCHASTIC DATA BASES,**
Iowa State Univ., Ames. Dept. of Economics.
J. C. Wade, A. D. Weiss, and L. R. Beard.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 345-355, June 1974. 5 fig, 4 ref. OWRT C-1681(No 3156)(3).

Descriptors: *Hydrologic data, *Mathematical models, *Simulation analysis, *Texas, Streamflow, Date collections, Data processing, Hydrology, Model studies, Stochastic processes.
Identifiers: *Data extension, *Sabin River(Tex), Fill-in techniques.

Basic to all water resource planning, design, and operation studies is the development of an acceptable hydrologic and meteorologic data base. Because most of the available historical records either have gaps located within an otherwise continuous set of observations or long periods of missing observations prior to gage installation or subsequent to gage removal, the problem of how to reconstitute the missing observations over the appropriate temporal and spatial horizon and then generate other equally likely stochastic data sets is one of considerable importance. Several methodologies and associated computer programs exist for filling noncontinuous multistation data sets. The successes and failures realized in striving to use one of these techniques, the Monthly Streamflow Simulation Program (MOSS), in eastern Texas were discussed. Specific modifications which were made to MOSS, in order to develop acceptable filled-in data bases, were also presented; and usage procedures were suggested for developing filled-in and stochastic data bases in eastern Texas. (See also W75-10507) (Sims-ISWS)
W75-10528

**RECURRENCE INTERVALS OF ANNUAL MINIMUM STREAMFLOWS,**
Keystone Junior Coll., LaPlume, Pa. Dept. of Mathematics.
E. S. Joseph.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 366-370, June 1974. 1 tab, 7 ref.

Descriptors: *Low flow, *Droughts, *Model studies, *Mathematical models, *Missouri, Flow, *Streamflow, Probability, Frequency, Frequency curves, Hydrology.
Identifiers: *Return periods.

Prerequisite to comprehensive planning for development of water resources in a river basin is the knowledge of the low-flow characteristics of streams in the basin. Information essential to planned development of water resources includes the magnitude and frequency of annual droughts. Such information concerning probable extremes can be obtained by a frequency analysis, using past records of the watershed. Owing to the variation of streamflow minimums, the analysis has to be necessarily done in a probabilistic framework. An analytical approach for estimating the magnitudes of annual droughts in a stream corresponding to specified return periods was proposed. The method was illustrated by a frequency analysis performed on the data of 26 storms in Missouri. The 10-, 50-, and 100-year droughts based on likelihood estimates were presented for these stations. With the help of a computer program, this method yielded results readily and overcame the disadvantages inherent in graphical procedures. (See also W75-10507) (Sims-ISWS)
W75-10530

**A TWO-DISTRIBUTION METHOD FOR FITTING MIXED DISTRIBUTIONS IN HYDROLOGY,**
Illinois State Water Survey, Urbana.
K. P. Singh.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No. 1275, p 371-382, June 1974. 5 fig, 2 tab, 15 ref.

Descriptors: *Mathematical models, *Frequency curves, *Hydrology, *Hydrologic data, Floods, Runoff, Streamflow, Probability, Computer programs, Data processing, Analytical techniques, Distribution patterns, Distribution.
Identifiers: *Curve fitting, *Mixed distributions, Log-Pearson type III distribution.

Samples of many hydrologic variables - such as floods, runoffs, and droughts - do not conform to any one standard distribution. The distributions obtained from the samples were considered as mixed distributions, each of which can be decomposed into two or more components. An objective methodology was developed for obtaining the parameter estimates of two component distributions constituting a mixed distribution. This methodology generated first-order estimates of means and variances of the component distributions and then refined them using an iteration procedure that minimized the sum of squared differences between the observed and fitted normal deviates. A mixture of only two normal distributions was shown to simulate satisfactorily the observed annual floods and monthly streamflows. The magnitudes of mean and variance obtained from the fitted mixed distributions were in accord with the corresponding estimates obtained from the observed flood distributions. In the case of monthly streamflow, the parameters of the component distributions possessed annual cycles. (See also W75-10507) (Sims-ISWS)
W75-10531

**ON THE JOINT DISTRIBUTION OF THE PERIODS AND AMPLITUDES OF SEA WAVES,**
National Inst. of Oceanography, Wormley (England).
For primary bibliographic entry see Field 2L.
W75-10534

**DAILY TEMPERATURE AND SALINITY OF SURFACE WATER OF PATUXENT RIVER AT SOLOMONS, MARYLAND, BASED ON 30 YEARS OF RECORDS (1938-1967),**
Maryland Univ., Solomons. Chesapeake Biological Lab.
D. E. Ritchie, Jr., and J. B. Genys.
Chesapeake Science, Vol 16, No 2, p 127-133, June 1975. 2 tab, 1 ref.

Descriptors: *Salinity, *Temperature, *Water quality, *Maryland, Chemical properties, Water properties, Saline water, Sea water, Physical properties, Thermal properties, Tides, Tidal waters, Surface waters, Rivers, Density, Statistical methods, On-site data collections.
Identifiers: Daily, *Patuxent River(Md), Bristol thermograph, Standard deviation, Minimum, Maximum, Coefficient of variation.

Thirty years of daily temperature and salinity records of Patuxent River surface water at Solomons, Maryland were reported. The 30-yr average value, standard deviation, minimum, maximum, and coefficient of variation for each calendar day were calculated from the records of daily noontime observations. A fourth degree polynomial regression can be used to predict the water temperature (C) for any given day (d) of the year where February 1 is counted as day 32: C = 11 - 0.417d + 0.00624d to the 2nd power - 0.0000245d to the 3rd power + 0.0000000285d to the 4th power. The 'warm-up' period lasts 6 months from February 1 to August 1; temperature ranges from 2.4 to 27.5C with standard deviations of 0.9 to 2.1C. The 'cool-down' period is completed 6 months later. The lowest reading (-0.8C) occurred on February 10 and 11 while the highest (30C) occurred on July 31, August 1 and 3. There was no correlation between salinity and temperature. The highest mean salinity (16.0 to 16.8 ppt) occurred during October 17 to December 16, with November 19 and 20 having the highest value. The lowest mean salinity (10.2-10.9 ppt) occurred during April 15 to June 10, with lowest value of 10.2 ppt on April 27, 30, and May 1. There were 187 days between dates of mean highest and mean lowest salinity. The lowest individual salinity recorded was 5.4 ppt on June 7, and the highest was 20.9 ppt on December 12. Coincidently, 188 days separate these day-of-the-year occurrences. (Henley-ISWS)
W75-10535

**NONLINEAR CHANNEL ROUTING BY COMPUTER,**
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-10543

**SOME FEATURES OF TSUNAMIS ON THE PACIFIC COAST OF SOUTH AND NORTH AMERICA,**
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
For primary bibliographic entry see Field 2L.
W75-10554

**FLOOD HAZARDS IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,**
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W75-10580

**A COMPARISON OF METHODS FOR ESTIMATING FLOOD PEAKS ON STREAMS IN MASSACHUSETTS,**
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 4A.
W75-10587

**INDEX TO WATER RESOURCES DATA FOR LOUISIANA: SURFACE WATER RECORDS; WATER-QUALITY RECORDS.**
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 5A.
W75-10590

**HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS METROPOLITAN AREA, 1973,**
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-10596

**LOW-FLOW CHARACTERISTICS OF MISSISSIPPI STREAMS,**
Geological Survey, Jackson, Miss.
E. J. Tharpe.
Mississippi Board of Water Commissioners, Jackson, Bulletin 75-1, 1975. 60 p, 5 fig, 2 tab, 28 ref.

Descriptors: *Low flow, *Streamflow, *Low flow frequency, *Hydrologic data, *Mississippi, Streamflow forecasting, Correlation analysis, Water yield, Discharge(Water), Gaging stations, Data collections, Runoff, Watershed management, Regulated flow.
Identifiers: 7-day average flows, 10-year recurrence interval.

Low-flow data for 443 sites on streams in Mississippi provide the basis for calculation of minimum 7-day average flows, and annual 7-day average low flows with 2-and 10-year recurrence intervals. These flow characteristics, particularly the annual 7-day average low flows with a 10-year recurrence interval, are used along with minimum observed discharges in determining the availability of flow for water supply and waste assimilation and in administering water laws and regulations. Low-flow characteristics of long-term stations were computed by a Log-Pearson Type III probability analysis of available data. For partial-record and short-term continuous-record sites these characteristics were defined from a correlation based upon flows concurrently observed at the site and at a nearby long-term station. At ungaged sites, low-flow characteristics may be approximated either by interpolation between gaged sites or from a map showing areas of near-uniform low-flow yields. These areas which are delineated on the basis of geologic and hydrologic similarities, have yields ranging from 0 to more than 0.5 cubic foot per second per square mile. (Woodard-USGS)
W75-10605

**SPILLWAY FOR BURNSVILLE DAM, LITTLE KANAWHA RIVER, WEST VIRGINIA; HYDRAULIC MODEL INVESTIGATION,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10665

**THE EFFECTS OF URBANIZATION ON FLOODS OF DIFFERENT RECURRENCE INTERVAL,**
University Coll., London (England). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W75-10709

**DETERMINE URBAN RUNOFF THE SIM WAY,**
Montreal Urban Community (Quebec). Wate rification Dept.
C. Mitci.
Water and Wastes Engineering, Vol 11, No 1, 26, 35-36, Jan, 1974, 15 fig, 2 tab, 16 ref, appe

Descriptors: *Rainfall-runoff relation *Rational formula, *Runoff forecasting, *U drainage, Antecedent precipitation, Urban r Design storm, Duration curves, Flow sy Hydrographs, Rainfall intensity, Time series ysis, Infiltration, Time of concentration.
Identifiers: Montreal Urban Community(Can

The Montreal Urban Community, including 2 nicipalities, wanted runoff hydrographs bas storm patterns for its runoff system design widely used rational formula which assume stant rainfall intensity and runoff through storm does not give actual storm runoff pa needed in designing facilities, even with co additional computer programs. A sim method, based on precipitation statistics a dated intensity-duration curves, permits matical simulation of design storms of v frequencies. Both antecedent rainfall (befo noff begins) and the percentage of impervio faces are considered to calculate the time the storm when rainfall exceeds infiltration noff begins. An excess rainfall curve is com A single coefficient which varies with time to reflect all losses such as depression stora surface detention. From the excess rainfall runoff hydrograph is computed. Data from measurement program and the inflow fro sub-basin are used to route the design storm through sewage collectors to obtain the system outflow hydrograph. For each given frequency and various percentages of impe surface, the hydrograph peaks, concen through the sewer system, give a chart to mine sewer facility size. (Herr-North Caroli
W75-10716

**A CRITERION FOR VEGETATION STIFF**
Waterloo Univ. (Ontario). Dept. of (Engineering.
For primary bibliographic entry see Field 4A
W75-10782

**WATERSHED BEHAVIOR AFTER F FIRE IN WASHINGTON,**
Forest Service (USDA), Wenatchee, Wash. Hydrology Lab.
For primary bibliographic entry see Field 4C
W75-10790

**EFFECTS OF SURFACE DRAINAG STREAM FLOW,**
Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 4A
W75-10794

**TOTAL SEDIMENT LOAD BY THE EXT LATED DATA PROCEDURE,**
Agricultural Research Service, Chickasha,
For primary bibliographic entry see Field 2J
W75-10847

**SEDIMENT-YIELD CHARACTERISTICS UNIT SOURCE WATERSHEDS,**
Agricultural Research Service, Chickasha,
For primary bibliographic entry see Field 2J
W75-10848

## F. Groundwater

**YDRAULIC BEHAVIOUR OF THE CHALK QUIFER IN THE YORKSHIRE WOLDS,**
stitute of Geological Sciences, London ngland). Dept. of Hydrogeology.
r primary bibliographic entry see Field 4B.
75-10506

**ALUATION OF GROUND WATER SOURCES: SACRAMENTO COUNTY,**
lifornia State Dept. of Water Resources, Sacranto.
S. Ford, and L. Chee.
lletin No. 118-3, July 1974. 141 p, 34 fig, 22 tab, ref, 1 append, 1 plate.

scriptors: *Groundwater resources, ydrogeology, *Water supply, *California, ater quality, *Hydrologic budget, Groundwater ing, Water levels, Land use, Groundwater ins, Aquifers, Subsurface waters, Water ources development, Groundwater movement, tural recharge, Computer models, Mathemati- models, Streamflow, Storage, Precipita-(Atmospheric), Pumping.
ntifiers: *Sacramento County.

ramento County is located in the lower portion he Sacramento Valley and immediately north he San Joaquin Valley. Since 1940, water de- d has exceeded supply and groundwater levels e declined. Concern over the continuing trend mpted local and state agencies to begin in- tigation of the water resources of the area as first step in development of alternative plans water resource management. Results were re- ed of a cooperative study by the Department Water Resources and the County of Sacramen- f geologic and hydrologic conditions affecting occurrence and movement of groundwater and relation between recharge to and withdrawals n the groundwater systems. A description was n of a mathematical model developed during study to simulate the reactions of the ground- er system to actions of man. The study is con- ing and will evaluate alternate plans of water urce management. (Sanderson-ISWS)
-10546

**OUND-WATER LEVELS IN NEW MEXICO,**
logical Survey, Albuquerque, N. Mex.
primary bibliographic entry see Field 4B.
-10582

**ROGEOLOGY OF THE TRIASSIC ROCKS MARYLAND,**
ogical Survey, Parkville, Md.
Nutter.
yland Geological Survey, Baltimore, Report vestigations No 26, 1975. 37 p, 11 fig, 1 plate, b, 22 ref, append.

riptors: *Hydrogeology, *Groundwater urces, *Aquifer characteristics, *Geologic in- gations, *Maryland, Water wells, Well data, logic logs, Water utilization, Water yield, r quality, Chemical analysis, Hydrologic Rocks, Mesozoic era.
tifiers: *Triassic rocks(Md).

rocks of the Newark Group of Late Triassic n Maryland occur in the northern and western of the Frederick Valley in Frederick and Car- Counties and in the western part of Mont- ery County. These consolidated bedrock ers consist of a complex interbedded ence of arkosic sandstone, shale, siltstone, quartz-pebble and limestone-pebble con- erate. Water is stored and transmitted gh joints, faults, and bedding-plane partings e rock and, to a limited extent, in interstitial space in the weathered rock mantle; the primary pore space in the rock has been almost eliminated by compaction and cementation. The Triassic-rock aquifers are a reliable source of water for domestic, farm, and small commercial use; only 6.5 percent of the wells inventoried yield less than 3 gallons per minute. Groundwater supplies sufficient for most commercial and light industrial use can be developed under favorable hydrogeologic conditions. Wells at least 300 or 400 feet deep return maximum water yields. The water in the Triassic-rock aquifers is generally of good chemical quality. (Woodard-USGS)
W75-10584

**HYDROGEOLOGIC DATA FOR THE FARMINGTON RIVER BASIN, CONNECTICUT,**
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-10591

**HYDROLOGICAL DATA FROM WELLS IN SOUTHWEST HILLSBOROUGH COUNTY, FLORIDA, 1950-74,**
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-10593

**MAP OF THE ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA, SHOWING GROUND-WATER SUBUNITS AND AREAS, LOCATION OF WELLS, AND WATER-LEVEL CONTOURS FOR SPRING 1974,**
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-10595

**SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--RIO GRANDE REGION,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W75-10597

**SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--OHIO REGION,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W75-10598

**A PREDICTIVE COMPUTER MODEL OF THE LOWER CRETACEOUS AQUIFER, FRANKLIN AREA, SOUTHEASTERN VIRGINIA,**
Geological Survey, Richmond, Va.
O. J. Cosner.
Available from NTIS, Springfield, Va 22161 as PB-243 410, $4.25 printed copy, $2.25 in microfiche. Water-Resources Investigations 51-74, April 1975. 62 p, 33 fig, 3 tab, 9 ref, 2 append.

Descriptors: *Aquifer characteristics, *Hydrogeology, *Computer models, *Water level fluctuations, *Virginia, Atlantic Coastal Plain, Hydrologic data, Groundwater movement, Digital computers, Systems analysis, Hydrology, Pumping, Water wells, Water yield, Groundwater recharge, Transmissivity, Groundwater resources, Storage coefficient, Forecasting, Model studies.
Identifiers: *Franklin area(Va), Lower Cretaceous aquifer.

The Lower Cretaceous aquifer in southeastern Virginia was simulated by a finite-difference digital model. The area modeled is centered at Franklin, Va. The aquifer is about 600 ft thick there, and is estimated to be 2,000 ft thick 35 miles to the east. The aquifer consists of alternating permeable and semipermeable sand, gravel, silt and claybeds, and it is overlain by a semipermeable confining bed. Transmissivity is about 19,000 cu ft/day/ft at Franklin, decreasing to the west and increasing to the east. A prepumping water-level surface was developed by modeling. The use of a modeling factor, transmissivity over vertical permeability of the confining bed, is described. Simulation runs to 1941, 1970, 1972 are in good agreement with historical data. Predictive runs show that if pumpage continues to increase, dewatering will occur at Franklin. If pumpage does not increase, additional drawdown will be small. (Woodard-USGS)
W75-10599

**GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1975,**
Geological Survey, Salt Lake City, Utah.
J. H. Eychaner.
Utah Division of Water Resources, Salt Lake City, Cooperative Investigations Report No 14. 1975. 26 p, 37 fig, 2 tab, 13 ref.

Descriptors: *Groundwater resources, *Water levels, *Basic data collections, *Utah, Hydrologic data, Hydrographs, Maps, Water wells, Withdrawal, Water utilization, Irrigation, Surface-groundwater relationships, Water quality, Dissolved solids, Precipitation(Atmospheric), Water level fluctuations.
Identifiers: *Groundwater development.

This report is the twelfth in a series of annual reports that describe groundwater conditions in Utah. The report includes individual discussions of the most important areas of groundwater withdrawal in the State for the calendar year 1974. Water-level fluctuations, however, are described for the period spring 1974 to spring 1975. The estimated total withdrawal from wells in 1974 was about 879,000 acre-ft which was about 165,000 acre-ft more than in 1973 and 195,000 acre-ft greater than the average annual withdrawal for the period 1964-73. Both the increase over 1973 and the increase over the 10-year average were due primarily to changes in withdrawals for irrigation. Estimated total withdrawals for irrigation in 1974 were about 611,000 acre-ft, which was about 27% more than the 480,000 acre-ft withdrawn in 1973. Changes in groundwater levels from spring 1974 to spring 1975 reflected the decreased availability of surface water and the increase in groundwater withdrawals. Water levels fell in most major groundwater basins in the State. Pavant Valley, in central Utah, was the only major groundwater basin in which water levels were higher in March 1975 than in March 1974. (Woodard-USGS)
W75-10606

**DRAINAGE ANALYSIS OF A CONFINING FORMATION,**
Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.
For primary bibliographic entry see Field 4A.
W75-10780

## 2G. Water In Soils

**OPERATIONAL VALUE OF WEATHER INFORMATION IN RELATION TO SOIL MANAGEMENT CHARACTERISTICS,**
Purdue Univ., Lafayette, Ind. Agricultural Experiment Station.
R. E. Ewalt, D. Wiersma, and W. L. Miller.
Agron J, Vol 65, No 3, p 437-439, 1973. Illus.
Identifiers: Forecasting, Management, Moisture content, *Operations, Precipitation(Atmospheric), *Soil management, *Weather information, Soil moisture.

Possible relationships between farm operator valuations of forecasts, soil management characteristics, and the accuracy of precipitation forecasts were studied. Two-thirds of the 145 interviewed farm operators used both precipitation and field conditions forecasts in planning and conducting major field operations. These operators

valued both types of forecasts at higher levels of usefulness than did the remaining 1/3, who used only precipitation forecasts. The usefulness of precipitation forecasts and field conditions forecasts increased with increasing water-holding capacity and susceptibility of soils to physical problems such as cloddiness, tillage plans and surface sealing. Farm operators who used both types of forecasts valued them at approximately the same levels of usefullness in relation to major field operations conducted during the crop season. Highest values were associated with field operations that are conducted during the spring months. Precipitation forecasts were more useful than field conditions forecasts in making general management decisions. No relationship was found between the error rates of precipitation forecasts and farm operator evaluation of their usefulness.--Copyright 1973, Biological Abstracts, Inc.
W75-10367

**ADSORPTION AND DEGRADATION OF CHLORBROMURON IN SOIL,**
Agricultural Research Service, Stoneville, Miss. South Weed Science Lab.
For primary bibliographic entry see Field 5B.
W75-10414

**PHOSPHORUS AVAILABILITY OF SOME PHILIPPINE RICE SOILS AS AFFECTED BY SOIL AND WATER MANAGEMENT PRACTICES,**
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W75-10421

**SOILS OF THE HIGH ARCTIC LANDSCAPES,**
Rutgers - the State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 2C.
W75-10458

**APPLICATION OF LOW-LATITUDE MICROBIAL ECOLOGY TO HIGH-LATITUDE DESERTS,**
Jet Propulsion Lab., Pasadena, Calif.
For primary bibliographic entry see Field 2C.
W75-10459

**THE DETERMINATION OF MERCURY IN SOILS AND RELATED MATERIALS BY COLD-VAPOUR ATOMIC ABSORPTION SPECTROMETRY,**
Macaulay Inst. for Soil Research, Aberdeen (Scotland).
For primary bibliographic entry see Field 5A.
W75-10485

**WATER-SOIL-PLANT INTERACTIONS WITH TERBACIL,**
Hawaii Univ.-Hilo Coll., Hilo.
For primary bibliographic entry see Field 5C.
W75-10486

**PREDICTION OF TRIFLURALIN DIFFUSION COEFFICIENTS,**
Agricultural Research Service, Stoneville, Miss. South Weed Science Lab.
For primary bibliographic entry see Field 5B.
W75-10542

**PEDOLOGIC COVER OF THE WATERSHED OF THE PORECKA RIVER,**
Institute for Soil Research, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 2A.
W75-10551

**A THEORY OF THE MASS TRANSPORT OF PREVIOUSLY DISTRIBUTED CHEMICALS IN A WATER-SATURATED SORBING POROUS MEDIUM: 4. DISTRIBUTIONS,**
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 5B.
W75-10632

**DRAINAGE ANALYSIS OF A CONFINING FORMATION,**
Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.
For primary bibliographic entry see Field 4A.
W75-10780

## 2H. Lakes

**ENVIRONMENTAL LIMITATIONS ON THE MICROBIAL DEGRADATION OF HYDROCARBONS IN TEMPERATE LAKES,**
Wisconsin Univ., Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W75-10407

**SUPPRESSION OF NITROGEN FIXATION BY BLUE-GREEN ALAGE IN A EUTROPHIC LAKE WITH TRACE ADDITIONS OF COPPER,**
California Univ., Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 5C.
W75-10480

**PHYSICAL MODEL STUDY OF CIRCULATION PATTERNS IN LAKE ONTARIO,**
State Univ. of New York, Buffalo. Dept. of Civil Engineering.
C. Li, K. M. Kiser, and R. R. Rumer.
Limnology and Oceanography, Vol 20, No 3, p 323-337, May 1975. 11 fig, 1 tab, 31 ref. NOAA Grant 2-35281.

Descriptors: *Model studies, *Lake Ontario, *Circulation, *Hydraulic models, Boundaries(Surfaces), Gravity, Shear, Seiches, Winds, Drifting(Aquatic), Thermal stratification, Flow, Froude number, Currents(Water), Stratification, Stress, Laboratory tests.
Identifiers: Earth rotation, Hydraulic throughflow, Seiche decay, Rossby number.

A distorted hydraulic model of Lake Ontario was constructed and operated in a rotating laboratory. The model study included the effects of the earth's rotation, gravity, and hydraulic through-flow. Boundary shear in the model was checked against theoretical predictions of seiche decay. Wind shear was adjusted to achieve appropriately scaled drift velocities in the model. Observed surface and subsurface circulation patterns were presented for a homogeneous and stratified lake model with and without a westerly wind. (Roberts-ISWS)
W75-10537

**INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.**
National Oceanic and Atmospheric Administration, Rockville, Md.
International Field Year for the Great Lakes (IFYGL) Bulletin No. 12, October 1974. 66 p.

Descriptors: *Great Lakes, *International Hydrological Decade, *International waters, *Canada, *United States, Lake Ontario, Publications, Programs, Data processing, Climatology, Evaporation, Model studies, Limnology, Remote sensing, Precipitation(Atmospheric), Meteorology.
Identifiers: *International Field Year for the Great Lakes.

Abstracts of nine Canadian International Field Year for the Great Lakes (IFYGL) papers related to Lake Ontario studies were given. Data for deviations from the normal (1941-1970) of record-breaking weather events were tabulated for number of meteorological variables on a bas wide basis. Mean monthly surface temperature Lake Ontario were tabulated for the normal (19 1971) and during IFYGL. The status of d management activities in the U.S. studies discussed and a summary of data for the fi IFYGL archive was tabulated. Brief reports both Canadian and U.S. scientific projects w included. Canadian and U.S. publications w listed. (Humphreys-ISWS)
W75-10547

**INTERNATIONAL FIELD YEAR FOR T GREAT LAKES.**
National Oceanic and Atmospheric Adminis tion, Rockville, Md.
International Field Year for the Great La (IFYGL) Bulletin No. 13, February 1975. 84 fig, 10 tab.

Descriptors: *Great Lakes, *International wat *International Hydrological Decade, *Can *United States, Lake Ontario, Programs, Publ tions, Water temperature, Currents(Wat Meteorology, Data processing, Remote sens Bibliographies.
Identifiers: *International Field Year for the G Lakes.

Tabulated data were presented for material tribution by major tributaries on the U.S. sid Lake Ontario. Lake Ontario temperature and rent data for July and August 1972 were also t lated. Brief reports on both Canadian and scientific projects were included. Canadian U.S. summaries of data available from final I national Field Year for the Great Lakes arch were tabulated. Canadian and U.S. publicat were listed. (Humphreys-ISWS)
W75-10548

**INTERNATIONAL FIELD YEAR FOR GREAT LAKES.**
National Oceanic and Atmospheric Admini tion, Rockville, Md.
International Field Year for the Great L (IFYGL) Bulletin No. 14, June 1975. 91 p, 7 f tab.

Descriptors: *Great Lakes, *International wa *International Hydrological Decade, *Can *United States, *Lake Ontario, Programs, P cations, Bibliographies, Eutrophication, M studies, Data processing, Water quality, C cover, Snow cover, Solar radiation, Infr radiation, Water temperature, Wind velocity.
Identifiers: *International Field Year for the G Lakes.

Listed were the official International Field for the Great Lakes (IFYGL) publications, Canadian-U.S. publications included in IF Bulletin No. 13, and additional IFYGL pub tions. U.S. information was presented on cover, solar and infrared radiation, radiative ing rates over central Lake Ontario, water qu characteristics of Oswego River, daily mean face wind speed over Lake Ontario in 1971, mean air and lake surface temperature in comparison of airborne radiation thermom with buoy temperature measurements, and management. Selected abstracts were pres for a cross-section of IFYGL Canadian inve tions. Brief reports on both Canadian and scientific projects were included. Canadian U.S. summaries of data available from IFYGL archives were tabulated. (Humph ISWS)
W75-10549

**INTERNATIONAL FIELD YEAR FOR GREAT LAKES.**
National Oceanic and Atmospheric Admin tion, Rockville, Md.

ailable from the National Technical Informa-
n Service, Springfield, Va 22161 as COM-74-
65, $4.75 in paper copy, $2.25 in microfiche. In-
national Field Year for the Great Lakes
YGL) Bulletin No. 9, February 1974. 82 p, 6 fig,
ib.

scriptors: *Great Lakes, *International
drological Decade, *International waters,
nada, *United States, Evaporation,
teorology, Programs, Publications, Atmospher-
physics, Lake Ontario, Fish populations, Cli-
tology, Precipitation(Atmospheric), Data
cessing.
ntifiers: *International Field Year for the Great
es.

ormation was given on the Canadian coopera-
studies of fish stocks and evaporation synthe-
Brief reports on both Canadian and U.S. scien-
projects were included. Canadian and U.S.
lications were listed. (Humphreys-ISWS)
5-10550

INVESTIGATION OF THE ECOLOGY AND
TER QUALITY OF A LAKE OUTLET,
ntana Univ., Missoula. Dept. of Zoology.
primary bibliographic entry see Field 5C.
5-10724

ECTS OF FARMING - URBAN DRAINAGE
FRESH WATER,
nge County Pollution Control Dept., Orlando,

primary bibliographic entry see Field 5G.
5-10802

## Water In Plants

TERIA IN AQUATIC ANIMALS,
fornia State Univ., Humboldt, Arcata. School
latural Resources.
. Botzler, T. F. Wetzler, and A. B. Cowan.
ildl Dis, Vol 9, No 2, p 163-170, 1973. Illus.
ntifiers: Aquatic animals, Chrysemys-picta-
ginata, Deer, Helisoma-sp, Listeria, *Listeria-
ocytogenes, Oxyloma-retusa, Physa-sayii,
obdella-hollensis, Rana-catesbeiana, Rana-
ens-pipiens, *Frogs, *Turtles, *Snails,
pard frogs, Bullfrogs, Isolation.

eria monocytogenes was isolated from 7
ard frogs (Rana pipiens pipiens), 3 bullfrogs
a catesbeiana), a painted turtle (Chrysemys
marginata), a leech (Placobdella hollensis)
monly found on turtles and 3 species of snails
sa sayii, Helisoma sp., Oxyloma retusa). Most
eria isolations were made from leopard frogs
cted from pond sites used frequently by deer,
tly after a period of heavy rain.--Copyright
, Biological Abstracts, Inc.
-10375

RACTERIZATION OF CADMIUM UP-
E BY PLANT TISSUE,
ornia Univ., Davis. Dept. of Agronomy and
e Science.
primary bibliographic entry see Field 5B.
-10479

ANALYSIS OF THE MECHANICS OF
RD CELL MOTION,
s A and M Univ., College Station. Bioen-
ring Program.
. Demichele, and J. H. Peter Sharpe.
nal of Theoretical Biology, Vol 41, No 1, p 77-
973. Illus.

riptors: *Stomata, *Cytological studies,
ermis, *Plant morphology.
ifiers: *Guard cell motion, Turgor pressure.

A mechanical analysis is presented of the cellular defomations which occur during the opening and closing of stomata. The aperture of the stomatal pore is shown to be a result of opposing pressures of the guard and adjacent epidermal cells. The analysis indicates that the epidermal cells have a mechanical advantage over the guard cells. With no mechanical advantage, an equal reduction in the turgor pressure of both guard and epidermal cells would have a neglible effect upon stomatal aperture. However, due to the mechanical advantage of the surrounding cells, the stomatal aperture increases with equal reductions in turgor, until the adjacent epidermal cells become flaccid. The minimum diffusion resistance of the pore occurs at this point. Further reductions in guard cell turgor lead to closure of the pore. The analysis further demonstrates how the shape, size, wall thickness and material properties of the guard cell walls influence their behavior.--Copyright 1974, Biological Abstracts, Inc.
W75-10488

GROWTH FACTORS IN THE FISH MEAL COMPONENTS OF CATFISH DIETS,
Georgia Univ., Savannah. Agricultural Experiment Station.
J. W. Andrews, and J. W. Page.
Journal of Nutrition, Vol 104, No 8, p 1091-1096, 1974.

Descriptors: Catfishes, Amino acids, *Fish diets, *Growth rates, *Channel catfish, Protein, Lipids.
Identifiers: Menhaden meal, Soybean meal.

Four feeding studies were conducted to determine to what extent soybean meal could be used to replace fish meal in diets for channel catfish (Ictalurus punctatus). When soybean meal was substituted on an isonitrogenous basis for menhaden meal, growth and feed efficiency were substantially reduced ($P < 0.05$). Gains were not enhanced when synthetic methionine, cystine or lysine, the most limiting amino acids as the results of this substitution, were added to the soy-substituted diets. When diets void of fish meal were supplemented with a lipid extract, nonlipid residue or ashed fraction of menhaden meal, growth and food conversion data revealed that the growth factors not provided by soybean meal were in the nonlipid residue of menhaden meal and were destroyed by ashing. A further study demonstrated that these factors were not polar lipids that could be removed by extraction with chloroform-methanol (2:1). These data suggested that the growth factors were in the protein fraction of menhaden meal but do not explain why growth responses were not obtained when the soy-substituted diets were supplemented with the most limiting amino acids.--Copyright 1974, Biological Abstracts, Inc.
W75-10658

IMPORTANCE OF PLANTS IN OXYGEN PRODUCTION, CARBON DIOXIDE CONSUMPTION AND AIR PURIFICATION,
Ohio Agric. Res. Dev. Cent., Wooster,Lab. Environment. Studies.
T. C. Weidensaul.
Hortscience, Vol 9, No 1, p 8-12, 1974. Illus.

Descriptors: *Oxygen, *Carbon dioxide, *Plant physiology, Production, Air environment.
Identifiers: *Air purification.

The importance of plants as suppliers of oxygen and their value as air purifiers have been questioned. This paper will present some of the facts regarding the relative importance of green plants in the production of O2 and consumption of CO2 and will put the role of plants in proper perspective as air purifiers.--Copyright 1974, Biological Abstracts, Inc.
W75-10715

EFFECTS OF SOIL MOISTURE ON STRESS ON 2 VARIETIES OF UPLAND COTTON IN ISRAEL: IV. EFFECTS OF PERIODS OF STRESS OCCURRENCE, CORRELATIONS AND REGRESSIONS,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
For primary bibliographic entry see Field 3F.
W75-10791

## 2J. Erosion and Sedimentation

RESEARCH IN STOCHASTIC MODELS FOR BEDLOAD TRANSPORT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
C. S. Hung, and H. W. Shen.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 262-286, June 1974. 9 fig, 24 ref. NSF Grant GK 11499.

Descriptors: *Bed load, *Sediment transport, *Model studies, *Stochastic processes, Movement, Flow, Sediment load, Running waters, Tractive forces, Streamflow, Probability, Mathematical models, Geology, Hydrology.
Identifiers: Single particle movement.

Research in stochastic models for bed load transport was reviewed, summarized, and critically examined. Discussions were given for (1) theoretical models in deriving the distributions of the step lengths and the rest periods, (2) theoretical derivation of the probability density function of the distance at a given time, (3) calculation of bed-load transport from stochastic models, and (4) experimental evidence (including recent single particle experimental results by the authors). The order of generality of all existing theoretical models was evaluated and the relationships among these were given. (See also W75-10507)
W75-10522

A STOCHASTIC MODEL OF SEDIMENT YIELD FOR EPHEMERAL STREAMS,
Agricultural Research Service, Fort Collins, Colo.
D. A. Woolhiser, and P. Todorovic.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 295-308, June 1974. 5 fig, 2 tab, 15 ref, 2 append.

Descriptors: *Sediment yield, *Ephemeral streams, *Model studies, *Stochastic processes, Sedimentation, Sediment transport, Sedimentation rates, Streamflow, Precipitation(Atmospheric), Runoff, Rainfall, Discharge(Water), Bed load, Suspended load, Hydrology.

The accumulated sediment yield of an ephemeral stream in some time interval may be treated as the sum of a random number of random variables. The number of sediment yield events in this interval is equal to the number of runoff events and is related to the number of precipitation events. Three progressively more complicated rainfall-runoff models were postulated: (1) the pure threshold model, (2) the general threshold model, and (3) the infiltration model. Analytic results for the runoff counting process were obtained for the pure threshold model and an approximation to the infiltration model was proposed. The resulting runoff counting process gave a good fit to data from two small watersheds near Hastings, Nebraska. An example was given of the application of the stochastic model of sediment yield to the problem of estimating mean and variance of annual sediment yield if only short concurrent records of sediment yield and runoff are available, but longer records of precipitation and runoff can be utilized. (See also W75-10507) (Sims-ISWS)
W75-10524

**DISPERSION OF CONTAMINATED BEDLOAD PARTICLES,**
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-10526

**COMPETENCE OF RIVERS TO TRANSPORT COARSE BEDLOAD MATERIAL,**
Texas Univ. at Austin. Dept. of Geological Sciences.
V. R. Baker, and D. F. Ritter.
Geological Society of America Bulletin, Vol 86, No 7, p 975-978, July 1975. 1 fig, 27 ref.

Descriptors: *Sediment transport, *Geomorphology, *Fluvial sediments, *Rivers, Erosion, Alluvium, Shear stress, Bed load, Coarse sediments, Particle size, Sediment load, Sedimentation, Hydraulics, Entrainment, Flow, Depth.
Identifiers: *Flow slope, Lift forces.

Shear-stress analyses provide easily determined estimates of the competence of rivers to transport coarse bed load material. Relevant data from diverse geological and engineering reports were integrated, and a good correlation between competent particle size and shear stress resulted when data points were derived in a uniform way. Because flow mechanics differ in contrasting fluvial environments, the shear stresses needed to entrain large sediment may diverge considerably from values based on theoretical grounds. In shallow rivers, entrainment may occur at lower shear stresses than predicted by the Shields theory because hydrodynamic lift and bank caving provide additional transporting force. In very deep flows, the shear stresses needed to initiate particle movement were greater than theoretical values. Potential use of the empirical relationship between particle size and shear stress was limited by the following considerations: (1) random nature of turbulent lift forces; (2) problems in interpreting the significance of the sedimentary deposit; (3) sediment finer than 5 cm in diameter was not considered; and (4) the analysis ignored special considerations of sediment packing, shape, and grain-size distributions. (Lee-ISWS)
W75-10540

**SEDIMENT CHARACTERISTICS OF STREAMS IN THE EASTERN PIEDMONT AND WESTERN COASTAL PLAIN REGIONS OF NORTH CAROLINA,**
Geological Survey, Raleigh, N.C.
C. E. Simmons.
Open-file report 75-291, 1975. 33 p, 9 fig, 5 tab, 13 ref.

Descriptors: *Sediment transport, *Sediment yield, *Sediment distribution, *North Carolina, Streamflow, Coastal plains, Slopes, Topography, Land use, Runoff, Storms, Reservoirs, Sediment discharge, Sedimentation rates, Data collections, Sampling, Suspended solids, Particle size.
Identifiers: *Piedmont region(NC).

The sediment-transport characteristics of streams were determined in a 6,000-square-mile area of the Coastal Plain and Piedmont regions of eastern North Carolina during 1969-73. The study covered all or parts of 21 counties and included data for 28 sediment-sampling stations located in parts of 4 major river basins, the Roanoke, Pamlico, Neuse, and Cape Fear. Annual suspended-sediment yields ranged from 333 to 12 tons per square mile. Streams in the Piedmont region have the highest yields. Suspended-sediment yield decreases in an eastward direction from the Piedmont to the Coastal Plain region. Sediment characteristics are directly affected by topography, storm runoff, geology, land use, and manmade detention structures. At one sampling station in the 1973 water year, 44 percent of the suspended sediment tonnage was transported during 34 days of high flow. In the Piedmont region, sediment yields vary indirectly with the percentage of forest cover in the basin, but there appears to be no definite relationship between forest cover and yield in the Coastal Plain region. Large lakes act as sediment-detention reservoirs. Average annual sediment yields ranges from 98 to 333 tons per square mile for 3 headwater streams which flow into Hydo Lake in Person County; however, the yield for the station less than 2 miles downstream from Hyco Dam was about 12 tons per square mile. Most suspended sediment during floods in Piedmont streams ranges in size from sand to silt, whereas the suspended material in flooding streams in the Coastal Plain is generally clay size. (Woodard-USGS)
W75-10586

**CHANNEL EROSION SURVEYS ALONG SOUTHERN SEGMENT OF THE TAPS ROUTE, ALASKA, 1972 AND 1973,**
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 8B.
W75-10594

**FLOOD WAVES AND SUSPENDED SEDIMENT PULSES IN URBANIZED CATCHMENTS,**
University of New England, Armidale (Australia). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W75-10647

**WATERSHED BEHAVIOR AFTER FOREST FIRE IN WASHINGTON,**
Forest Service (USDA), Wenatchee, Wash. Forest Hydrology Lab.
For primary bibliographic entry see Field 4C.
W75-10790

**TOTAL SEDIMENT LOAD BY THE EXTRAPOLATED DATA PROCEDURE,**
Agricultural Research Service, Chickasha, Okla.
P. B. Allen, and B. B. Barnes.
In: Present and Prospective Technology for Predicting Sediment Yields and Sources, USDA, Pub. No. ARS-S-40, June 1975, p 100-108, 6 fig, 1 tab, 11 ref.

Descriptors: *Sediment discharge, *Sediment transport, *Suspended sediments, *Sediment load, Sedimentation, Sediment yield, Open channel flow, Sampling, Runoff flow, Erosion, Agricultural watersheds, Measurement, Mathematical models, River flow, Water measurement, Watersheds(Basins), Computer models, Sediment distribution, Soil erosion, Velocity, Hydrology, Hydrometry.
Identifiers: *Bed-material transport, *Sediment measurement, *Sediment models.

A procedure is presented that computes bed-material transport near the streambed in the unsampled portion of a stream cross section. Its principal use is where accurate unmeasured loads are designed for addition to measured loads determined with conventional, depth-integrated, suspended sediment samples. For each computation two or three point suspended sediment samples and two or three velocity measurements must be taken below mid-depth at each of several stream verticals. Sediment concentrations by particle-size ranges and respective depths define concentration distribution equations for each vertical. Velocities and respective depths define a velocity distribution equation for each vertical. Summation of the products of respective concentration and velocity equations integrated over the unsampled depth represents sediment transport in the unsampled zone. (ARS)
W75-10847

**SEDIMENT-YIELD CHARACTERISTICS FROM UNIT SOURCE WATERSHEDS,**
Agricultural Research Service, Chickasha, Okla.
E. D. Rhoades, N. H. Welch, and G. A. Coleman.
In: Present and Prospective Technology for ... dicting Sediment Yields and Sources, USDA, ... No. ARS-S-40, June 1975, p 125-129, 2 tab.

Descriptors: *Sediment yi... *Watershed(Basins), *Rainfall, *Runoff, Rai... Cropland, Gully erosion.
Identifiers: *Unit source watersheds

Sediment yield data along with precipitation runoff are presented for a 5-year period from rangeland and seven cropland watersheds loc... in the Southern Great Plains. Two eroded g... land watersheds in poor condition produced ... times more runoff and 100 times more sedi... than two nearby virgin grassland watershed... good-to-excellent condition. Sediment yield fr... gully comprising less than 1 percent of the ar... a poor-to-fair eroded grassland water... produced 51 percent of all sediment from ... watershed. Sediment yield from crop... watersheds was shown to be very closely ... sociated with the cover and surface conditio... the time of the runoff producing event. Very ... sediment was lost from fall-sown wheat or al... during the spring, however such areas were ... nerable during the fall when there was little ... ground cover. Areas that are bare during the s... are more likely to produce a major portion o... sediment during this period. (ARS)
W75-10848

## 2K. Chemical Processes

**ORGANIC MATTER IN NATURAL WA... AND WATER TREATMENT,**
New Hampshire Univ., Durham. Dept. of Che... try.
For primary bibliographic entry see Field 5B.
W75-10351

**DETERMINATION OF CADMIUM, COP... AND LEAD IN NATURAL WATERS AF... ANION-EXCHANGE SEPARATION,**
Vienna Univ., (Austria).
For primary bibliographic entry see Field 5A.
W75-10385

**DETERMINATION OF MANGANESE IN N... RAL WATERS BY ATOMIC ABSOR... SPECTROMETRY WITH A CARBON ... ATOMIZER,**
Kyoto Univ. (Japan).
For primary bibliographic entry see Field 5A.
W75-10386

**NBS ADDS FOREIGN WRINKLE TO S... DARDS WORK,**
For primary bibliographic entry see Field 5A.
W75-10490

**ATOMIC ABSORPTION SPECTROME... DETERMINATION OF CADMIUM, L... SILVER, THALLIUM AND ZINC IN SILI... ROCKS BY DIRECT ATOMIZATION F... THE SOLID STATE,**
Oslo Univ. (Norway). Dept. of Chemistry.
F. J. Langmyhr, J. R. Stubergh, Y. Thomasse... E. Hanssen, and J. Dolezal.
Analytica Chimica Acta, Vol 71, No 1, p ... July 1974. 4 tab, 12 ref.

Descriptors: Analytical techn... *Spectroscopy, *Rocks, *Heavy metals, C... um, Lead, Zinc, Silicates, Inorganic compo... Instrumentation, Laboratory tests, T... procedures, Pollutant identification, Che... analysis.
Identifiers: *Atomic absorption spectros... Silver.

ic absorption spectrometric methods were ibed for the determination of cadmium, lead, , thallium and zinc in some international and silicate rocks. The metals were atomized ly from the solid samples in a graphite fur- The data were compared with results ob- by atomizing solutions in the flame, in the ite furnace, and with earlier data. Measure- were made with a Perkin-Elmer 303 atomic ption spectrophotometer equipped with a rium arc source background corrector. The btained compare favorably with recent anal- y the absorption tube technique and with ac- n analysis. For most samples measured by spectrography and this atomic absorption d agreement was satisfactory. Considering w levels of lead, the proposed method can be ied as moderately precise. (Jernigan-Van- )
0492

**RMINATION OF NICKEL IN ROCKS R EPITHERMAL NEUTRON ACTIVA-**

tt for Atomenergi, Kjeller (Norway). e Labs.
nnes.
ica Chimica Acta, Vol 68, No 1, p 25-30, y 1974. 2 tab, 21 ref.

ptors: *Nickel, *Analytical techniques, s, Standards, *Neutron activation analysis, oscopy, Radioisotopes, Chemical reactions, procedures, Instrumentation, Pollutant ication, Silicates, Chemical analysis.

was determined in seven U.S. Geological standard rocks by reactor activation analy- ed on the Ni58(n,p)Co58 reaction. The pur- f the work described was to extend this down to lower concentration levels in o see how good determinations could be ned either by purely instrumental analysis radiochemical separation of Co58 - Co60. itional goal was to attempt a contribution to provement of nickel data on the U.S. ical Survey standard silicate rocks. The tained were compared with previous litera- lues. The method was applicable to most cal samples. (Jernigan-Vanderbilt)
493

**UM, THORIUM, AND LEAD CONCEN- ONS IN THREE SILICATE STANDARDS METHOD OF LEAD ISOTOPIC ANALY-**

cal Survey, Denver, Colo.
umoto, R. J. Knight, and M. H. Delevaux.
eological Survey, Professional Paper 800- 11-115, 1972. 5 tab, 15 ref.

tors: *Lead, *Heavy metals, *Analytical ues, *Silicates, *Rocks, Mineralogy, studies, Testing procedures, Isotope frac- n, Radioactivity techniques, Pollutant cation, Chemical analysis.

dilution analyses of uranium, thorium, and two U.S. Geological Survey rock stan- CR-1 and AGV-1 and those in a National tics and Space Administration (NASA) rom Knippa, Tex.) standard showed that rations in BCR-1 are 1.73 ppm U, 5.99 ppm 13.56 ppm Pb, in AGV-1 are 1.96 ppm U, n Th and 36.53 ppm Pb, and in NASA e 1.87 ppm U, 6.42 ppm Th, and 5.13 ppm mparison of lead contents for BCR-1 and nal split indicates that the standard is con- d by lead; however, homogeneity of the has been established and variation of the ation is less than 1 percent. A new e for isotopic analysis of lead, the silica phate method, was tested for analytical nties. The lead isotopic composition for btained by the method using double-spike tion correction is Pb 206/Pb204 = 18.794, Pb 207/Pb 204 = 15.610, and Pb 208/Pb 204 = 38.660. (Jernigan-Vanderbilt)
W75-10494

**FAST SEPARATION OF TIN (IV) FROM TIN (II) AND FROM NUMEROUS METAL IONS ON ION-EXCHANGE PAPERS,**
Tabriz Univ. (Iran). Analytical Lab.
W. Husain, and M. Gulabi.
Separation Science, Vol 6, No 5, p 737-739, October 1971. 2 tab, 7 ref.

Descriptors: *Separation techniques, *Tin, *Cations, *Chromatography, Ions, Ion-exchange, Solvents, Analytical techniques, Metals, Pollutant identification, Chemical analysis.

A fast method for the separation of tin(IV) and tin(II) was developed on titanic tungstate ion-exchange papers. To develop a suitable method of separation, a large number of solvent systems were tried. A mixture of 0.5M ammonium acetate and 0.1M acetic acid in the volume ratio 2:1 was the most suitable solvent system for fast separations. Tin(IV) could also be separated from 40 other cations on the papers in only 20 minutes. (Jernigan-Vanderbilt)
W75-10497

**SPECTROSCOPIC DETERMINATION OF ATOMIZATION EFFICIENCY (CUCL-CU+CL) IN AN AIR-HYDROGEN FLAME,**
Nagoya Univ. (Japan). Dept. of Synthetic Chemistry.
K. Kitagawa, M. Yanagisawa, and T. Takeuchi.
Analytica Chimica Acta, Vol 68, No 1, p 212-216, January 1974. 1 tab, 4 fig, 6 ref.

Descriptors: *Analytical techniques, *Copper, Efficiencies, *Flame photometry, Spectroscopy, Chemical reactions, Laboratory tests, Testing procedures, Pollutant identification, Chemical analysis.

An equation for the comparison of ionic and atomic lines in determining the atomization efficiency of absorption spectrometry was derived. In the experimental work, a solution of copper (II) chloride was sprayed into an air-hydrogen flame supported by a Beckman burner, and two atomic copper lines and a CuCl line consisting of many rotational lines were observed. The atomization efficiency was 70-90% in the temperature range of 1,700-2,200 K. The high excitation temperature did not cause high atomization efficiencies which suggests that atoms obtain energy after dissociation, and that the excitation temperature is not necessarily consistent with translational, vibrational, or rotational phenomena in the diffusion flame. The method is valid for most experimental purposes with an advantage that no reaction equilibrium is assumed. (Jernigan-Vanderbilt)
W75-10498

**RAPID EXTRACTIVE SPECTROPHOTOMETRIC DETERMINATION OF GOLD (III) WITH 4-(2-PYRIDYLAZO)- RESORCINOL,**
Indian Inst. of Tech., Bombay. Dept. of Chemistry.
S. G. Nagarkar, and M. C. Eshwar.
Analytica Chimica Acta, Vol 71, No 2, p 461-463, August 1974. 1 fig, 1 tab, 11 ref.

Descriptors: *Spectrophotometry, *Gold, *Analytical techniques, Testing procedures, Separation techniques, Statistics, Pollutant identification.

A method for the determination of gold (III) is described that compared favorably in accuracy and sensitivity with other methods, and took less than 20 min. for extraction and determination. The relative standard deviation, calculated from 10 determinations with 240 micrograms of gold(III) in 25 ml was plus or minus 1.10%. The effects of reagent concentration and acidity, tartaric or citric acid, and nonaqueous solvent and stability were discussed. The complex showed maximal absorbance at 540 nm. Beer's law was obeyed in the concentration range 3.5-18 micrograms Au(III) per ml. The interference of about 40 ions was studied for solutions containing 9-60 micrograms Au(III) per ml. (Pulliam-Vanderbilt)
W75-10499

**ERROR ANALYSIS OF DOBSON SPECTROPHOTOMETER MEASUREMENTS OF THE TOTAL ATMOSPHERIC OZONE CONTENT,**
National Aeronautics and Space Administration, Wallops Island, Va. Wallops Station.
For primary bibliographic entry see Field 7B.
W75-10545

**WATER FOR INDUSTRIAL DEVELOPMENT IN ALCORN, ITAWAMBA, PRENTISS, AND TISHOMINGO COUNTIES, MISSISSIPPI,**
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 3E.
W75-10581

**HYDROGEOLOGY OF THE TRIASSIC ROCKS OF MARYLAND,**
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 2F.
W75-10584

**HYDROLOGIC RECONNAISSANCE OF THE SOUTHERN UINTA BASIN, UTAH AND COLORADO,**
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 3B.
W75-10585

**INDEX TO WATER RESOURCES DATA FOR LOUISIANA: SURFACE WATER RECORDS; WATER-QUALITY RECORDS.**
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 5A.
W75-10590

**HYDROLOGICAL DATA FROM WELLS IN SOUTHWEST HILLSBOROUGH COUNTY, FLORIDA, 1950-74,**
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-10593

**A RIVER-QUALITY ASSESSMENT OF THE UPPER WHITE RIVER, INDIANA,**
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 5B.
W75-10600

**TEMPERATURES OF WYOMING STREAMS,**
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 7C.
W75-10604

**A THEORY OF THE MASS TRANSPORT OF PREVIOUSLY DISTRIBUTED CHEMICALS IN A WATER-SATURATED SORBING POROUS MEDIUM: 4. DISTRIBUTIONS,**
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 5B.
W75-10632

**TRACE ELEMENTS IN MELBOURNE RIVERS - AN INTERLABORATORY ANALYSIS,**
Materials Research Labs., Melbourne (Australia).
For primary bibliographic entry see Field 5A.
W75-10649

**WATER ANALYSIS OF RIVER WATERS IN KAGAWA (IX), CHEMICAL COMPOSITION OF THE AYA WATER BASIN, (IN JAPANESE),**
T. Itoyama.
Kagawa Daigaku Kyoiu Gakubu Kenkyu Hokoku, (Mem. Fac. Educ., Kagawa Univ.), Vol 2, No 230, p 1-7, 1974. 1 fig, 11 tab, 7 ref.

Descriptors: *Analytical techniques, *Groundwater, *Rivers, *Chemical analysis, Geochemistry, Calcium, *Pollutant identification, *Hardness(Water), Chlorides, Chemical oxygen demand, Silica.
Identifiers: *Aya Water basin(Japan).

The differences in chemical composition of the groundwater and river water of the Aya Water basin, Japan, were investigated between May 1969 and January 1970. In the upper mountaneous district of the Aya Water basin, all measurements of chemical composition, including total hardness, Ca hardness, Cl, SiO2, and total residue, except for COD, were higher in the groundwater than in the river water. The weight ratios, groundwater to river water, total residue to total hardness, and Ca hardness to Cl hardness, were determined. Fluctuation of values of the chemical composition during a given year were also studied. (Prague-FIRL)
W75-10841

## 2L. Estuaries

**HEAVY METAL CONTENTS OF FISHES CAUGHT IN KAOHSIUNG HARBOR, (IN CHINESE),**
National Taiwan Univ., Taipei. Inst. of Oceanography.
For primary bibliographic entry see Field 5A.
W75-10430

**LABORATORY MEASUREMENT OF SURFACE TEMPERATURE FLUCTUATIONS INDUCED BY SMALL AMPLITUDE SURFACE WAVES,**
TRW Systems Group, Redondo Beach, Calif. Engineering Sciences Lab.
J. H. Chang, and R. N. Wagner.
Journal of Geophysical Research, Vol 80, No 18, p 2677-2687, June 20, 1975. 14 fig, 6 ref. Navy Prime Contract 00017-72-C-4401.

Descriptors: *Ocean waves, *Water temperature, *Radiation, *Analytical techniques, *Laboratory tests, Heat transfer, Diffusion, Thermal radiation, Boundary processes, Thermal conductivity.
Identifiers: *Infrared radiometer, Monochromatic surface waves.

Convergent or divergent flows on a cooled ocean surface can induce surface temperature fluctuations. This effect is important for the interpretation of infrared radiation from the ocean. Laboratory experiments under controlled conditions were conducted to measure surface temperature fluctuations induced by surface waves whose dynamic characteristics could also be measured. The surface waves were produced in the laboratory. An infrared radiometer was used to measure the temperature changes. The major experimental task was to discriminate between the thermal and reflectance contributions to the wave-induced total radiometric signal. A technique to measure the upper bound of the reflectance contribution was developed, validated, and implemented. The magnitude of measured temperature fluctuations induced by small monochromatic surface waves agreed well with predictions from linear theories. In the linear wave dynamic regime the amplitude of the wave-induced temperature fluctuation is dependent on the near-surface heat transfer. This dependence was found to be linear by systematically increasing the surface heat transfer by means of an increase in wind velocity. (Singh-ISWS)
W75-10505

**TOWARD AN ICE-FREE ARCTIC OCEAN,**
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2C.
W75-10532

**ON THE JOINT DISTRIBUTION OF THE PERIODS AND AMPLITUDES OF SEA WAVES,**
National Inst. of Oceanography, Wormley (England).
M. S. Longuet-Higgins.
Journal of Geophysical Research, Vol 80, No 18, p 2688-2694, June 20, 1975. 7 fig, 1 tab, 10 ref.

Descriptors: *Ocean waves, *Fluctuations, *Frequency, *Distribution, *Probability, *Gulf of Mexico, Energy, Histograms, Mathematical studies, Data collections, Statistical methods, Theoretical analysis.
Identifiers: Joint probability density, Marginal density, Wave theory.

A theoretical expression for the joint distribution of wave period and amplitude, which was previously derived for a Gaussian record with a narrow spectrum, was restated in simple form. According to this distribution, the variability of wave periods for waves of a given height is inversely proportional to the wave height and the higher waves tend to be more regular. The distribution was found to agree well with observations of wave periods and amplitudes from the Gulf of Mexico. In shallow water, especially for steep waves, the distribution can be expected to be less applicable because of the enhanced nonlinearity. (Singh-ISWS)
W75-10534

**WAVE CLIMATE MODEL OF THE MID-ATLANTIC SHELF AND SHORELINE (VIRGINIAN SEA), MODEL DEVELOPMENT, SHELF GEOMORPHOLOGY, AND PRELIMINARY RESULTS,**
Virginia Inst. of Marine Science, Gloucester Point.
V. Goldsmith, W. D. Morris, R. J. Byrne, and C. H. Whitlock.
Available from the National Technical Information Service, Springfield, Va 22161 as NASA-SP-358, $6.25 in paper copy, $2.25 in microfiche. NASA SP-358 and VIMS SRAMSOE No. 38, 1974. 146 p, 13 fig, 5 tab, 162 ref, 2 append.

Descriptors: *Waves(Water), *Ocean waves, *Model studies, *Atlantic Ocean, *Continental shelf, Coasts, Shallow water, Shores, Geomorphology, Mathematical models, Mathematical studies, Shoals.
Identifiers: *Virginian Sea.

A description was presented of the development and preliminary results of the Wave Climate Model of the Mid-Atlantic Continental Shelf and Shoreline (Virginian Sea), a joint effort of the Virginia Institute of Marine Science and the Langley Research Center. A review of the shelf geomorphology was also presented because the most important influence on the wave climate of this shelf is the interaction between the ocean waves and the various shelf relief elements. The Virginian Sea Wave Climate Model differs from previous models in the following important elements: (1) The model covers a very large geographic area of the continental shelf and shoreline, Cape Henlopen, Delaware, to Cape Hatteras, North Carolina, an area of 20,000 square nautical miles within a single large grid. (2) Distortions due to flat representations of the spherical Earth and problems resulting from the fact that waves travel great circle paths were overcome by constructing a Transverse Mercator map projection tangent to the Earth along the center of the grid. (3) An improved understanding of wave behavior in the area of crossed wave rays is now available from theoretical studies. (Sims-ISWS)
W75-10552

**SOME FEATURES OF TSUNAMIS ON PACIFIC COAST OF SOUTH AND N AMERICA,**
Department of the Environment, (Ontario). Marine Sciences Directorate.
T. S. Murty, S. O. Wigen, and R. Chawla.
Manuscript Report Series No. 36, 1975. 37 p 9 tab, 14 ref.

Descriptors: *Tsunamis, *Pacific Ocean, America, *South America, Ocean waves, Coasts, Inlets(Waterways), Bays, Es Water circulation, Oceans, Oceano Resonance.
Identifiers: *Secondary undulations.

In order to investigate the response of inlet namis, the resonance characteristics of son on the coast of Chile were deduced through analytical considerations. A comparison w with the inlets of southeast Alaska, the n coast of British Columbia, and Vancouver It was shown that the general level of inte secondary undulations is highest for Va Island inlets, and least for those of C Alaska. It was also shown that tsunami ners are more common than is generally b (Sims-ISWS)
W75-10554

**SEDIMENT CHARACTERISTICS OF ST IN THE EASTERN PIEDMONT AND WI COASTAL PLAIN REGIONS OF CAROLINA,**
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 2
W75-10586

**THE LOXAHATCHEE - A RIVER IN DIS SOUTHEAST FLORIDA,**
Geological Survey, Miami, Fla.
For primary bibliographic entry see Field
W75-10588

**ADDITIONAL STUDIES OF THE MACROINVERTEBRATES AND HYDR CAL CONDITIONS OF UPLAND CAN TAMPA BAY, FLORIDA,**
National Marine Fisheries Service, St. Pe Fla. Southeast Region.
For primary bibliographic entry see Field
W75-10617

**NORTON POINT DIKE STUDY, ISLAND, NEW YORK; HYDRAULIC INVESTIGATION,**
Army Engineer Waterways Experiment Vicksburg, Miss.
For primary bibliographic entry see Field
W75-10662

**LOS ANGELES AND LONG BEACH H MODEL STUDY; REPORT 2, OBSERV OF SHIP MOORING AND MOVEMENT**
Army Engineer Waterways Experimen Vicksburg, Miss.
For primary bibliographic entry see Field
W75-10664

**THE PERIMETER CANAL - A N PROACH TO DISCHARGE URBAN INTO A COASTAL MANGROVE AREA**
Greiner (J.E.) Co., Inc., Tampa, Fla.
For primary bibliographic entry see Field
W75-10773

## 3B. Water Yield Improvement

**LAND USE SIMULATION MODEL OF THE SUBALPINE CONIFEROUS FOREST ZONE,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
C. F. Leaf, and G. E. Brink.
Research Paper RM-135, 42 p, February 1975. 9 fig, 16 ref, 5 tab.

Descriptors: *Computer models, *Simulation analysis, *Forest management, Hydrology, Watershed management, *Land use, *Weather modification, *Lumbering, Evapotranspiration, Soil water, Snow cover, *Coniferous forests, Water yield, Water yield improvement, Watersheds(Basins), Interception, Sediment yield, Clear-cutting.
Identifiers: Forest cover.

A dynamic model simulates the short- and long-term hydrologic impacts of combinations of timber harvesting and weather modification to develop management strategies for planning intervals which can vary from a few years to the rotation age of subalpine forest (120 years and longer). Management strategies may subdivide a given planning unit, defined by environmental characteristics, into as many as eight distinct response units, which may be managed independently. Different cutting practices may be imposed on the response units, and any number of cuttings can be made at specified years during the planning interval. All interactions between the various response units are accounted for in both time and space. Moreover, the model contains time trend functions which computer changes in evapotranspiration, soil water, forest cover density, reflectivity, interception, snow redistribution, and sediment yield as the forest stands respond to timber harvesting. (Witt-IPC)
W75-10404

**WATERSHED MANAGEMENT IN THE ROCKY MOUNTAIN SUBALPINE ZONE: THE STATUS OF OUR KNOWLEDGE,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
C. F. Leaf.
Research Paper RM-137, 31 p, February 1975. 18 fig, 77 ref, 9 tab.

Descriptors: *Forest management, *Watershed management, *Water yield, *Reviews, Simulation analysis, *Rocky Mountain Region, Wyoming, Colorado, New Mexico, Snow cover, Snowmelt, Runoff forecasting, Lumbering, Weather modification, Water supply, Land use, Model studies, Watersheds(Basins), Water sources, Mountains, Water yield improvement, Land use.
Identifiers: Subalpine watersheds.

Watershed management in the subalpine zone of Wyoming, Colorado, and New Mexico is described. Forest hydrology is briefly discussed, followed by an in-depth discussion and review of field studies of the effects of watershed management practices on snow accumulation, melt, and subsequent runoff; and simulation models designed to predict the hydrologic impacts of timber harvesting and weather modification. Pertinent literature is included, along with unpublished research, observations, and experience. Research needs are highlighted, and guidelines for implementing watershed management principles in land use planning are summarized. (Witt-IPC)
W75-10405

**SIMULATING TIMBER YIELDS AND HYDROLOGIC IMPACTS RESULTING FROM TIMBER HARVEST ON SUBALPINE WATERSHEDS,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
C. F. Leaf, and R. R. Alexander.
Research Paper RM-133, 20 p, February 1975. 9 fig, 17 ref, 11 tab.

Descriptors: *Computer models, *Forest management, *Watershed management, *Water yield, Hydrology, Simulation analysis, Rocky Mountain Region, Snow cover, Snowpacks, Snowmelt, Runoff forecasting, Solar radiation, Model studies, Water supply, Lumbering, Watersheds(Basins), Water sources, Mountains, Water yield improvement.
Identifiers: *Timber yield, Subalpine watersheds.

A dynamic simulation model which has been specifically designed to determine the hydrologic changes resulting from timber harvesting and correlary models which simulate timber yields are described. Emphasis is placed on the planning unit which is defined by environmental characteristics, including combinations of slope, aspect, elevation, and forest cover. The models are intended for use on subalpine watersheds where the primary source of streamflow is from melting snow. The hydrologic model simulates winter snow accumulation, the short- and longwave radiation balance, snowpcake condition, snowmelt, and subsequent runoff in time and space. The timber models simulate projected timber yields in response to changes in cultural treatments and/or variations in original stand and site conditions. The models have been used to simulate the effects of forest and watershed management on several representative drainage basins in the Rocky Mountain Region of the United States. Projected hydrologic changes and growth and yield subsequent to timber harvesting in lodgepole pine and spruce-fir are described. (Witt-IPC)
W75-10406

**HYDROLOGIC RECONNAISSANCE OF THE SOUTHERN UINTA BASIN, UTAH AND COLORADO,**
Geological Survey, Salt Lake City, Utah.
D. Prince, and L. L. Miller.
Utah Department of Natural Resources, Salt Lake City, Technical Publication No 49, 1975. 66 p, 11 fig, 3 plate, 15 tab, 38 ref.

Descriptors: *Water resources development, *Groundwater resources, *Surface water availability, *Utah, *Colorado, Hydrologic data, Hydrologic cycle, Water importing, Water utilization, Irrigation, Water yield, Water quality, Arid climates, Semiarid climates.
Identifiers: *Southern Uinta basin(Utah and Colo).

The southern Uinta Basin covers about 4,900 square miles in northeastern Utah and northwestern Colorado. For the most part, it is an arid to semiarid region. During the period 1941-70, average annual precipitation ranged from less than 8 inches in the north-central part to more than 26 inches in the extreme western part. The area averages about one person for every 4.5 square miles. It is utilized mainly for livestock grazing and the production of oil and gas. Net imports of water from the Duchesne River for irrigation within the southern Uinta Basin average about 70,000 acre-feet per year as of 1972. About 94% of the average annual water supply from precipitation and imports is consumed within the southern Uinta Basin by evapotranspiration and sublimation from the winter snowpack. Both the surface water and groundwater are saline throughout a major part of the basin. Only in the headwater areas along the south rim of that subbasin can fresh water generally be found. The most promising opportunities for obtaining large sustained water supplies are surface reservoir storage of runoff in the headwaters of the larger streams. (Woodard-USGS)
W75-10585

**PROGRESS IN AUSTRALIAN HYDROLOGY 1965-1974.**
For primary bibliographic entry see Field 2A.
W75-10646

**WATERSHED MANAGEMENT PROBLEMS AND OPPORTUNITIES FOR THE COLORADO FRONT RANGE PONDEROSA PINE ZONE: THE STATUS OF OUR KNOWLEDGE,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W75-10655

**WATER-YIELD IMPROVEMENT FROM ALPINE AREAS: THE STATUS OF OUR KNOWLEDGE,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
M. Martinelli, Jr.
Research Paper RM-138, March 1975. 16 p, 12 fig, 1 tab.

Descriptors: *Alpine, *Snow management, *Water yield improvement, *Snowpacks.
Identifiers: Snow fences, Blowing snow, Snow accumulation.

Snowpack management can be effective means of improving water yields from the already productive alpine type. Snow accumulates in the lee of terrain breaks, and fences upwind of natural accumulation areas effectively trap additional snow. Snowfences can also control blowing and drifting snow on highways and in avalanche-prone areas. (Forest Service)
W75-10660

**ESTIMATING THE TRANSPORT AND EVAPORATION OF BLOWING SNOW,**
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W75-10695

**PRIORITY PROBLEMS FOR MODIFYING CUMULUS PRECIPITATION,**
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
L. O. Grant.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York p 131-146, 1974. 2 tab, 10 ref.

Descriptors: *Precipitation(Atmospheric), *Weather modification, *Clouds, Artificial precipitation, Research priorities, Cloud seeding, Cloud physics, Meteorology, Precipitable water.
Identifiers: *Cumulus precipitation.

Cumulus clouds are extremely complex. It seems unlikely that the model calculated and field demonstrated seeding effects of individual small cumuli can substantially alter the areal precipitation, at least on the High Plains. High priority scientific problems in the development of a technology of cumulus modification for augmentating precipitation include: (1) a lack of detailed observational description of individual clouds and of cloud interactions, (2) the absence of cloud model verifications and evaluations, (3) a lack of understanding of cloud interactions with their environment and with each other, and (4) the complexity of developing an experimental design for conducting cumulus seeding experiments. (See also W75-10769) (Humphreys-ISWS)
W75-10774

**WEATHER MODIFICATION FOR USE IN THE HIGH PLAINS,**
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
R. A. Schleusener and J. R. Miller, Jr.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 147-164, 1974. 9 fig, 3 tab, 11 ref. DOI 14-06-D-6796, 14-06-D-6660, NOAA N 22-188-72(N).

Descriptors: *Weather modification, *Cloud seeding, *Decision making, *South Dakota, Artificial precipitation, Water supply, Precipitation(Atmospheric), On-site investigations, Technology, Projects, Clouds, Rainfall, Hail, Insurance, Storms, Cloud seeding, *Great Plains.
Identifiers: *Hail suppression, *High Plains.

The development and extent of use of weather modification in the High Plains were examined. Data presented were in the nature of a progress report. The decision processes involved in a scientific experiment and in a users' decision to utilize weather modification were contrasted. The extent of use of weather modification and the basis for decisions made to use weather modification in the Plains were examined. Weather modification was being used in 28 projects in 6 states in the summer of 1973 in the Plains. Research results on seeding for rain increase give statistically significant rainfall increases for individual clouds less than 30,000 ft in depth, suggest rainfall increases for areas of about 1000 sq mi, and are non-existent for areas in the Plains larger than 10,000 sq mi. Research results on seeding for hail suppression over the north central Plains suggest hail suppression of about 50% and provide an adequate basis for some user groups to proceed with applied programs. Improved methods are needed to evaluate applied projects. Future needs require reduction of scientific uncertainties and ability to respond to user needs within the constraints imposed by society. (See also W75-10769) (Humphreys-ISWS)
W75-10775

**USERS' VIEW OF WEATHER MODIFICATION,**
Kansas State Senate, Topeka. 39th District.
D. Christy.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 165-170, 1974.

Descriptors: *Weather modification, *Cloud seeding, *Artificial precipitation, *Kansas, Benefits, Legal aspects, Droughts, Precipitation(Atmospheric), Agriculture, Meteorology.

The writer's experience with weather modification efforts in Kansas were reviewed. It was concluded that weather modification is valid, that hail suppression has a good probability of being justified, and that there is a lot to learn. It was suggested that during the developing years, attempts at weather modification should be instituted by citizens as they have been in the past. As public support develops, permissive type of legislation should be instituted so that state government could help when an area wants the modification bad enough to do something about it. National research should continue with more emphasis on the command type of 'Break the Drought' applications. (See also W75-10769) (Sims-ISWS)
W75-10776

**ROLE OF THE PUBLIC IN WEATHER MODIFICATION,**
Colorado State Univ., Fort Collins.
A. R. Chamberlain.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 171-177, 1974.

Descriptors: *Weather modification, *Cloud seeding, *Social participation, Decision making, Public rights, Economics, Social aspects, Precipitation(Atmospheric), Rainfall.
Identifiers: *Public involvement.

Weather modification is too important f
major decisions to be left to the scientists
gineers. The lay citizen is supportive of bu
terested in seeking involvement in lab
research or in small scale field research
ments conducted with the knowledge of
group of very local people. As the scientist
gineer move along an activity spectrum
development and operations, the role and
of the public increases very markedl
scientists and engineers who have miss
point quickly find themselves cast into ad
relationships and conflict with the public
merous consumer and environmental o
tions. Frequently years of delay result
delays can be avoided or reduced if we be
to apply better decision models that bring
and public together in the formative stage
ject and to initiate more effort to develo
system decision making techniques that
commodate quality, value, and other unm
ble but definable items. (See also W7
(Sims-ISWS)
W75-10777

## 3C. Use Of Water Of Impaire Quality

**WATER REUSE IN A PAPER REPROC PLANT,**
Oklahoma Univ., Norman. School of
gineering and Environmental Science.
For primary bibliographic entry see Field
W75-10401

**WATER-SOIL-PLANT INTERACTIONS TERBACIL,**
Hawaii Univ.-Hilo Coll., Hilo.
For primary bibliographic entry see Field
W75-10486

**PHOSPHORUS IN PERCOLATES MANURED LYSIMETERS,**
Guelph Univ. (Ontario). Dept. of Land Science.
For primary bibliographic entry see Field
W75-10573

**WELLTON-MOHAWK DRAINAGE A MEXICAN SALT PROBLEM,**
Wellton-Mohawk Irrigation and Drainage Ariz.
For primary bibliographic entry see Field
W75-10783

**UTILIZATION OF SEWAGE EFFLUE IRRIGATION,**
For primary bibliographic entry see Field
W75-10798

**IRRIGATION MANAGEMENT FOR SA TROL,**
Agricultural Research Service, Riversi Salinity Lab.
J. Van Schilfgaarde, L. Bernstein, J. D.
and S. L. Rawlins.
In: Agricultural and Urban Considerati rigation and Drainage; Selected Papers Irrigation and Drainage Division Speci ference, Fort Collins, Colorado, April 2 American Society of Civil Engineers, p 647-672, 1974. 8 fig, 5 tab, 24 ref, 1 app

Descriptors: *Irrigation, *Salts, *Salt *Leaching, Crops, Irrigation practices, of practices, Irrigation programs, Rates tion, Infiltration rates, Irrigation efficie tion water, Water quality, Salinity, Sa Management, Lysimeters, Drainage, Ag

ON THE PEAK-LOAD PRICING OF URBAN WATER SUPPLY,
Clark Univ., Worcester, Mass. Graduate School of Geography.
For primary bibliographic entry see Field 6C.
W75-10706

WATER RATES: AN ASSESSMENT OF CURRENT ISSUES,
California Univ., Berkeley.
For primary bibliographic entry see Field 6C.
W75-10707

THE EFFECTS OF URBANIZATION ON FLOODS OF DIFFERENT RECURRENCE INTERVAL,
University Coll., London (England). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W75-10709

THE MASTER PLAN FOR WATER-SUPPLY IN THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON,
Ottawa-Carleton Regional Municipality, Ottawa (Ontario).
F. E. Ayers.
Journal of the American Water Works Association, Vol 67, No 1, p 1-5, Jan 1975. 5 fig.

Descriptors: *Comprehensive planning, *Water supply development, *Water distribution(Applied), *Water demand, *Distribution systems, *Regional analysis, Hydrostatic pressure, Pressure conduits, Networks, Supply, Water storage, Water management(Applied), Water districts, Governments, Regions, Water resources development, *Canada.
Identifiers: Ottawa-Carleton Regional Municipality(Ontario-Canada), Ottawa River.

The Regional Municipality of Ottawa-Carleton, the first in Ontario, Canada, must supply and distribute water to the 425,000 residents in the cities of Ottawa and Vanier, 3 villages, and 11 townships. Two engineering firms developed short term plans based on a projected 1990 population of 635,000 and long term plans based on a population of 1,000,000 by the year 2030. Per capita consumption figures and average and maximum-day demand as well as maximum-hour demand figures were computed. The existing system which distributed purified water from the Ottawa River through three major pressure districts was studied. Network analysis was employed to find the best arrangement to integrate the central system with outlying areas presently bing served by up to 20 low capacity wells and to provide for regional growth at the same time. Additional filtration will be provided by upgrading both existing plants. Expansion plans are formulated for 6 pressure districts. To provide emergency reserves, 29.5 mil gal of additional ground reservoirs and four new 1-million-gallon elevated tanks are being added. Major mains from 24 to 60 inches in diameter are being constructed for maximum-hour demands and reservoir filling, as well as many smaller links in the distribution system. Substantial orderly construction progress is being made to serve the development of the area anticipated by the recently adopted master plan. (Herr-North Carolina)
W75-10710

FINANCING WATER WORKS,
Studley Shupert and Co., Inc., Boston, Mass.
W. P. Coues.
Journal of New England Water Works Association, Vol 87, No 3, p 207-217, Sept 1973.

Descriptors: *Bond issues, *Interest rates, Debt, Capital, Repayment contracts, Economics, Planning, *Financing, Investment, Financial feasibility, Return(Monetary), *Water works, Public utilities, Utilities.

General advice and instructions are given on procedures and financial obligations which a water utility should consider before selling bonds to raise money for improvements. The author, an investment counselor, considers the problem of bond financing for water works from both the perspective of the the utility and of the investor. Prevailing national business and economic conditions in the fall of 1972 are reviewed and short-range forecasts are offered for prospects of the money market, which must be considered by local authorities attempting to sell bonds. Since water utilities traditionally have had stable earnings, particularly where sales are to residential and commercial customers, investors in utility revenue bonds are more interested in the financial status of the community and less concerned about the specifics of its water utility plant and operation. They seek solidly based, professionally organized and formulated bond offerings. Professional assistance from bankers and legal counsel is urged, with special emphasis on seeking legal advice from a firm specializing in bond financing. Lists of specific procedures to be followed or avoided are offered, as well as a description of the characteristics of ideal financial conditions which bond dealers prefer. (Herr-North Carolina)
W75-10712

WATER WORKS IMPROVEMENTS--SPRINGFIELD, VERMONT,
Dvfresne-Henry Engineering Corp., North Springfield, Vt.
G. R. Allen.
Journal of New England Water Works Association, Vol 87, No 2, p 115-127, June, 1973. 10 fig.

Descriptors: *Distribution systems, Water distribution(Applied), *Water supply development, *Water delivery, *Hydraulic systems, *Water management(Applied), Water supply, Water wells, Water pressure, Groundwater availability, Pumps, Safe yield, Piping systems(Mechanical), *Vermont, Long-term planning
Identifiers: *Springfield(VT), Weathersfield Reservoir(VT).

After thorough engineering studies the Town of Springfield, Vermont, has improved the effectiveness of its present water distribution system and made long range plans for future growth. In 1904 the Weathersfield Reservoir was built about 4 miles north of the town. With a safe yield of 200,000 G.P.D., it delivers water from about 260 feet above the town by gravity flow. In the 1940's and '50's two well fields were drilled and a hand-started booster pump was added. But by the 1960's the pressure during peak periods was inadequate due to increased consumption and the hilly topography of the newer development. In 1967 the deficiencies were dramatized by a $2.5 million fire loss at the high school despite 3 nearby hydrants. Flow and pressure were insufficient. A two phase improvement program was designed. The first phase, to improve distribution of present supply, is essentially complete at a cost of $873,680 with $563,000 paid by a H.U.D. grant. Two concrete distribution storage reservoirs were built to level the demand peaks. Four and one half miles of transmission mains and 8 automated pumps were installed to incorporate the reservoirs into and permit maximum use of the existing system. Phase two, to provide additional supply, will not need to be implemented before 1990 when consumption is expected to exceed the improved capacity. (Herr-North Carolina)
W75-10713

DETERMINE URBAN RUNOFF THE SIMPLE WAY,
Montreal Urban Community (Quebec). Water Purification Dept.
For primary bibliographic entry see Field 2E
W75-10716

**WATER AND WASTEWATER FACILITIES FOR FLORIDA HOUSING DEVELOPMENTS,**
Singer Co., Bridgeport, Conn. Water Resources Div.
For primary bibliographic entry see Field 5D.
W75-10717

**WATER SUPPLY FROM RENOVATED WASTEWATER--A RESOURCE MANUAL FOR MASSACHUSETTS PLANNERS, PUBLIC OFFICIALS AND CITIZEN GROUPS.**
Clark Univ., Worcester, Mass.
For primary bibliographic entry see Field 5D.
W75-10722

**RIVERS IN THE CITY,**
For primary bibliographic entry see Field 6B.
W75-10723

**CLOSED RECYCLING SYSTEM FOR WATER PURIFICATION AND WASTE REDUCTION,**
For primary bibliographic entry see Field 5D.
W75-10735

**MULTIPLE CYCLE PROCESS FOR WASTEWATER PURIFICATION,**
Airco, Inc., Montvale, N.J. (assignee)
For primary bibliographic entry see Field 5D.
W75-10738

**ECONOMIC IMPACT OF THE CONVERSION OF WATER FROM IRRIGATION TO MUNICIPAL AND INDUSTRIAL USE IN THE RIO GRANDE BASIN OF NEW MEXICO,**
New Mexico State Engineer, Santa Fe.
For primary bibliographic entry see Field 6D.
W75-10771

**IMPACTS OF RURAL TO URBAN WATER USE,**
Texas Office of the Governor, Austin. Water Task Force.
For primary bibliographic entry see Field 6D.
W75-10772

**OPTIMAL SIZING OF URBAN FLOOD-CONTROL SYSTEMS,**
Hydrologic Engineering Center, Davis Calif. Planning Analysis Branch.
For primary bibliographic entry see Field 4A.
W75-10821

## 3E. Conservation In Industry

**THEORETICAL AND APPLIED CONCEPTS OF WATER RESOURCES FOR SOCIAL WELFARE.**
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W75-10354

**THE ECONOMIC IMPACT OF MERCURY POLLUTION ON FISHERIES AND OTHER RELATED BUSINESSES AROUND PICKWICK LAKE,**
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-10356

**INDUSTRIAL INTERDEPENDENCIES AND EXTERNAL DISECONOMIES OF WATER RESOURCES,**
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W75-10358

**STUDY OF SOLID WASTE MANAGEMENT PRACTICES IN THE PULP AND PAPER INDUSTRY.**
Gorham International, Inc., Maine.
For primary bibliographic entry see Field 5D.
W75-10366

**REDUCTION OF EFFLUENT POLLUTION AT THE ARKHANGEL'SK MILLS (SNIZHENIE ZAGRYAZNENNOSTI STOCHNYKH VOD NA ARKHANGEL'-SKOM KOMBINATE),**
Arkhangelsk Kombinat (USSR)
For primary bibliographic entry see Field 5D.
W75-10368

**INSTRUCTION FOR RECORD KEEPING OF WATER CONSUMPTION AT THE ENTERPRISES OF THE PAPER INDUSTRY (INSTRUKTSIYA UCHETA RASKHODA VODY NA PREDPRIYATIYAKH OTRASLI),**
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi, Gidrogeologii, Moscow (USSR).
G. E. Gal'per, Ya. V. Nikitin, and A. F. Shabalin.
Bumazhnaya Promyshlennost, No 3, p 24-25, March, 1975. 3 fig.

Descriptors: *Water consumption, *Pulp and paper industry, *Logging(Recording), Recycling, Industrial water, Sulfite liquors, Pulp wastes, Recirculated water, Reclaimed water, Water reuse, Suspended solids, Dissolved solids, Waste water, Effluents, Water pollution sources, Water pollution control, Water quality control.
Identifiers: White water, Soviet Union(U.S.S.R.).

The All-Union Scientific and Technical Association of the Pulp and Paper Industry has developed a system for recording water consumption at pulp and paper mills. The system standardizes record keeping, explains how to calculate the overall consumption, and describes methods to be used for the determination of water consumption. The chapter devoted to the terminology to be used is discussed in this article. Recycled water is defined as water containing suspended and/or dissolved substances which is returned to the production line without any treatment (e.g., white water, or weak sulfite and kraft spent liquors used in pulp washing). Reused water is water containing suspended and/or dissolved substances which underwent treatment (cooling, purification, or both). Water successively used is water which has been used in one process, then used without any treatment in another process (or processes). Waste water (effluent) is water discharged into a river or another natural water reservoir after purification or without purification. Reused waste water is effluent which underwent purification in special equipment and is returned to the production line. (Stapinski-IPC)
W75-10370

**WASTE WATER TREATMENT: WATER RECLAMATION AND REUSE,**
National Environmental Research C ater, Cincinnati, Ohio. Advanced Waste Treatr ent Research Lab.
For primary bibliographic entry see Field 5D.
W75-10372

**TAIO PAPER (COMPANY, IYOMISHIMA, JAPAN) EXPANDS TO 1,000,000 TONS/YEAR,**
For primary bibliographic entry see Field 5D.
W75-10380

**USE OF ORGANIC FLOCCULANTS FOR TEXTILE PLANT WATER TREATMENT (POUZITI ORGANICKYCH FLOKULANTU K CIRENI VODY PRO TECHNOLOGII TEXTILNI VYROBY),**
For primary bibliographic entry see Field 5F.
W75-10383

**INDUSTRIAL WASTES: PAPER AND ALLI PRODUCTS,**
National Council of the Paper Industry for Air Stream Improvement, Inc., New York
For primary bibliographic entry see Field 5D.
W75-10397

**WATER REUSE IN A PAPER REPROCESSI PLANT,**
Oklahoma Univ., Norman. School of Civil gineering and Environmental Science.
For primary bibliographic entry see Field 5D.
W75-10401

**WATER-QUALITY REQUIREMENTS FOR T PETROLEUM INDUSTRY,**
Neptune MicroFloc, Inc., Corvallis, Oreg.
For primary bibliographic entry see Field 5D.
W75-10465

**INTERNATIONAL EXPLORATION LOCA MINERALS AND OILS,**
National Science Foundation, Washington, Office for the International Decade of Ocean ploration.
For primary bibliographic entry see Field 5B.
W75-10467

**WATER FOR INDUSTRIAL DEVELOPMEN ALCORN, ITAWAMBA, PRENTISS, TISHOMINGO COUNTIES, MISSISSIPPI,**
Geological Survey, Jackson, Miss.
B. E. Wasson, and E. J. Tharpe.
Mississippi Research and Development Ce Jackson, 1975. 60 p, 31 fig, 10 tab, 38 ref.

Descriptors: *Water resources develop *Industrial water, *Mississippi, Groundw resources, Surface waters, Water yield, W quality, Data collections, Aquifer characteri Streamflow, Chemical analysis, Water deman
Identifiers: Alcorn County, Itawamba Co Prentiss County, Tishomingo County.

Groundwater presently supplies all public an dustrial water demands in Alcorn, Pre Itawamba, and Tishomingo Counties, Missis Pumpage in 1974 from public supply and indu wells was about 8 million gallons per day principal water-bearing units are the upper 10 of the Paleozoic rocks, and the overlying C Formation, Eutaw Formation, Coffee Sand Ripley Formation of Late Cretaceous age. St in the four-county area represent large pot water supplies. The Tennessee River, bounds the northeast corner of the area, has mal flow of about 13,000 mgd. The quality of in the area is generally good, the dissolved- concentration in most of the water is less th mg per litre and rarely more than 500 mg pe The pH of surface water is usually near n the pH of groundwater ranges from 5 to mor 8, the deeper water having the highe (Woodard-USGS)
W75-10581

**THE LAWS AND THEIR ENFORCEM PROGRESS AMIDST PROBLEMS,**
For primary bibliographic entry see Field 5C
W75-10607

**METHOD OF TREATING ALUMINUM TAINING WASTE WATER,**
Kurita Water Industries Ltd., Osaka (assignee)
For primary bibliographic entry see Field 5I
W75-10730

**AIR AND WATER POLLUTION CONTRO**
El Paso Southern Co., Tex. (assignee)
For primary bibliographic entry see Field 5I
W75-10732

ED RECYCLING SYSTEM FOR WATER
ICATION AND WASTE REDUCTION,
imary bibliographic entry see Field 5D.
0735

EEDINGS OF THE INTERNATIONAL
ERENCE ON WASTE OIL RECOVERY
EUSE.
ation of Petroleum Re-Refiners, Washing-
C.
mary bibliographic entry see Field 5D.
0739

CONOMIC MODEL OF WASTE OIL
VERY, REPROCESSING AND DISTRIBU-
SYSTEMS,
nmental Quality Systems, Inc., Rockville,

mary bibliographic entry see Field 5D.
0768

OMIC IMPACT OF THE CONVERSION
ATER FROM IRRIGATION TO MU-
L AND INDUSTRIAL USE IN THE RIO
DE BASIN OF NEW MEXICO,
exico State Engineer, Santa Fe.
nary bibliographic entry see Field 6D.
771

## onservation In Agriculture

HORUS AVAILABILITY OF SOME
PINE RICE SOILS AS AFFECTED BY
AND WATER MANAGEMENT PRAC-

arolina State Univ., Raleigh. Dept. of Soil

nchez, and A. M. Briones.
ournal, Vol 65, No 2, p 226-228, 1973.

ors: Water management(Applied),
orus, *Flooding, Oxidation, Nutrients,
ion, *Rice, Soils, *Soil management.
rs: *Philippine Islands.

enhouse experiments were conducted on 6
tatives Philippine lowland rice soils. The
l effects of flooding to rice vary with the
available soil P, as measured by P uptake.
f high P availability, no differences were
when rice was grown under constant
on partially oxidized profile or when
was delayed 15-35 days after seeding. The
eatments produced lower yields and P up-
omparison to constant flooding in soils of
to low P availability. When severe water
curred, rice growth, yield and P uptake
y decreased in all soils regardless of P
ty. Puddling flooded soils had no effect
ields or P uptake at harvest regardless of
ilability. Puddling unflooded soils severe-
sed growth and responses to applied P
vere soil shrinkage took place. The
of flooding on P uptake by rice depend
he available P level and the type of water
ent used.--Copyright 1973, Biological
, Inc.
1

OF A PHYTOPLANKTON CULTURE
GERMINATION AND SEEDLING
PMENT OF BARLEY, SUGAR BEETS
TTUCE,
Bioculture, Inc., Phoenix, Ariz.
Lab.
is, and E. R. Bigler.
rnal, Vol 65, No 3, p 462-464, 1973. Illus.

rs: *Planting management, Phytoplank-
mination, Plant growth, *Barley, *Sugar
ttuce, *Chlorophyta, Seeds.

The effect of various quantities of a Chlorophyta phytoplankton culture on seed germination, seedling development, and yield was evaluated in both the laboratory and field. In the laboratory, 'Arivat' barley (Hordeum vulgare L.) seedlings were grown in aqueous solutions of phytoplankton culture. Shoot length was increased by 100 and 1000 ppm concentrations of the culture but was unchanged at 10000 and 100000 ppm. There was an inverse relationship between shoot length and shoot weight per unit length. In the field, barley seedling emergence was significantly increased by injecting diluted phytoplankton culture with the seed at a rate of 3 1/240 m of row. Preplant irrigation with a 1000 ppm dilution of phytoplankton culture in the field increased sugar beet (Beta vulgaris L.) and lettuce (Lactuca sativa L.) seedling emergence. Subsequent post-plant applications of the phytoplankton resulted in additional increase in seedling emergence. Increased production was found for the sugar beets at all levels of treatment. This further increase could not be allocated to either growth regulator or soil modification but could be the result of both acting at once.--Copyright 1973, Biological Abstracts, Inc.
W75-10496

**SOME EFFECTS OF FIELD WEATHERING OF SEED COTTON IN A DESERT ENVIRONMENT,**
Arizona Univ., Tucson. Dept. of Agronomy and Plant Genetics.
D. R. Buxton, H. N. Stapleton, Yahia Makki, and R. E. Briggs.
Agron Journal, Vol 65, No 1, p 14-17, 1973, Illus.

Descriptors: *Weathering, *Cotton, Seeds, Deserts, Environment, *Southwest US, Crop production, Harvesting.

In field studies in southwestern USA, cotton (Gossypium hirsutum L.) was machine picked about every 10 days to investigate the effect of weathering. Each harvest was from cotton not previously harvested. Other plots were harvested repeatedly by hand to determine the contribution of late-open bolls to changes in seed cotton properties. In a greenhouse study open bolls were weathered for 10 wk and sampled weekly. The bolls were moistened with 0.5 ml water/boll either weekly or twice weekly and compared with an unwatered check to investigate the effect of wetting and drying cycles that occur in the field from rain and dew formation. Weathering did not result in loss of dry weight of lint or seed. Upper-half-mean-fiber-length was significantly reduced by the 10-wk greenhouse weathering period, but fiber fineness and strength were not affected. Weathering in the field resulted in average reductions of 0.8, 0.8, and 1.0%/wk for upper-half-mean-length, strength, and fineness, respectively, during Oct. and Nov. Harvesting late in the fall will not reduce yield if cotton does not drop to the ground, but a reduction in fiber quality can be expected.--Copyright 1973, Biological Abstracts, Inc.
W75-10557

**HYDROLOGY OF THE ALBEMARLE-PAMLICO REGION, NORTH CAROLINA--A PRELIMINARY REPORT ON THE IMPACT OF AGRICULTURAL DEVELOPMENTS,**
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 4C.
W75-10602

**WATER RESOURCES OF THE TOPPENISH CREEK BASIN, YAKIMA INDIAN RESERVATION, WASHINGTON.**
Geological Survey, Tacoma, Wash.
Available from NTIS, Springfield, Va 22161 as PB-243 749, $7.50 printed copy, $2.25 in microfiche. Water-Resources Investigations 42-74, January 1975. 144 p, 32 fig, 5 tab, 31 ref, 4 append.

Descriptors: *Water resources, *Indian reservations, *Washington, *Hydrologic data, Surface waters, Groundwater resources, Irrigation, Water resources development, Water wells, Well data, Aquifer characteristics, Water yield, Water levels, Water utilization, Hydrogeology, Streamflow, Hydrology, Surface-groundwater relationships.
Identifiers: *Yakima Indian Reservation(Wash), Toppenish Creek basin(Wash).

About 94 percent, or 655,000 acre-feet per year, of water used for irrigation in the Toppenish Creek basin of the Yakima Indian Reservation Wash., is diverted from the Yakima River, the eastern boundary of the reservation. The flows of Toppenish Creek and its tributaries are small in comparison, but they are vital to irrigation of areas upslope from the irrigation canals. About 17.5 acre-feet per year of groundwater from a basalt aquifer and about 3.5 acre-feet per year from young and old valley-fill aquifers also are used for irrigation in the basin. Each aquifer is capable of yielding more than 1000 gallons per minute to efficiently constructed wells. Owing to seepage from canals and irrigated lands, the groundwater level in the young valley fill aquifer is higher at present (1974) than in the past, but some water-level declines have occurred in the old valley fill and basalt aquifers. Water levels in wells tapping the basalt aquifer have been lowered in some places as much as 80 feet during the past 15 years. The young valley fill aquifer in the eastern part of the basin is the best source of groundwater. (Woodard-USGS)
W75-10603

**RECLAMATION OF TEXTILE PRINTING WASTEWATERS FOR DIRECT RECYCLE,**
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5D.
W75-10676

**RESPONSES OF 'BEARSS' LEMON TO NITROGEN, POTASSIUM AND IRRIGATION APPLICATIONS,**
Agricultural Research and Educational Center, Lake Alfred, Fla.
R. C. J. Koo, T. W. Young, R. L. Reese, and J. W. Kesterson.
Proc Fla State Hortic Soc, 86 p 9-12, 1973(1974).

Descriptors: *Lemon, *Nitrogen, *Potassium, Irrigation programs, *Fertilizers, Fertilization, Fruit crops, Irrigation practices, *Crop production.
Identifiers: *Bearss lemon.

Results of a 4-yr study of young bearing 'Bearss' lemon on sour orang rootstock under 3 levels each of N and K fertilization and 2 levels of irrigation treatments are reported. Increased N application resulted in an increase in fruit production, peel oil content, scab infection and green fruit after curing. The latter 2 factors accounted for lower fresh fruit pack. Potash application increased the acid content of fruit. High soil moisture content maintained through irrigation resulted in increased fruit production, peel oil, scab infection, fruit size, and hastened fruit maturity. Different fertilizer and irrigation programs are suggested for fresh and processing lemons.--Copyright 1974, Biological Abstracts, Inc.
W75-10714

**RELATIONSHIPS BETWEEN DROUTH AND CORN YIELDS ON SELECTED SOUTH ATLANTIC COASTAL PLAIN SOILS,**
North Carolina State Univ., Raleigh.
C. D. Sopher, R. J. McCracken, and D. D. Mason.
Agronomy Journal, Vol 65, No 3, p 351-35[illegible], 1973. Illus.

Descriptors: *Corn(Field), Crop production, *Drought tolerance, *Coastal plains, *North Carolina, Soil-water-plant relationships, *Drought resistance.
Identifiers: Drought index.

The effects of drouth-days by physiological growth period on corn (Zea mays L.) grain yields was determined, and a 1-figure drouth index suitable for expressing these effects was developed. A drought-day was defined as a 24-hr period when potential evapotranspiration exceeds rainfall plus the effective moisture storage capacity. The physiological growth periods were: 2-equal-length periods prior to tasseling; tasseling; and a maturity period. The study was conducted on 2 major North Carolina Soil Groups. On the better drained (Udultic) soils of the Upper and Middle Coastal Plains, drough-days accounted for 62.6% of the corn yield variation. The effects of drouth were detrimental in the 2nd and 4th growth periods, and grain yields were reduced to zero after 5 drouth-days during the tasseling period. For the very poorly drained (Aquatic) soils of the Tidewater Region, drouth-days accounted for 41.2% of the yield variation. Detrimental drought-day effects were only present during the 2nd and tasseling periods. The reduction of the effects of drouth-days on these soils was attributed to moisture extrction from an underlying water table. Using the derived regression coefficients for weights, the drough-days by physiological growth periods were weighted and summed to develop a 1-figure drough-index This index may be used as a single climatic variable in regression-correlation studies of the crop-soil ecological system.--Copyright 193, Biological Abstracts, Inc.
W75-10721

**AGRICULTURAL AND URBAN CONSIDERATIONS IN IRRIGATION AND DRAINAGE.**
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 4A.
W75-10769

**WEATHER MODIFICATION FOR USE IN THE HIGH PLAINS,**
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-10775

**GROUNDWATER CONTROL BY PUMPING,**
Central Nebraska Public Power and Irrigation District, Holdrege.
For primary bibliographic entry see Field 4B.
W75-10778

**GROUNDWATER MODEL AS A TOOL IN PLANNING AND MANAGEMENT,**
CH2M/Hill, Portland, Oreg.
For primary bibliographic entry see Field 4B.
W75-10781

**DEVELOPMENT OF LARGE SCALE DRIP IRRIGATION SYSTEMS,**
Superior Farming Co., Bakersfield, Calif.
B. R. Olson, Jr.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 311-316, 1974.

Descriptors: *Irrigation systems, *Evaluation, *Irrigation engineering, *California, Irrigation, Economics, Irrigation practices, Irrigation operation and maintenance, Irrigation design, Automation, Experimental farms, Agriculture, Argicultural engineering, Testing.
Identifiers: *Drip irrigation, Test plots.

Superior Farming Company owns and operates 37,000 acres (15,000 hectares) in the western United States from Tucson, Arizona, to Madera, California. Over 34,000 acres (13,800 hectares) are in operation near Bakersfield, California. Water and labor costs are fairly expensive and increasing rapidly. There were just two of the factors involved in the analysis of the benefits of drip irrigation. During the summer of 1970, Superior Farming Company embarked on an ambitious program of drip irrigated test plots on a variety of crops. The tests were conducted on tomatoes, almonds, citrus, grapes, plums, and apples. The plots included a variety of soil types, from a clay to sand, in different areas throughout California. The system was designed with the aid of a computer which minimized, for each joint of pipe, the annual depreciated pipe cost plus power costs for the underground hydraulic system. More practical, economical research is required concerning proper filtration for drip systems. Hopefully, new and better emitters will be designed within the next few years. The producing, commercial grower must always weight the economics of any irrigation system. Superior Farming Company feels that drip irrigation has a good economic outlook in some areas. (See also W75-10769) (Sims-ISWS)
W75-10784

**WATER USE AND PRODUCTION OF TRICKLE IRRIGATED ONIONS,**
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
T. C. Patterson.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 317-328, 1974. 4 fig, 2 tab, 8 ref.

Descriptors: *Irrigation, *Irrigation practices, *Irrigation efficiency, *New Mexico, *Onions, Crop response, Irrigation systems, Furrow irrigation, Sprinkler irrigation, Salinity, Agriculture, Crops.
Identifiers: *Trickle irrigation.

In acreage and value of production, dry onions are one of New Mexico's most important vegetables. The purpose of this study was to determine the extent to which sprinkler and trickle irrigation systems can be used to optimize water-use efficiency of onions by maintaining high water-application efficiency and continuous high levels of readily available moisture in the soil. The control was furrow irrigation applied according to local practice. This study also monitored the salinity levels under the various treatments. It was found that the use of trickle and sprinkler irrigation systems capable of efficiently applying light, frequent applications of irrigation water can significantly increase the water-use efficiency of onions. Total yield of onions can normally be significantly increased by maintaining higher soil moisture levels throughout the growing season. Irrigation systems operated at extremely high efficiencies result in considerable water savings, but without a leaching fraction added to depths of application, a rapid salt build up occurs. (See also W75-10769) (Sims-ISWS)
W75-10785

**FLOAT VALVE PROVIDES VARIABLE FLOW RATES AT LOW PRESSURES,**
California Polytechnic State Univ., San Luis Obispo. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8C.
W75-10789

**EFFECTS OF SOIL MOISTURE ON STRESS ON 2 VARIETIES OF UPLAND COTTON IN ISRAEL: IV. EFFECTS OF PERIODS OF STRESS OCCURRENCE, CORRELATIONS AND REGRESSIONS,**
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
A. Marani.
Exp Agric. Vol 9, No 2, p 121-128, 1973, Illus.

Descriptors: *Soil moisture, *Cotton(Fi
*Moisture stress, Regression analysis, Correl
analysis, Irrigation, Plant physiology, Seeds,
production.
Identifiers: *Israel.

Effects of moisture stress during different s
of cotton development were evaluated by
correlation and regression methods on data o
rigation experiments from 3 different climat
gions. Significant negative correlations were f
between the number of days in which soil moi
was below a threshold level and several
traits. Flower number was usually affected a
sely by stress at the beginning of flowering
number, boll retention, boll weight, lint yiel
length and seed index by stress at the e
flowering; earliness and lint fineness by stres
ing early boll development. Lint index, p
and strength were affected by stress at dif
periods and effects of stress on lint yield wer
related with its effects on boll number
weight, lint length and early maturity. (Se
W72-08772, W72-05180, and W72-05179)—
right 1973, Biological Abstracts, Inc.
W75-10791

**PROTEIN CONTENT OF WINTER W
GRAIN AS RELATED TO SOIL AND
MATIC FACTORS IN THE SEMI-ARID
TRAL GREAT PLAINS,**
D. E. Smika, and B. W. Greb.
Agronomy Journal, Vol 65, No 3, p 433-436
Illus.

Descriptors: *Protein, *Wheat, *Great
Arid lands, Nebraska, Colorado, Regressio
ysis, *Soil water, Soil profiles, *Cli
Nitrates, Nitrogen, Air temperature.

Protein content of wheat (Triticum aestiv
grain has decreased in recent years in the
Great Plains. Protein content data from
Platte, Nebraska; Akron, Colorado; and
southwestern Nebraska locations were sh
be negatively correlated by linear regressi
total precipitation > 1.25 cm for a 15-day
40-55 days before maturity (r = -0.70**)
available soil water at seeding so a depth o
1.8 m (r = -0.79**). Grain protein level
shown to be positively correlated by linear
sion with total soil NO3-N to depths of 1.2
m (r = 0.82**) and by curvilinear regressi
maximum air temperature for a 5-day perio
days before maturity (r = 0.74**). With a
tors combined, r sup 2 = 0.96. With availa
water to seeding plus NO3-N in the soil p
seeding and protein content of wheat grain
= 0.86. Maximum yield was obtained wit
of soil water available at seeding, and at l
kg/ha of NO3-N at seeding was needed t
grain with 12% protein.--Copyright 1973,
cal Abstracts, Inc.
W75-10792

**EVALUATION OF AGRICUL
DRAINAGE IN WATER QUALITY MA
MENT,**
Water Resources Engineers, Inc., Walnu
Calif.
For primary bibliographic entry see Field 5
W75-10796

**EFFECTIVENESS OF PRECIPITATIO
MOUNTAIN MEADOW,**
Agricultural Research Service, Fort Collin
For primary bibliographic entry see Field
W75-10799

**IRRIGATION MANAGEMENT FOR SA
TROL,**
Agricultural Research Service, Riversid
Salinity Lab.
For primary bibliographic entry see Field
W75-10800

KLE IRRIGATION DESIGN REQUIRE-TS FOR ROW CROPS,
ultural Research Service, Phoenix, Ariz. Conservation Lab.
Bucks.
gricultural and Urban Considerations In Ir-n and Drainage; Selected Papers from the ion and Drainage Division Speciality Con-e, Fort Collins, Colorado, April 22-24, 1973. can Society of Civil Engineers, New York, 589, 1974. 1 fig, 3 tab, 13 ref, 2 append.

ptors: *Irrigation, *Irrigation systems, tion efficiency, *Crops, Field crops, Cot-eld), Furrow irrigation, On-site investiga-Consumptive use, Leaching, Salts, Irriga-actices, Agriculture.
iers: *Trickle irrigation, Row crops, ge.

perly-managed trickle irrigation system provide a soil environment where the im possible water application will permit mination of seeds, emergence of seedlings, development of an adequate root system. principles of plant water needs are essen-ie same for trickle irrigation as for other ir-methods. Soil moisture must be main-n a range that permits adsorption of water t roots at a rate comparable to transpiration and the soluble salt content in the root zone ot limit plant growth and water absorption. search on the management of trickle irriga-ystems was conducted on cotton and e. Quantity and frequency of trickle irriga-possible increased yield and decreased ir-water requirement were evaluated and ed to standard-furrow irrigation practices. l and peak consumptive-use requirements, using trickle irrigation for cotton and production, appeared to be the same as ow irrigation. The capability of varying cy of trickle irrigation, depending on the l crop, would provide flexibility in the n of a trickle irrigation system. An overall n efficiency as high as 90% seems possible trickle irrigation of row crops with y available trickle irrigation systems. (See 5-10769) (Sims-ISWS)
301

EAR STUDY OF DES MOINES RIVER QUALITY,
ate Univ., Ames. Engineering Research

ary bibliographic entry see Field 5B.
03

ING AND SOIL TEMPERATURE EF-ON WHEAT DURING GRAIN FILLING,
ge National Lab., Tenn.
moore, R. A. Fischer, and L. H. Stolzy.
ny Journal, Vol 65, No 3, p 361-364, 1973.

ors: *Flooding, *Soil temperature, *Root systems, *Crop production, on.
rs: Root respiration, Grain filling.

environment of wheat (Triticum aestivum hell) was modified with flooding and soil ure treatments during the grain filling n assessment of the relation between root on and grain yield. Short term flooding ys) at 15-17 C soil temperature in a pot l experiment did not influence yield. erm flooding (20-30 days) reduced yield % at 15-17 C soil temperature and by 73% oil temperature. Yield reduction was as-with smaller mean grain weight. At 5C erature 30 days of flooding had no signifi-ct on yield. Stem dry weight per tiller l by about 25% with increase in soil tem-from 5 to 25 C for both flooded and non-reatments. Mathematical simulation esti-root respiration applied to the experimen-tal conditions indicated that roots were a minor sink for assimilate during the grain filling stage. Root environmental effects on wheat yield could not be interpreted in terms of roots being competitive with the developing grain for photosynthate. The significant effects of soil conditions on the maturing wheat plant indicate some importance of roots and root environment during the grain filling stage.--Copyright 1973, Biological Abstracts, Inc.
W75-10829

**ACTMO, AN AGRICULTURAL CHEMICAL TRANSPORT MODEL,**
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 5B.
W75-10846

# 4. WATER QUANTITY MANAGEMENT AND CONTROL

## 4A. Control Of Water On The Surface

**ANALYZING REIMBURSEMENT MECHANISMS FOR RESOURCE DEVELOPMENT PROJECTS,**
Wyoming Univ., Laramie. Div. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W75-10353

**LAND USE SIMULATION MODEL OF THE SUBALPINE CONIFEROUS FOREST ZONE,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W75-10404

**WATERSHED MANAGEMENT IN THE ROCKY MOUNTAIN SUBALPINE ZONE: THE STATUS OF OUR KNOWLEDGE,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W75-10405

**THE LOWER COLORADO RIVER: A BIBLIOGRAPHY,**
Arizona Western Coll., Yuma.
For primary bibliographic entry see Field 10C.
W75-10453

**PROCEEDINGS SYMPOSIUM ON STATISTICAL HYDROLOGY.**
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 2A.
W75-10507

**SOME PROBLEMS IN PURE AND APPLIED STOCHASTIC HYDROLOGY,**
Toronto Univ. (Ontario). Dept. of Mechanical Engineering; and Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 2A.
W75-10508

**STATISTICAL TOLERANCE LIMITS FOR A PEARSON TYPE III DISTRIBUTION,**
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-10511

**A MODEL OF STATISTICAL ERRORS IN ESTIMATING STREAMFLOW FROM CONTINUOUS-STAGE RECORDS,**
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2E.
W75-10512

**USE OF AUTOREGRESSIVE RUNOFF MODELS IN RESERVOIR STUDIES,**
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-10523

**STATISTICAL INFERENCE ON STREAMFLOW PROCESSES WITH MARKOVIAN CHARACTERISTICS,**
Arizona Univ., Tucson. Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W75-10525

**RECURRENCE INTERVALS OF ANNUAL MINIMUM STREAMFLOWS,**
Keystone Junior Coll., LaPlume, Pa. Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W75-10530

**NONLINEAR CHANNEL ROUTING BY COMPUTER,**
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
M. C. Quick, and A. Pipes.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY6, Proceedings Paper 11353, p 651-664, June 1975. 11 fig, 9 ref, 2 append.

Descriptors: *Channel flow, *Stage-discharge relations, *Canada, *Routing, *Hydraulic design, *Model studies, River forecasting, Digital computers, Flow, Storage, Channels, Design, Hydraulics, Hydrology, Simulation analysis.
Identifiers: *Fraser River(British Columbia), Wedge storage.

A simple but accurate nonlinear river channel routing method was developed which can be calibrated from standard water survey measurements of stage-discharge and stage-velocity. The flow model was based on well-established kinematic flood wave behavior. The routing coefficients were not derived from analysis of the inflows and outflows to a given reach, but were derived directly from the stream gaging data for each reach, i.e., the stage-discharge and the stage-velocity curves. The routing procedures are computationally simple and are described by equations. Because the procedure computes according to wave travel time, the storage term is purely wedge storage and this led to part of the simplification. Because the procedure operates on changes in flow, an extremely simple reservoir routing-method was derived. The model was designed for computation by digital computer, although hand computation is feasible for simple systems. (Lardner-ISWS)
W75-10543

**INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.**
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W75-10550

**FLOOD PLAIN INFORMATION: OUACHITA RIVER, HOT SPRINGS CREEK, STOKES CREEK, MOLLY CREEK, GULPHA CREEK, CITY OF HOT SPRINGS, ARKANSAS.**
Army Engineer District, Vicksburg, Miss.

Prepared for the City of Hot Springs, Arkansas, June, 1974. 29 p, 15 fig, 24 plates, 7 tab.

Descriptors: *Floods, *Flooding, *Flood plains, *Flood profiles, *Flood forecasting, Flood data, Flood damage, Maximum probable flood, Historic floods, *Arkansas.
Identifiers: Hot Springs(Arkansas), *Ouachita River(Ark), Garland County(Ark), Hot Springs Creek(Ark), Stokes Creek(Ark), Molly Creek(Ark), Gulpha Creek(Ark), Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

The Ouachita River, which rises at Rich Mountain in the Ouachita Mountains west of Mena, Arkansas, and its tributary creeks, with drainage basins of rugged and steep terrain, flow through the Hot Springs, Arkansas area encompassing all types of urban, rural, and recreational land uses. Additional development is expected for the various floodplains as pressure for expansion increases. Carpenter Dam, owned and operated by Arkansas Power and Light Company since 1932, forms Lake Hamilton about 1 mile downstream from the junction of Hot Springs Creek and the Ouachita River. Gates at Carpenter Dam are also operated for maximum flood control. Blakely Mountain Dam, which forms Lake Ouachita, was constructed in 1944 on the Ouachita River about 10 miles above Hot Springs by the Army Corps of Engineers as part of a flood control program. Its flood gates are being operated to keep flooding at a minimum. Floods occur during all seasons. Much of the rainfall occurs in April and May with an average annual rainfall of 54 inches. The greatest flood of record occurred in May, 1923 when Hot Springs Creek had an elevation of 643.4 feet at mile 4.47 and extensive damage was caused by rushing flood waters on the city's main street. The elevation of the projected Intermediate Regional Flood (IRF) would be 646.3 feet and of the Standard Project Flood (SPF) would be 647.3 feet at mile 4.37. Peak discharge at the mouth of Hot Springs Creek would be 12,600 cfs for an IRF and 19,600 cfs for an SPF. Future damage could be extensive due to the high waters, high velocities and rapid rise of flood waters. (Park-North Carolina)
W75-10559

**FLOOD PLAIN INFORMATION: BUSHKILL CREEK, VICINITY OF EASTON, PENNSYLVANIA.**
Army Engineer District, Philadelphia, Pa.
Prepared for the Lehigh-Northampton County Joint Planning Commission, January, 1972. 26 p, 10 fig, 15 plates, 8 tab.

Descriptors: *Flood forecasting, *Flood plains, *Flood damage, Flood data, Flood profiles, Flood stages, Obstruction to flow, Land use, Planning, Historic floods, *Pennsylvania, Flash floods, Delaware River.
Identifiers: *Bushkill Creek(Pa), Easton(Pa), Flood plain management, Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

Aside from the City of Easton, Pennsylvania, located at the confluence of Bushkill Creek and the Delaware River, the flood plain of Bushkill Creek is mostly undeveloped. The upper and middle reach are characterized by low banks with gently sloping flood plains, the lower reach by steep banks, man-made fills, and retaining walls. Spring floods are caused by snowmelt runoff and heavy rains; fall floods by general rainfall runoff. Flash floods produced by local thunderstorms occur year-round. The most severe flood recorded, caused by a thunderstorm, occurred July 9, 1945 and had a magnitude between an Intermediate Regional Flood (IRF) and a Standard Project Flood (SPF). Based on gage information, an IRF would have a water surface elevation of 204.6 ft. m.s.l.d. and a peak discharge of 10,000 cfs at the creek's mouth; and SPF's elevation would be 207.2 ft. and peak discharge would be 24,500 cfs. In several locations, the water surface elevation of the July 1945 flash flood was greater than an IRF or SPF due to structures which were clogged with debris. There are 9 dams, 45 bridges, and 2 buildings that cross the creek and can create obstructions. (Diefendorf-North Carolina)
W75-10560

**FLOOD PLAIN INFORMATION: BLOOMSBURG, COLUMBIA COUNTY, PENNSYLVANIA-SUSQUEHANNA RIVER.**
Army Engineer District, Baltimore, Md.
Prepared for the Columbia County Planning Commission, Bloomsburg, Pennsylvania, February, 1974. 36 p, 3 fig, 13 plates, 8 tab.

Descriptors: *Flood plains, *Flood data, *Floods, *Flood profiles, Flood forecasting, Flood recurrence interval, Flood stages, Flood proofing, Nonstructural alternatives, Maximum probable flood, Regional flood, Flow duration, Historic flood, *Pennsylvania.
Identifiers: Bloomsburg(Pa), Columbia Co(Pa), *Susquehanna River(Pa), Fishing Creek(Pa), Catawissa Creek(Pa), Standard Project Flood, Intermediate Regional Flood.

Portions of Columbia County, Pennsylvania, were flooded extensively in 1936 and 1972 by waters from the Susquehanna River, Fishing Creek, and Catawissa Creek; studies indicate larger floods are possible. Unfortunately, there is continuous pressure to develop the flood plain due to the area's increasing population. Major floods on the Susquehanna River can occur during any season, but most have occurred in the spring. Although a combination of heavy rain and snowmelt caused past flooding, the largest flood of record resulted from Tropical Storm Agnes in June 1972 when heavy rains fell on previously saturated ground. As much as 16 inches fell in some areas of the Susquehanna basin with record runoffs. Flooding here causes moderately rapid rises in the river stage, is of long duration, and has a high flow velocity. During the June 1972 flood, the river rose one foot per hour and remained out of banks for 3 1/2 days, and water velocity was as high as 9 miles/hour. The river is crossed by two highway bridges and one railroad bridge, but the underclearances are above the Intermediate Regional Flood level, offering little flow obstruction. There are no flood control projects authorized, and while six upstream reservoirs lower the frequency of flooding, they do not provide complete protection. An Intermediate Regional Flood would rise 7 ft over 54 hours and stay above bankfull 96 hours; a Standard Project Flood would rise 35 feet in 96 hours and be above bankfull 148 hours. (Grden-North Carolina)
W75-10561

**FLOOD PLAIN INFORMATION: BRANDYWINE CREEK, CHESTER COUNTY, PENNSYLVANIA.**
Army Engineer District, Philadelphia, Pa.
Prepared for the Chester County Planning Commission, March, 1972. 24 p, 8 fig, 13 plates, 8 tab.

Descriptors: *Flood forecasting, *Flood plains, *Flood damage, Flood profiles, Historic floods, Flood stages, Obstruction to flow, Land use, Planning, *Pennsylvania.
Identifiers: *Brandywine Creek(Pa), Chester County(Pa), Chadds Ford(Pa), Lenape(Pa), Soil Conservation Service, Water Resources Authority, Flood plain management, Standard Project Flood, Intermediate Regional Flood.

This is the third of 4 reports on Brandywine Creek flooding. It covers 9.8 miles of the Main Stem beginning near the Pennsylvania-Delaware border continuing upstream to the confluence of East and West Branches near Lenape, Pennsylvania. The relatively broad flat flood plain, bordered by gently rolling hills, is rural and largely undeveloped. Floods generally occur in the summer and fall when rain is greatest. Obstruction to flow is created by 6 bridges and 3 dams which are the low-flow type with no significant storage or flo control capacity. Information on historic floods the Chadds Ford, Pa., gage gives largest flo records of 17,200 cfs in 1920 and 16,800 cfs 1942. At this gage, an Intermediate Regional Flo (IRF) would have a discharge of 24,000 cfs an Standard Project Flood (SPF) of 63,100 cfs. B would inundate residential, commercial, and dustrial properties, creating hazardous situatio The Soil Conservation Service has proposed c struction of 10 dams to be located on East West Branches which would reduce the IRF SPF discharges to 18,700 cfs and 49,200 respectively. The Water Resources Authority developed a plan for the purchase of wa resources protection rights in areas most critica water resources. (Diefendorf-North Carolina)
W75-10562

**FLOOD PLAIN INFORMATION: GOLDSMI GULCH, DUTCH CREEK, LILLEY GUL AND COON CREEK, VOLUME VI, DENV METROPOLITAN REGION, COLORADO.**
Army Engineer District, Omaha, Nebr.
Prepared for Denver Regional Council of Gov ments and the Urban Drainage and Flood Co District, October, 1971. 50 p, 20 fig, 21 plates tab.

Descriptors: *Floods, *Flooding, *Flood forec ing, *Flood flow, *Flood peak, Flood water, structions to flow, Tributaries, Maximum pr ble flood, *Colorado, Flood data, Flood plains
Identifiers: Goldsmith Gulch(Col), D Creek(Col), Lilley Gulch(Col), Coon Creek( Denver(Col), Denver County(Col), Arap County(Col), Intermediate Regional Flood, S dard Project Flood.

The four streams located at the southern edg Denver, Colorado, flow through areas underg urbanization and are susceptible to the f floods typical of the region. Goldsmith G draining 7.80 sq mi in southeast Denver an jacent Arapahoe Creek, has an average gradie 19.6 ft/mi with a maximum of 26.9 ft/mi. flood plain is narrow in the upper reaches widens slightly as it merges with the Cherry C flood plain.' Average channel depth is 4.5 ft average channel top width of 83 ft. Maxi channel top width is 200 ft. Planned subdivi are the predominant development pattern. By this basin is expected to be about 92% develo Dutch Creek and its major tributaries, L Gulch and Coon Creek, have narrow flood p which widen slowly in downstream direc Most basin land is presently agricultural with scattered urban development. Dutch Creek is anticipated to be about 36% developed by Past floods on the streams have been quick r of short duration, and caused by 'cloudburst storms. Based on data correlated for si streams since discharge measurements ar available specifically for the streams of th port, potential floods, the Intermediate Reg Flood (IRF) and the Standard Project Flood would have peak discharges of 3,500 cfs and cfs respectively on Goldsmith Gulch above and 3,750 cfs and 16,600 cfs on Dutch Creek the confluence with Coon Creek. Roads acro creeks would be in danger from the high v and high velocities. Accompanying tables plates give detailed data for points on the str (Park-North Carolina)
W75-10563

**FLOOD PLAIN INFORMATION: MEA CREEK, ALBEMARLE COUNTY AND C LOTTESVILLE, VIRGINIA.**
Army Engineer District, Norfolk, Va.
Prepared for Charlottesville and Albemarle ty, Virginia, January, 1972. 49 p, 7 fig, 14 pla tab.

Descriptors: *Floods, *Flooding, *Water m ment(Applied), *Virginia, *Flood profiles, plains, Flood control, Flood protection.

ifiers: *Meadow Creek(Va), Albemarle
nty(Va), Charlottesville(Va), Standard Project
d, Intermediate Regional Flood, Rivanna
(Va).

low Creek, a small stream whose flood plains
from 75 to 700 feet, flows easterly for 6 miles
ng in and out of Charlottesville, Virginia,
al times before emptying into the Rivanna
. The outer edge of the flood plain is defined
ruptly rising topography which curtails flood
s. Development in the flood plain consists of
a few scattered structures. Obstructions to
flow include bridges and culverts but
vater effects in a flood are relatively minor
o the stream's fairly steep slope. Minor to
rate flooding prevails in the spring, although
floods may occur at any time resulting from
general rains or from intense rainfall from
al storms. Duration of floods is short and the
rises rapidly to overbank stages. No flood
ge prevention measures currently exist. In
ce of data for Meadow Creek, information
ollected from nearby streams. The greatest
occurred in October 1942. At approximately
ft. above the mouth of Meadow Creek, an
ediate Regional Flood (IRF) would have
ischarge of 5,900 cubic feet per second (cfs)
naximum channel velocity of 12 ft/sec and
um overbank velocity of 5 ft/sec. A Stan-
roject Flood (SPF) at the same site would
rge 9,400 cfs with 14 ft/sec maximum
y channel flow and 6 ft/sec maximum over-
elocity. 'The SPF profile for Meadow Creek
vary from 1 to 7 feet higher than the IRF in
dy area.' (Salzman-North Carolina)
0564

D PLAIN INFORMATION: MACON
TY, ILLINOIS.
Engineer District, Chicago, Ill.
ed for Macon County Regional Plan Com-
n, February, 1971. 107 p, 47 fig, 24 plates, 17

otors: *Floods, *Flooding, *Flood frequen-
lood profiles, *Flood protection, *Flood
, *Flood forecasting, Flow, *Flood plains,
ctions to flow, Rivers, Tributaries,
s, Flood damage.
ers: Decatur(IL), *Sangamon River(Ill), In-
iate Regional Flood(IRF), Standard Project
SPF), Stevens Creek(IL), Spring
L), Finley Creek(IL), Big Creek(IL), Long
L).

port will aid Macon County, Illinois, and
of Decatur in solving local flood problems
Sangamon River and Stevens, Spring, Fin-
ng and Big Creeks, a total of 54 miles of
. The main flood season is winter and
ut flash floods are a year-round problem.
ve floods have occurred from 1939 to 1968
us seasons causing damage to the industri-
mercial and especially to the agricultural
ordering the river and creeks. Most of the
ial development is above the damage level
ssures exist for increasing residential
ment in the floodplain. Nearly all the
across the five creeks are serious obstruc-
the Intermediate Regional Flood (IRF) and
dard Project Flood (SPF). The major flood
d was in May, 1943 with an elevation of
at the Illinois Highway 48 bridge about a
ow Decatur Dam on the Sangamon River.
F would be 0.45 feet higher and the SPF
e 12.44 feet higher than the flood of 1943 at
e location. Lake Decatur, a long narrow
pply reservoir with average depth of less
feet, is not effective in reducing flood
Flood hazard areas, river profiles, and sig-
data on the river and 5 creeks are
d for policy guidance. (Park-North
)
65

**FLOOD PLAIN INFORMATION: EAST FORK ONE HUNDRED AND TWO RIVER, BEDFORD, IOWA.**
Army Engineer District, Kansas City, Mo.
January, 1969. 34 p, 11 fig, 10 plates, 6 tab.

Descriptors: *Flood data, *Flood velocity, *Flood, *Flooding, *Flood plains, *Flood control, Flood protection, Flood frequency, Flood forecasting, Flow, Obstructions to flow, Rivers, *Iowa, Flow characteristics, Historic floods.
Identifiers: *Bedford(Ia), *East Fork One Hundred and Two River(Ia), Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

This report covers a 5-mile reach of the East Fork One Hundred and Two River as it flows through Taylor County, Iowa, in the vicinity of Bedford. Major floods occurred in January, 1960 and June, 1967 with elevations and peak discharges of 1078.5 feet at 5400 cfs and 1076.5 at 6800 cfs respectively. Reduced elevation despite greater flow was due to channel improvements which have been the only flood prevention measures. Primary use of the floodplain is agricultural although there is some industrial, municipal, and residential development that has been damaged in the past. Substantially more damage could be sustained in an Intermediate Regional Flood (IRF) or a Standard Project Flood (SPF) with crests of 1082.7 and 1085.9 feet respectively. Flood velocities, rates of rise, and durations could present greater hazards than previously. Velocities in the 1967 flood ranged from 6 to 11 feet per second; an SPF would have channel velocities up to 14.9 feet per second, which could cause considerable erosion, and overbank velocities up to 2.1 feet per second which could deposit debris from the river. These studies and predictions can be used as a basis for additional flood protection measures. (Park-North Carolina)
W75-10566

**FLOOD PLAIN INFORMATION REPORT: SENECA CREEK, MONTGOMERY COUNTY, MARYLAND.**
Army Engineer District, Baltimore, Md.
Prepared for Maryland-National Capital Park and Planning Commission, June, 1967. 13 p, 6 plates, 2 tab.

Descriptors: *Floods, Flood plains, *Flood protection, *Flood plain zoning, Planning, Land use, *Maryland, Flood proofing, Management.
Identifiers: *Floodplain management, *Seneca Creek(MD), Montgomery County(MD), Maryland-National Capital Park and Planning Commission.

Flood damages along Seneca Creek 15 miles northwest of Washington, D.C. at the time of this report were minor. The floodplain is primarily rural with the exception of the small town of Seneca on the Potomac at the creek mouth. July, 1956 was the major flood of record which caused four deaths and $200,000 to $300,000 in damage, generally to roads and bridges. Plates show the areas encompassed by the 1956 flood. A potential flood of 50-year frequency would vary little from this flood. The subdivision regulations of Montgomery County restrict development within the 50-year floodplain. Floodplain management recommended as a primary flood damage control measure should determine the limits of potential flood areas, provide access to flood-plain limits information, only plan development in floodplains of low-damage potential uses, and enforce existing laws and enact any new laws necessary to assure planned development in the floodplains. Cooperation and coordination of local, state, and federal policies is urged. A coordinated floodplain management program would reduce the demand for flood control structures which have already cost $5 billion for construction over the past 30 years. Preferable nonstructural alternatives are outlined. (Park-North Carolina)
W75-10567

**FLOOD PLAIN INFORMATION: MILL RUN, BLAIR COUNTY, PENNSYLVANIA.**
Army Engineer District, Baltimore.
Prepared for Blair County Planning Commission, Altoona, Pa. January, 1974. 22 p, 16 plates, 5 tab.

Descriptors: *Flood data, *Flooding, *Flood profiles, Flood damage, Flood forecasting, Flood protection, Flood recurrence interval, Flood peak, Flood discharge, Non-structural alternatives, Flash floods, Maximum probable flood, *Flood plain zoning, Flow duration, *Pennsylvania, Historic floods.
Identifiers: *Mill Run(Pa), Blair Co(Pa), Altoona(Pa), Standard Project Flood, Intermediate Regional Flood.

The probability and extent of future flooding along Mill Run in Blair County and the City of Altoona, Pennsylvania, is described to assist planners in minimizing vulnerability to flood damage through flood plain zoning, subdivision regulations, and flood protection works construction. The major flood of record occurred in 1936, although most property damage occurred in the September, 1967, flood. Residents report flooding in the Lleswen and Eldorado areas during 15 of the past 43 years. Flood determinations indicate that an Intermediate Regional Flood (IRF) would reach depths of 5.1 feet to 14.3 feet above streambed, and many of Altoona's bridges, residential areas, and light industrial areas would be inundated. Standard Project Floods (SPF) are not much higher, but the flooded areas and corresponding damage would be greater. There is also no definite flood season here. IRF water velocity ranges up to 14 ft/sec, but would be of short duration. The stream would rise from bankfull stage to its crest in 14 hours and return to its banks in less than 9 hours. No authorized flood control projects exist, and present zoning ordinances do not include flood plain zoning. (Grden-North Carolina)
W75-10568

**SPECIAL FLOOD HAZARD INFORMATION REPORT: CHICKASAWHAY RIVER, WAYNESBORO, WAYNE COUNTY, MISSISSIPPI.**
Army Engineer District, Mobile, Ala.
Prepared for Mississippi Research and Development Center, December, 1971. 10 p, 4 fig, 8 plates, 2 tab.

Descriptors: *Floods, *Flooding, *Flood plains, *Flood forecasting, Flood control, Flood protection, Historic floods, *Mississippi.
Identifiers: *Chickasawhay River(MS), Waynesboro(MS), Wayne County(MS), Intermediate Regional Flood, Standard Project Flood.

The Chickasawhay watershed in southeastern Mississippi drains an area of 2970 square miles. Within the 12-mile study reach its width varies between 100 and 250 feet with the bank height varying between 20 and 50 feet. The average slope is 0.7 feet per mile. The floodplain width varies from one to two miles. Development in the wide and flat floodplain at Waynesboro consists of residential areas interspersed with light industrial and commercial firms. Flood producing storms may occur anytime of the year. The major flood producing storms are usually of the frontal type which occur in winter and spring and last several days. Summer thunderstorms characterized by high intensities over small areas can cause flash flooding. A severe storm in summer or early fall can result from a tropical hurricane. No floodplain regulations exist. The largest flood occurred in April 1900 cresting at 170 feet, mean sea level (msl). The most recent flood on February 26, 1961 crested at 167.6 feet, msl. The 50-year flood and the Intermediate Regional Flood (IRF) would inundate the floodplain with the IRF affecting 3,700 acres of the 20,000 acres which comprise the Waynesboro Planning Area, with 400 acres flooded within the city limits. Floodplain management techniques to reduce damage are outlined. (Salzman-North Carolina)

W75-10569

**FLOOD PLAIN INFORMATION: BROOKINGS, BROOKINGS COUNTY, SOUTH DAKOTA, VOLUME I - DEER CREEK.**
Army Engineer District, Omaha, Neb.
Prepared for South Dakota Water Resources Commission and City of Brookings, April, 1973. 29 p, 22 fig, 10 plates, 4 tab.

Descriptors: *Flood plains, *Flood control, *Floods, *Flooding, Obstructions to flow, Flood forecasting, *South Dakota, Flood frequency, Flood damage, Flood protection.
Identifiers: *Deer Creek(SD), Brookings(SD), Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

Development in the 95-square mile basin of Deer Creek, a tributary of the Big Sioux River in Brookings County, South Dakota, is largely agricultural, with 71% cropland, 23% pasture, and 6% other land uses. Brookings is the major city in the study area (population 13.717 in 1970) and development on its eastern border has resulted in pressure for residential development in the flood plain. Research from residents and newspapers has established the flood history of Deer Creek. Serious floods were reported nine times from 1881 to 1969 with April 21, 1881 and May 3, 1912 the highest. Magnitude data is unavailable. Flows are obstructed by trees and brush growing on the flood plain and banks. Projected floods at the upstream limits of the study area are computed at a 8,180 cfs discharge for the Intermediate Regional Flood (IRF) and 20,180 cfs for the Standard Project Flood. The greatest historical flood may have approached the IRF with its 100 year frequency. The study makes no flood protection recommendations but states that some have already been developed. Brookings County has a flood plain ordinance, but the City of Brookings does not yet, and the entire length of lower Deer Creek falls within the extraterritorial planning and zoning boundary of the City of Brookings. (Park-North Carolina)
W75-10570

**FLOOD PLAIN INFORMATION: WHITE CLAY CREEK, NEW CASTLE COUNTY, DELAWARE.**
Army Engineer District, Philadelphia, Pa.
Prepared for the New Castle County Department of Planning, June, 1972. 27 p, 12 fig, 13 plates, 19 tab.

Descriptors: *Flood plains, *Flood damage, *Land use, *Planning, Flood data, Flood stages, Historic floods, Obstruction to flow, Dams, Hurricanes, *Delaware, Urbanization.
Identifiers: *White Clay Creek(DE), *Christina River(DE), New Castle County(DE), Newark(DE), Hurricane Agnes, Comprehensive development plan, Intermediate Regional Flood, Standard Project Flood, Floodplain management, Tidal flooding.

The total drainage area of White Clay Creek, a major tributary of Christina River, is 162 square miles. The floodplain along the upper reach is narrow, wooded, and mostly undeveloped. Along the lower reach development of the relatively wide flat floodplain is more concentrated, including industrial and commercial development at Newark, Delaware. There are 5 dams with no significant storage capacity. Twelve bridges and stored flotable material might cause obstruction to flood flow. The main flood season is summer and early fall due to major storms. Marshland near the confluence of White Clay Creek and Christina River is also subject to tidal and fluvial flooding from the river. The highest recorded stage, 34.6 feet m.s.l.d., occurred in July 1937 and was influenced by backwater from an obstructive railroad bridge. The highest recorded peak flow is 9,020 cfs in June 1972, resulting from Hurricane Agnes. An Intermediate Regional Flood (IRF) would reach 30.9 ft. m.s.l.d. and 10,500 cfs and a Standard Project Flood (SPF) would reach 41.6 ft. m.s.l.d. and 40,800 cfs. Both types of future floods would result in inundation of residential, commercial, and industrial properties. A tentative Comprehensive Development Plan covering future development through 1985 has been developed. Along with this study it can serve as a basis for floodplain regulatory measures. (Diefendorf-North Carolina)
W75-10571

**FLOOD PLAIN INFORMATION: SHABAKUNK CREEK, WEST BRANCH SHABAKUNK AND LITTLE SHABAKUNK CREEKS, MERCER COUNTY, NEW JERSEY.**
Army Engineer District, Philadelphia, Pa.
Prepared for the Mercer County Planning Board and the New Jersey Department of Environmental Protection, October, 1973. 32 p, 9 fig, 34 plates, 8 tab.

Descriptors: *Flood plains, *Flood profile, *Flooding, *Flood forecasting, Obstructions to flow, Flood water, Tributaries, Flood protection, Flood recurrence interval, Flow characteristics, Flood damage, *New Jersey.
Identifiers: Mercer County(NJ), *Shabakunk Creek(NJ), Flood Hazard Area Design Flood(FHADF), Standard Project Flood(SPF).

Located near Trenton, New Jersey, Shabakunk Creek, West Branch Shabakunk Creek, and Little Shabakunk Creek are extensively developed for commercial uses near their mouths and residential use further upstream. More commercial development is projected which will increase the impervious surfaces along the flood plains and act as an obstruction to flood flows creating backwater during a flood. This is further complicated by trees and vegetation and materials stored along the creeks and the obstructive nature of many of the 51 bridges spanning the creeks. Forty bridges are obstructive to the Floodway Design Flood, 46 are obstructive to the Flood Hazard Area design Flood (FHADF) and 48 are obstructive to the Standard Project Flood (SPF). During an SPF water rises at a maximum rate of 1.8 ft/hr after overbank flooding occurs and can remain out of banks for as much as 1 1/2 days. The major floods of record were estimated from gage data on nearby Assunpink Creek in Trenton and are, in three out of four floods, related to hurricanes. Commercial and residential properties along the creeks have been severely damaged by floods in 1938, 1955, 1967, and 1971. Future floods would create even more damage inundating large portions of the Lawrenceville Shopping Center, overtopping roads, bridges and the tracks of the Reading Railroad. The projected FHADF (100 year recurrence interval) has a projected discharge of 2800 cfs and an elevation of 62.7 ft at the confluence of the West Branch with the Shabakunk Creek while the SPF would discharge 5500 cfs and have an elevation of 65.4 ft. generally 2 to 3 ft above the record flood of 1971. (Park-North Carolina)
W75-10572

**FLOOD PLAIN INFORMATION: CATOMA CREEK, VICINITY OF MONTGOMERY, ALABAMA.**
Army Engineer District, Mobile, Ala.
Prepared for the Central Alabama Regional Planning and Development Commission, April 1972. 18 p, 4 fig, 6 tab, 14 plates.

Descriptors: *Flood plains, *Flood control, *Flood damage, *Flood profiles, Flood data, Flood stages, Obstruction to flow, Historic floods, *Alabama, Land use, Planning.
Identifiers: *Catoma Creek(Alabama), *Aalabama River, Montgomery(Alabama), Floodplain management, Intermediate Regional Flood, Standard Project Flood.

Although most of the Catoma Creek floodplain is primarily agricultural or undeveloped, the pressure for future development is high due to its proximity to Montgomery, Alabama. With no existing controls, damage to agricultural and residential sections would be considerable in an Intermediate Regional Flood (IRF) and worse in a Standard Project Flood (SPF). More severe flood conditions on the lower reach of the creek will be produced by flooding of the Alabama River, of which Catoma Creek is a tributary, than from local floods on the Creek itself. Winter and spring are the major flood season, but floods can occure year-round from intense rainfall. Seven bridges and some vegetation create obstructions to flood flow. The U.S.G.S. stream gaging station at the U.S. Highway 331 bridge recorded the highest flood on Feb. 25, 1961, with an elevation of 179.7 ft, m.s.l. and a peak discharge of 48,600 cfs. Peak discharge of an IRF would be 61,000 cfs and of an SPF 104,000 cfs. Measured at the same gaging station, the elevation of an IRF would be 1.2 ft and of an SPF 4.6 f above the 1961 elevation. (Diefendorf-North Carolina)
W75-10574

**FLOOD PLAIN INFORMATION: UPPER RIVER ROUGE, MINNOW POND DRAIN, BELL BRANCH AND TARABUSI CREEK, WAYNE AND OAKLAND COUNTIES, MICHIGAN.**
Army Engineer District, Detroit, Mich.
Prepared for the Water Resources Commission Michigan Dept. of Natural Resources an Southeast Michigan Council of Governments January, 1972. 70 p, 21 fig, 22 plates, 17 tab.

Descriptors: *Flood damage, *Flood forecasting *Flood plains, *Historic floods, Obstructions t flow, Flood profiles, Flood stages, Flood data Planning, Land use, Urbanization, *Michigan.
Identifiers: *Upper River Rouge(MI), Minnow Pond Drain(MI), Bell Branch(MI), Tarabu Creek(MI), Wayne County(MI), Oaklan Creek(MI), Floodplain management, Standar Project Flood(SPF), Intermediate Region Flood(IRF), 50-year frequency flood, Riv Rouge(MI).

Four different water courses northwest of Detroi Michigan, are studied: Upper River Rouge, Mi now Pond Drain, Bell Branch, and Tarabu Creek. Most of the floodplain is limited to agricu tural, recreational and residential uses. Floo caused by heavy rains usually occur at the sam time on all 4 streams. Floods are characterized b rapid rate of rise and short duration. In total the are 52 bridges that can obstruct flow. A tre toward higher river flows and more freque flooding due to urbanization is reflected by ga records kept since March 1958. The flood record of all 4 creeks occurred in June 1968, wit peak discharge of 1730 cfs, only 60 cfs less tha 50-year frequency flood, at Five Mile Road Upper River Rouge. At this point, an Intermedi Regional Flood (IRF) would produce 2210 cfs a a Standard Project Flood (SPF) 5170 cfs. An I would have stages ranging from .3 to 5.9 f greater than June 1968 flood and an SPF wo range up to 14.3 feet higher. The primary purpo of this information is to indicate probable risk recurrent flooding thereby providing the basis planning to minimize vulnerability. All commu ties within the study area have already adop some type of floodplain regulation. (Diefendo North Carolina)
W75-10575

**FLOOD PLAIN INFORMATION: WI BRANCH SUSQUEHANNA RIVER, LYCOMI COUNTY, PENNSYLVANIA.**
Army Engineer District, Baltimore, Md.
Prepared for Lycoming County Planning Com sion, February, 1971. 37 p, 3 fig, 12 plates, 7 tab

Descriptors: *Floods, *Flooding, *Flood profi *Flood data, Flood frequency, Flood forecast Flood flow, Flood peak, Flow, *Pennsylva *Flood plains.

ers: *Susquehanna River(Pa), William-
a), Bull Run(Pa), Lycoming County(Pa),
diate Regional Flood, Standard Project
Susquehanna River.

g on the West Branch of the Susquehanna
Williamsport, Pa., is caused by intense
ead rainfall in the 6,214 square miles of the
ove the study area. Three-fourths of the
uncleared, helping to retain runoff from
ains. Severe flooding can occur in late
nd early spring from heavy rains (40
nnual average) and snowmelt (42 inches
annually). The study area covers 13 miles
West Branch in the Williamsport
itan area, including Moutoursville,
k, Williamsport, South Williamsport and
wn. Bull Run, a small tributary, is
l separately. Much of the lowland near
is still being farmed. Only secondary
d railroad spur lines remain in the flood
ich averages over a mile wide through the
a, since major rail and highway facilities
n either raised, moved, or are protected
or walls. Protection is afforded for the
l area up to the 1936 flood height by
alls, four upstream reservoirs. A county
on regulation including flood plain
ns is being drafted since development is
into unprotected areas. The major flood
d was in March, 1936, with a peak
of 264,000 cfs which covered 3,100 acres
nsport. Future floods of 220,000 cfs peak
at Williamsport gaging station for the In-
e Regional Flood (IRF) and 407, 000 cfs
harge at the same gage for the Standard
Flood (SPF) are predicted. The IRF
would be 1.9 feet lower than the 1936
file while the SPF would be 7.2 feet
the upper limit of the study area. Flood
up to 9-10 ft/sec in the channel and 4
the overbank, together with high water
duration could cause millions of dollars
. (Park-North Carolina)
5

PLAIN INFORMATION: FALLING
CHESTERFIELD COUNTY, VIR-

ineer District, Norfolk, Va.
or the Chesterfield County Board of Su-
August, 1972. 31 p, 7 fig, 13 plates, 6

s: *Floods, *Flooding, *Flood control,
files, Flood protection, *Flood plains,
*Falling Creek(Va), Chesterfield
).

eek, located south of Richmond, Vir-
drainage area of 47 square miles. The
vs in an easterly direction for 20 miles
ical drop of 250 feet before emptying
nes River. Flood plains are mostly un-
with residential property comprising
pancy. Two stream gaging stations pro-
showing that floods occur during all
sulting from heavy general rainfall as
m thunderstorms or tropical storms in
or fall. Rising from low stages to ex-
l peaks in relatively short periods of
s are characterized by high velocity
ral and manmade obstructions exist in-
m with no flood storage capacity. The
od probably occurred on July 18, 1945.
t recorded flood was September 12,
ng at 12.67 feet with a peak discharge
The most recent flood crested at 10.39
23, 1969. An Intermediate Regional
Standard Project Flood would cause
damage to the flood plain with peak
f 9,900 cfs and 17,950 cfs respectively.
furnishes a basin for the adoption of
ntrols to guide flood plain develop-
nan-North Carolina)

**FLOOD PLAIN INFORMATION: JAMES RIVER, EAGLE ROCK TO LICK RUN, BOTETOURT COUNTY, VIRGINIA.**
Army Engineer District, Norfolk, Va.
Prepared for Fifth Planning District Commission, June 1971. 39 p, 6 fig, 9 plates, 10 tab.

Descriptors: *Floods, *Flooding, Dams, *Flood profiles, *Virginia, *Flood control, Flood protection, *Flood plains.
Identifiers: *James River(Va), Jackson River(Va), Cowpasture River(Va), Botetourt County(Va), Eagle Rock(Va), Lick Run(Va), Intermediate Regional Flood, Standard Project Flood.

Jackson and Cowpasture Rivers join to form the James River about a mile north of Lick Run and 340 miles above its mouth. The James River flows through a winding channel with flood plain varying from a few hundred to several thousand feet in width in this study reach, its upper 18 miles. Several residential, commercial, and industrial properties as well as rural areas lie in the flood plain. Main flood season is from October through May, but floods with duration varying from several hours to several days can occur in any month due to intense local thunderstorms or tropical storms. Gathright Dam is being constructed 44 miles upstream from Lick Run on the Jackson River as the only flood control for the study area and should reduce floods by 3 feet. The greatest flood occurred in 1877 with a peak discharge of 120,000 cfs. The most recent flood occurred August 20, 1969 as the remains of Hurricane Camille dumped about 27 inches of rainfall on the James Basin in less than 6 hours. With a peak discharge of 58,500 cfs recorded on the James at Lick Run, homes, roads, railroads and bridges were destroyed and high waters in cities and towns caused millions of dollars in damages. With Gathright Dam operating, an Intermediate Regional Flood (IRF) and Standard Project Flood (SPF) on the James River at Lick Run would have peak discharge of 62,300 cfs and 177,000 cfs respectively. An IRF could rise 21.3 ft in 22 hours remaining above bankfull for 57 hours; maximum velocity could be 9.6 ft/sec in the channel (mile 339.7), 3.8 ft/sec overbank (mile 322.0). The SPF could rise 33.8 ft in 36 hours remaining above bankfull 142 hours; maximum velocity could be 15.6 ft/sec in the channel (mile 332.5), 6.9 ft/sec overbank (mile 322.0). (Salzman-North Carolina)
W75-10578

**FLOOD PLAIN INFORMATION: JOHNSON CREEK AND TRIBUTARY, CHESTERFIELD COUNTY, VIRGINIA.**
Army Engineer District, Norfolk, Va.
Prepared for the Chesterfield County Board of Supervisors, September, 1973. 23 p, 8 fig, 11 plates, 4 tab.

Descriptors: *Floods, *Flooding, *Flood control, *Flood forecasting, Flood protection, Flood plains, *Virginia, *Flood plains.
Identifiers: *Johnson Creek(Va), Chesterfield County(Va), Intermediate Regional Flood, Standard Project Flood.

Johnson Creek, located south of Richmond, Virginia, has a drainage area of about 9 square miles at its mouth. Flowing in an easterly direction for 6 miles before emptying into the James River which causes backwater effects in the lower reaches, the creek slopes at an average of 20 feet per mile. Although the channel is clear of vegetation, overbank areas are highly vegetated with sparse development on the flood plains. Increasing population in the nearby Richmond area will create pressure for building on flood plains of Johnson Creek and its tributaries. Because no stream gages exist on Johnson Creek, data was collected from similar streams in the vicinity. Floods, caused by heavy general rainfall, occur during all seasons, and are characterized by rapidly rising flood stages in a relatively short time. Larger and more infrequent floods result from intense local thunderstorms or hurricanes in summer or fall. Natural and manmade obstructions, including bridges and culverts, impede flood flows. Although no flood damage reduction measures exist, flood studies are required before approval of subdivisions and site development plants. The largest flood probably occurred on July 18, 1945. The most recent flood on June 7, 1972 resulted in considerable damage. An Intermediate Regional Flood and Standard Project Flood would result in inundation of the flood plain with peak discharges at the mouth of Johnson Creek of 5,280 cfs and 9,230 cfs respectively. Substantial damage to residential property, streets, roads, utilities would result from either an IRF or an SPF. Plates detail expected water surface elevations and lateral extent of these floods. (Salzman-North Carolina)
W75-10579

**FLOOD HAZARDS IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,**
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W75-10580

**HYDROLOGIC RECONNAISSANCE OF THE SOUTHERN UINTA BASIN, UTAH AND COLORADO,**
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 3B.
W75-10585

**A COMPARISON OF METHODS FOR ESTIMATING FLOOD PEAKS ON STREAMS IN MASSACHUSETTS,**
Geological Survey, Boston, Mass.
G. D. Tasker.
Boston Society of Civil Engineers Journal (ASCE), Vol 62, No 1, p 9-19, April 1975. 4 fig, 2 tab, 9 ref.

Descriptors: *Floods, *Flood peak, *Streamflow, *Massachusetts, Flood forecasting, Methodology, Flood frequency, Curves, Flow profiles, Correlation analysis, Evaluation.
Identifiers: *Estimating flood peaks.

Modifications of the Potter method (Potter, 1957) and the Small Basin Study (SBS) method (Johnson and Tasker, 1974) for estimating flood peaks from basin characteristics are used to predict the 50- and 10-year peak discharges at 77 continuous and partial-record gaging stations in Massachusetts. The predicted peaks made by each method are compared with the peak discharge estimated from station frequency curves for each station. Results indicate that, while the random error for both methods is about the same, the modified Potter method systematically predicts peaks which are substantially higher (150 percent) than those estimated from station frequency curves. (Woodard-USGS)
W75-10587

**REPORT ON THE RIVER MASTER OF THE DELAWARE RIVER FOR THE PERIOD DECEMBER 1, 1973-NOVEMBER 30, 1974,**
Geological Survey, Reston, Va.
J. V. B. Wells, and R. E. Fish.
June 1975. 87 p, 3 fig, 1 plate, 19 tab.

Descriptors: *Delaware River Basin Commission, *Delaware River, *Streamflow, *Water management, Reservoirs, Estuaries, Data collections, Monitoring, Water quality, Saline water intrusion, Precipitation(Atmospheric), Water temperature, River basin development.

The 1974 annual report year, December 1, 1973 to November 30, 1974, of the Delaware River Master was a year of excessive precipitation and much above average runoff. Pepaction, Cannonsville, and Neversink Reservoirs of the City of New

York spilled for many months. The annual flow of the Delaware River at Montague adjusted for change in reservoir storage and diversions, was 39% above median and the third highest for the period of record beginning 1940. Diversions and releases from the reservoirs of the city of New York were made within the terms of the Amended Decree of the U.S. Supreme Court, dated June 7, 1954. Diversions by New Jersey through the Delaware and Raritan Canal were within prescribed limits of the Amended Decree. The combined usable contents of Pepacton, Cannonsville, and Neversink Reservoirs on November 30, 1974 was the greatest for November 30 since 1967. Precipitation on the basin above Montague for the 1974 report year was excessive, totaling 52.18 inches, which was the third highest for a report year in the period of record beginning December 1940. Excessive precipitation and runoff during December caused Cannonsville Reservoir to fill and caused the contents of Pepacton and Neversink Reservoirs to increase rapidly. All reservoirs spilled by April. The actual uncontrolled runoff plus actual powerplant releases during the period July 12 to September 2 totaled 98,503 cfs-days. The advance estimate for those days was 77,290 cfs-days. The net cumulative difference between the estimate and actual was -22%. Streamflow in the Delaware River estuary for 8 months of the reporting period retained the salinity front seaward; furthermore, the increased flows were conducive to lowering temperatures during the summer months and raising dissolved-oxygen levels. (Woodard-USGS)
W75-10589

**PROBLEMS RELATED TO WATER QUALITY AND ALGAL CONTROL IN LOPEZ RESERVOIR, SAN LUIS OBISPO COUNTY, CALIFORNIA,**
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W75-10601

**HYDROLOGY OF THE ALBEMARLE-PAMLICO REGION, NORTH CAROLINA--A PRELIMINARY REPORT ON THE IMPACT OF AGRICULTURAL DEVELOPMENTS,**
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 4C.
W75-10602

**WATER RESOURCES OF THE TOPPENISH CREEK BASIN, YAKIMA INDIAN RESERVATION, WASHINGTON.**
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 3F.
W75-10603

**LOW-FLOW CHARACTERISTICS OF MISSISSIPPI STREAMS,**
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 2E.
W75-10605

**VALLEY DESIGN IN URBAN GROWTH CENTRES,**
University of New South Wales, Kensington (Australia). Faculty of Military Studies.
For primary bibliographic entry see Field 6B.
W75-10643

**PROGRESS IN AUSTRALIAN HYDROLOGY 1965-1974.**
For primary bibliographic entry see Field 2A.
W75-10646

**PREDICTING THE CONCENTRATION OF AQUATIC HERBICIDE RESIDUES IN WATERWAYS,**
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
For primary bibliographic entry see Field 5B.
W75-10648

**CANOPY WEIGHT DISTRIBUTION AFFECTS WINDSPEED AND TEMPERATURE IN A LODGEPOLE PINE FOREST,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
H. L. Gary.
Forest Science, Vol 20, No 4, p 369-371, December 1974. 1 fig, 10 ref.

Descriptors: *Biomass, *Air temperature, Transpiration, Forest management, *Wyoming, Measurement, *Canopy, *Lodgepole pine trees.
Identifiers: *Windspeed.

Weight distribution of needles plus branches approximated a normally distributed population for 10 randomly selected trees in an 80-year-old stand in southern Wyoming. Windspeeds were minimum and mid-day air temperatures maximum in the mid-canopy region where needles and branch weight were concentrated. (Forest Service)
W75-10654

**A NUMERICAL MODEL FOR PREDICTING THE EFFECTS OF LANDSLIDE-GENERATED WATER WAVES,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8A.
W75-10661

**NORTON POINT DIKE STUDY, CONEY ISLAND, NEW YORK; HYDRAULIC MODEL INVESTIGATION,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10662

**WAIMANO STREAM FLOOD CONTROL PROJECT, PEARL CITY, HAWAII; HYDRAULIC MODEL INVESTIGATION,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10663

**FLOOD CONTROL PROJECT ON LYTLE AND WARM CREEKS AND SANTA ANA RIVER, CALIFORNIA; HYDRAULIC MODEL INVESTIGATION,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10668

**THE EFFECTS OF URBANIZATION ON FLOODS OF DIFFERENT RECURRENCE INTERVAL,**
University Coll., London (England). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W75-10709

**FINANCING WATER WORKS,**
Studley Shupert and Co., Inc., Boston, Mass.
For primary bibliographic entry see Field 3D.
W75-10712

**WATER WORKS IMPROVEMENTS--SPRINGFIELD, VERMONT,**
Dufresne-Henry Engineering Corp., North Springfield, Vt
For primary bibliographic entry see Field 3D
W75-10713

**DETERMINE URBAN RUNOFF THE SIMPLEWAY,**
Montreal Urban Community (Quebec). Water Purification Dept.
For primary bibliographic entry see Field 2E.
W75-10716

**ANALYSIS OF A LARGE WATER DISTRIBUTION SYSTEM USING ADVANCED COMPUTER SOFTWARE,**
Orlando Utilities Commission, Fla.
R. E. Savarese, and D. G. Simmons.
Public Works, Vol 104, No 12, p 60-61, Dec 1973

Descriptors: *Water distribution(Applied), *Distribution systems, *Computer models, *Systems analysis, Hydrostatic pressure, Pipelines, Utilities, Simulation analysis, Water demand, Water management(Applied), Computer programs, Design criteria, Florida.
Identifiers: *Orlando(FL), Hardy Cross Network Analysis, 'Water X' Program.

A new computer software system, the 'Water' program, is a vast improvement over the previous 'Hardy Cross Network Analysis' programs. The Orlando, Florida, water distribution system was analyzed without making excess demands on manual or computer time. This large system, including 7 pumping stations and 6 elevated storage tanks, required a basic model of 190 junctions and 500 pipes from 12 to 36 inches in diameter to simulate the system of transportation mains. A model of this size cannot easily be manipulated with manual calculations to examine alternative configurations and flow demands and cost up to $ for an average computer analysis run. The exact accuracy of input data needed to avoid costly false starts was achieved with a checking program which reduced checking time by 90%. The network analysis software was also made 'self-starting'; the user is not required to assign initial estimated flows for each pipe. Non-convergent systems were encountered in which the computer was unable to assign flow and pressure distributions to a hypothetical configuration of water distribution hardware. Simplifying the model aided convergence. This sort of program provides management with testing capability for present and proposed designs. All parameters such as elevated tank heads, flow demand patterns, and pipe sizes can easily be varied to suit the engineer's requirements and then tested by computer simulation. (Herr-North Carolina)
W75-10720

**WATER COLLECTION AND STORAGE DISPERSION APPARATUS,**
F. R. Walcott.
US Patent No 3,890,934, 4 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 935, No 4, p 1449, June 24, 1975.

Descriptors: *Patents, *Water storage, *Water supply, *Rainfall, *Wildlife conservation, Rain water, Storage tanks, Equipment.
Identifiers: Module construction.

A modular apparatus is disclosed which collects stores and dispenses rainwater to wildlife. The apparatus includes an elongated storage tank having a central depression into which ducts discharge water. The tank and ducts are composed of panels arranged with respect to each other to provide a path for rainfall water to follow. The tank has slotted rails which receive the edges of the panels thus constructing an enclosure for storage of water gathered via the panelled ducts. A gr

ispensing unit is remotely connected to the e tank by a flexible hose provided with a ntional float valve mechanism. The sing unit includes an opening exposing a ty of the storage water for wildlife drinking es. The modular construction allows the ap- s to be transported to remote areas for in- on and usage. (Sinha-OEIS)
0727

HERMAL CHANNEL AND HARBOR ICE ROL SYSTEM,
'an Huisen.
atent No. 3,889,473, 5 p, 9 fig, 7 ref; Official e of the United States Patent Office, Vol 3, p 965, June 17, 1975.

tors: *Patents, *Geothermal studies, erature, *Thawing, *Ice cover, Heat flow, Polar regions, Transportation.
ers: Sea passage, Shipping channels.

od of forming an open shipping channel n two navigable bodies of water separated ozen ice barrier is described. A number of mal wells are drilled through the surface of th lying beneath the ice and water into a hot rock geothermal subsurface strata along a route joining the bodies of water. ated fluid at a temperature of at least 100 transferred from the lower hot end of each a surface of the frozen ice barrier in an sufficient to melt the frozen ice barrier e frozen ice barrier melts to form a water annel joining the wells and the bodies of nto a continuous open, navigable shipping at least 80 feet in width. At least one side annel is lined with a wall of thermal insu- naterial extending above the wave and e. (Sinha-OEIS)
734

ULTURAL AND URBAN CONSIDERA- N IRRIGATION AND DRAINAGE.
n Society of Civil Engineers, New York.
Papers from the Irrigation and Drainage Speciality Conference, Fort Collins, , April 22-24, 1973. American Society of gineers, New York, 1974. 800 p, $12.00.

ors: *Conferences, *Irrigation, e, *Water utilization, *Water quality, modification, Groundwater, Irrigation and maintenance, Irrigation systems, ic control, Watershed management, Sur- nage, Drainage effects, Irrigation effects, nental effects, Irrigation water, Urban Drainage systems, Pumping, eds(Basins), Economics.

erence objective was to explore many of tions of the interdependencies between d irrigation water use. The twelve broad discussed were groundwater, changing e, weather modification, drainage by operation and maintenance, efficient ir- automatic controls, agricultural and nsiderations, suburban drainage, water , irrigation water requirements, and ality. (See also W75-10770 thru W75- umphreys-ISWS)
9

E FROM RECHARGE AND LANDFILL
,
Univ., Berkeley. Dept. of Geological ng.
ry bibliographic entry see Field 5B.
0

IC IMPACT OF THE CONVERSION ER FROM IRRIGATION TO MU- AND INDUSTRIAL USE IN THE RIO BASIN OF NEW MEXICO,
co State Engineer, Santa Fe.

For primary bibliographic entry see Field 6D.
W75-10771

**IMPACTS OF RURAL TO URBAN WATER USE,**
Texas Office of the Governor, Austin. Water Task Force.
For primary bibliographic entry see Field 6D.
W75-10772

**THE PERIMETER CANAL - A NEW APPROACH TO DISCHARGE URBAN WATER INTO A COASTAL MANGROVE AREA,**
Greiner (J.E.) Co., Inc., Tampa, Fla.
C. H. King, Jr., and G. M. Ward.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 99-129, 1974. 13 fig, 1 tab, 5 ref.

Descriptors: *Canals, *Inland waterways, *Urban runoff, *Florida, Coastal plains, Hydraulic structures, Conveyance structures, Estuarine environment, Mangrove swamps, Bays.
Identifiers: *Cape Coral(Fla), Perimeter canal.

Following a general evaluation of the hydrologic environment in and around Cape Coral, Florida, the discussion turned to the need for and the design of a perimeter canal for conveyance of storm water, It was anticipated such a feature would overcome adverse affects to marine bay ecosystems when freshwater enters tidewater. The perimeter canal was designed to: (1) collect runoff, (2) provide for sediment deposition, (3) encourage salt and fresh water mixing, (4) preserve natural sheet flow to the vegetative zone, (5) remove nutrients, (6) provide recreation and navigation opportunities, and (7) provide a buffer between development and the preserved mangrove zone. Design parameters were presented and a map showed the canal's route. (See also W75-10769) (Jess-ISWS)
W75-10773

**PRIORITY PROBLEMS FOR MODIFYING CUMULUS PRECIPITATION,**
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W75-10774

**WEATHER MODIFICATION FOR USE IN THE HIGH PLAINS,**
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-10775

**USERS' VIEW OF WEATHER MODIFICATION,**
Kansas State Senate, Topeka. 39th District.
For primary bibliographic entry see Field 3B.
W75-10776

**ROLE OF THE PUBLIC IN WEATHER MODIFICATION,**
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 3B.
W75-10777

**GROUNDWATER CONTROL BY PUMPING,**
Central Nebraska Public Power and Irrigation District, Holdrege.
For primary bibliographic entry see Field 4B.
W75-10778

**CHANGE IN QUALITY OF PUMPED DRAINAGE EFFLUENT,**
Bureau of Reclamation, Aurora, Colo.
For primary bibliographic entry see Field 5B.
W75-10779

**DRAINAGE ANALYSIS OF A CONFINING FORMATION,**
Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.
L. C. Benz, and E. J. Doering.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 225-250, 1974. 8 fig, 2 tab, 8 ref.

Descriptors: *Saline soils, *Artesian aquifers, *Water table, *Drainage, *North Dakota, Pumping, Drawdown, Sandstones, Aquicludes, Glacial drift, Water wells, Slopes, Hydraulic properties, Artesian heads, Observation wells, Hydraulic gradient, Equations, Heat flow, Diffusivity, Piezometers, Curves.

A poorly drained saline area covers 400,000 acres in northeastern North Dakota in the Red River Valley. The upward flow of saline water into a thick overburden of glacial till and lacustrine sediments has created and sustained soil salinity and a high water table. Pumping from the artesian formation reduces hydraulic head in the aquifer, but the response in the glacial till and lacustrine sediments is very slow. It was shown that lowering the water table 2 feet with an aquifer drawdown of 32 feet when the hydraulic diffusivity was 1.44 sq ft/day would require continuous pumping for 5.3 years. The time required to effect hydraulic head redistribution (and water table control) is very dependent upon the hydraulic diffusivity of the overburden. Pump drainage to relieve the high water table and salinity was shown to be feasible even though continuous pumping would be required. A drainage system of 11 wells, pumped at a rate of 500 gallons per minute or less per well, would be adequate and would have an annual cost of $0.34 per acre. (See also W75-10769) (Visocky-ISWS)
W75-10780

**GROUNDWATER MODEL AS A TOOL IN PLANNING AND MANAGEMENT,**
CH2M/Hill, Portland, Oreg.
For primary bibliographic entry see Field 4B.
W75-10781

**A CRITERION FOR VEGETATION STIFFNESS,**
Waterloo Univ. (Ontario). Dept. of Civil (Engineering.
N. Kouwen, and A. Harrington.
In: Agricultural and Urban Considerations, in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 273-284, 1974. 6 fig, 1 tab, 4 ref, 1 append.

Descriptors: *Streamflow, *Vegetation effects, *Stream gages, Vegetation, Retardance, Weeds, Grasses, Velocity, Measurement, Laboratory tests, Roughness(Hydarulic), Channel flow, Hydarulics.
Identifiers: *Vegetation stiffness.

When water or air flows over a flexible vegetation, the vegetation will bend and thereby reduce its height. In an open channel which is lined with such vegetation, the roughness of the channel walls and channel bed is very much affected by the flexural rigidity of the vegetation. For instance, when the vegetation is in an erect position it has a very much higher retardance effect than when it is prone, even though the relative roughness may be equal (using the channel bed as the limit of the cross-section). It is therefore important to know under which conditions the vegetation can be expected to be prone or erect. The growth of weeds in rivers and canals is sometimes desirable and at other times cannot be avoided. Problems arise such as

loss of capacity in irrigation or drainage canals and uncertainty in interpolating flows at stream gaging sites infested with weeds. This paper pointed out how previously published work could be applied to practical situations. (See also W75-10769) (Sims-ISWS)
W75-10782

**WELLTON-MOHAWK DRAINAGE AND THE MEXICAN SALT PROBLEM,**
Wellton-Mohawk Irrigation and Drainage District, Ariz.
C. C. Tabor.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 285-309, 1974. 9 fig.

Descriptors: *Irrigation, *Drainage, *Water quality, *Arizona, *Mexico, *Colorado River, Mexican Water Treaty, Salinty, Drainage water, Drainage systems, Drainage wells, Water reuse, Groundwater, Subsurface drainage, River systems, Irrigation systems, Drainage practices, Water policy, Governments, Political aspects, Drainage programs.
Identifiers: *Wellton-Mohawk drainage, *Mexicali Valley, *San Luis Valley, Gila Project.

The Wellton-Mohawk Division of the Bureau of Reclamation's Gila Project straddles the Gila River in southwestern Arizona. The project was authorized by Congress after World War II and first delivered water from Imperial Dam on the Colorado River in 1952. It was decided at the time of construction of the irrigation system that the drainage works should be delayed until there was an actual need. Later, a system of pumped drainage was constructed which keeps the groundwater mostly below the root zone of the crops. The drainage water was allowed to flow into the old channel of the Gila River and thence into the Colorado. The first effluent came out of this channel in 1961. Soon after, objections were made by Mexican interests that the salt level of Colorado River water delivered to Mexico at Morelos Dam has been 3000 and 4000 parts per million due to drainage from the Wellton-Mohawk Irrigation and Drainage District, that thousands of acres of farm land in the Mexicali Valley have gone out of production due to this high saline water, and that lack of drainage in Mexicali Valley has nothing to do with the problem. It was argued in this paper that the salt levels are much less than claimed. The decrease in cotton production on Mexican farms was ascribed largely to the arrival of the pink bollworm and to water-logged fields due to poor drainage. Mexico has recently begun a rehabilitation program of canal lining and drainage improvements which should help the situation considerably. Also, there are planned revisions in the U.S. system which should improve the quality of the Colorado River water. (See also W75-10769) (Sims-ISWS)
W75-10783

**DEVELOPMENT OF LARGE SCALE DRIP IRRIGATION SYSTEMS,**
Superior Farming Co., Bakersfield, Calif.
For primary bibliographic entry see Field 3F.
W75-10784

**WATER USE AND PRODUCTION OF TRICKLE IRRIGATED ONIONS,**
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W75-10785

**SOME FACTORS AFFECTING CONTROL OF FLOW IN A LARGE CANAL SYSTEM,**
California Univ., Davis. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W75-10786

**CURRENT WATER SYSTEMS AUTOMATION RESEARCH AND DEVELOPMENT IN THE BUREAU OF RECLAMATION,**
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 8C.
W75-10787

**AUTOMATION OF AN EXISTING IRRIGATION SYSTEM - PART I,**
Modesto Irrigation District, Calif.
For primary bibliographic entry see Field 8C.
W75-10788

**FLOAT VALVE PROVIDES VARIABLE FLOW RATES AT LOW PRESSURES,**
California Polytechnic State Univ., San Luis Obispo. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8C.
W75-10789

**WATERSHED BEHAVIOR AFTER FOREST FIRE IN WASHINGTON,**
Forest Service (USDA), Wenatchee, Wash. Forest Hydrology Lab.
For primary bibliographic entry see Field 4C.
W75-10790

**NEW CONCEPTS IN SUBURBAN DRAINAGE IN FLORIDA,**
Diaz, Seckinger and Associates, Inc., Tampa, Fla.
K. A. Bryant, Jr., and J. N. Krider.
In: Agricultural and Urban Considerations In Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 471-500, 1974. 13 fig, 9 ref, 1 append.

Descriptors: *Hydraulic design, *Florida, Design, Design standards, Soil surveys, Runoff, Detention reservoirs, Land development, Drainage, Construction.
Identifiers: *Tampa Bay area(Fla), Runoff models.

Preliminary investigation and final design criteria for a 100-acre subdivision were presented. The development, a 'bedroom' community, is located in the Tampa Bay area of Florida. All steps taken from preliminary investigation through final design were outlined. The discussion included the use of a runoff model and design of a detention basin and its outlet works. Several phases of actual construction were also mentioned. (See also W75-10769) (Jess-ISWS)
W75-10793

**EFFECTS OF SURFACE DRAINAGE ON STREAM FLOW,**
Conservation Service, Temple, Tex.
H. N. McGill, A. C. Bennett, W. B. Moody, and G. C. Vittetoe.
In: Agricultural and Urban Consideration In Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 501-510, 1974. 1 fig, 1 tab, 8 ref.

Descriptors: *Engineering structures, Rainfall-runoff relationships, *Streamflow, Runoff, Peak discharge, *Hydrographs, Discharge(Water), Surface drainage, Routing, Drainage systems, *Texas.
Identifiers: *Cedar Lake Creek(Tex), Drainage improvements, Resultant discharge.

A procedure for analyzing the effects of drainage works of improvement on downstream peak discharges was presented. Hydrographs were developed for incremental areas of the watershed for conditions without and with drainage measures. These were routed and combined through the stream course. (See also W75-10769) (Jess-ISWS)
W75-10794

**ENVIRONMENTAL ISSUES, EFFECTS, AND SOLUTIONS,**
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 6G.
W75-10795

**EVALUATION OF AGRICULTURAL DRAINAGE IN WATER QUALITY MANAGEMENT,**
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5G.
W75-10796

**ART OF AGRICULTURAL DRAINAGE DESIGN AND COSTS,**
Wright Water Engineers, Inc., Denver, Colo.
R. L. Toren.
In: Agricultural and Urban Considerations In Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1974. American Society of Civil Engineers, New York, p 557-574, 1974. 1 tab.

Descriptors: *Drainage systems, *Drainage engineering, *Tile drainage, *Sewage effluent, *United States, Drainage practices, Engineering Costs, Construction costs, Farm management, Lateral conveyance structures, Pipes, Outlets, Tiles, Filters, Subsurface drainage, Agricultural engineering, Agriculture, Sewage disposal, Irrigation, Drainage, Foreign countries, Specifications.

Answers to a questionnaire received from drainage engineers throughout the United States and various other countries showed that the design and costs of subsurface drainage systems for agricultural drainage vary considerably. In the humid sections of the United States, especially the Midwest, drains are often placed on top of glacial till which is, at times, only 24 inches below the surface. Cohesive soils characterize the profile of the upper two and three feet and a gravel filter usually is not specified. Drain spacings may vary from 30 to 60 feet. Material and construction costs may be as low as 20 cents per lineal foot for a 4-inch drain 30 to 60 inches deep. In the arid west the depth to the drain is normally 5 to 8 feet deep and drains are spaced as close as 75 feet and as far apart as 600 feet. Gravel filters are invariably specified and average material and construction costs vary from 75 cents to $1.75 per lineal foot for a 4-inch drain with a gravel filter. Average installed costs for a 6-inch drain, 6 to 8 feet deep, vary from 85 cents to $5.30 per lineal foot. Drainage engineers are generally receptive to the practice of renovating sewage effluent on agricultural land. (See also W75-10769) (Sims-ISWS)
W75-10797

**UTILIZATION OF SEWAGE EFFLUENT IN IRRIGATION,**
For primary bibliographic entry see Field 5D.
W75-10798

**EFFECTIVENESS OF PRECIPITATION IN MOUNTAIN MEADOW,**
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 2D.
W75-10799

**IRRIGATION MANAGEMENT FOR SALT CONTROL,**
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 3C.

0800

KLE IRRIGATION DESIGN REQUIRE-
TS FOR ROW CROPS,
ltural Research Service, Phoenix, Ariz.
Conservation Lab.
imary bibliographic entry see Field 3F.
0801

CTS OF FARMING - URBAN DRAINAGE
ESH WATER,
e County Pollution Control Dept., Orlando,

mary bibliographic entry see Field 5G.
0802

YEAR STUDY OF DES MOINES RIVER
R QUALITY,
State Univ., Ames. Engineering Research

mary bibliographic entry see Field 5B.
0803

EMS OF WATER QUALITY MANAGE-
IN WESTERN RIVER BASIN SYSTEMS,
nia Univ., Los Angeles. Coll. of Engineer-

nary bibliographic entry see Field 5G.
804

T OF AGRICULTURAL USE ON WATER
TY FOR DOWNSTREAM USE FOR IR-
ION,
tate Univ., Logan. Dept. of Agricultural
gation Engineering.
nary bibliographic entry see Field 5G.
805

RDS A SHARPER CONCEPT OF AN AC-
ARIABLE,
o State Univ., Fort Collins.
nary bibliographic entry see Field 6A.
813

AL SIZING OF URBAN FLOOD-CON-
YSTEMS,
gic Engineering Center, Davis Calif.
Analysis Branch.
avis.
of the Hydraulics Division, Proceedings of
Vol 101, No HY8, Proceedings Paper no
1077-1092, August 1975. 5 fig, 1 tab, 9 ref.

ors: *Flood control, Water resources,
ion analysis, *Computer models,
zation, Planning, Hydrology, Size,
ation, Methodology, Drainage, Costs,
rs, Storage, Pumping plants, Diversion,
runoff relationships, Equations, Mathe-
nodels, Systems analysis, Model studies.
rs: Economic analysis, Benefit maximiza-
ial costs, Minimization, Automatic search
e, Univariate gradient procedure, New-
son convergence procedure, Systems en-

sizes for components of urban flood-con-
ems can be determined from a detailed
n analysis controlled by an optimization
ogy. Flood-control measures within
as frequently consist of complex systems
ion storage reservoirs, channel modifica-
ees, land-use controls, flood proofing,
ing facilities. The optimal size of each of
tem components depends on the system
n with other components and the
c, economic, environmental, and other
nce outputs of the system. A technique
developed and programmed for an exist-
ation model that automatically deter-
sizes of urban flood-control components
of detention storage, flow diversions, and pumping plants, the objective being to maximize system net benefits subject to accomplishment of hydrologic performance targets and to minimize social costs. The system is simulated using hydrologic data, component cost and performance functions, and flow damage information at damage centers. Utilized also are an automatic search procedure--the univariate gradient procedure--and the Newton-Raphson convergence procedure. (Bell-Cornell)
W75-10821

**COMPUTER SIMULATION OF WATER DISTRIBUTION NETWORKS,**
Boeing Computer Services, Inc., Seattle, Wash. Mathematicals and Modeling Unit.
C. R. Gagnon, and S. L. S. Jacoby.
Transportation Engineering Journal, American Society of Civil Engineers, Vol 101, No TE3, Proceedings paper No 11515, p 553-567, August 1975. 4 fig, 26 ref.

Descriptors: *Water distribution(Applied), *Simulation analysis, *Computer models, *Network design, *Pipelines, *Transportation, Computer programs, Digital computers, Mathematical models, Equations, Systems analysis, Flow, Model studies.
Identifiers: Implicit loop method, Newton-Raphson method, Iteration, Computation, Operating conditions, Automatic search technique, Nonlinear equations, Remote terminals.

Simulating the performance of water distribution systems on computers helps to improve their design. The two principal phases of a new method--the 'implicit loop method'--for this simulation problem are described. The first phase consists of generating on the computer a network computational model. In the second phase, this computational model is used in an iterative modified Newton method to solve the simulation problem. Detailed information about the method is given from which the reader can produce a computer program. An implementation of the method is described which uses the interactive capability afforded by remote terminals. The implicit loop method for analyzing water distribution networks is very flexible and readily adaptable to a variety of networks, designs, and operating conditions. The method requires a minimum of input data, is particularly well-suited to digital computations, and is exceptionally well-suited to provide input error diagnostics. All this makes the use of interactive computing techniques with remote terminals practical, reliable, and highly cost effective. (Bell-Cornell)
W75-10823

**DERIVATION OF RESERVOIR OPERATING RULES BY ECONOMIC ANALYSIS,**
Kentucky Water Resources Inst., Lexington.
C. O. Dowell.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 545, $5.75 in paper copy, $2.25 in microfiche. Research Report No 6, 1967. 116 p, 24 fig, 20 tab, 21 ref. OWRR A-006-KY. 14-01-0001-787.

Descriptors: Reservoirs, *Reservoir operation, *Flood control, Economics, *Recreation, *Operating costs, Storage capacity, *Kentucky, *Benefits, Water supply, Water level fluctuations.

A methodology was developed for determining an optimum set of reservoir operating rules specifying the monthly allocation of storage space based on the example of Rough River Reservoir, a Corps of Engineers project in Breckinridge and Grayson Counties, Kentucky, and assuming this multipurpose reservoir provides flood control, water supply, and recreation. The operating rules were derived by the method of marginal analysis which uses as its criteria achievement of maximum net benefits from the available storage capacity. Benefit relationships were derived for each use. The variation of flood control benefits with available flood storage was determined from Corps of Engineers stage-damage curves and statistical analysis of the historical storms in the area. The variation of water supply yield with the allowable water surface fluctuation within the reservoir was determined by using statistical properties of past stream-flow to synthesize a month-by-month operation of the reservoir. Recreation benefits as they varied with available storage were determined for five levels of annual visitation (up to twice the present value) by sub-dividing use among three activity types and estimating how each type of use would be affected by a fluctuation of water level. (Huffsey-Kentucky)
W75-10825

**ANALYSIS OF RESERVOIR RECREATION BENEFITS,**
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 6B.
W75-10826

**THE EFFECT OF LANDOWNER ATTITUDE ON THE FINANCIAL AND THE ECONOMIC COSTS OF ACQUIRING LAND FOR A LARGE PUBLIC WORKS PROJECT,**
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 6B.
W75-10827

**REVIEW OF THE ECONOMIC BENEFITS AND COSTS RESULTING FROM DEWEY RESERVOIR,**
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 6B.
W75-10828

## 4B. Groundwater Management

**HYDRAULIC BEHAVIOUR OF THE CHALK AQUIFER IN THE YORKSHIRE WOLDS,**
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
S. S. D. Foster, and R. I. Crease.
The Institution of Civil Engineers Proceedings, Part 2, Research and Theory, Vol 59, p 181-188, March 1975. 4 fig, 10 ref.

Descriptors: *Groundwater, *Aquifer characteristics, *Aquifer testing, Groundwater availability, Hydrogeology, Transmissivity, Specific yield, Pumping, Water table aquifers, Wells, Streamflow, Flow augmentation, Cores, Laboratory tests, Permeability, Flow, Hydraulic properties.
Identifiers: *Chalk Aquifer, England, Delayed yield.

The groundwater hydraulics of the Chalk Aquifer in the Yorkshire Wolds were investigated in detail by a major hydrogeological pumping test and associated techniques in the Etton area and by the analysis of groundwater level and river flow data from the West Beck catchment. Nationally, the aquifer accounts for about 15% of all water supplies and current interest focuses on its potential for low-flow augmentation. Laboratory tests on core samples showed very low intergranular permeability and, therefore, flow was believed to be primarily through fissures. Early time-drawdown data from observation wells showed the effects of delayed yield. Analysis of late data gave transmissivity and specific yield values of about 1000 sq m/day and 0.005, respectively. Limited groundwater recession data in the West Beck catchment had a log-linear relationship similar to that of river flows. Considerable caution is required of preliminary investigations and extrapolation from pilot operations for river augmentation schemes. A high transmissivity, low specific yield, water-table aquifer will have a more rapid response than most unconfined systems. Actual

groundwater flow rates will also be relatively fast, a significant factor in the spread of pollutants, should they reach the water table. (Visocky-ISWS)
W75-10506

**EVALUATION OF GROUND WATER RESOURCES: SACRAMENTO COUNTY,**
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2F.
W75-10546

**WATER FOR INDUSTRIAL DEVELOPMENT IN ALCORN, ITAWAMBA, PRENTISS, AND TISHOMINGO COUNTIES, MISSISSIPPI,**
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 3E.
W75-10581

**GROUND-WATER LEVELS IN NEW MEXICO, 1972,**
Geological Survey, Albuquerque, N. Mex.
J. D. Hudson.
New Mexico State Engineer Basic Data Report, 1975. 72 p, 32 fig, 38 tab, 36 ref.

Descriptors: *Groundwater resources, *Water level fluctuations, *Basic data collections, *New Mexico, Observation wells, Aquifer characteristics, Pumping, Water utilization, Groundwater recharge, Maps, Hydrographs.

Water levels were measured in a network of about 1,600 observation wells in 35 areas located within nine major surface-water drainage basins in New Mexico. The measurements were made in January or February 1973 and reflect water-level changes with measurements made in January or February 1972. Maps showing well locations and water-level changes for 1972 are included for most areas. The water-level data are used in the U.S. Geological Survey and the State Engineer of New Mexico in evaluating the groundwater resources of the State. (Woodard-USGS)
W75-10582

**HYDROGEOLOGY OF THE TRIASSIC ROCKS OF MARYLAND,**
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 2F.
W75-10584

**HYDROLOGIC RECONNAISSANCE OF THE SOUTHERN UINTA BASIN, UTAH AND COLORADO,**
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 3B.
W75-10585

**HYDROGEOLOGIC DATA FOR THE FARMINGTON RIVER BASIN, CONNECTICUT,**
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-10591

**HYDROLOGICAL DATA FROM WELLS IN SOUTHWEST HILLSBOROUGH COUNTY, FLORIDA, 1950-74,**
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-10593

**MAP OF THE ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA, SHOWING GROUND-WATER SUBUNITS AND AREAS, LOCATION OF WELLS, AND WATER-LEVEL CONTOURS FOR SPRING 1974,**
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-10595

**SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--RIO GRANDE REGION,**
Geological Survey, Reston, Va.
S. W. West, and W. L. Broadhurst.
Available from Supt. of Documents, GPO, Washington, D.C. 20402 - Price $1.75. Professional Paper 813-D, 1975. 39 p, 21 fig, 2 tab, 154 ref.

Descriptors: Texas, New Mexico, Mexico, Colorado, *Groundwater resources, *Regional analysis, *Rio Grande River, Water supply, Water utilization, Aquifer characteristics, Water yield, Water quality, Withdrawal, Irrigation, Hydrologic data, Maps, Hydrographs, Appraisals, Economics, Evaluation, Water resources development, Surface-groundwater relationships, Watershed management, Legal aspects, Underground storage, Underground waste disposal.
Identifiers: *Rio Grande Region.

The Rio Grande is an interstate and international stream which begins in high mountains of Colorado, flows across New Mexico, and forms the boundary between Texas and Mexico. Annual precipitation on the region is about 86 million acre-feet; however, all but 4 million acre-feet is returned to the atmosphere by evapotranspiration. The groundwater reservoirs contain an aggregate of 5,800 million acre-feet of fresh and slightly saline water in storage, which could be withdrawn through wells. In contrast, the surface reservoirs have a combined storage capacity of only 18 million acre-feet. Withdrawal of groundwater in 1970 was 2.7 million acre-feet, of which 88% was used for irrigation. The region appears to offer several possibilities for utilizing underground space for purposes other than the withdrawal of water, such as waste disposal, artificial recharge, water-quality control, and development of geothermal energy. (Woodard-USGS)
W75-10597

**SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--OHIO REGION,**
Geological Survey, Reston, Va.
R. M. Bloyd, Jr.
Available from Supt. of Documents, GPO, Washington, D.C. 20402 - $1.75 (paper cover). Professional Paper 813-A, 1974. 41 p, 22 fig, 13 tab, 25 ref.

Descriptors: *Groundwater resources, *Regional analysis, *Ohio River, Water supply, Water utilization, Aquifer characteristics, Water yield, Water quality, Hydrologic data, Withdrawal, Groundwater recharge, Appraisals, Planning, Water resources development, Watershed management, Underground storage, Underground waste disposal.
Identifiers: *Ohio River Region.

Groundwater in the Ohio Region is a large, important, and manageable resource that should have a significant role in regional water development. On the basis of a comparison of groundwater withdrawals with estimated groundwater recharge, the groundwater resources probably will not be used at full potential under existing development plans. Annual groundwater use (1960) by municipalities and rural residents was about 1,000 million gallons per day. Average annual regional groundwater recharge is about 35,000 mgd. Therefore, base-year (1960) municipal and rural groundwater use is only about 3% of recharge. Annual regionwide groundwater use (1965) by industry also is only about 3% of recharge. Total potable groundwater available from storage in the outwash and alluvial aquifers in the Ohio River valley and the subbasins is about 23,000 billion gallons. This is about four times the flood-control storage of all Ohio Region Corps of Engineers reservoirs constructed, under construction, or in advance planning as of July 1965. Approximately 85,000 billion gallons of potable groundwater is available from storage in aquifers other than the outwash and alluvial aquifers. (Woodard-USGS)
W75-10598

**A PREDICTIVE COMPUTER MODEL OF TH LOWER CRETACEOUS AQUIFER, FRANKL AREA, SOUTHEASTERN VIRGINIA,**
Geological Survey, Richmond, Va.
For primary bibliographic entry see Field 2F.
W75-10599

**WATER RESOURCES OF THE TOPPENI CREEK BASIN, YAKIMA INDIAN RESERV TION, WASHINGTON.**
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 3F.
W75-10603

**GROUND-WATER CONDITIONS IN UTA SPRING OF 1975,**
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 2F.
W75-10606

**PROGRESS IN AUSTRALIAN HYDROLO 1965-1974.**
For primary bibliographic entry see Field 2A.
W75-10646

**SEEPAGE FROM RECHARGE AND LANDFI DITCHES,**
California Univ., Berkeley. Dept. of Geolog Engineering.
For primary bibliographic entry see Field 5B.
W75-10770

**GROUNDWATER CONTROL BY PUMPING,**
Central Nebraska Public Power and Irrigation trict, Holdrege.
J. A. Robertson, Jr, F. J. Dragoun, and D. W. Sa
In: Agricultural and Urban Considerations in rigation and Drainage; Selected Papers from Irrigation and Drainage Division Speciality C ference, Fort Collins, Colorado, April 22-24, 1 American Society of Civil Engineers, New Y p 179-194, 1974. 7 fig, 4 tab.

Descriptors: *Conjunctive use, *Irrigat *Nebraska, Water resources developm Groundwater, Surface waters, Water man ment(Applied), Climatic data, Average, Land Crops, Water quality, Wells, Irrigation wells.

There are 116,700 acres being irrigated by sur water in the loessial uplands of the south cer area of Nebraska between the Platte Republican Rivers. After approximately 30 y of surface irrigation and a rising groundw table, the trend appears to be toward a stable dition. This stable sub-surface condition e through The Central Nebraska Public Power Irrigation District's development of 270 gro water wells and other improvements. The consequential contribution to the present c tion has been the expansion and developme more than 2400 private wells. Conjunctive u water is essential for maximum benefit from supplies, surface and sub-surface, but p management of both supplies is also essential Central District, with the help of a consultin gineering firm, has developed a groundw model to predict the effect of changes (suc canal lining and pipelines) in the surface system on the groundwater resource. The major problem remaining is development equitable revenue base for the surface water system that includes not only the surface wa rigators but also the groundwater irrigators re ing recharge benefits from the surface water system. (See also W75-10769) (Humphreys-IS
W75-10778

GE IN QUALITY OF PUMPED
NAGE EFFLUENT,
of Reclamation, Aurora, Colo.
mary bibliographic entry see Field 5B.
0779

NAGE ANALYSIS OF A CONFINING FOR-
ON,
ltural Research Service, Mandan, N. Dak.
rn Great Plains Research Center.
mary bibliographic entry see Field 4A.
0780

NDWATER MODEL AS A TOOL IN
NING AND MANAGEMENT,
Hill, Portland, Oreg.
Charley, E. V. Lance, and G. M. Powell.
ricultural and Urban Considerations in Ir-
and Drainage; Selected Papers from the
on and Drainage Division Speciality Con-
, Fort Collins, Colorado, April 22-24, 1973.
an Society of Civil Engineers, New York,
72, 1974. 8 fig, 8 ref.

tors: *Model studies, *Planning,
gement, *Groundwater, *Nebraska, Irriga-
ystems, Irrigation canals, Percolation,
e, Irrigation efficiency, Water table, Arte-
ifers, Transmissivity, Storage coefficient,
Permeability, Peak loads, Safe yield,
Costs, Soil moisture, Root zone,
ranspiration, Reservoir storage, Conjunc-

ers: *Platte River(Neb), *Republican
eb).

undwater model is an excellent tool for
the conjunctive use of ground and sur-
ters and for developing design criteria for
n system improvements. To construct and
model of a groundwater basin in south-
Nebraska, 10 years of groundwater, sur-
ter, cropping pattern, and climatological
re used. The completed model simulated
ement of all groundwater within the basin
dicted groundwater elevations at nodal
or proposed changes to the irrigation
nd projected changes in the cropping pat-
y use of the model, management can
e problems and devise solutions making
use of the resource available to them with
ce based on the responses of the simula-
el. (See also W75-10769) (Visocky-ISWS)
81

ANALYSIS OF RIVER WATERS IN
A (IX), CHEMICAL COMPOSITION OF
A WATER BASIN, (IN JAPANESE),
ary bibliographic entry see Field 2K.
41

ERMAL POWER PLANT WITH HIGH
NCY,
ary bibliographic entry see Field 8C.
45

## ffects On Water Of
## n's Non-Water
## vities

TING TIMBER YIELDS AND
LOGIC IMPACTS RESULTING FROM
HARVEST ON SUBALPINE
SHEDS,
rvice (USDA), Fort Collins, Colo. Rocky
Forest and Range Experiment Station.
ary bibliographic entry see Field 3B.
06

**THE LOXAHATCHEE - A RIVER IN DISTRESS, SOUTHEAST FLORIDA,**
Geological Survey, Miami, Fla.
H. G. Rodis.
Central and Southern Florida Flood Control District report, 1973. 9 p.

Descriptors: *Saline water intrusion, *Florida, *Streams, Environmental effects, Land clearing, Construction, Canals, Land development, Watershed management, Investigations, Surveys, Evaluation, Streamflow, Regulated flow, Groundwater levels, Water quality control, Pesticides, Nutrients, Path of pollutants, Water pollution sources.
Identifiers: *Loxahatchee River(Fla).

Before the turn of the century, the northwest fork of the Loxahatchee River in southeast Florida sustained a flow of fresh water to the sea and its narrow flood plain was covered by a dense river-forest of sub-tropical trees and plants. Today, with land development, digging of canals, and water control practices, salt water is encroaching upstream and has transformed the lower reach of this river into an arm of the sea. The upper reach too has changed, having practically disappeared into a maze of canals and ditches and a quiltwork of farms and homes. Only the middle reach now remains virtually unchanged. The middle reach of the Loxahatchee River is threatened with conversion to a brackish-water environment because diminishing fresh water flow is permitting salt water to move farther and farther upstream. The river requires a continuous flow of 50 cfs at the beginning of its middle reach to retard further upstream movement of the sea. This flow is valid only if groundwater inflow along the middle reach does not fall below 1971-73 levels. In addition to maintaining a minimum flow, the flow should be low in pesticides, nutrients, or other toxic materials. Otherwise, because of the deleterious effects of these substances on plant life, much of the benefit of salinity control will be mullified. (Woodard-USGS)
W75-10588

**CHANNEL EROSION SURVEYS ALONG SOUTHERN SEGMENT OF THE TAPS ROUTE, ALASKA, 1972 AND 1973,**
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 8B.
W75-10594

**HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS METROPOLITAN AREA, 1973,**
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-10596

**HYDROLOGY OF THE ALBEMARLE-PAMLICO REGION, NORTH CAROLINA--A PRELIMINARY REPORT ON THE IMPACT OF AGRICULTURAL DEVELOPMENTS,**
Geological Survey, Raleigh, N.C.
R. C. Heath.
Available from NTIS, Springfield, Va 22161 as PB-243 642, $5.25 printed copy, $2.25 in microfiche. Water-Resources Investigations 9-75, May 1975. 98 p, 49 fig, 6 tab, 43 ref.

Descriptors: *Land clearing, *Agricultural engineering, *Swamps, *Drainage practices, Environmental effects, Overland flow, *North Carolina, Estuaries, Groundwater, Hydrology, Lakes, Geology, Water wells, Water level fluctuations, Land subsidence, Channeling, Farm management, Water quality, Oysters, Shrimp.
Identifiers: Albemarle Sound(NC), Pamlico River(NC), Dismal Swamp(NC), Yorktown Formation(NC), Castle Hayne Limestone(NC), Pungo River Formation(NC), Suffolk Scarp(NC).

Extensive agricultural land clearing and drainage operations are changing the hydrology in a 650 sq mi area of the Albemarle-Pamlico region in North Carolina. The affected area is part of the 1,634 sq mi peninsula that lies between Albemarle Sound on the north and Pamlico River on the south. The artificial drainage system being constructed will probably result in only a slight modification of the natural annual evapotranspiration, overland runoff, and groundwater discharge, but will likely result in several important problems. First, changes in the water quality of the sounds and estuaries resulting from the rapid runoff of storm waters may prove harmful to the fishery resources. Second, lowering of the water table may cause relatively rapid subsidence of the land surface in an irregular pattern in the extensive areas underlain by thick peat deposits as a result of biochemical oxidation, peat fires, and wind. (Woodard-USGS)
W75-10602

**FLOOD WAVES AND SUSPENDED SEDIMENT PULSES IN URBANIZED CATCHMENTS,**
University of New England, Armidale (Australia). Dept. of Geography.
I. Douglas.
Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers, Australia, Preprints of Papers, p 61-64, May 1975. 4 fig, 13 ref.

Descriptors: *Flood discharge, *Urbanization, *Urban runoff, *Sediment load, *Storm runoff, Sediment discharge, Watersheds(Basins), Rainfall-runoff relationships, Tropical regions, *Australia, Graphical methods, Sediment transport.
Identifiers: Malaysia(Kuala Lumpur), New South Wales.

Analysis of storm event sediment transport using dimensionless sediment concentration graphs reveals contrasts between runoff and sediment yield from urban areas and that from adjacent rural lands. For a catchment in New South Wales (Australia) which is 15% urbanized, the contasts are marked for short-duration local storms, but not for major rainfall events. In the vicinity of Kuala Lumpur (Malaysia), a tropical area 40% urbanized, the contrast is so great that even in extreme events urban runoff and sediment yields are greater than those from rural areas. In estimating the hydrologic effects of urbanization, account must be taken of the original character of the ground surface and the proportion rendered impermeable by urbanization. (CSIRO)
W75-10647

**WAIMANO STREAM FLOOD CONTROL PROJECT, PEARL CITY, HAWAII; HYDRAULIC MODEL INVESTIGATION,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10663

**LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION, PHYSICAL MODEL FEASIBILITY STUDY,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10670

**NEW SNOW FENCE DESIGN CONTROLS DRIFTS, IMPROVES VISIBILITY, REDUCES ROAD ICE,**
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W75-10693

THE EFFECTS OF URBANIZATION ON FLOODS OF DIFFERENT RECURRENCE INTERVAL,
University Coll., London (England). Dept. of Geography
G. E. Hollis.
Water Resources Research, Vol 11, No 3, p 431-435, June, 1975. 3 fig, 1 tab, 20 ref.

Descriptors: *Floods, *Urbanization, *Urban runoff, *Runoff, Hydrology, Land use, Time of concentration, Surface runoff, Urban hydrology, Annual peak discharge, Peak discharge, Permeability, *Flood recurrence interval, Watersheds(Basins), Watershed management.

Urbanization does not affect floods of different recurrence intervals equally. Impervious cover such as roofs and roads prevents infiltration into the soil and speeds runoff. The effect is greatest in small floods which may be increased by a factor of 10 or more. L. B. Leopold (Hydrology for Urban Land Planning, 1968) has shown that urban-induced increases in peak discharges of annual floods can range from 1.5 up to 6 times the discharge of a similar undeveloped basin. But the effect diminishes as the size of the flood increases, since during prolonged rainstorms a rural watershed can become saturated and respond hydrologically as if it were an impervious urbanized area. Leopold's methodology is extended to derive a family of curves for the relationships between the increase in flood peaks following a given amount of urbanization, the percentage of the basin paved, and the flood recurrence interval. Data from 15 empirical studies were tabulated and graphed. The results show that paving less than 5% of the drainage area has negligible effect on floods with return intervals of 1 year or more; complete urbanization which results in at least 30% paving of the basin may double the discharge of the 100-year flood; and a flood with recurrence interval above 150 years is not materially affected by urbanization. (Herr-North Carolina)
W75-10709

RUNOFF OF OILS FROM RURAL ROADS TREATED TO SUPPRESS DUST,
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 5B.
W75-10766

IMPACTS OF RURAL TO URBAN WATER USE,
Texas Office of the Governor, Austin. Water Task Force.
For primary bibliographic entry see Field 6D.
W75-10772

WATERSHED BEHAVIOR AFTER FOREST FIRE IN WASHINGTON,
Forest Service (USDA), Wenatchee, Wash. Forest Hydrology Lab.
J. D. Helvey.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Specialty Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 403-422, 1974. 6 fig, 4 tab, 16 ref, 1 append.

Descriptors: *Forest fires, *Watersheds(Basins), *Washington, Streamflow, Snowpacks, Precipitation(Atmospheric), Gaging stations, Soil moisture, Sedimentation, Temperature, Hydrographs, Evapotranspiration, Vegetation, Debris avalanches, Channel erosion, Geology, Road construction, Lumber, Lumbering.
Identifiers: *Entiat Experimental Forest(Wash), *Cascade Range, Shade reduction, Debris torrents.

More than 120,000 acres of forested land was burned over in north-central Washington in the summer of 1970. Included in the area was the Entiat Experimental Forest, where hydrologic measurements began in 1959. This area, located on the east slope of the Cascade Range, varies in elevation from 2000 to 7000 feet above sea level. Slope gradients average about 50%, but slopes over 90% are quite common. For the first time in this area, hydrologic data collected from forested watersheds in their natural condition could be compared with records collected after the vegetation was destroyed by fire. Hydrologic behavior in 1972 was in sharp contrast to pre-fire conditions, but was confounded by several factors. The effects of a single factor could not be determined. For example, the effect on runoff of reduced evapotranspiration caused by destruction of the vegetation by fire was confounded by abnormally high precipitation. Other complicating factors included logging road construction, logging over snow, and intense summer rainstorms. Studies are underway to monitor trends of vegetation development and to relate vegetation density to soil movement and water yield. In this way it is hoped to evaluate the effectiveness of various treatments on hydrologic behavior of these burned-over watersheds. (See also W75-10769) (Roberts-ISWS)
W75-10790

GROUNDWATER PROTECTION IN HIGHWAY CONSTRUCTION IN THE CATCHMENT AREA OF THE CITY OF BERNE AT KIESEN (GRUNDWASSERSCHUTZ BEIM AUTOBAHN IM FASSUNGSGEBIET STADT BERN IN KIESEN),
For primary bibliographic entry see Field 5C.
W75-10837

## 4D. Watershed Protection

SIMULATING TIMBER YIELDS AND HYDROLOGIC IMPACTS RESULTING FROM TIMBER HARVEST ON SUBALPINE WATERSHEDS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W75-10406

PEDOLOGIC COVER OF THE WATERSHED OF THE PORECKA RIVER,
Institute for Soil Research, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 2A.
W75-10551

WATERSHED MANAGEMENT PROBLEMS AND OPPORTUNITIES FOR THE COLORADO FRONT RANGE PONDEROSA PINE ZONE: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
H. L. Gary.
Research Paper RM-139, March 1975. 32 p, 24 fig, 4 tab, 70 ref.

Descriptors: Forest management, *Range management, Vegetation effects, *Ponderosa pine zone, *Watershed management, Conifers, Land use, Planning, Coniferous forests.

The east flank of the Continental Divide consists largely of open timber stands and grasslands. Soils erode easily after abuse. Precipitation ranges from 15 to 20 inches, about two-thirds from high-intensity storms from April to September. Guidelines are provided for maintaining satisfactory watershed conditions. The 3- to 5-inch water yields are comparatively small in contrast to yields of 12 to 25 inches from the high-altitude subalpine forests, but are important to development along the Front Range. Watershed management practices can be expected to provide practical alternatives for increasing water supplies. (Forest Service)
W75-10655

EVALUATION OF DISPOSAL AREAS IN JAMES RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10669

ACTMO, AN AGRICULTURAL CHEMICAL TRANSPORT MODEL,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 5B.
W75-10846

TOTAL SEDIMENT LOAD BY THE EXTRAPOLATED DATA PROCEDURE,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 2J.
W75-10847

SEDIMENT-YIELD CHARACTERISTICS FROM UNIT SOURCE WATERSHEDS,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 2J.
W75-10848

# 5. WATER QUALITY MANAGEMENT AND PROTECTION

## 5A. Identification Of Pollutants

ANALYTIC CHARACTERIZATION OF SEWE LOADING BY SPENT LIQUORS OF THE PUL INDUSTRY (ANALYTISCHE KENNZEICHUN DER BELASTUNG DER VORFLUTER DURC ABLAUGEN DER ZELLSTOFFINDUSTRIE),
For primary bibliographic entry see Field 5D.
W75-10381

DETERMINATION OF CADMIUM, COPPE AND LEAD IN NATURAL WATERS AFTE ANION-EXCHANGE SEPARATION,
Vienna Univ., (Austria).
J. Korkisch, and A. Sorio.
Analytica Chimica Acta, Vol 76, No 2, p 393-39 June, 1975. 5 tab, 11 ref.

Descriptors: *Water analysis, *Cadmiu *Copper, *Pollutant identification, *Lead, *Ani exchange, Spectrophotometry, Chemical analysi Analytical techniques, Separation technique Water chemistry, Water properties, Water qualit Water pollution sources, Pollutants, Resin Metals, Inorganic compounds, Ion exchang Foreign research, Foreign countries.
Identifiers: Dowex 1-X8 resin, Austr Hydrobromic acid, Ascorbic acid, Nitric ac Methanol.

A method is described for the determination cadmium, copper, and lead in samples of natu non-saline waters. After acidification w hydrobromic acid, the water sample is filter and, following the addition of ascorbic ac passed through a column of the strongly ba anion-exchange resin Dowex 1-X8 (bromide for On this exchanger cadmium (II), copper (I), a lead (II) are adsorbed as anionic bromide co plexes. After elution of these elements wit molar nitric acid, the determinations by atomic sorption spectrometry are carried out in the me um consisting of 90% (volume basis) methanol 10% 1.5 molar hydrobromic acid. The proced was used for the routine determination of cad um, copper, and lead in water samples collected Austria. (Witt-IPC)
W75-10385

ETERMINATION OF MANGANESE IN NATU-AL WATERS BY ATOMIC ABSORTION PECTROMETRY WITH A CARBON TUBE TOMIZER,
yoto Univ. (Japan).
Shigematsu, M. Matsui, O. Fujino, and K. inoshita.
nalytica Chimica Acta, Vol 76, No 2, p 329-336, ne, 1975. 4 fig, 4 tab, 16 ref.

escriptors: *Water analysis, *Pollutant identifiti-tion, *Manganese, *Spectrophotometry, Chemi-l analysis, Analytical techniques, Water chemis-y, Water properties, Water quality, Water pollu-n sources, Pollutants, Metals, Inorganic com-unds.
entifiers: Atomic absorption spectrometry.

e atomic absorption spectrometry of manganese s studied with carbon tube atomizers. Among rious inner diameters of carbon tubes small res gave higher sensitivity, but large bores gave gher reproducibility. A fairly linear calibration rve was obtained in the range of 1-6 times 10 to minus 10th power g of manganese with injec-n volumes of 5 microliters. The detection limit s 1.5 times 10 to the minus 11th power g, and the ative standard deviation was 3.5%. In 40-fold ounts, few salts interfered, but there were con-erable interferences from 400 and 4000-fold ounts. Manganese in natural waters was deter-ned by extracting it into diisobutyl ketone as the thyldithiocarbamate; the amounts found lay in range 0.5-33 ppb. (Witt-IPC)
5-10386

ENT LIQUOR FROM PEROXIDE EACHING OF GROUNDWOOD PULP FROM RUCE,
almers Univ. of Technology, Goteborg veden). Dept. of Chemical Engineering.
Samuelson, and L.-A. Sjoberg.
lulose Chemistry and Technology, Vol 8, No 6, 07-613, November/December, 1974. 14 fig, 3

scriptors: *Bleaching wastes, Lignins, Al-ols, Organic compounds, Acids, Organic acids, rbohydrates, Water pollution sources, Wastes, ustrial wastes, Pollutants, Waste er(Pollution), Pulp and paper industry, Organic ds, Organic wastes.
ntifiers: *Peroxide bleaching, *Groundwood p, *Spruce trees(Picea), Acetic acid, Hemicel-se, Pectins, Wood extractives, Methanol, For-acid, Malonic acid, Tartronic acid, Malic acid.

tic acid was the most abundant organic com-nd in the spent bleach liquor, along with ap-ciable amounts of lignin, hemicelluloses, pectic stances, extractives, and methanol. Small unts of monocarboxylic acids, especially for-acid, and of dicarboxylic acids, such as onic, tartronic, and malic acids, were found as cal oxidation products of lignin and car-ydrates. (Ward-IPC)
5-10392

TERMINATION OF THE TRANSITION TALS MANGANESE, IRON, COBALT, PPER AND ZINC IN RIVER FISHES WITH LP OF X-RAY FLUORESCENCE ANALYSIS D FLAMELESS ATOMIC ABSORPTION CTROSCOPY, (BESTIMMUNG DER RGANGSMETALLE MANGAN, EISEN, BALT, KUPFER UND ZINK IN FLUSS-CHEN MIT HILFE DER RONTGEN-ORES-ZENZANALYSE UND DER FLAM-NLOSEN ATOMABSORPTION),
desforschungsanstalt fuer Fischerei, Hamburg st Germany). Isotopenlaboratorium.
Harms.
niv fur Fischerei Wissenschaft, Vol 25, No p 63-74, September 1974. 4 fig, 1 tab, 18 ref.

Descriptors: *Analytical techniques, *X-ray fluorescence, *X-ray analysis, *Methodology, *Metals, *Spectroscopy, Iron, Copper, Zinc, Manganese, Cobalt, Fish, Absorption, Fluorescence, Pollutant identification.
Identifiers: *Bioaccumulation.

Fishes from the river Elbe were analyzed for manganese, iron, cobalt, copper and zinc using flameless atomic absorption spectroscopy and x-ray fluorescence. The analysis was based on a selective separation and enrichment of the metals by chelate exchanger chromatography. In element determinations, the metal traces were enriched by complex precipitation and transferred into an ideally measurable form. (Katz)
W75-10408

**CORTICOSTEROID CONCENTRATIONS IN SOCKEYE SALMON (ONCORHYNCHUS NERKA) EXPOSED TO LOW CONCENTRATIONS OF COPPER,**
Fisheries and Marine Service, Vancouver (British Columbia). Vancouver Lab.
For primary bibliographic entry see Field 5C.
W75-10415

**X-RAY MICROANALYSIS OF ZINC AND IRON IN THE CHELORIDE CELLS OF MAYFLY LARVAE OF THE RIVER SULZ, (RONTGENMIKROANALYSE VON ZINK UND EISEN IN CHLORIDZELLEN VON EINTAGSFLIGENLARVEN AUS DER SULZ),**
Landesanstalt fuer Gewasserkunde und Gewasserschutz Nordrhein-Westfalen, Krefeld (West Germany).
K. Heuss, and W. Wichard.
Oecologia, Vol 19, No 1, p 71-74, 1975. 1 fig, 1 tab, 3 ref. English abstract.

Descriptors: *Iron, *Zinc, *Mayflies, *Larvae, *Analytical techniques, *X-ray analysis, Aquatic insects, Bioindicators, Electron microscopy, Metals, Absorption, *Pollutant identification.
Identifiers: Bioaccumulation, *Chloride cells.

Chloride cells of mayfly larvae accumulate dissolved iron and zinc in correlation to different concentrations in the river Sulz. Energy-dispersive X-ray microanalysis with a scanning electron microscope was used for the analysis. (Katz)
W75-10416

**MARINE POLLUTION BIOASSAY BY SEA URCHIN EGGS, AN ATTEMPT TO ENHANCE ACCURACY,**
Doshisha Univ., Kyoto (Japan). Biological Lab.
N. Kobayashi.
Publications of the Seto Biological Laboratory, Vol 21, No 5/6, p 377-391, December 1974. 7 tab, 6 ref.

Descriptors: *Bioassay, *Bioindicators, *Water quality control, *Sea water, Aging(Biological), Fertilization, Embryonic growth stage, Pollutants, Water pollution effects, *Pollutant identification.
Identifiers: *Sea urchin eggs.

To improve the sensitivity of methods for marine pollution bioassay aged sea urchin eggs were utilized. The eggs were left in test water for some hours before they were inseminated; and then rates of fertilization, first cleavage, gastrulation and some anomalies in the test water were observed. Various abnormalities, i.e. the retarded formation of the fertilization membrane or the lack of one polyspermy, irregular cleavage and development, occurred more sensitively on aged eggs; and this seems to provide a better technique for bioassay of marine pollution. Hours to insemination should be limited within the range in which the eggs follow the normal development in ordinary, unpolluted sea water, since abnormalities occur in polluted water. They were 9 hours in Pseudocentroutus, 6 hours (warmed) in Hemicentrotus and 3 hours in Anthocidaris. The effects of heavy metals and other chemicals upon the aging of the eggs are not significant. (Katz)
W75-10419

**HEAVY METAL CONTENTS OF FISHES CAUGHT IN KAOHSIUNG HARBOR, (IN CHINESE),**
National Taiwan Univ., Taipei. Inst. of Oceanography.
S. S. Jeng, G. S. Wang, Y. W. Huang, and J. L. Lain.
Journal of the Fisheries Society of Taiwan, Vol 3, No 1, p 29-32, 1974. 1 fig, 1 tab, 4 ref. English abstract.

Descriptors: *Heavy metals, *Cadmium, *Copper, *Lead, *Mercury, *Nickel, *Zinc, *Water pollution effects, Shellfish, Fish, Tissue analysis, Environmental effects, Harbors.
Identifiers: *Kaohsiung Harbor(Taiwan), Republic of China.

Cadmium, copper, lead, mercury, nickel and zinc concentrations in fish and shellfish caught in Kaohsiung harbor in February, 1974 were studied. Cadmium, mercury, lead and zinc concentrations were around ordinary levels. However, the contents of copper and nickel in the fish and shellfish were higher than in those from other areas. This may indicate that the waters in Kauhsiung harbor were contaminated by copper and nickel discharged from the factories. (Katz)
W75-10430

**BIOASSAY DATA FOR MARINE POLLUTION USING SEA URCHIN EGGS, 1972 AND 1973,**
Doshisha Univ., Kyoto (Japan). Biological Lab.
N. Kobayashi.
Publications of the Seto Marine Biological Laboratory, Vol 21, No 5/6, p 411-432, December 1974. 17 tab.

Descriptors: *Bioassay, *Bioindicators, *Growth rate, *Inhibition, *Temperature, *Water quality control, Water pollution effects, Laboratory tests, Data collections, *Sea water, Pollutant identification.
Identifiers: *Sea urchin eggs, Hemicentrotus pulcherrimus, Anthocidaris crassispina, Japan.

The data accumulated from seventeen biological assay experiments are presented. Eggs of Hemicentrotus pulcherrimus and Anthocidaris crassispina were used to assay marine pollution during two years of experimentation. Water was from various sources and ranged in temperature from 13-28C. (Katz)
W75-10432

**ANALYSIS OF TRI-ARYL PHOSPHATE ESTERS AND THE DETERMINATION OF IMOL S-140 IN FISH TISSUE AND WATER SAMPLES BY GAS CHROMATOGRAPHY,**
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. A. J. Murray.
Journal of the Fisheries Research Board of Canada, Vol 32, No 4, p 457-460, April 1975. 2 fig, 2 tab, 9 ref.

Descriptors: *Toxicity, *Organic compounds, *Gas chromatography, *Organophosphorus compounds, Oil, Analytical techniques, Chemical analysis, Water analysis, Sampling, Laboratory tests, *Pollutant identification, *Phenols, Lubricants.
Identifiers: Tissue analysis, *Imol.

A method is described for the analysis of tri-aryl phosphate esters used commercially as lubricants. In a fish toxicity study, Imol S-140 (tri-tolyl phosphate) was extracted from fish tissue and water samples, hydrolyzed, and the individual phenols measured by gas chromatography as the

trimethylsilyl derivatives. The lower detection limit was about 3 ppm of Imol in wet fish tissue. (Katz)
W75-10442

**MULTICHANNEL TOXICANT INJECTION SYSTEM FOR FLOW-THROUGH BIOASSAYS,**
National Water Quality Lab., Duluth, Minn.
D. L. DeFoe.
Journal of the Fisheries Research Board of Canada, Vol 32, No 4, p 544-546, April 1975. 1 fig, 2 ref.

Descriptors: *Design, *Bioassay, Construction equipment, Costs, Instrumentation, *Measurement.
Identifiers: *Flow-through bioassays, *Water-metering cells, Falling water.

A mechanical injection system needing little maintenance is described which offers a dependable and flexible method for maintaining multiple toxicant concentrations in flow-through bioassays. Falling water from a series of water metering cells similar to those of a proportional diluter, activates a series of mechanical syringe injectors. The system dispenses equal amounts of toxicant dispersants (solvents, wetting agents or additives) to all toxicant concentrations and to a dispersant control and allows changing unlimited toxicant concentrations independently of each other. (Katz)
W75-10443

**RESIDUES OF POLYCHLORINATED BIPHENYLS (PCB) AND CHLORINATED PESTICIDES IN FISH AND BIRDS OF THE PO DELTA, (RESIDUS DE POLYCHLOROBIPHENYLS (PCB) ET DE PESTICIDES CHLORES DANS LES POISSONS ET LES OISEAUX DU DELTA DU PO),**
Bologna Univ. (Italy). Istituto di Biochimica.
For primary bibliographic entry see Field 5B.
W75-10446

**ELECTRON MICROSCOPE AUTORADIOGRAPHY OF KIDNEY AFTER ADMINISTRATION OF PB-210 IN MICE,**
Tokyo Univ. (Japan). Dept. of Public Health.
M. Murakami, and K. Hirosawa.
Nature, Vol 245, No 5421, p 153-154, September 21, 1973, 1 fig, 8 ref.

Descriptors: *Lead, *Rodents, *Cylological studies, Distribution, *Radioisotopes, Animal physiology, Analytical techniques, Microscopy, Electron microscopy, *Pollutant identification, Metals.

The precise localization of PB 210 in some organelles in the tubular epithelial cells of the mouse kidney was demonstrated by the use of electron microscopic autoradiography. Male mice were injected intraperitioneally with 0.5 ml of solution of RaD in 0.1% acetic acid and killed 30 minutes after injection. RaD contains PB 210, Bi 210, and Po 218 in radioactive equilibrium. Alpha-emission of Pb 210 results in the appearance of silver grains in the emulsion. Counting the grains on 20 tubules showed that in the epithelial cells, more than half of the grains were found on mitochondria and about one third on the cytoplasm, half of which were associated with cytoplasmic membranes. A few grains were found on the nuclei of the epithelial cells. The results indicated that lead is accumulated in the mitochondria and in the cytoplasm as soon as 30 minutes after its administration. Grains were found on the various kinds of membrane and on the cytoplasm free of membranes. Thus, the cytoplasm as well as the membranes seem to be involved in the incorporation and transport of lead. (Jernigan-Vanderbilt)
W75-10476

**AVERAGE TRACE ELEMENT COMPOSITION OF LOW LEVEL MARINE ATMOSPHERIC PARTICULATES,**
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W75-10477

**PERSISTENCE OF CADMIUM-INDUCED METABOLIC CHANGES IN LIVER AND KIDNEY,**
Ottawa Univ. (Ontario). Dept. of Pharmacology
R. L. Singhal, Z. Merali, S. Kacew, and D. J. B. Sutherland.
Science, Vol 183, No 4129, p 1094-1096, March 15, 1974. 2 tab, 15 ref.

Descriptors: *Cadmium, *Rodents, *Metabolism, Animal physiology, Laboratory tests, Toxicity, Protein, *Biochemistry, Cytological studies, *Pollutant identification.

Daily intraperitoneal injection of cadmium chloride (1 milligram per kilogram) for 45 days enhanced gluconeogenesis as evidenced by significant increases in the activities of liver and kidney cortex pyruvate carboxylase, phosphopyruvate carboxylase, hexosediphosphatase, and glucose-6-phosphatase, the quartet of key, rate-limiting enzymes involved in the biotransformation of non-carbohydrate precursors into glucose. Whereas cadmium treatment decreased the level of hepatic glycogen, the concentration of blood glucose and urea was significantly elevated by this heavy metal. Discontunation of the heavy metal treatment for 28 days, in rats previously injected with cadmium for 45 days, failed to restore the observed biochemical alterations in hepatic and renal carbohydrate metabolism to control values. Evidence indicates that cadmium augments the glucose-synthesizing capacity of liver and kidney cortex and that various metabolic changes persist even after a 4-week period of withdrawal from exposure to the heavy metal. (Jernigan-Vanderbilt)
W75-10478

**TOXIC TRACE ELEMENTS: PREFERENTIAL CONCENTRATION IN RESPIRABLE PARTICLES,**
Illinois Univ., Urbana. School of Chemical Sciences.
D. F. S. Natusch, J. R. Wallace, and C. A. Evans, Jr.
Science, Vol 183, No 4121, p 202-204, January, 1974. 1 fig, 2 tab, 13 ref. NSF (GI 31605) and (GH 33634).

Descriptors: *Trace elements, *Toxicity, *Industrial wastes, *Fossil fuels, *Air pollution, Cadmium, Lead, Laboratory tests, Analytical techniques, Spectroscopy, Arsenic compounds, Pollutant identification, Path of pollutants.

This study was designed to test the theory that combustion characteristics at the particle source determines why many toxic elements are most concentrated in the smallest ambient airborne sources. The tests were conducted in reference to fly ash derived from coal-fired power plants. The elements arsenic, antimony, cadmium, lead selenium and thallium were most concentrated in the smallest respirable particles emitted from coal-fired power plants. It was concluded that these elements, or their compounds are probably volatilized during combustion and preferentially absorb or condense onto the small particles which can most easily pass through conventional control equipment. (Jernigan-Vanderbilt)
W75-10482

**LEAD METABOLISM IN THE NORMAL HUMAN: STABLE ISOTOPE STUDIES,**
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
M. B. Rabinowitz, G. W. Wetherill, and J. D. Kopple.
Science, Vol 182, p 725-727, November 16, 19
fig, 9 ref. NSF-GI-38339.

Descriptors: *Human population, *Metabo
*Lead, *Stable isotopes, Isotope studies, Dist
tion, Kinetics, Diets, Mass spectrometry, E
tions, Pollutant identification.

The effects of lead intake on a healthy, 53-
old, white male weighing 70 kilogram were
died. A low lead diet of 2500 kcal/day with a
dant proteins, vitamins and minerals was
ministered for 160 days. During the first 104
each meal was supplemented with Pb204 nitra
increase the total dietary lead intake to 367 m
grams. For the next 10 days, the subject rec
Pb207 nitrate. For the remaining time, the su
received only the low lead diet. The concentr
and isotopic composition of lead was deter
serially in the diet, blood, urine, facial hair, a
mosphere by mass spectrometric isotope dil
analysis. The kinematics and distribution of le
the body were, analyzed in terms of a three
partment model: compartment one was b
compartment two was soft tissue, and com
ment three was the skeleton. Results showe
2/3 of assimilated lead was dietary in origi
that the remainder was inhaled. (Rowe-Vande
W75-10484

**THE DETERMINATION OF MERCUR
SOILS AND RELATED MATERIALS BY C
VAPOUR ATOMIC ABSORPTION S
TROMETRY,**
Macaulay Inst. for Soil Research, Abe
(Scotland).
A. M. Ure, and C. A. Shand.
Analytica Chimica Acta, Vol 72, No 1, p
September, 1974. 4 fig, 6 tab, 48 ref.

Descriptors: *Spectrophotometry, *Anal
techniques, *Mercury, *Soil analysis, Peat
ganic matter, Soils, Heavy metals, Soil chem
Testing procedures, *Pollutant identification
Identifiers: *Atomic absorption spectrometry

Since no authenticated soil reference sampl
mercury analysis were available, an evaluat
a new circulation apparatus for atomic abso
was performed with three sample prepa
methods using natural samples. One o
methods involved digestion and wet oxid
which employed a nitric and sulfuric acid m
for digestion followed by potassium permang
oxidation. The second method, which could
ly be adapted for the collection and determi
of Hg in air or other gases, involved acid dige
wet oxidation, and collection in potassiu
manganate. The third method - oxygen flask
bustion - involved burning a pelleted sampl
perforated tantalum basket in an oxygen
flask containing a collecting solution to abso
Hg evolved. In the analysis, the usual bu
technique for Hg removal from the sample
tion was replaced by a procedure in which th
cury in the reduced sample was parti
between a fixed volume of air and the liquid
in a closed vessel by agitation. The air wa
blown through an absorption cell for me
ment. Absorption peak-heights were some 3
greater than those obtained with a bubbling s
without recirculation. For 1g samples, the a
cal range was 0.01-0.5 ppm. (Pulliam-Vander
W75-10485

**ATOMIC-ABSORPTION SPECTROM
DETERMINATION OF COPPER, LEAD,
MIUM AND MANGANESE IN PULP
PAPER BY THE DIRECT-ATOMIZA
TECHNIQUE,**
Oslo Univ. (Norway). Dept. of Chemistry.
F. J. Langmyhr, Y. Thomassen, and A. Mas
Analytica Chimica Acta, Vol 68, No 2, p 3
February, 1974, 1 fig, 2 tab, 3 ref.

riptors: *Heavy metals, *Analytical iques, Spectroscopy, Copper, Lead, Cadmi- Manganese, Equipment, Sampling, Testing dures, *Pollutant identification.
ifiers: *Atomic absorption spectroscopy.

direct-atomization technique of atomic ab- ion spectrometry was applied to the deter- ion of copper, lead, cadmium and manganese ample of pulp and four types of paper. Sam- f 1-20 mg were ashed and atomized in a gra- furnace, the determinations being based on andard addition technique. The method was e, rapid and sensitive and no reagents were to the samples. (Jernigan-Vanderbilt)
0489

**ADDS FOREIGN WRINKLE TO STAN- DS WORK,**
ong.
ical and Engineering News, Vol 51, No 31, p July 30, 1973.

iptors: Standards, *Materials testing, Con- *Metals, Analytical techniques, Govern- , Specifications, Investigations, Pollutants, ity, Public health, *Pollutant identification, elements, Water quality standards.
fiers: *Standard reference materials.

o the international concern for standard nce materials (SRM's) applicable to areas as health, pollution control, and resource pment, the National Bureau of Standards ded participation by foreign scientists to its s. Japan's effort is the largest, but there is me work in Pakistan and Yugoslavia. The was advanced that in time some of the n scientists will develop new techniques to e for exotic trace elements. For a certificate issued, the concentration of each element ed must be determined either by two or more etely different analytical techniques or by more separate laboratories using the same que. At the time, certification studies on ical materials were concentrating on 12 ele- that were either known or suspected to be r have known physiological functions. The had recently extended the trace element program into the area of energy and pollu- f legal limits to the amounts of trace ele- are set and techniques for measuring them tely are not available, then the law can be enforced nor upheld without excessive or litigation. (Pulliam-Vanderbilt)
0490

**IC ABSORPTION SPECTROMETRIC RMINATION OF CADMIUM, LEAD, R, THALLIUM AND ZINC IN SILICATE S BY DIRECT ATOMIZATION FROM OLID STATE,**
niv. (Norway). Dept. of Chemistry.
mary bibliographic entry see Field 2K.
0492

**RMINATION OF NICKEL IN ROCKS EPITHERMAL NEUTRON ACTIVA-**

t for Atomenergi, Kjeller (Norway). Labs.
mary bibliographic entry see Field 2K.
0493

**UM, THORIUM, AND LEAD CONCEN- ONS IN THREE SILICATE STANDARDS METHOD OF LEAD ISOTOPIC ANALY-**

ical Survey, Denver, Colo.
mary bibliographic entry see Field 2K.
0494

**EFFECT OF DIETARY SELENIUM ON GLUTATHIONE PEROXIDASE IN THE CHICK,**
California Univ., Davis. Dept. of Food Science and Technology.
S. T. Omaye, and A. L. Tappel.
Journal of Nutrition, Vol 104, No 6, p 747-753, June 1974. 3 fig, 3 tab, 20 ref.

Descriptors: *Toxins, *Lipids, Path of pollutants, *Animal metabolism, *Animal pathology, Environmental effects, Metals, *Pollutant identification, Water pollution effects.
Identifiers: *Selenium.

Tissues of chicks fed a diet deficient in selenium demonstrated decreased glutathione (GSH) peroxidase activity. GSH peroxidase activity was dose-related to the level of selenium; the specific activity increased as a logarithmic function of the dietary selenium level. Essentially, there was no difference between the activity of GSH peroxidase in various tissue soluble fractions from chicks fed equal gram-atoms of selenium as sodium selenite and as selenomethionine. Regression analysis of pooled data for GSH peroxidase and GSH reductase activities in tissues of chicks fed 0.1 ppm selenium indicated a linear relationship between the two enzymes. These data supported the hypothesis that GSH peroxidase and GSH reductase are metabolically related. GSH reductase activity was not related to dietary selenium levels. The implications of this study were that GSH peroxidase is dependent upon selenium for activity and that it also is a part of a detoxification system for peroxides. (Pulliam-Vanderbilt)
W75-10495

**FAST SEPARATION OF TIN (IV) FROM TIN (II) AND FROM NUMEROUS METAL IONS ON ION-EXCHANGE PAPERS,**
Tabriz Univ. (Iran). Analytical Lab.
For primary bibliographic entry see Field 2K.
W75-10497

**SPECTROSCOPIC DETERMINATION OF ATOMIZATION EFFICIENCY (CUCL-CU+CL) IN AN AIR-HYDROGEN FLAME,**
Nagoya Univ. (Japan). Dept. of Synthetic Chemistry.
For primary bibliographic entry see Field 2K.
W75-10498

**RAPID EXTRACTIVE SPECTROPHOTOMETRIC DETERMINATION OF GOLD (III) WITH 4-(2-PYRIDYLAZO)- RESORCINOL,**
Indian Inst. of Tech., Bombay. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W75-10499

**REMOVAL OF TRACE METALS DURING CONVENTIONAL WATER TREATMENT,**
For primary bibliographic entry see Field 5F.
W75-10501

**ENRICHMENT OF SURFACE FRESHWATER MICROLAYERS WITH ALGAE,**
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
B. C. Parker, and R. F. Hatcher.
Journal of Phycology, Vol 10, No 2, p 185-189, 1974.

Descriptors: *Algae, Eutrophication, Water pollution effects, *Sampling, Biological communities, *Pollutant identification.

Using a variety of techniques for sampling microlayers in freshwater environments, the frequent occurrence of significant and striking differences in algal community structure and densities relative to subsurface water is demonstrated.--Copyright 1974, Biological Abstracts, Inc.
W75-10583

**INDEX TO WATER RESOURCES DATA FOR LOUISIANA: SURFACE WATER RECORDS; WATER-QUALITY RECORDS.**
Geological Survey, Baton Rouge, La.
Louisiana Department of Public Works, Baton Rouge, Water Resources Basic Records Report No 8, 1975. 81 p, 2 tab.

Descriptors: Indexing, *Streamflow, *Water quality, *Louisiana, *Stations, Information retrieval, *Data collections, Hydrologic data, Sites, Drainage area, Cooperatives, Pollutant identification.
Identifiers: *Water resources index(La), Period of record collections.

This index is a tabulation of all sites at which streamflow or water-quality data have been collected in Louisiana by the U.S. Geological Survey through December 31, 1974. Table 1 is an alphabetical listing of all streamflow and water-quality stations, and table 2 is a downstream order listing of stations. Both listings include the same data in 6 columns: (1) Station name and location used for reference purposes; (2) type of records available at the site; (3) drainage area in square miles; (4) the elevation, in feet above mean sea level, of the zero of the gage; (5) the agency that furnished financial cooperation in the operation of the station; and (6) the dates, month and year, for which records are available. (Woodard-USGS)
W75-10590

**A RIVER-QUALITY ASSESSMENT OF THE UPPER WHITE RIVER, INDIANA,**
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 5B.
W75-10600

**TEMPERATURES OF WYOMING STREAMS,**
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 7C.
W75-10604

**STUDIES ON THE METABOLISM OF CHLOROPHENOLS IN FISH-III ISOLATION AND IDENTIFICATION OF A CONJUGATED PCP EXCRETED BY GOLDFISH,**
Hyogo Prefecture Fisheries Experiment Station, Kobe (Japan).
H. Akitake, and K. Kobayashi.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 41, No 3, p 321-327, March 1975. 4 fig, 1 tab, 15 ref.

Descriptors: *Organic compounds, *Freshwater fish, Analytic techniques, *Biochemistry, Laboratory tests, Methodology, *Phenols, *Pollutant identification, Water pollution effects.
Identifiers: *Goldfish, Carassius auratus, *PCP, Excretion, Phenolic compounds, Chemical breakdown, Conjugation, Detoxification mechanism.

The amount of phenolic compounds (PCP) in goldfish, Carassius auratus, was less than that lost from the PCP-medium during culture. Most of the PCP excreted was in a conjugated form, pentachlorophenyl-sulfate, accompanied with a small free-form amount. The study suggested that fish possess a detoxification mechanism for chlorophenols which involves sulfate conjugation. (See also W70-08375 and W70-08379) (Katz)
W75-10611

**RESIDUE ANALYSES ON 2-AMINO-4 PHENYLTHIAZOLE, A PISCINE ANESTHETIC, IN FISHES-I A MODEL RADIO-TRACER EXPERIMENT WITH MEDAKA,**
Meiji Seiki Kaisha Ltd., Yokohama (Japan). Research Labs.
Y. Sekizawa, K. Umemura, M. Shimura, A. Suzuki, and T. Kikuchi.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 41, No 4, p 449-458, April 1975. 4 fig, 2 tab, 12 ref.

Descriptors: *Killifishes, Laboratory experiments, Organic compounds, *Tracers, Fish physiology, *Absorption, Metabolism, Analytical techniques, Chromatography, Aquaculture, Equations, *Pesicide residues, Radioactivity techniques, Analytical techniques, *Pollutant identification.
Identifiers: *Medaka, *Anesthetic(Piscine), Residue analysis, 2-Amino-4-phenylthiazole, Excretion, Bioaccumulation.

Residue analyses on 3H-2-amino-4-phenylthiazole were performed in medaka (killifish, Oryzias latipes). This fish was selected because of its ready application in radiotracer experiments and its marked and unique ability to detoxify the piscine anesthetic, 2-amino-4-phenylthiazole to its N-hexuronyl conjugate. The absorption/excretion balance showed an average 102% recovery indicating that the excretion treatment effectively exhausted the residue from medaka. The half-life for retention of this compound and its N-hexuronyl conjugate in the fish body was approximately 12-15 hours. The fates of both the anesthetic and its N-hexuronyl conjugate in the fish body were determined separately in a time course survey using TLC radiography. Plots for the excretion of the major product, i.e. the conjugate, and the anesthetic per se produced two crossing exponential curves suggesting that there are two compartmentations of both the conjugate and the anesthetic per se in medaka. A mathematical simulation of the residue was also described. (Katz)
W75-10614

**DEVICES FOR TOXICOLOGICAL LONG-TERM STUDIES ON AQUATIC ORGANISMS (GERATE ZUR DURCHFUHRUNG TOXIKOLOGISCHER LANGZEITSTUDIEN AN WASSERORGANISMEN),**
Farbwerke Hoechst, Frankfurt am Main (West Germany).
N. Knauf.
Archiv fur Fischerei Wissenschaft, Vol 26, No 3, p 103-108, April 1975. 2 fig, 13 ref.

Descriptors: Aquatic animals, Design, *Laboratory tests, Construction, *Flow, Toxicity, Water pollution effects, Pollutant identification, Analytical techniques.
Identifiers: Dynamic tests, Flow-through studies, Residue studies.

For the performance of dynamic tests with water organisms two different types of flow-through apparatus were described as were experiences in running the devices. They were built from ordinary laboratory materials; the basic principle was uncomplicated; the tests were safe. They can be used for experiments with chronic toxicity of threshold concentrations and for residue studies. (Katz)
W75-10618

**PCBS IN THE SPOTTED SHARKS, MUSTELUS MANAZO, FROM TOKYO BAY, (IN JAPANESE),**
Tokai Regional Fisheries Research Lab., Tokyo (Japan).
H. Shimma, and Y. Shimma.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 40, No 11, p 1179-1186, November 1974. 2 fig, 4 tab, 11 ref.

Descriptors: *Polychlorinated biphenyls, *Sharks, *Saline water fish, *Growth stages, *Bioassay, *Lipids, Fish physiology, Organic compounds, Pollutant identification, Water pollution effects.
Identifiers: *Spotted sharks, Mustelus manazo, Bioaccumulation, *Tokyo Bay, Liver, Flesh, Yolk lipid, Biosynthesis, *Japan.

Lipids were extracted successively with 2:1 mixture of n-hexane and chloroform-methanol from flesh, liver and other viscera of 7 spotted sharks, Mustelus manazo taken from Tokyo Bay. One shark contained embryos. The contents and composition patterns of chlorobiphenyls were examined. Among immature fish, a linear relationship between body weight and PCB content was observed. PCBs found in the liver consisted mainly of hexa- and hepta-chlorinated compounds. In parent fish, the PCB content in flesh tended to increase, possibly with age. In embryos, the PCB content of yolk lipid was twice that of body lipid and similar to the Chloroform-methanol extracted lipid from parent fish liver. (Katz)
W75-10622

**INFLUENCE OF A THERMAL EFFLUENT ON MOVEMENT OF BROWN BULLHEAD (ICTALURUS NEBULOSUS) AS DETERMINED BY ULTRASONIC TRACKING,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-10628

**THE EFFECT OF CERTAIN ORGANIC POLLUTANTS ON COPPER TOXICITY TO FISH (LEBISTES RETICULATUS),**
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5C.
W75-10637

**TRACE ELEMENTS IN MELBOURNE RIVERS - AN INTERLABORATORY ANALYSIS,**
Materials Research Labs., Melbourne (Australia).
A. T. Phillip, R. W. Pettis, J. E. Harris, G. J. Fabris, and P. L. Boar.
Proceedings of the Royal Australian Chemical Institute, Vol 42, No 8, p 209-215, August 1975. 1 fig, 5 tab, 31 ref.

Descriptors: *Water analysis, *Heavy metals, *Water pollution, *Rivers, *Australia, Analytical techniques, *Trace elements, Chemical analysis, Copper, Cadmium, Lead, Toxicity, Aquatic life.
Identifiers: Melbourne(Vic), Yarra River, Maribyrnong River.

A survey of levels of copper, lead and cadmium in the Yarra and Maribyrnong Rivers (Victoria, Australia) was undertaken cooperatively by three independent laboratories, each with expertise in the analysis of trace elements in water. The overall mean values obtained indicate that the metals occur at levels not expected to produce toxic effects on any but the most sensitive of aquatic organisms. Variations in results obtained by the three laboratories are reported and discussed, with recommendations for standard procedures and precautions. (CSIRO)
W75-10649

**BIOLOGICAL BASES FOR WATER QUALITY STANDARDS,**
Rice Univ., Houston, Tex. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W75-10677

**ANALYSIS OF POLLUTION FROM MARINE ENGINES - STATUS REPORT,**
Environmental Control Technology Corp., Ann Arbor, Mich.
J. E. Schenk, P. G. Meier, and M. E. Bender.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 926-938. 16 fig, 1 tab, 7 ref. EPA 15020 GPG.

Descriptors: *Boating, *Water pollution effects, Recreation, Gasoline, Lead, Water pollution sources, *Florida, Lakes, *Pollutant identification.
Identifiers: *Motor boats, Outboard engines.

The first year report of a two-year study into the effect of outboard engine stress on natural, freshwater systems describes the investigative
proach, preliminary results, and research pr
tions for the subsequent year. Two lakes
Archer, Florida allowed simultaneous testin
both engines equipped with crankcase drai
systems and drainless engines. The nort
study, conducted near Saline, Michigan, used
engines of the drainless type and leaded ve
non-leaded gasoline. The discussion centers o
northern study, differentiated by the fact th
undergoes a rest period during ice cover, whil
southern investigation operates all year.
amount of outboard motor stress that a parti
body of water might be exposed to was
proached from the viewpoint of the numbe
boats that reasonably could be expected to oc
a given water surface area and investigation o
isting data on the effects of outboard emis
where stress levels are indicated for fish tai
reproductive success, and acute toxicity.
analysis showed only slight increases in the
and sediments; however, an apparent threefo
crease in lead concentration was noted in
material. The first year results substantiate
definite conclusions on the effects of outboar
gines on an aquatic ecosystem. (Auen-Wiscon
W75-10688

**AUTOMATED SEQUENTIAL COMPO
SAMPLING. A NEW TECHNIQUE FOR WA
POLLUTION STUDY AND CONTROL,**
N-Con Systems Co., Inc., Larchmont, N.Y.
M. I. Beach, and J. S. Beach.
In: Proceedings of the 27th Industrial Waste
ference, May 2-4, 1972, Purdue Unive
Lafayette, Indiana, Engineering Extension S
No 141, Part 2, p 1084-1088. 1 fig.

Descriptors: *Analytical techniques, *
identification, *Industrial wastes, Liquid w
Sampling, Automation, *Pollutant identific
Pollution abatement, Water pollution control.

The new type sampler described, combine
best features of grab and composite sampler
is a valuable technique for evaluating indu
wastes and storm flows because it provides
by-hour profiles of waste conditions which c
correlated with production schedules or sp
events. All 24 samples are available for sp
analysis if it is necessary. Simple or flow-p
tioned composites for any desired period c
made to suit the needs or goals of a water q
control program. Sequential composites
possible self-cancelling factors such as pH, a
and alkalinity, or color variations, as well
nificant factors which would be lost by dilu
a 24-hour composite or missed in a single
sample. Analysis of the individual sequentia
posites can aid in determining the effect of
of spills as well as establishing when they oc
and how long they lasted. Data acquired from
ysis can also be useful in determining whe
particular condition is the result of a sing
cident or continual small discharges. The se
tial composite is made up of a series of freq
collected samples composited and retained
dividual containers each of which repres
sub-period within the overall sampling p
(Auen-Wisconsin)
W75-10690

**TOXICITY OF THE LAMPRICID
TRIFLUOROMETHYL-4-NITROPHENOL
(TFM) TO THE NONTARGET FISH IN ST
TESTS,**
Bureau of Sport Fisheries and Wildlife, La
Wis. Fish Control Lab.
For primary bibliographic entry see Field 5C.
W75-10701

**TOXICITY OF THE LAMPRICID
TRIFLUOROMETHYL-4-NITROPHENOL**

) TO NONTARGET FISH IN FLOW-DUGH TESTS,
u of Sport Fisheries and Wildlife, LaCrosse, Fish Control Lab.
rimary bibliographic entry see Field 5C.
10702

CITY OF THE LAMPRICIDE 3-LUOROMETHYL-4-NITROPHENOL ) TO SELECTED AQUATIC INVER-ATES AND FROG LARVAE,
u of Sport Fisheries and Wildlife, Warm gs, Ga. Southeastern Fish Control Lab.
imary bibliographic entry see Field 5C.
0703

YEAR STUDY OF DES MOINES RIVER ER QUALITY,
State Univ., Ames. Engineering Research

imary bibliographic entry see Field 5B.
0803

MOTE SENSING LASER FLUOROMETER,
tment of the Environment, Ottawa io). Inland Waters Directorate.
D'Neil, A. R. Davis, H. G. Gross, and J.

and Unconventional Optics Journal, No 52, May, 1974. 26 fig, 7 ref.

ptors: *Lasers, *Remote sensing, ometry, Analytical techniques, Sampling, ills, *Pollutant identification, Instrumenta-reams, Chemical wastes, Monitoring, Oil on.
iers: Fluormeters.

ote sensing laser fluorometer has been con-d to observe organic and biological materi-water. By remote sensing, larger areas may erved than by point sampling techniques. orne fluorosensor, as developed by the De-nt of the Environment (Canada), was to be lely for detecting oil spills. It has now been to detecting chlorophyll, dye and other in-chemical wastes. Although the fluoromet-ice cannot make unambiguous identifica-oil types, the instrumentation has wide ap-n in monitoring naturally occurring waters iutants. When used in combination with gauging stations or automatic sampling remote sensing laser fluorometer could useful data on the temporal characteristics vater flowing past the sensor. Further uses making remote reflectance measurements, h it would be limited to a single ngth. (Prague-FIRL)
831

IVITY OF HUMAN DIPLOID EMB-C LUNG CELLS FROM ISOLATION OF VIRUSES FROM SEWAGE,
lygieny, Prague (Czechoslovakia).
nary bibliographic entry see Field 5C.
836

ANALYSIS OF RIVER WATERS IN VA (IX), CHEMICAL COMPOSITION OF A WATER BASIN, (IN JAPANESE),
nary bibliographic entry see Field 2K.
841

OXICITY OF HEAVY METAL IONS TO OBIC DIGESTION,
Pollution Research Lab., Stevenage d).
nary bibliographic entry see Field 5D.
843

**A GRAVITY-FLOW COLUMN TO PROVIDE PESTICIDE-LADEN WATER FOR AQUATIC BIOASSAYS,**
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
P. W. Borthwick, M. E. Tagatz, and J. Forester.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 6, p 183-187, February 1975. 1 fig, 3 tab, 5 ref.

Descriptors: *Pesticides, *Bioassay, *Laboratory tests, Technology, *Design, Chlorinated hydrocarbon pesticides, Methodology, Solvents, Carriers, Solubility, Pollutant identification.
Identifiers: *Mirex, *Gravity-flow column.

A column containing granular pesticide, bait, or inert material coated with pesticide achieves realistic concentrations of pesticides in bioassay water without using carrier solvents that may affect results. Mirex was introduced into flow-through aquatic bioassay systems without a solvent by means of a gravity-flow column containing mirex bait. Fluctuations in the mirex concentration within individual tanks were not significant. The system is being used in toxicity and uptake tests. (Katz)
W75-10844

**AN EVALUATION OF PERSISTENCY FOR WATER BORNE ORGANICS,**
Worcester Polytechnic Inst., Mass.
For primary bibliographic entry see Field 5B.
W75-10850

## 5B. Sources Of Pollution

**ORGANIC MATTER IN NATURAL WATER AND WATER TREATMENT,**
New Hampshire Univ., Durham. Dept. of Chemistry.
J. H. Weber.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 915, $3.25 in paper copy, $2.25 in microfiche. Presented at New Hampshire Water Works Association Meeting, September 5, 1974. 12 p, 1 fig, 1 tab, 2 ref. OWRR A-035-NH(1).

Descriptors: *Organic matter, *Chemical properties, *Water treatment, Chelation, Metals, Ions, Potable water, Color, Ozone, New Hampshire.
Identifiers: Alum, Activated charcoal, Oyster River(N.H.), Metal chelates.

An overview of rivers and lakes, including the origin and general nature of their dissolved and undissolved material is given. The origin of organic material is mainly decaying vegetative matter mixed with or on top of soil. Chelating agents and metal chelates, the nature of organic matter in water, and isolation of organic matter from water are considered. Effects due to the presence of chelating agents in natural water are: dissolving of precipitated metal ions; precipitation of normally dissolved metal ions. Chelated metal ions are not removed by precesses that remove metal ions. One of several reasons to remove organic matter before domestic water usage is aesthetic as people do not like to drink colored water, although the amount or organic matter that causes the yellow is not considered toxic. The organic matter forms metal chelates. Chelating agents might prevent the removal of very toxic matals like lead, mercury, and cadmium. Treatment for organic matter includes application of alum, filtering through activated charcoal, and utilization of ozone. The chemical nature of organic matter was determined by processing more than six tons of water to isolate 30 g of organic matter from the Oyster River, New Hampshire. (Jones-Wisconsin)
W75-10351

**CELLULOSE DEGRADATION IN WASTE WATER TREATMENT,**
Uppsala Univ. (Sweden). Inst. of Biochemistry.
For primary bibliographic entry see Field 5D.
W75-10376

**UTILIZATION OF A KRAFT EFFLUENT CHANNEL BY FISH AND AQUATIC ORGANISMS,**
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 5C.
W75-10377

**ORGANIC COMPOUNDS IN PULP MILL LAGOON DISCHARGE,**
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 5D.
W75-10402

**ENVIRONMENTAL LIMITATIONS ON THE MICROBIAL DEGRADATION OF HYDROCARBONS IN TEMPERATE LAKES,**
Wisconsin Univ., Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W75-10407

**ADSORPTION AND DEGRADATION OF CHLORBROMURON IN SOIL,**
Agricultural Research Service, Stoneville, Miss. South Weed Science Lab.
K. E. Savage.
Weed Science, Vol 21, No 5, p 416-420, 1973.

Descriptors: *Adsorption, Toxicity, *Water pollution sources, Soils, Chromatography, *Microbial degradation, Biodegradation, Cucumbers, Pollutant identification.
Identifiers: *Chlorbromuron, Cucumis-sativus, *Freundlich equation, Phytotooxicity.

The adsorption-desorption equilibria of chlorbromuron (3-(4-bromo-3-chlorophenyl)-1-methoxy-1-methylurea) in soil conformed to the Freundlich equation. Values of the constants, k and n, ranged 4.2-12.3 and 1.2-2.5, respectively, in 8 soils. No significant linear correlation was detected between the Freundlich k values and soil texture, organic-matter content, pH, or water-holding capacity. Degradation studies were conducted using 14C-carbonyl-radiolabeled chlorbromuron in soil incubated at 18 or 32C, with and without prior autoclaving, and with and without glucose enrichment. Degradation was enhanced by the higher temperature and glucose amendment, and it was retarded by autoclaving. Thin-layer chromatography indicated no accumulation of the monomethyl or monomethoxy derivative of chlorbromuron in any of the treatments. Chlorbromuron degraded rapidly in the incubation studies. Rapid loss of phytotoxicity was also noted in a greehouse study with cucumber (Cucumis sativus L. 'Explorer') bioassay. Phytotoxicity from 4 ppmw (micro-g/g dry plant weight) chlorbromuron had diminished to a very low level after 12 wk.--Copyright 1974, Biological Abstracts, Inc.
W75-10414

**EXPERIMENTAL INVESTIGATION ON THE BIOLOGICAL CONCENTRATION OF MERCURY-I. ON THE RATE OF MERCURY TRANSFER THROUGH THE FOOD CHAIN FROM JACK MACKEREL TO YOUNG YELLOWTAIL (IN JAPANESE),**
Aichi Prefecture Fisheries Experimental Station, Miya (Japan).
For primary bibliographic entry see Field 5C.
W75-10441

**RESIDUES OF POLYCHLORINATED BIPHENYLS (PCB) AND CHLORINATED PESTICIDES**

**IN FISH AND BIRDS OF THE PO DELTA, (RESIDUS DE POLYCHLOROBIPHENYLS (PCB) ET DE PESTICIDES CHLORES DANS LES POISSONS ET LES OISEAUX DU DELTA DU PO),**
Bologna Univ. (Italy). Istituto di Biochimica.
R. Viviani, G. Crisetig, P. Cortesi, and E. Carpene.
Revue Internationale D'Oceanographie Medicale, Vol 35-36, p 79-90, 1974. 1 fig, 2 tab, 22 ref.

Descriptors: *Polychlorinated biphenyls, *DDT, *Pesticide residues, *Fish, *Birds, *Dieldrin, *Path of pollutants, Pesticides, Absorption, Chlorinated hydrocarbon pesticides, Water pollution sources, Food webs, Gulls, Pollutant identification.
Identifiers: *Po River(Italy), Tissue analysis, Bioaccumulation.

Residues of lindane, dieldrin, DDT and its metabolites and PCB found in fish and birds captured in the Po delta during 1972 were reported. In fish, chlorinated pesticides and PCB were always less than 1 ppm in the muscle while the liver contained up to 4 ppm of DDT and its metabolites. Gobius paganellus contained 12 ppm of PCB. The sea-gull (Larus ridibundus) showed the highest levels of DDT and its metabolites (4 ppm in the muscle and liver) while the common tern had the highest level of PCB (7.9 ppm in the muscle and 8.6 in the liver). The levels of chlorinated hydrocarbons in the muscles of fish were lower than the tolerance limits for public health (5 ppm) established in the U.S. (Katz)
W75-10446

**THALLIUM: OCCURRENCE IN THE ENVIRONMENT AND TOXICITY TO FISH,**
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 5C.
W75-10449

**RESOURCE DEVELOPMENT IN CANADA'S HIGH ARCTIC,**
For primary bibliographic entry see Field 2C.
W75-10463

**OCEAN POLLUTANTS POSE POTENTIAL DANGER TO MAN,**
R. J. Seltzer.
Chemical and Engineering News, Vol 53, No 8, p 19-20, February 24, 1975.

Descriptors: *Water pollution effects, Oceans, *Waste disposal, Organic compounds, Model studies, Pollutants, Water pollution sources, *Path of pollutants.
Identifiers: *Hexachlorobenzene, Transuranic elements, Synthetic organic chemicals.

Studies are being conducted to assess materials and technologies and their potential impacts on ocean environments. Certain marine pollutants pose no threat at present levels, while others should be carefully monitored. While the oceans should play a useful role in waste disposal, their potential for diluting harmful effects is limited. A transport model to estimate the mass flow and ultimate fate of pollutants is being developed. Six groups of materials have been chosen for case studies: transuranic elements; synthetic organic chemicals; waste materials, sludges, and sediments dumped or discharged into the ocean; metallic wastes; medicinal wastes; and marine litter. The critical parameters were: rate of release into the environment; persistence in the environment; concentration factors for ocean compartments (such as estuaries or surface films) and bioaccumulation; and toxicity, both long and short range. Two materials of major concern are transuranic elements from nuclear weapons tests and hexachlorobenzene. The latter is the only synthetic organic chemical examined which seems to present a problem. Hexachlorobenzene is resistant to degradation, disperses easily through the food web, and has resulted in wildlife losses worldwide. Its sources are pesticides and wastes from factories manufacturing other chlorinated hydrocarbons. Doubts still remain about the impact of low-molecular weight halogenated hydrocarbons and tetracyclines and of aromatic hydrocarbons. (Prague-FIRL)
W75-10464

**USCG SETS BROADER USE OF POLLUTION CONTROL SYSTEMS,**
Coast Guard, Washington, D.C. Office of Marine Environment and Systems.
For primary bibliographic entry see Field 5G.
W75-10466

**INTERNATIONAL EXPLORATION LOCATES MINERALS AND OILS,**
National Science Foundation, Washington, D.C. Office for the International Decade of Ocean Exploration.
F. D. Jennings.
Sea Technology, Vol 16, No 1, p 29-30, January 1975.

Descriptors: Oceans, *Water pollution effects, Aquatic life, *Oil, Climates, Investigations, Metals, Surface waters, Exploration, Mineralogy, *Water pollution sources, Organic compounds.
Identifiers: *Minerals location.

Exploration by the Living Resources, Seabed Assessment, Environmental Forecasting, and Environmental Quality programs of the International Decade of Ocean Exploration has been conducted in the past two years, and further work is planned through 1977. Studies investigated the location of natural oil accumulations as well as areas of pollution and the effects of pollutants on marine organisms. The goal of these studies is the understanding of the role of the ocean in weather and climate and knowledge of circulation within the ocean. It was suggested that heavy metals, chlorinated hydrocarbons, and the water-soluble fractions of petroleum hydrocarbons be used to study pollution effects on aquatic life. Data now complete from the Geochemical Oceans Sections Study provide quantitative bases for knowledge of stirring and mixing processes of the sea and exchange of material between deep and surface waters. (Prague-FIRL)
W75-10467

**TAR POLLUTION OF SIERRA LEONE BEACHES,**
Fourah Bay Coll., Freetown (Sierra Leone). Inst. of Marine Biology and Oceanography.
W. Okera.
Nature, Vol 252, No 5485, p 682, December, 1974. 1 fig, 2 ref.

Descriptors: Oceans, *Plastics, Ships, Pollutants, Marine life, *Africa, *Water pollution sources, Water pollution effects.
Identifiers: *Sierre Leone, West Africa, Pelagic tar, Tankers, *Tar pollution.

Pelagic tar and plastic wastes have been found in parts of the Pacific and Atlantic oceans. Extensive and considerable fouling of the sandy beaches of Sierra Leone, West Africa, by tar lumps has been observed from June 1973 to July 1974. The extent of current pollution suggests that the whole Sierra Leone coastline, and perhaps those of flanking countries as well, may be subject to frequent tar pollution, proabably originating from the heavy, offshore traffc of tankers and ships. During ebb tide, at Lumley Beach, tar lumps and other debris are deposited on the sand in a series of crescent-shaped aggregations by the receding waves. The lumps are inhabited by a variety of marine organisms such as colonies of small goose barracles, and ghost crabs (Ocypode spp.). (Prague-FIRL)
W75-10472

**AVERAGE TRACE ELEMENT COMPOSITIO OF LOW LEVEL MARINE ATMOSPHERI PARTICULATES,**
Liverpool Univ. (England). Dept. of Oceano raphy.
R. Chester, and J. H. Stoner.
Nature, Vol 246, No 5429, p 138-139, Novemb 16, 1973. 1 tab, 7 ref.

Descriptors: *Metals, *Trace elements, *Ocear *Air pollution, Sampling, On-site data collectio Manganese, Nickel, Cobalt, Chromium, T Lead, Zinc, *Pollutant identification, *Path of p lutants.

Data on the average trace metal composition aeolian particulates from the lower atmosphere various major wind systems over the World Oce are presented. For the elements, Mn, Ni, Co, C Cr, V, Ba, and Sr, the enrichment factors we reasonably close to unity, i.e., these elements we not significantly enriched in average low le marine aeolian particulates. In contrast, the e ments Sn, Pb, and Zn were enriched in the aeol particulates, relative to average crustal materi by one order of magnitude, even when geograp cal variations are smoothed out by taking a wor wide average. It was concluded that Sn, Pb, a Zn are being released preferentially into marine mosphere (from sources which probably incl the activities of man) and are concentrating, re tive to average crustal material, in low le aeolian particulates. (Jernigan-Vanderbilt)
W75-10477

**CHARACTERIZATION OF CADMIUM U TAKE BY PLANT TISSUE,**
California Univ., Davis. Dept. of Agronomy Range Science.
J. M. Cutler, and D. W. Rains.
Plant Physiology, Vol 54, No 1, p 67-71, Ju 1974. 2 tab, 7 ref, 22 ref.

Descriptors: Grains, *Cadmium, *Adsorpti *Metabolism, Plant physiology, Zinc, Copp Mercury, Cytological studies.

The uptake of cadmium by excised root tissu barley was investigated with respect to kinet concentration and interactions with various tions. The role of metabolism in Cd absorption examined using a range of temperatures, ana bic treatment, and chemical inhibitors. The upt and distribution of Cd in intact barley plants also determined. A large fraction of the Cd ta up by excised barley roots was apparently result of exchange adsorption and was displa by subsequent desorption with unlabeled Cd, Cu or Hg. Another fraction of Cd which could be displaced by desorption in unlabeled Cd thought to result from strong irreversible bin of Cd, perhaps on sites of the cell wall. The f tion of the Cd taken up beyond that by exch adsorption by fresh roots was a linear functio temperature, and inhibited by conditions of oxygen and by the presence of 2, 4-dinitrophe It was concluded that this fraction of Cd ent excised barley roots by diffusion. Diffusion, v followed by sequestering, probably accounts the accumulation of Cd observed in intact ba plants. (Jernigan-Vanderbilt)
W75-10479

**ABSORPTION OF CADMIUM, COPPER ZINC BY DOG WHELKS IN THE BRIS CHANNEL,**
Bristol Univ. (England). School of Chemistry.
R. D. Stenner, and G. Nickless.
Nature, Vol 247, No 5438, p 198-199, Jan 1974. 2 tab, 5 ref.

Descriptors: *Absorption, *Cadmium, M animals, *Heavy metals, *Copper, *Zinc, O data collections, Analytical techniques, troscopy, *Pollutant identification, Channels.
Identifiers: Britol Channel, *Dog whelks.

dog whelks were collected. Ten specimens e analyzed for cadmium, copper and zinc, and rest were transported to a clearly identifiable uted area. The concentration of cadmium in dog whelks increased at an appreciably slower than that of zinc. At the end of the fourth th, the cadmium was significantly lower than in the native specimens, but it was increasing dily. By the end of the second month, the zinc centrations were statistically indistinguishable n those of native specimens. The copper con-rations remained considerably less than those e native specimens. (Jernigan-Vanderbilt)
-10481

**IC TRACE ELEMENTS: PREFERENTIAL NCENTRATION IN RESPIRABLE PARTI-S,**
ois Univ., Urbana. School of Chemical nces.
primary bibliographic entry see Field 5A.
-10482

**ISTRIBUTION AND CONCENTRATION OF RCURY IN THE ENVIRONMENT,**
consin Univ., Madison.
Gerner.
ng Engineering, Vol 25, No 6, p 52-53, June, , 7 ref.

criptors: *Mercury, *Human pathology, tribution, Organic compounds, Inorganic pounds, Public health, Poisons, Hazards, h of pollutants, Water pollution sources.

ief overview of mercury in the environment its toxic effects was given. The redistribution his trace element by man and ways of con-ng it are discussed. The concentration of the ent in its organic and inorganic forms was ussed, and it was suggested that the best way eal with the problem of mercury in the en-ment is to apply the techniques of preventive cine. (Jernigan-Vanderbilt)
-10483

**ENATE UPTAKE AND REDUCTION BY ILLOPORA VERRUCOSA,**
le Island Univ., Kingston. Graduate School of nography.
primary bibliographic entry see Field 5C.
-10491

**ERSION OF CONTAMINATED BEDLOAD TICLES,**
rado State Univ., Fort Collins. Dept. of Civil neering.
Shen, and H. F. Cheong.
Proceedings Symposium on Statistical ology, Arizona University, Tucson, August ptember 2, 1971. Miscellaneous Publication 275, p 323-335, June 1974. 12 fig, 2 tab, 6 ref. T B-014-COLO(4) NSF GK 11499, OWRT -001-1435.

criptors: *Bed load, *Dispersion, *Sediment port, *Model studies, Bottom sediments, ments, Stochastic processes, *Path of pollu-, Streamflow, Channels, Mathematical ls, Mathematical studies, Movement, Pollu-, Hydrology.

nalysis based on the concentration distribu-function described the dispersion of con-ated particles released simultaneously from a e in the bed of a stream with steady, uniform Lagrangian probabilistic model, in which the ment of each particle is described as an al-e sequence of steps and rest periods was It was shown that the concentration distribu-was initially highly skewed and became essively symmetrical with time so that it be approximated by a Gaussian curve. The udinal location of the peak of the distribution function advanced slightly faster than the movement of the mass center of the distribution curve, so that after a sufficiently long time the peak approached the mass center. Also presented was a simplified procedure for deriving an excellent approximation to the envelope of the family of distribution curves parameterized by time, even when the shape factor r takes on nonintegral values. This yielded curve that is always uniformly lower than the envelope with the deviation between the two curves diminishing with time. For a dimensionless time scale greater than five, the error incurred was 5% and less, depending upon the value of r. (See also W75-10507) (Sims-ISWS)
W75-10526

**A NOTE ON MIXED DISTRIBUTIONS IN HYDROLOGY,**
State Univ. of New York, Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 2E.
W75-10527

**MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF PEATS,**
Guelph Univ. (Ontario). Dept. of Botany and Genetics.
For primary bibliographic entry see Field 7B.
W75-10536

**PREDICTION OF TRIFLURALIN DIFFUSION COEFFICIENTS,**
Agricultural Research Service, Stoneville, Miss. South Weed Science Lab.
L. E. Bode, C. L. Day, M. R. Gebhardt, and C. E. Goering.
Weed Science, Vol 21, No 5, p 485-489, 1973, Illus.

Descriptors: *Diffusion, *Herbicides, Forecasting, Mathematical models, *Soil moisture, Temperature, Soils, Soil temperature, *Path of pollutants, Water pollution sources.
Identifiers: *Trifluralin diffusion coefficients.

In the range of 4.4-49C, there is an exponential relationship between temperature and trifluralin (a,a,a-trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine) diffusion coefficients. Diffusion is low in airdry soil for all temperatures. It increases to a maximum value when the soil has 8-15% w/w (weight in weight) soil moisture content and then decreases steadily as moisture content increases. When the air-filled fraction of soil void space is reduced below approximately 40% v/v (volume in volume) by either compression or addition of moisture, diffusion begins to decrease. An equation was developed to predict trifluralin diffusion coefficients from a factorial experiment with 7 soil moisture contents, 5 soil temperatures and 2 bulk densities. Diffusion coefficients ranged 3.8 x 10 to the minus 11th power sq cm/sec-2.8 x 10 to the minus 6th power sq cm/sec. Fifteen terms were required in the prediction model to describe accurately the response surface of trifluralin diffusion coefficients. When the equation it was possible to predict trifluralin diffusion coefficients for any combination of measured soil parameters as long as they were represented by the range of the variables used in the experiment.--Copyright 1974, Biological Abstracts, Inc.
W75-10542

**EVALUATION OF GROUND WATER RESOURCES: SACRAMENTO COUNTY,**
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2F.
W75-10546

**THE DRIFT OF MAYFLIES (EPHEMEROPTERA) IN THE BRAZOS RIVER, TEXAS,**
Fish and Wildlife Service, Fort Worth, Tex. Div. of River Basin Studies.
T. J. Cloud, Jr., and K. W. Stewart.
J Kans Entomol Soc. Vol 47, No 3, p 379-396, 1974, Illus.

Descriptors: *Texas, *Mayflies, Aquatic insects, Invertebrates, Aquatic drift, Rivers, Bioindicators, Path of pollutants.
Identifiers: Baetis-sp, *Brazos River(Tex), Heptagenia-sp, Isonychia-sicca-manca, Neochoroterpes-mexicanus, Tricorythodes-sp.

An investigation into the drift-ecology of the mayfly populations of the Brazos River, a Southwestern USA river, was conducted from April, 1972-Feb., 1973. Bi-monthly drift samples were used to delineate the nocturnal periodicities and seasonal fluctuations of 6 spp. (Neochoroterpes mexicanus, Tricorythodes sp., Baetis sp., Caenis sp., Heptagenia sp. and Isonychia sicca manca), 3 of which are new and as yet undescribed. Highest levels of behavioral drift, expressed in drift density units, occurred during the night of the summer sample dates. The drift of exuviae seems to be an accurate indicator of mayfly emergence in the Brazos River.--Copyright 1974, Biological Abstracts, Inc.
W75-10558

**PHOSPHORUS IN PERCOLATES FROM MANURED LYSIMETERS,**
Guelph Univ. (Ontario). Dept. of Land Resource Science.
D. G. Bielby, D. A. Tel, and L. R. Webber.
Canadian Journal of Soil Science, Vol 53, No 3, p 343-346, 1973.

Descriptors: *Corn(Field), *Farm wastes, *Phosphorus, *Lysimeters, Percolation, Poultry, Water pollution sources.

The quantities and concentrations of soluble P in the percolates from lysimeters with applications of liquid poultry manure over a 3-yr period are reported. Three corn plants were grown on each lysimeter, and the group of lysimeters was surrounded by corn plants to avoid an oasis effect. Aliquots of the percolates were obtained when the accumulated volume was equivalent to or greater than a 1-cm depth over the surface area of a lysimeter. The amount of P in the percolates during the periods prior to planting and during the growing season was very low, trace-0.003 g/lysimeter. The largest amount of P, 0.003 g, was found in the percolates from nonmanured lysimeters prior to the planting period. This loss would be equivalent to 0.05 kg/ha. In all treatments, the addition of water after harvest removed more P than from the nonirrigated lysimeters. The water was added in small amounts several times/wk. A pulse-type of input contributed to a greater movement of P than a continuous input. Over the 3-yr period, the P added in the 4 treatments was equivalent to 50, 408, 1240 and 1590 kg/ha. During the 3 yr the percolates contained the equivalent of 0.35, 0.65, 0.38 and 0.35 kg of P/ha for the 4 treatments, respectively; and the corresponding concentrations of P in the percolates were 0.029, 0.057, 0.033 and 0.034 mg/l. Applied P tends to remain immobile in a soil. Attenuation of the P would occur as the water moved through the subsoil.--Copyright 1974, Biological Abstracts, Inc.
W75-10573

**THE LOXAHATCHEE - A RIVER IN DISTRESS, SOUTHEAST FLORIDA,**
Geological Survey, Miami, Fla.
For primary bibliographic entry see Field 4C.
W75-10588

**A RIVER-QUALITY ASSESSMENT OF THE UPPER WHITE RIVER, INDIANA,**
Geological Survey, Indianapolis, Ind.
W. J. Shampine.
Available from NTIS, Springfield, Va 22161 as PB-243 739, $4.75 printed copy, $2.25 in

microfiche. Water-Resources Investigations 10-75, 1975. 68 p, 28 fig, 12 tab, 28 ref.

Descriptors: *Water quality, *River basins, *Indiana, *Chemical analysis, *Water pollution sources, Nutrients, Pesticide residues, Biological communities, Municipal wastes, Industrial wastes, Reservoirs, Thermal stratification, Bottom sediments, Land use, Sewage effluents, Path of pollutants.
Identifiers: *Upper White River(Ind).

The White River in Indiana can be subdivided into five distinct river-quality sections. Section 1, above Winchester, drains a rural area and is affected by agricultural land use, although the river quality generally is good. Section 2, between Winchester and Muncie, is affected by urbanization at Winchester and Muncie. The river quality generally is good, although stretches near the cities occasionally have problems. Section 3, Muncie to Anderson, is polluted by urban effluent. Section 4, Anderson to Indianapolis, is further polluted (particularly at Anderson), but the river tends to recover considerably at Indianapolis, and becomes relatively clean. Section 5, below Indianapolis, is polluted. In October 1972 the nitrogen load increased from 5.45 tons per day above Indianapolis to 18.43 tons per day below the city. Ten micrograms per kilogram of DDD, 20 of chlordane, and 20 of polychlorinated biphenyls were extracted from sediments in the White River below Indianapolis. The median coliform bacteria count below Indianapolis is 360,000 colonies per 100 millilitres of water. The only benthic invertebrates found in the White River below Indianapolis are pollution-tolerant species, and very few fish are found. Conditions are similar, but to a somewhat lesser degree, below Muncie. (Woodard-USGS)
W75-10600

**PROBLEMS RELATED TO WATER QUALITY AND ALGAL CONTROL IN LOPEZ RESERVOIR, SAN LUIS OBISPO COUNTY, CALIFORNIA,**
Geological Survey, Menlo Park, Calif.
R. H. Fuller, R. C. Averett, and W. G. Hines.
Available from NTIS, Springfield, Va 22161 as PB-243 466, $4.25 printed copy, $2.25 in microfiche. Water-Resources Investigations 47-74, February 1975. 46 p, 18 fig, 6 tab, 34 ref.

Descriptors: *Water pollution sources, *Algae, *Algal control, *Reservoirs, *California, Water quality, Hydrologic data, Rainfall, Streamflow, Sediment transport, Water yield, Sediment yield, Dissolved oxygen, Water temperature, Limnology, Nuisance algae, Chemical analysis, Diatoms, Nutrients, Copper sulfate, Water quality control.
Identifiers: *Lopez Reservoir(Calif).

Lopez Reservoir in San Luis Obispo, Calif., is a multipurpose impoundment that was filled during a 30-weed period following a series of intense storms during the winter 1968-69. The reservoir is used for flood control, water supply, and recreation. At full pool Lopez Reservoir has a surface area of 974 acres, a maximum depth of 145 feet, and a shoreline of 22 miles. Nuisance algal blooms have been a frequent occurrence in the reservoir since the first summer after filling (1969). Dominant bloom species include the blue-green alga Anabaena unispora, the diatoms Stephanodiscus astraea and Cyclotella operculata, and the green algae Pediastrum duplex and Sphaerocystis schroeteri. During a bloom of A. unispora in May 1972, the total cell count at the lake surface was almost 100,000 cells per millilitre of water. Lopez Reservoir is thermally stratified from April until November. Dissolved-oxygen stratification closely parallels the thermal stratification. Anoxic conditions begin to develop in mid-May, and by early July all water below a depth of 40 feet is oxygen deficient. The application of copper sulfate to reduce algal production has met with little success. Possible application rates and methods of determining application rates based upon water chemistry are presented. (Woodard-USGS)
W75-10601

**COPPER, ZINC AND TOTAL PROTEIN LEVELS IN THE PLASMA OF SOCKEYE SALMON (ONCORHYNCHUS NERKA) DURING THEIR SPAWNING MIGRATION,**
Memorial Univ. of Newfoundland, St. Johns. Marine Sciences Research Lab.
For primary bibliographic entry see Field 5C.
W75-10613

**ON THE ACCUMULATION OF ORGANOCHLORINE PESTICIDES, PCB AND CERTAIN HEAVY METALS IN FISH AND SHELLFISH FROM THAI COASTAL AND INLAND WATERS,**
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Isotopenlaboratorium.
E. Huschenbeth, and U. Harms.
Archiv fur Fisherei Wissenschaft, Vol 26, No 3, p 109-122, April 1975. 1 fig, 10 tab, 13 ref.

Descriptors: Fish, Molluscs, Crustaceans, DDT, DDE, Dieldrin, *Organic pesticides, Copper, Zinc, Cadmium, Lead, Mercury, *Heavy metals, *Bioassay, Environmental effects, Laboratory tests, Sampling, Water pollution sources, *Polychlorinated biphyenls, Pollutant identification.
Identifiers: TDE, Lindane, Bioaccumulation, Tissue analysis, *Thailand(Gulf of Siam), Species.

819 samples of 27 genera of fish, 4 genera of crustaceans, and 3 genera of molluscs were collected from the Thai coast and inland areas and analysed for DDT, TDE, DDE. Lindane, Dieldrin, PCB, copper, zinc, cadmium, lead and mercury content. The study suggested that no need immediately existed for the development of expensive monitoring programs as pesticides, PCB and heavy metals concentrations in Thai fish were comparable to North Atlantic and North Sea fish. (Katz)
W75-10616

**ADDITIONAL STUDIES OF THE FISHES, MACROINVERTEBRATES AND HYDROLOGICAL CONDITIONS OF UPLAND CANALS IN TAMPA BAY, FLORIDA,**
National Marine Fisheries Service, St. Petersburg, Fla. Southeast Region.
For primary bibliographic entry see Field 5C.
W75-10617

**THE CONCENTRATION OF MERCURY, COPPER, NICKEL, SILVER, CADMIUM AND LEAD IN THE NORTHERN ADRIATIC ANCHOVY, ENGRAULIS ENCRASICHOLUS, AND SARDINE, SARDINA PILCHARDUS,**
Australian Inst. of Marine Sciences, Townsville.
M. Gilmartin, and N. Revelante.
Fishery Bulletin, Vol 73, No 1, p 193-201, January 1975. 10 tab, 32 ref.

Descriptors: Metals, *Heavy metals, *Mercury, *Copper, *Nickel, *Silver, *Cadmium, *Lead, Marine fish, *Fish physiology, *Bioassay, Laboratory tests, Path of pollutants, Water pollution sources, Sampling, Water pollution effects.
Identifiers: *Anchovy, *Sardine, Engraulis encrasicholus, Sardina pilchardus, Bioaccumulation, Tissue analysis, *Adriatic Sea.

Levels of mercury, copper, nickel, silver, cadmium and lead were determined in various tissues of the northern Adriatic anchovy, Engraulis encrasicholus, and sardine, Sardina pilchardus throughout a seven month fishing season. The highest concentrations of nickel, silver, cadmium and lead occurred in the skin and gills, with little interspecific differences and no unusually high values. The highest concentrations of mercury and copper occurred in internal tissues, with anchovy showing markedly higher concentrat than the sardine. Total mercury concentratson anchovy muscle ranged from 70 to 215 nanogr per gram wet weight, concentrations 2-4 ti greater than in the same or similar anchovy spe off northwestern Africa, southeastern Un States, and California. (Katz)
W75-10620

**ABSORPTION, METABOLISM, AND EXC TION BY GOLDFISH OF THE ANIONIC TERGENT SODIUM LAURYL SULPHATE,**
Unilever Ltd., Sharnbrook (England). Unile Research Lab.
For primary bibliographic entry see Field 5C.
W75-10626

**UPTAKE, ELIMINATION AND BIOTRANSF MATION OF THE LAMPRICIDE 3-TRIF ROMETHYL-4-NITROPHENOL (TFM) BY L VAE OF THE AQUATIC MI CHIRONOMUS TENTANS,**
Viterbo Coll., La Crosse, Wis. Dept. of Biolog
For primary bibliographic entry see Field 5C.
W75-10629

**A THEORY OF THE MASS TRANSPORT PREVIOUSLY DISTRIBUTED CHEMICALS A WATER-SATURATED SORBING POR MEDIUM: 4. DISTRIBUTIONS,**
Oregon State Univ., Corvallis.
F. T. Lindstrom, and L. Boersma.
Soil Science, Vol 119, No 6, p 411-420, June 1 1 fig, 4 tab, 12 ref, append. NIEHS Grant ES 40.

Descriptors: *Mass transfer, *Chemicals, *Po media, *Boundary processes, Inflow, Sorp Dispersion, *Distribution, Numerical anal Leaching, Saturated flow, Velocity, Equat Convection.
Identifiers: Sorbed phase, Free phase, P system.

A quantitative analysis of a mass transfer pro of chemicals in porous media was presented specific problem considered was that where t flow boundary has an initial zero concentrati receives an inflow of chemical concentrati sub O for a period of finite duration T sub 1, which the inflow continues with water of chemical concentration. Free and sorbed chemical concentration distribution equa were first obtained for dispersion during the period O less that t less than or equal to T during which the chemical enters the soil. solutions were presented in the form of single volution integral expressions obtained by La transform techniques. This resulting distrib became the initial concentration distributio the subsequent leaching process during the period T sub 1 less than t less than or equal to 2. Equations were developed which describ free and sorbed phase chemical distribu resulting from the leaching process. Solutio both sets of equations were obtained by num quadrature techniques. A typical example w played. The scheme that was presented is adaptable to a repeating or 'pulsed' sy Periodic application of a fertilizer, followed rigation, is an example of such a system. (Se W73-07668 and W72-03459) (Visocky-ISWS)
W75-10632

**OIL IN THE SEA.**
The Dock and Harbour Authority, Vol 55, N p 323, January, 1975.

Descriptors: *Oil pollution, *Oceans, Urb noff, Oil industry, Water pollution sources, pollution effects, Microorganisms, Biode tion, Organic compounds, *Oil.
Identifiers: Petroleum hydrocarbons.

e United States National Research Council has epared a report on petroleum hydrocarbons en- ing the world's oceans. Of six million tons of se hydrocarbons that enter the world's oceans year, about 35% come from transportation ac- ties, including tanker bilges, drydocks, ter- nals operations, and accidents; 31% from river l urban runoff; 13% from coastal refineries and nicipal and industrial wastes; 10% from at- spheric fallout; 10% from natural seepage; and % from offshore oil operations. One year's ut of oil is thought to exist on the open sea as ating specks and lumps. Tar masses have ap- red in formerly unpolluted areas worldwide, ginating primarily from tanker washings and e discharges. Reliable information on the rates iodegradation of oil by microorganisms in the ans was not available. (Prague-FIRL)
5-10640

EDICTING THE CONCENTRATION OF UATIC HERBICIDE RESIDUES IN WATER- YS,
mmonwealth Scientific and Industrial Research anization, Griffith (Australia). Div. of Irriga- Research.
M. O'Loughlin.
drology Symposium, Armidale, Australia, 5. The Institution of Engineers Australia, prints of Papers, p 56-60, May 1975. 6 fig, 7 ref.

criptors: *Herbicides, *Irrigation canals, ter pollution, *Aquatic weed control, Irriga- water, , Diffusion, Dispersion, Model studies, istence, Pesticide toxicity, Pesticide residues, ecasting.
tifiers: *Acrolein.

tact herbicides are commonly used for con- ing aquatic weed growth in irrigation channel ems. One of the most effective, acrolein, is c to aquatic life, and care is needed to avoid esirable effects outside the target area. hods are given for predicting the attenuation he peak herbicide concentration and the total experienced by weeds or other life in the nel. Simple one-dimensional expressions pro- conservation estimates for maximum concen- on and dose. Three-dimensional effects are ortant only very close to the point of herbicide tion. (CSIRO)
-10648

CE ELEMENTS IN MELBOURNE RIVERS - NTERLABORATORY ANALYSIS,
erials Research Labs., Melbourne (Australia).
primary bibliographic entry see Field 5A.
-10649

LUATION OF DISPOSAL AREAS IN ES RIVER; HYDRAULIC MODEL IN- TIGATION,
y Engineer Waterways Experiment Station, sburg, Miss.
primary bibliographic entry see Field 8B.
-10669

ER POLLUTION PROBLEMS AS- IATED WITH CONTROL OF STACK GAS SSION,
onal Lime Association, Washington, D.C.
Lewis.
roceedings of the 27th Industrial Waste Con- ce, May 2-4, 1972, Purdue University, yette, Indiana, Engineering Extension Series 41, Part 2, p 1089-1092. 1 tab.

riptors: *Waste pollution sources, *Air pollu- *Cleaning, *Gases, Metallurgy, Powerplants, Sulfur compounds, Fly ash, *Path of pollu- Waste disposal, Economics, Carbon diox-

ifiers: *Wet scrubbers, *Stack gas emissions, culate matter.

The water pollution potential resulting from the clean up of stack emission gases and particularly the clean up of gases from metallurgical smelters and coal burning powerplants is discussed. While pollutants in the gas of coal burning powerplants and metallurgical smelters are generally referred to as particulate matter, oxides of nitrogen, sulfur dioxide, and carbon dioxide, they may also contain many elements which volatilize in one form or another and terminate in the aqueous scrubbing medium. Few of the many technologies advanced from the treatment of gases from these particular sources have been attempted commercially; some are operating successfully due mainly to local circumstances where economics or end uses are favorable. Few, if any, treatment technologies have adequately described or provided means for the prevention of water pollution from the clean up of these gases. A possible solution is that a water treatment facility be designed into every stack gas clean up system using an aqueous medium for scrubbing which would include sludge dewatering for permanent storage or use in construction materials. An environmental clean up program based on economic efficiency cannot generate a dollar profit in today's societal structure. Emission and effluent standards may have to be revised to meet an economically acceptable solution. (Auen-Wisconsin)
W75-10691

**DETERIORATION OF WATER QUALITY IN DISTRIBUTION SYSTEMS,**
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W75-10711

**OIL REUSE--A NATIONAL NEED,**
Environmental Quality Systems, Inc., Rockville, Md.
For primary bibliographic entry see Field 5D.
W75-10740

**THE SOURCE AND SUPPLY OF VIRGIN LUBES,**
Sun Oil Co., Philadelphia, Pa.
D. W. Twomey.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 9-16, 1974. 6 fig.

Descriptors: *Oil, *Oil wastes, *Oil industry, Waste disposal, Oil pollution, Industrial wastes, Recycling.
Identifiers: *Lube oils, Re-refining.

Manufacturing lube oils is expensive in both capital and operational cost; relatively few barrels of crude oil within a refinery system are made into lube--only 3-6% in a fully integrated refinery. The supply of lubes is not easily or inexpensively increased by additions to existing plants while the demand for lubes has grown rapidly during a period of declining capacity. Two solutions are offered for meeting national objectives of an adequate supply for the domestic market and maintaining foreign markets for profit and trade balance: the addition of domestic capacity to produce additional lubes; and, the conservation of lubes. A large percentage of lubes can be recovered. These include railroad engine lubes, transformer oil, industrial hydraulic oil, circulating oil for lubrication, industrial gear oil, emulsifiable cutting oils, and gas absorption oil. These oils can be economically recovered for secondary use because they exist in large quantities in relatively few locations and the large volume has already created a disposal problem. The pressures of supply, cost and proper disposal should work together to make reconditioning or re-refining a large and valuable business. (See also W75-10739) (Orr-FIRL)
W75-10741

**WASTE OIL MANAGEMENT--THE ENVIRONMENTAL PROTECTION AGENCY'S ROLE,**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10742

**DISPOSAL OF USED CRANKCASE AND OTHER OILS IN CANADA,**
Department of the Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 5D.
W75-10743

**WASTE OIL IN MARYLAND: A POLLUTANT OR A RESOURCE,**
Maryland Environmental Service, Annapolis.
M. T. Long.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 43-54, 1974. 2 ref.

Descriptors: *Oil, *Oil wastes, *Waste disposal, *Oil industry, Water pollution sources, Industrial wastes, Fuels, Maryland, Industrial wastes.

A study was performed by the Maryland Environmental Service and the EPA to determine the amounts and characteristics of waste oils in Maryland and to design a program for the collection, transportation, processing and use of these oils. The design constraints were that all of the waste oils generated in the State be accepted, that the majority of the waste oils be converted into fuel, that present technology be used and that environmental protection be strongly considered. An estimated 18.5 million gallons of waste oil were generated in Maryland in 1972. Maryland has the technology to feasibly collect all of the waste oils produced in the state, to process these oils into fuel oils and to dispose of non-processable oils and residues in an environmentally acceptable way. Such a waste oil recovery and reuse program is outlined. Mathematical modeling of collection and transportation systems, preliminary plant design, market analysis and the constraints imposed, indicate that the program can be self-supporting at volumes greater than 30 mgy. The proposed program would have several advantages including alleviation of fuel oil shortages during the winter months, reduction of environmental damage to the water, land, and air resources of Maryland, reduction of high volumes of waste oil spills and the attendant cost of clean-up, prevention of waste of a resource, and reduction of maintenance cost in sewers and municipal treatment plants. (See also W75-10739) (Orr-FIRL)
W75-10744

**WASTE OIL: THE RECAPTURE OF AN ENERGY RESOURCE (THE GENERATION, DISPOSAL AND RECOVERY OF WASTE OIL IN THE NEW YORK METROPOLITAN AREA),**
Council on the Environment of New York City.
For primary bibliographic entry see Field 5D.
W75-10745

**WASTE LUBRICATING OIL CHARACTERISTICS--DO THEY VARY GEOGRAPHICALLY, SEASONALLY, AND WITH ORIGIN,**
American Petroleum Inst., New York. Task Force on Utilization of Waste Lubricating Oils.
R. C. Carter.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 73-90, 1974. 14 tab.

Descriptors: *Oil, *Oil wastes, *Waste disposal, *Oil industry, Industrial wastes, Water pollution sources, Laboratory tests.
Identifiers: Lubricating oils.

The American Petroleum Institute is studying the characteristics of waste lubricating oils as the first phase of a project to determine how to make economic use of these used oils. The raw analytical data from samples representing winter driving conditions from thirteen representative locations throughout the continental U.S. are presented. The second phase of the project will involve burning tests to demonstrate the feasibility of burning small ratios of waste fuel oil blends without significant impacts on the environment. The continental U.S. was divided into five geographical areas--Pacific Coast, Rocky Mountain, Plains States, East Coast, and Mid-West Rural--then from each of the first four of these zones three cities or city areas were selected to have samples taken from it. Water content, flash point, ASTM distillation to 450 F, sulfated residue, aluminum, barium, calcium, copper, iron, lead, magnesium, phosphorus, sodium, zinc, total bromine, and total chlorine, and sulfur contents were determined on the hydrocarbon layer. (See also W75-10739) (Orr-FIRL)
W75-10746

**OILY BILGE FROM COMMERCIAL VESSELS,**
Environmental Quality Systems, Inc., Rockville, Md.
R. Waller.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 185-199, 1974. 4 tab.

Descriptors: *Oily water, *Ships, *Water pollution sources, *Oil pollution, Pollutant identification, Fuels, Oil wastes, Recycling, Port authorities, Minnesota.
Identifiers: *Bilge water, Re-refining industry, Duluth(Minn).

A grant has been provided to the Seaway Port Authority of Duluth (Minn) to characterize the sewage, bilge, ballast, dunnage and garbage from the various vessels that enter Duluth Harbor. The major marine waste categories include: sanitary sewage; other sewage; garbage/refuse; dunnage; ballast water; cargo loss; tank washing; and, spilled cargo. Over sixty samples of sanitary sewage, bilge, ballast, garbage and dunnage were taken from commercial vessels entering Duluth Harbor. The oil content and total volume of bilge waters varies considerably between vessels. Diesel-driven vessels appear to generate a bilge water that can be quite high in oil content although the volume of bilge water generated is less than that from steam-driven vessels. The bulk of the data presented is for vessels with no onboard oily waste control system. Waste oil re-refiners expecting to handle bilge water must be prepared to accept a highly variable feedstock. (See also W75-10739) (Orr-FIRL)
W75-10752

**SHIPYARD PROBLEMS WITH OILY WASTES,**
A. C. K. Clark.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 201-205, 1974.

Descriptors: *Ships, *Oil wastes, *Oily water, *Waste disposal, Recycling, Water pollution sources, Facilities, Waste treatment, Port authorities.
Identifiers: *Shipyards, Re-refining.

The receiving and disposing of oily wastes from ships by shipyards has been an opportunity for economically alert shipyards. The shipyards could profit doubly by this -- charging ships a fee for offloading their oily wastes and then saving on the cost of purchasing fuel by separating and then burning the oil from the ships. Receiving slop barges were towed out to ships at anchorage or at piers, to be loaded with slop oil and towed ashore for disposal of the wastes. Powered barges with centrifuges received many thousands of gallons of oil wastes, pumping the centrifuged water back into the harbor. Shipyard settling tanks separated the remaining oil and water; the residual water was pumped into the harbor. However, current regulations place limitations on the amount of oily water released to a harbor and on the amount of harmful emissions from the burning of fuels. The regulations provide that no oil or oily water may be dumped into the harbor that would create sheen on the surface. Equipment to reduce the amount of residual oil in oily wastes to such low levels is not currently available therefore, alternate methods of slop disposal must be found. The quantities of wastes received by shipyards may seem small to the oil re-refining industry, but they are large problems for shipyards that do not have suitable disposal facilities. Such facilities are economically non-viable for individual shipyards to build and therefore should come under the control of port authorities. (See also W75-10739) (Orr-FIRL)
W75-10753

**CHARACTERISTICS OF OIL POLLUTION IN AND AROUND U.S. WATERS,**
Coast Guard, Washington, D.C.
P. W. Van Voorhis.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 207-224, 1974. 6 fig, 5 tab, 8 ref.

Descriptors: *Oil pollution, *Coast Guard regulations, Pollutant identification, *Oily water, *Oil wastes, Water pollution, Oil-water interfaces, Oil spills, Water pollution sources, Federal Water Pollution Control Act.
Identifiers: Chemical Hazard Response Information System(CHRIS), 1972 Federal Water Pollution Control Act Admendments.

One of the effects of the 1972 amendments to the Federal Water Pollution Control Act was to extend and strengthen the U.S. Coast Guard's regulatory authority for the control of oil and hazardous substances discharged into U.S. coastal waters. The oil pollution problem in the U.S. today, and the Coast Guard's growing program to combat it are discussed. The main emphasis is on the oil discharges which have occurred in or upon U.S. waters between 1970 and 1972, concentrating on frequency, volume, causes and characteristics, as well as the problems and expense associated with removal. The Coast Guard has been developing a pollution response program which involves field personnel organized to effectively respond to a pollution incident, district and Headquarters coordinating and administrative elements, and equipment to be utilized by field personnel in containment and removal activities. The Chemical Hazard Response Information System (CHRIS) was developed and placed in operation during the spring of 1974. CHRIS provides field personnel with the necessary information to make an effective response to discharges of hazardous polluting substances. The Coast Guard's research and development program has been working toward the development of equipment to be utilized in offshore and fast current oil discharges. Research has also been aimed toward reducing the quantity of oil released, controlling the spread of released oil, and removing oil from water. (See also W75-10739) (Orr-FIRL)
W75-10754

**QUALITY PRODUCTS FROM USED PETROLEUM OILS,**
For primary bibliographic entry see Field 5D.
W75-10756

**RUNOFF OF OILS FROM RURAL ROADS TREATED TO SUPPRESS DUST,**
Edison Water Quality Research Lab., N.J.
F. J. Freestone.
In: Proceedings of the International Confere
on Waste Oil Recovery and Reuse, February
14, 1974, Washington, D.C., Information Trans
Incorporated, Washington, D.C., p 375-393, 1
6 fig, 7 tab, 3 ref.

Descriptors: *Oil, *Rural areas, Metals, Lead,
noff, Roads, *Oil pollution, Oil wastes, *Path
pollutants.
Identifiers: Oil runoff, Lead pollution, Dust
pressants.

Waste crankcase oils applied to rural roads in
United States for the purpose of dust control c
tain about one percent by weight of lead c
pounds. In Hunterdon County, New Jersey, wh
roads are oiled twice yearly, two rural roads w
examined to determine whether or not oil lea
the roads. Of the oil applied, it was estimated
about one percent remains in the top inch of r
surface material and that oil penetration below
top inch is minimal. Oil may leave the road du
wet weather by flotation from wet road surf
material; lead also leaves the road surface with
noff. A considerable amount of lead--about
mg/kg--may be associated with dust particles
the road and may be carried by winds to c
taminate crops and fields adjacent to the road
is not possible to quantify the amount of oil run
However, the ecological consequences of ru
oil and its accompanying heavy metals such
lead need to be studied further. (See also W
10739) (Prague-FIRL)
W75-10766

**SEEPAGE FROM RECHARGE AND LANDF
DITCHES,**
California Univ., Berkeley. Dept. of Geolo
Engineering.
P. A. Witherspoon, and T. N. Narasimhan.
In: Agricultural and Urban Considerations i
rigation and Drainage; Selected Papers from
Irrigation and Drainage Division Specialty C
ference, Fort Collins, Colorado, April 22-24, 1
American Society of Civil Engineers, New Y
p 39-66, 1974. 12 fig, 2 tab, 6 ref, 2 append. A
Contract DACW05-71-C-0114.

Descriptors: *Path of pollutants, *Groundw
recharge, *Landfills, *Model studies, *Seep
Recharge, Groundwater, Groundwater movem
Water pollution, Water pollution control, Ma
matical models, Leaching, Subsurface drain
Groundwater potential, Flow, Permeability,
water movement, Pit recharge, Induced inf
tion.

An investigation was made of steady-flow re
gular recharge pits into two dimensional flo
gions using a numerical method of analysis. I
case of single layer systems, the effects o
dimensions of the flow region, pit size, hydr
gradient and anisotropy on total flow rates
the pit were investigated. In addition, the poss
ty of reducing pit leakage by means of a
permeability lining in the recharge pit wa
vestigated. For the particular two-dimens
systems studied, it was found that the overall
rate increases with increasing hydraulic grad
but in a slightly non-linear manner. By varyin
width and depth of the recharge pit it was pos
to determine that optimum pit dimensions
beyond which only slight improvement in
rates can be accomplished by increasing pit di
sions. For an isotropic, single layer system
results of this work suggest that these opti
dimensions are attained when both the depth
the width of the pit are 0.1 to 0.2 times
thickness of the flow region. In the third di
sion, the recharge pit is in the form of a long
or channel. The results imply that in arti
recharge operations, considerable costs cou
avoided by not designing recharge pits with di
sions greater than the optimum values. O
other hand, in the case of landfill operations
results suggest that increasing the depth a
width of the pit will not necessarily cause pr

l increases in the volume of leachates enter-
ie groundwater system. (See also W75-10769)
-ISWS)
10770

NGE IN QUALITY OF PUMPED
NAGE EFFLUENT,
u of Reclamation, Aurora, Colo.
Carlson.
gricultural and Urban Considerations in Ir-
on and Drainage; Selected Papers from the
tion and Drainage Division Speciality Con-
ce, Fort Collins, Colorado, April 22-24, 1973.
ican Society of Civil Engineers, New York,
223, 1974. 8 fig, 3 tab, 5 ref.

iptors: *Drainage wells, *Irrigation,
ona, *Model studies, Pumping, Wells,
dwater, Water quality, Hydraulic models,
etical analysis, Laboratory tests, Mathe-
l models, Aquifers, Aquifer testing, Saline
On-site data collections, Irrigation effects.
fiers: *Gila project(Ariz).

ulic model studies were made to obtain in-
nto the process of removing saline water
a two-part aquifer with a pumped well.
etical equations of the process were
ped and checked by the model study. These
ons were applied to field data from Wellton-
vk Division, Gila Project, Arizona, to pre-
ture change in salinity of the drainage ef-
Hydraulic model studies verified the form
exponential equation which describes the
in salinity of the pumped effluent from an
r initially filled with saline water of higher
tration that the replacement irrigation deep
ation water. Assuming that the pumping
ion in the Wellton-Mohawk Division will
ue in a pattern similar to that from 1966
h 1972, the average salinity of the drainage
t will decrease exponentially. Salt concen-
measurements made in the Wellton-
vk main conveyance channel are the best
of data for determination of the weighted
e salinity effluent conditions. These data
sed to predict future average salinity values
llton-Mohawk drainage flows. A system's
s study has been made and a 'Drainage
ions Scheduling Model' developed. This
natical model should be helpful in develop-
ture pumping schedules. (See also W75-
(Humphreys-ISWS)
0779

YEAR STUDY OF DES MOINES RIVER
R QUALITY,
State Univ., Ames. Engineering Research

aumann, J. G. DeBoer, and C. S. Oulman.
ricultural and Urban Considerations in Ir-
n and Drainage; Selected Papers from the
on and Drainage Division Speciality Con-
, Fort Collins, Colorado, April 22-24, 1973.
an Society of Civil Engineers, New York,
27, 1974. 9 fig, 4 tab, 2 ref.

ptors: *Water quality, Pollutants,
ltural runoff, *Iowa, Rivers, Dams,
ant identification, *Water pollution
, Biochemical oxygen demand, Nitrogen
nds, Phosphorus compounds, Chlorides,
ms, Sampling, Leaching, Water analysis,
data collections, On-site investigations,
ture.
ers: *Des Moines River(Ia).

s Moines River is the major waterway for a
art of central Iowa. One major dam has
onstructed on this river and a second is
onstruction. Saylorville Dam, expected to
pleted in 1975, is located a few miles north
Moines. This preimpoundment study of
ines River water quality is to be followed
st-impoundment study when the Saylorville
completed. During this study, beginning in July, 1967, samples of Des Moines River water have been collected from a number of sampling points. Data pertaining to a number of water quality parameters at one station were analyzed to determine whether any trends were apparent that would suggest the need to make additional analyses or studies before the reservoir is filled. These data were reported along with results of an investigation of the sources of pollutants. Sources related to farming and the agricultural industry were found to be major contributors to the pollution of the Des Moines River. It was concluded that the protection of the water quality of the Saylorville Reservoir will depend to a large extent in the future on the management practices that are employed by the agricultural community within the watershed area. (See also W75-10769) (Sims-ISWS)
W75-10803

**EFFECT OF AGRICULTURAL USE ON WATER QUALITY FOR DOWNSTREAM USE FOR IRRIGATION,**
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 5G.
W75-10805

**A REMOTE SENSING LASER FLUOROMETER,**
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 5A.
W75-10831

**GROUNDWATER PROTECTION IN HIGHWAY CONSTRUCTION IN THE CATCHMENT AREA OF THE CITY OF BERNE AT KIESEN (GRUNDWASSERSCHUTZ BEIM AUTOBAHN IM FASSUNGSGEBIET STADT BERN IN KIESEN),**
For primary bibliographic entry see Field 5C.
W75-10837

**ACTMO, AN AGRICULTURAL CHEMICAL TRANSPORT MODEL,**
Agricultural Research Service, Chickasha, Okla.
M. H. Frere, C. A. Onstad, and H. N. Holtan.
USDA Report ARS-H-3, 54 p, June 1975. 18 fig, 17 tab, 57 ref.

Descriptors: *Mathematical models, *Water pollution sources, Sediment transport, Runoff, Model studies, Watersheds(Basins), Nutrients, Pesticides, Leaching, Erosion, *Chemicals, *Path of pollutants, *Agricultural watersheds.

A mathematical model has been developed to describe the movement of chemicals in and across an agricultural watershed. For each storm in a series of model predicts the mean concentration of the chemical in the runoff, the total amount carried by runoff water and sediment, and the location of the chemical remaining on the watershed. ACTMO is composed of three submodels. The hydrology submodel uses watershed characteristics to calculate runoff, infiltration, soil moisture, etc. from weather data. The erosional submodel uses soil characteristics to compute rill and interrill erosion, deposition, and clay enrichment from runoff predictions. The chemical submodel uses information about the chemical application along with data from the other two submodels to calculate the chemical movement. The watershed is limited to an area that can be described by a single rainfall input, such as a farm-size area. (ARS)
W75-10846

**AN EVALUATION OF PERSISTENCY FOR WATER BORNE ORGANICS,**
Worcester Polytechnic Inst., Mass.
F. L. Hart, T. Helfgott, and R. G. Bedard.
In: 30th Annual Purdue Industrial Waste Conference, May 6-8, 1975, West Lafayette, Indiana, Purdue University, 16 p. 1 fig, 2 tab, 11 ref. OWRT A-030-CONN(7). 14-31-0001-3007.

Descriptors: *Organic compounds, Aquatic environment, *Persistance, *Biodegradation, *Oxygen demand, *Nitrogen, *Industrial wastes, *Pesticides, Laboratory tests, Organic wastes, Pollutant identification, Path of pollutants, Water pollution sources.
Identifiers: *Refactory index, Degree of degredation, Water-borne organics, Ultimate oxygen demand.

A laboratory method is discussed for designating water borne organics, from both industrial wastewaters and natural sources, according to resistance to biodegradation. Procedures and deviations are given for the parameters 'Refactory Index' which is reported as a normalized number indicating degree of degradation. Real-time parameters of oxygen demand and nitrogen are used along with slower long-term biological/biochemical measurements to formulate the refractory index values. Lists of refractory index values for common industrial organics and natural materials are offered along with a discussion as to the significance of the refractory index and its interpretation. Measurements of organic carbon, nitrates, BOD(5), and ultimate BOD per 100mg of organic compounds are also reported. Organic materials, especially those originating from industry and characterized as refractory (i.e. having refractory index values close to zero) are considered persistent for stipulated environmental conditions. This persistency is extrapolated to the bioreactors of wastewater treatment and the receiving aquatic environment. (deLara-Connecticut)
W75-10850

**THE EFFECT OF THE QUANTITY OF SILT TO THE ATTACHED MICROORGANISMS OF THE KUZURYU-GAWA RIVER IN THE HOKURIKU DISTRICT, (IN JAPANESE),**
Kanagawa Univ. (Japan). Biology Inst.
For primary bibliographic entry see Field 5C.
W75010696

## 5C. Effects Of Pollution

**UTILIZATION OF A KRAFT EFFLUENT CHANNEL BY FISH AND AQUATIC ORGANISMS,**
Florida Univ., Gainesville. School of Forest Resources and Conservation.
J. V. Shireman.
In: TAPPI Environmental Conference, Denver, Colorado, May 14-16, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 185-196. 7 fig, 14 ref, 3 tab.

Descriptors: *Pulp wastes, *Fish populations, *Benthic fauna, Dissolved oxygen, Sulfates, Turbidity, Hardness(Water), Chemical oxygen demand, Alkalinity, Aquatic life, Aquatic microorganisms, *Florida, Water pollution sources, Wastes, Industrial wastes, Water pollution effects, Fish types, Fish reproduction, Hydrogen ion concentration, Effluents.
Identifiers: Chronomids, Kraft mills.

Water quality parameters, fish populations, and benthic organisms were monitored from May 1974 to January 1975 in a kraft mill effluent channel of Hudson Pulp and Paper Corporation, Palatka, Florida. Dissolved oxygen in the channel ranged from 4.7 to 7.2 ppm and pH varied from 5.95 to 8.05 during the study. Sulfates and turbidity varied little and were less than 25 ppm. Total hardness, COD, and alkalinity were lowest during the summer and began to increase in September. Alkalinity and COD values continued to increase for the remainder of the study, but hardness increased

until October then dropped and leveled off from November through January. Benthic fauna consisted primarily of chronomids. The effluent channel was found to be suitable for fish habitation and growth. The most abundant species were mosquitofish, brown bullhead, white catfish, and warmouth. Bluegill, redear sunfish, golden shinner, yellow bullhead, and gizzard shad were less abundant but seemed to be permanent residents of the channel. The relative abundance of fish within the channel changed seasonally. There has been no indication of reproduction occurring in the channel, and thus recruitment must be from outside the channel. (Sykes-IPC)
W75-10377

**SWIMMING PERFORMANCE OF JUVENILE COHO SALMON (ONCORHYNCHUS KISUTCH) EXPOSED TO BLEACHED KRAFT PULP MILL EFFLUENT,**
B.C. Research Ltd., Vancouver. Div. of Applied Biology.
T. E. Howard.
Journal of the Fisheries Research Board of Canada, Vol 32, No 6, p 789-793, June, 1975. 13 ref. 5 tab.

Descriptors: *Salmon, *Swimming, *Performance, *Bleaching wastes, *Water pollution effects, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Fish, Lethal limit, Aerobic treatment, Water pollution treatment, Color, Lignins, Toxicity, Pollutants, Water pollution.
Identifiers: Coho salmon(Oncorhynchus kisutch), Kraft mills.

Maximum critical swimming speeds were not achieved by fingerling coho salmon in concentrations of bleached kraft pulp mill effluent above a threshold concentration between 10-20% of the 96 hr LC(50). Reduction of swimming performance was related to effluent concentration but not to exposure time after the initial 18 hr. Swimming performance returned to control levels for fish tested in water after 6-12 hr recovery from exposure to effluent concentrations up to 0.7 LC(50). The effluent was rendered nontoxic by aerobic microbiological fermentation but some reduction in swimming performance was measured which was attributed, in part, to the effects of color and lignin materials remaining after treatment. These findings are discussed in relation to the mode of toxic action of bleached kraft mill effluents and their possible impact on aquatic ecosystems. (Witt-IPC)
W75-10387

**EFFECTS OF ACUTE EXPOSURE TO BLEACHED KRAFT PULP MILL EFFLUENT ON CARBOHYDRATE METABOLISM OF JUVENILE COHO SALMON (ONCORHYNCHUS KISUTCH) DURING REST AND EXERCISE,**
B. C. Research Ltd., Vancouver. Div. of Applied Biology.
D. J. McLeay, and D. A. Brown.
Journal of the Fisheries Research Board of Canada, Vol 32, No 6, p 753-760, June, 1975. 2 fig, 42 ref.

Descriptors: *Salmon, *Carbohydrates, *Metabolism, *Water pollution effects, Wastes, Industrial wastes, Water pollution sources, Fish, Lethal limit, Toxins, Aquatic animals, Water pollution, Swimming, Biochemistry.
Identifiers: Coho salmon, Liver, Glycogen, Plasma, Glucose, Muscle, Blood sugar.

In the static study (no exercise), liver glycogen stores were unchanged during 12 hr exposure to 0.8 of the 96 hr LC(50); longer exposures caused a progressive decrease to levels one-fifth those of controls at 72 hr. Plasma glucose levels in fish held in 0.8 LC(50) effluent for 3-96 hr were elevated; at 96 hr, glucose had increased three-fold. Mean values for plasma lactate were elevated at 3, 6, 24, 72, and 96 hr. In the exercise (swimming one body length/second)-rest study, muscle glycogen levels decreased 53-78% during exercise in water or effluent (0.7 LC(50) for 4-12 hr, and did not recover during 12 hr rest in water. Muscle glycogen for fish exercised for 12 hr in effluent and then rested for 4-12 hr in effluent was lower compared to values for fish exercised in effluent and then rested in water. There was no difference in liver glycogen levels of fish exercised in effluent or water for 4-12 hr. Values of liver glycogen for fish exercised in effluent for 12 hr and then rested for 4, 8, or 12 hr in effluent decreased 60-70% compared to fish exercised in water for 12 hr and then rested in water and by 55-65% from fish exercised in effluent for 12 hr and rested in water for 4-12 hr. Plasma glucose levels were elevated one- to four-fold during exercise in water or effluent. Fish resting in water for 4, 8, or 12 hr following exercise in water had relatively stable glucose levels; whereas for fish exercised and then rested in effluent the glucose levels increased two-fold during resting. Plasma lactate levels were elevated five- to six-fold during exercise in water or effluent for 4-12 hr, declining to values 1-2 times those of stock fish within 4 hr rest. Plasma lactate levels for fish exercised in effluent and then rested in effluent or water were higher than those for fish exercised and rested in water. (Witt-IPC)
W75-10388

**TOXICITY OF PULPING WASTES TO FISH,**
Institute of Paper Chemistry, Appleton, Wis.
J. Weiner.
Bibliographic Series No. 265, 1975. 67 p, 214 ref.

Descriptors: *Bibliographies, *Pulp wastes, *Toxicity, *Fish, Aquatic animals, Aquatic microorganisms, Bleaching wastes, Industrial wastes, Wastes, Water pollution sources, *Water pollution effects, *Toxins, Pollutants, Water pollution.

This annotated and indexed bibliography deals with the lethal and sublethal effects of pulp mill effluents (including bleach plant discharges) on fish and related aquatic organisms and covers the literature from about 1930 through 1974. (Brown-IPC)
W75-10403

**ENVIRONMENTAL LIMITATIONS ON THE MICROBIAL DEGRADATION OF HYDROCARBONS IN TEMPERATE LAKES,**
Wisconsin Univ., Madison. Dept. of Bacteriology.
D. M. Ward, and T. D. Brock.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 095, $5.25 in paper copy, $2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, June 1975. 103 p, 16 fig, 5 tab. OWRT A-054-WIS(2). 14-31-0001-4050, 14-31-0001-5050.

Descriptors: *Microbial degradation, Organic compounds, *Biodegradation, Nutrients, *Nitrogen, *Oil pollution, *Phosphorus, *Wisconsin, Lakes, *Bacteria, Inhibition, Oxidation, Water pollution effects.
Identifiers: *Limiting nutrients, Heterotrophic bacteria.

Nutritionally versatile heterotrophic bacteria inhabit lakes and develop in response to hydrocarbon introduction. However, the response of naturally-occurring oil-degrading microorganisms depends on environmental conditions within a lake. The rate of hydrocarbon biodegradation varied seasonally in Lake Mendota because of temperature limitation in spring and fall and nutrient limitation in mid-summer, and was optimal for only one month during the year. Nutrient limitation was also observed in lakes of varying nutrient content in Vilas County. Relationships between hydrocarbon oxidation rates and temperature or nutrient levels were shown by correlation and experimentally, and optimum conditions established. Hexadecane oxidation was inhibited in lake wat and sediment samples incubated anaerobicall Acetate inhibition was indirectly caused by depl tion of nitrogen and phosphorus by acetate-oxid ing bacteria. Glucose inhibition occurred in t presence of excess nitrogen and phosphorus a may result from regulatory interference such catabolite repression. The presence of oil degra ing bacteria does not ensure rapid removal of pollutants in temperate lakes where environmen conditions usually limit hydrocarbon biodegrad tion.
W75-10407

**EFFECT OF A MIXTURE OF SUCCINIC AC MONO-SULPHO-ESTER AND OLEFIN SU FONATE ON FISH (UBER DIE WIRKU EINER MISCHUNG VON SULFOBERNSTE SAURE-HALBESTER UND OLEFINSULFON AUF FISCHE),**
Bundesforschungsanstalt fuer Fischerei, Hamb (West Germany). Institut fuer Kuesten- und B nen-fischerei
H. Mann, and H. Stache.
Archiv fur Fischerei Wissenschaft, Vol 25, 1/2, p 53-56; September 1974. 1 fig, 1 tab, 2 r (English abstract).

Descriptors: *Fish, *Rainbow trout, *Salmoni *Sulfur compounds, *Organic compoun *Toxicity, Lethal limit, Laboratory tests, F physiology, Water pollution effects, Biodegra tion.
Identifiers: *Golden ide, *Leuciscus i melanotus, *Succinic acid mono-sulpho-es *Olefin sulfonate, *Bioaccumulation.

The effect of a mixture of succinic acid mo sulpho-ester and olefin sulfonate on golden (Leuciscus idus melanotus) and rainbow tr (Salmo gairdneri) was examined. In the case golden ide the first losses occurred at 5 mg/l; v trout at 7.5 mg/l. These values were compared w the reduction in the surface tension of the responding concentrations. It was confirmed th detrimental effect on fish is to be noticed a reduction below 50 dyn/cm. The investiga product showed a good biodegradability. Acc ing to present investigations a detrimental ef on surface waters is not to be expected. (Katz)
W75-10409

**EFFECTS OF MIREX ON THE LARV DEVELOPMENT OF BLUE CRAB,**
Duke Univ., Durham, N.C. Dept. of Zoology.
C. G. Bookhout, and J. D. Costlow, Jr.
Water, Air and Soil Pollution, Vol 4, No 1, p 126, March 1975. 2 fig, 6 tab, 19 ref.

Descriptors: *Crabs, *Chlorinated hydrocar pesticides, *Lethal limit, *Growth sta *Larvae, *Bioassays, Water pollution effects, vironmental effects, Toxicity, Laboratory stud Tissue analysis, Mortality.
Identifiers: *Blue crab, Callinectes sapi *Mirex, Bioaccumulation, Sublethal effects.

After a 5-day period in experimental concen tions of 0.01, 0.1, 1.0 and 10.0 ppb mirex, there differential survival in two replicate series of crab, (Callinectes sapidus) larvae in relatio concentration. 0.01 and 0.1 ppb mirex sublethal concentrations and the 1.0 and 10.0 mirex were acute. Differences in survival wer tributed to stage and media effects. Residue mirex in developmental stages increased with centration, but biological magnification greatest in larvae reared in the lowest conce tion of mirex and lowest in larvae reared in highest concentration. (Katz)
W75-10410

**THE EFFECT OF DIFFERENT SALINI AND MANGANESE ION ON THE SURVI RESPIRATION OF THE BALTIC FLOUN**

**CURONECTES FLESUS TRACHURUS NKER)) OF THE GULF OF RIGA,**
Union Research Inst. of Sea Fisheries and nography, Moscow (USSR).
Karpevich, and A. T. Shurin.
al of Icthyology, Vol 5, p 753-763, 1973. 7 fig, 8 ref.

riptors: *Salinity, *Respiration, *Metals, assay, Saline water, Metabolism, Laboratory Oxygen, Mortality, Isotope studies, En- mental Effects, Growth rate, Dissolved ox- Temperatures, Metabolism, *Manganese, r pollution effects.
ifiers: Survival, *Baltic flounder, Pleu- tes flesus trachurus, Tissue analysis.

ffect of different salinities and of manganese e survival and respiration of juvenile Baltic ders was investigated. The overall salinity and the lower lethal limits have been lished. The fish were kept in solutions of anese chloride prepared with natural water the Gulf of Riga. The penetration of man- e into all the organs and body fluids of the der was established by the method of neutron tion analysis (after irradiation of tissue and samples of the flounders in a reactor n flux). Its flow is slight in weak manganese ons (up to 7.5 mg/liter) and the flounder suc- in eliminating excess manganese. At concen- ns above 12-17 mg/l manganese accumulates ally important organs (heart, liver, gonads), esult of which metabolic processes are dis- and the fish die. (Katz)
0411

**C EFFECTS OF ALIPHATIC ORINATED BY-PRODUCTS FROM VINYL ORIDE PRODUCTION ON MARINE ALS,**
sh Water and Air Pollution Research Lab., org.
senberg, O. Grahn, and L. Johansson.
Research, Vol 9, No 7, p 607-612, July 1975. 2 tab, 11 ref.

iptors: *Toxicity, *Lethal limit, rination, *Bioassay, *Plastics, oduction, Marine animals, *Shrimp, ns, *Industrial wastes, Mortality, Water pol- sources, Water pollution effects, Hatching, ducts.
fiers: Plastic by-products, Vinyl chloride, rinated hydrocarbons, Gadus morhua, Cran- angon, EDC-tar, Polychaetes.

cute toxic effects of chlorinated aliphatic carbons, formed as by-products from one sh and one Norwegian plastic production y, were examined by experiments with cod, and a polychaete. The toxicity of 1,2- roethane and a distillate with heavier com- s were also estimated. The 48-h LC50 ratio en the concentrations of a Swedish by- ct, a Norwegian by-product, and roethane was 1:9:34. The effects of 1,2- roethane, 1,1,2-trichloroethane, and 1,1,2- roethane on the reproductivity and on the al of polychaete adults were studied. The uctivity was affected by these components lower concentrations than those having oxicity effects on adult specimens. (Katz)
0412

**CITY OF PHOSPHAMIDON TO AMER- LOBSTERS (HOMARUS AMERICANUS) AT 4 AND 12C,**
es Research Board of Canada, St. Andrews Brunswick). Biological Station.
McLeese.
l of the Fisheries Research Board of a, Vol 31, No 9, p 1556-1558, September, fig, 2 tab, 9 ref.

Descriptors: *Lobsters, *Water temperature, *Pesticides, *Organophosphorus Pesticides, *Toxicity, *Lethal limit, Laboratory tests, Path of pollutants, Animal physiology, Water pollution effects.
Identifiers: LC50, LT50, *Phosphamidon, Bioaccumulation, *Fenitrothion, Running water, Static water.

The 96-h LC50 for phosphamidon for American lobsters, Homarus americanus, at 12C was 50 micrograms/liter and the lethal threshold is 18 micrograms/liter in both static and running water tests. At 4C the 96-h LC50 was 180 micrograms/liter and the lethal threshold was 18-28 micrograms/liter. Phosphamidon was 50-60 times less toxic than fenitrothion. (Katz)
W75-10413

**CORTICOSTEROID CONCENTRATIONS IN SOCKEYE SALMON (ONCORHYNCHUS NERKA) EXPOSED TO LOW CONCENTRATIONS OF COPPER,**
Fisheries and Marine Service, Vancouver (British Columbia). Vancouver Lab.
E. M. Donaldson, and H. M. Dye.
Journal of the Fisheries Research Board of Canada, Vol 32, No 4, p 533-539, April 1975; 2 fig, 9 tab, 14 ref.

Descriptors: *Salmonids, (Sockeye salmon, *Copper, *Copper compounds, *Bioassay, Fish Physiology, Water pollution effects, Laboratory tests, Lethal limit, Environmental effects, Pollutant identification.
Identifiers: Yearlings, *Steroids, *Corticosteroids, *Sublethal effects, Competitive protein binding, Technique, *Bioaccumulation, Stress response mechanism.

Yearling sockeye salmon (Oncorhynchus nerka) were exposed for 1-24 h to 10-7, 10-6, or 10-5 molar cupric sulphate in freshwater aquaria. Plasma cortisol, cortisone and 'total' corticosteroid concentrations were measured by a competitive protein binging technique. Cortisol, cortisone and 'total' corticosteroid levels were significantly higher than control concentrations after 1 h of exposure to 10-5 or 10-6m copper. 'Total' corticosteroid and cortisone concentrations were significantly higher than control concentrations after 2 and 4h of exposure to 10-7 m copper, respectively. Fish exposed to 10-5 copper died between 8 and 24 h. The data reflect a rapid corticosteroid stress response to lethal and sublethal concentrations of copper. The technique may be of use for rapid evaluation of effluents containing heavy metals, especially those containing a mixture of toxicants. (Katz)
W75-10415

**STUDIES ON THE METABOLISM OF CHLOROPHENOLS IN FISH-I ABSORPTION AND EXCRETION OF PCP BY GOLDFISH,**
Kyushv Univ., Fukuoka (Japan). Faculty of Agriculture.
K. Kobayashi, and H. Akitake.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 41, No 1, p 87-92, January 1975. 3 fig, 3 tab, 6 ref.

Descriptors: Freshwater fish, *Fish physiology, *Bioassay, *Absorption, *Organic compounds, *Lethal limit, Laboratory studies, Mortality, *Metabolism.
Identifiers: *Goldfish, Carassius auratus, Bioaccumulation, Excretion, *Pentachlorophenol(PCP), C-14 label, Adsorption rates.

At concentrations of pentachlorophenol (PCP) of 0.1, 0.2, and 0.4 ppm, the amount accumulated by goldfish, Carassius auratus increased with time. Maximum accumulation was observed in fish exposed to 0.2 ppm, giving 116 micro g-PCP/g-body weight. After 10 hr in PCP-free water only half of the original amount remained due to excretion by active elimination. PCP concentration in the fish increased by the amount expected from absorption minus that expected from excretion until 100 micro g-PCP-body weight concentration at which time mortality occured. PCP found in the fish had not undergone decomposition. (See also W75-10418) (Katz)
W75-10417

**STUDIES ON THE METABOLISM OF CHLOROPHENOLS IN FISH-II TURNOVER IN ABSORBED PCP IN GOLDFISH,**
Kyushu Univ., Fukuoka (Japan). Faculty of Agriculture.
K. Kobayashi, and H. Akitake.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 41, No 1, p 93-99, January 1975; 2 fig, 3 tab, 7 ref.

Descriptors: Freshwater fish, *Fish physiology, *Bioassay, *Adsorption, *Organic compounds, Tissue analysis, Membranes, Laboratory studies.
Identifiers: *Goldfish, Carassius auratus, Bioaccumulation, *Pentachlorophenol, *Gall bladder, Passive diffusion, Active elimination, Excretion.

Pentachlorophenol (PCP) absorbed by goldfish, Carassius auratus, was accumulated in various organs, especially the gall bladder. The biliary concentration of PCP reached 539 micro g/g after 24-hr exposure and showed further increase even after after fish were transferred to clean, running water for 24 hours, reaching a level of 1,077 micro g/g which accounted for 41% of the total PCP detected. A decrease in PCP level was observed for all other organs examined. The characteristic accumulation of PCP in the gall bladder indicates that fish can dispose of PCP by active elimination such as conjugation and decomposition, and passive diffusion. (See also W75-10417) (Katz)
W75-10418

**MARINE POLLUTION BIOASSAY BY SEA URCHIN EGGS, AN ATTEMPT TO ENHANCE ACCURACY.**
Doshisha Univ., Kyoto (Japan). Biological Lab.
For primary bibliographic entry see Field 5A.
W75-10419

**UREA IN THE WATERS OF LAKE KINNERET (SEA OF GALILEE),**
Kinneret Limnological Lab., Timberias (Israel).
T. Berman.
Limnology and Oceanography, Vol 19, No 6, p 977-980, 1974. 1 fig, 20 ref.

Descriptors: *Ureas, *Nitrogen compounds, *Ammonia, *Nitrogen cycle, *Photoplankton, *Zooplankton, Aquatic productivity, Ecosystems, Bacteria, Primary productivity, Eutrophication, Biomass, Algae, Limnology.
Identifiers: *Organic nitrogen, *Lake Kinneret(Sea of Galilee), Urea sources, Israel.

Urea concentrations measured in the pelagic waters of Lake Kinneret over a 12-month period varied from undetectable to maximum values of 80 and 150 micrograms N/liter, with a seasonal pattern of fluctuation. Although urea is not a major constituent of the dissolved organic nitrogen and represents a relatively low amount when compared with ammonia, it may provide a significant source of available nitrogen for lake planktonic algae and bacteria. (Katz)
W75-10420

**UPTAKE OF THREE POLYCHLORINATED BIPHENYLS, DDT AND DDE BY THE GREEN SUNFISH, LEPOMIS CYANELLUS RAF.,**
Illinois State Natural History Survey, Urbana.
J. R. Sanborn, W. F. Childers, and R. L. Metcalf.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 2, p 209-217, February 1975. 6 fig, 4 tab, 16 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclors, *Bioassay, *DDT, *DDE, *Metabolism, *Sunfishes, Freshwater fish, Laboratory tests, Analytical techniques, Tracers, Carbon radioisotopes, Pesticide residues, Pollutants, Absorption.
Identifiers: Lepomis cyanellus, Aroclor 1242, Aroclor 1248, Aroclor 1254.

The uptake of three pure 14C PCB's, DDT and DDE by the green sunfish was investigated in order to determine the physiologic effects of these compounds and their susceptibility to metabolism. The penta chlorobiphenyl showed a similar uptake and retention curve to DDT and DDE. The tetrachlorobiphenyl disappeared from test fish more rapidly than more highly chlorinated compounds and the trichlorobiphenyl was the most susceptible to metabolism. (Katz)
W75-10422

**ACUTE TOXICITY OF KANAMYCIN TO STEELHEAD TROUT (SALMO GAIRDNERI),**
Fisheries and Marine Service, Vancouver (British Columbia). Vancouver Lab.
J. McBride, G. Strasdine, and U. H. M. Fargerlund.
Journal of the Fisheries Research Board of Canada, Vol 32, No 4, p 554-558, April 1975; 6 fig, 1 tab, 9 ref.

Descriptors: *Rainbow trout, *Salmonids, Trout, *Toxicity, *Mortality, *Fish diseases, Fish physiology, Fish toxins, *Growth stages, *Antibiotics, Laboratory tests, Lethal limit, Bacteria, Pseudomonas.
Identifiers: *Steelhead trout, Tissue analysis, *Kanamycin, Aeromonas, Plasma cortisol pathology.

Kanamycin adminilstration at the recommended dosage (10.0-20.0 micro g) for the treatment of fish infected with species of Aeromonas and Pseudomonas was highly toxic to steelhead trout, Salmo gairdneri. Descriptions of both gross and microscopic pathological alterations, as well as plasms cortisol concentrations were provided. (Katz)
W75-10423

**EFFECTS OF METHYLMERCURY ON APPROACH AND AVOIDANCE BEHAVIOR OF MALLARD DUCKLINGS,**
Bureau of Sport Fisheries and Wildlife, Laurel Md. Patuxent Wildlife Research Center.
G. Heinz.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 5, p 554-564, May 1975; 5 tab, 16 ref.

Descriptors: *Mercury, *Waterfowl, *Environmental effects, *Animal behavior, *Mallard Duck, Birds, Ducks(Wild), Laboratory tests, Heavy metals, Methodology, Analytical techniques, Water pollution effects.
Identifiers: Methylmercury dicyandiamlde.

The effect of low dietary levels of methylmercury dicyandiamide fed to mallard ducks on approach and avoidance behavior of their offspring was investigated. The ducks were fed a control diet or a diet of 0.5 or 3 ppm mercury. The approach behavior, in response to a tape-recorded maternal call, and avoidance of a frightening stimulus were measured. There were no significant differences among ducklings in the percentage that approached the tape-recorded maternal call. Ducklings from parents fed the diet containing mercury were hypersensitive in the test of avoidance of a frightening stimulus. (Katz)
W75-10424

**EFFECT OF THE INSECTICIDE ZECTRAN (MEXACARBATE) ON SEVERAL ALGAE,**
Montana Univ., Missoula. Dept. of Botany.
R. P. Sheridan, and M. A. Simms.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 5, p 565-569, May, 1975. 2 fig, 10 ref.

Descriptors: *Algae, *Insecticides, *Oxygen, *Respiration, *Photosynthesis, Laboratory tests, Primary productivity, Toxicity, Growth rate, Water pollution effects.
Identifiers: *Zectran.

Field samples of freshwater algae were examined to determine the effect of the insecticide Zectran on-photosynthesis rate. Concentrations of Zectran between 10 and 103 ppb affected neither oxygen production nor NaH14 CO3 uptake in any of the seven genera tested. However, Zectran at a concentration of 104 ppb after 1 hour effected a reduction in photosynthesis of Chroococcus, Oedogonium and in a mixed sample of Zygnema, Mougeotia and Spirogyra. Mougeotia, Spirogyra and Schizoonium were not affected by exposure to 104 ppb Zectran after an hour, but oxygen production was significantly reduced after 24 hours of exposure to this same concentration. (Katz)
W75-10425

**CRITICAL THERMAL MAXIMA OF THREE SPECIES OF HAWAIIAN ESTUARINE FISH: A COMPARATIVE STUDY,**
Oceanic Inst., Waimanalo, Hawaii.
J. R. Sylvester.
Journal of Fish Biology, Vol 7, No 2, p 257-262, 1975. 2 fig, 1 tab, 18 ref.

Descriptors: *Temperature, *Estuaries, *Fish, *Hawaii, Time, Thermal stress, Fish physiology, Seasonal, Laboratory tests, Brackish-water fish.
Identifiers: *Mugil cephalus, *Chelon engeli, *Kuhlia sandvicensis, Critical thermal maxima, Acclimation.

Critical thermal maxima of three species of Hawaiian estuarine fishes were determined in relation to acclimation temperature and time of day. The species studied were Mugil cephalus, Chelon engeli, and Kuhlia sandvicensis. Critical thermal maxima of all three species were significantly affected by acclimation temperature and time. In relation to acclimation temperature, M. cephalus and C. engeli have similar critical thermal maxima with K. sandvicensis having a critical thermal maxima about 1 degree C. lower than that of the two other species. Mugil cephalus and Chelon engeli showed an increasing critical thermal maxima toward midday which decreased thereafter. OCritical thermal maximum of Kuhlia sandvicensis increased throughout the day. (Katz)
W75-10426

**EFFECTS OF HEAVY METALS AND PESTICIDES ON THE MASS MORTALITIES OF CULTURED SHELLFISHES ALONG THE SOUTHWEST COAST OF TAIWAN, (IN CHINESE),**
Academia Sinica, Taipei (Taiwan). Inst. of Zoology.
S. S. Jeng, Y. W. Huang, J. L. Lain, L. T. Sun, and G. S. Wang.
Journal of the Fisheries Society of Taiwan, Vol 3, No 2, p 35-39, 1974. 3 fig, 15 ref. English abstract.

Descriptors: *Heavy metals, *Pesticides, *Chlorinated hydrocarbon pesticides, *Mortality, *Water pollution effects, *Oysters, *Bioassay, *Commercial Shellfish, DDT, Dieldrin, Mercury, Lead, Cadmium, Zinc, Nickel, Arsenic compounds, Population, Sampling, Environmental effects.
Identifiers: Tissue analysis, Bioaccumulation, BHC, *Taiwan.

Oysters reared along the southwest coast of Taiwan were sampled monthly for one year for heavy metals and organochlorine pesticides analyses. During their 'danger season', April, both dead and live oysters were analyzed. Results showed that heavy metal contents in the oyste were normal throughout the year and during t 'danger season', and were close to ordinary leve in the dead oysters. No aldrin, endrin, or he tachlor expoxide were detected and only sm amounts of DDT, BHC, and dieldrin were prese It was suggested that large-scale death of the she fish was not directly related to heavy metals a organochlorine pesticides. (Katz)
W75-10427

**THE EFFECTS OF CRUDE OIL ON TH PALATABILITY OF MARINE CRUSTACEANS**
Louisiana State Univ., Baton Rouge. School Forestry and Wildlife Management.
L. H. Knieper, and D. D. Culley, Jr.
The Progressive Fish-Culturist, Vol 37, No 1, p 14, January 1975. 3 fig, 2 tab, 18 ref.

Descriptors: *Organoleptic properties, *Crude o *Crustaceans, *Commercial shellfish, Shrim Crabs, Absorption, Water quality control, Wa pollution effects, Lethal limit.
Identifiers: *Sublethal effects, Panaeus ssp., C linectes sapidus, Taste tests.

The palatability of Panaeus aztecus, P. setifer and Calliniectes sapidus was investigated after posure to sublethal doses of various crude o The threshold level for identification of an o taste on shrimp and crab was determined by a ta panel. Threshold levels varied according to spec and oil. They ranged from 49 ppm in P. setiferu 1,250 ppm in the crab. (Katz)
W75-10428

**DDT : SHORT TERM EFFECTS OSMOREGULATION IN BLACK SURFPER (EMBIOTOCA JACKSONI),**
University of Southern California, Los Ange Dept. of Biological Sciences.
J. P. Waggoner, and M. G. Zeeman.
Bulletin of Environmental Contamination Toxicology, Vol 13, No 3, p 297-300, March 19 1 tab, 11 ref.

Descriptors: *Toxicity, *Perches, *DDT, Os sis, *Permeability, Membrane processes, *I physiology, *Bioassay, *Teleosts, Chlorin hydrocarbon pesticides, Environmental effe Water pollution effects, Methodology, Mortalit
Identifiers: *Black surfperch, *Osmoregulat Embiotoca jacksoni.

The effects of DDT on osmoregulation in a ma teleost and the ability of this osmoregulat failure to cause death were investigated. A D suspension was injected intraperitoneally black surfperch. Plasma osmotic concentratio creased substantially only at doses much la than are likely to be encountered in nature. D of marine telecosts from DDT poisoning prob involves factors other than osmoregula failure. (Katz)
W75-10429

**HEAVY METAL CONTENTS OF FIS CAUGHT IN KAOHSIUNG HARBOR, (IN CH ESE),**
National Taiwan Univ., Taipei. Inst. of Ocea raphy.
For primary bibliographic entry see Field 5A.
W75-10430

**TEMPERATURE-INDUCED CHANGES ACUTE TOXICITY OF ZINC TO ATLAN SALMON (SALMO SALAR),**
Guelph Univ. (Ontario). Dept. of Zoology.
P. V. Hodson, and J. B. Sprague.
Journal of the Fisheries Research Boar Canada, Vol 32, No 1, p 1-9, January 1975. 2 tab, 26 ref.

criptors: *Atlantic salmon, *Salmonids, hal limit, *Zinc, *Water pollution effects, xicity, *Water temperature, Metals, Laborato- tudies, Seasonal, Winter, Fish populations, per, Equation, Bioassay, Fish physiology, En- nmental effects, Mortality, *Canada.
tifiers: *LC50, Acclimation, Continuous- , Bioaccumulation, Parr, *Miramichi r(New Brunswick).

e groups of Atlantic salmon (Salmo salar) parr acclimated to water temperatures of 3, 11, 9C and then exposed to lethal concentrations inc. The cold-acclimated salmon survived r than warm-acclimated salmon, although the hold LC50 of zinc was highest for salmon at An equation to predict the threshold LC50 given. In polluted rivers, zinc concentrations suggested to be most damaging to fish popu- ns during the winter months. Measured con- ations of zinc and copper in the Miramichi , New Brunswick, were highest in winter estimated toxicity was also greatest. (Katz) 10431

SSAY DATA FOR MARINE POLLUTION G SEA URCHIN EGGS, 1972 AND 1973,
isha Univ., Kyoto (Japan). Biological Lab.
rimary bibliographic entry see Field 5A.
10432

REASE OF NET CARBON FLUX IN TWO IES OF MUSSELS CAUSED BY EX- CTS OF CRUDE OIL,
achusetts Univ., Gloucester. Marine Station.
Gilfillan.
e Biology, Vol 29, No 1, p 53-57, 1975. 6 fig,

iptors: *Mussels, *Salinity, *Oil, *Carbon *Metabolism, *Stress, Water pollution ef- Laboratory tests, Toxicity, Water pollution es, Crustaceans.
fiers: Mytilus edulis, Modiolus demissus, oil, *Carbon flux.

ts of crude oil and salinity on the metabolism o common filter-feeding animals (Mytilus and Modiolus demissus) have been in- ated. Carbon budgets have been calculated ch species under a variety of combinations content and salinity. Both reduced salinity e presence of crude oil tend to decrease the rbon flux for each species; stresses from source interacted in their effects on experi- l animals. Although similar responses to oil shown by each species, Mytilus edulis ap- l to be slightly more resistant to oil than lus demissus. (Katz) 0433

C EFFECTS OF AN ANIONIC DETER- ON THE GILLS OF RAINBOW TROUT,
Univ., Birmingham (England). Dept. of ical Sciences.
Abel, and J. F. Skidmore.
Research, Vol 9, No 8, p 759-765, August 2 fig, 1 tab, 23 ref.

ptors: *Salmonids, *Rainbow trout, *Fish logy, *Organophosphorus compounds, r pollution effects, *Toxicity, *Detergents, atory tests, Lethal limit, Path of pollutants.
iers: Tissue analysis, Bioaccumulation, n lauryl sulphate, Gills, LT50, Sublethal Osmoregulation, Hypoxia.

anges that occurred in the gill tissue of rain- out, Salmo gairdneri, exposed to 100 mg/l n lauryl sulphate were similar to those in- by other toxic agents. The gill epithelium away from the underlying tissue, and ocytes and granulocytes invaded the sub- ial spaces. Detailed changes at the cellular mostly related to cell death, distinguished SLS-induced damage from that caused by zinc sulphate. Epithelial lifting was suggested to be a consequence of a decrease in gill surface area imposed by the need to maintain osmotic stability while sustaining the progressive loss of epithelial cells caused by pollutant action. (Katz)
W75-10434

**EFFECTS OF THE INSECTICIDE SEVIN AND ITS FIRST HYDROLYTIC PRODUCT, 1-NAPTHOL, ON SOME EARLY DEVELOPMENTAL STAGES OF THE BAY MUSSEL, MYTILUS EDULIS,**
Oregon State Univ., Newport. Dept. of Fisheries and Wildlife.
D. A. Armstrong, and R. E. Millemann.
Marine Biology, Vol 28, No 1, p 11-15, 1974. 1 fig, 2 tab, 16 ref.

Descriptors: *Bioassay, *Pesticides, *Growth stages, *Larval growth stage, Mussels, Toxicants, Bioindicators, Environmental effects, Water pollution effects.
Identifiers: *Mytilus edulis, Growth anomalies, Sublethal effects, EC50, *Sevin, 1-napthol.

Six developmental stages of the bay mussel Mytilus edulis from fertilization to 32 h after fertilization, and also unfertilized eggs, were exposed for 1 hr to different concentrations of the insecticide Sevin and its first hydrolytic product, 1-napthol. After exposure, the larvae or eggs were separated from the pesticide solution and returned to clean water. At 48 h after fertilization, the numbers of normal and abnormal larvae were determined and 1-h EC50 values (the effective concentrations that caused anomalous development of 50% of the test animals) were calculated. The most sensitive developmental stage was the one that occurred shortly after fertilization at the time of appearance of the first polar body. Thereafter, sensitivity decreased as age increased. The EC50 of Sevin for the first polar body stage and the 32-h stage were 5.3 and 24.0 mg/l of Sevin, respectively. The EC50 of 1-napthol for the first polar body stage was 5.2 mg/l. Effects of the toxicants on development were characterized by the disjunction of blastomeres, a reduction in the rate of development, and asynchronous and unaligned cleavages. (Katz)
W75-10435

**THE EFFECTS OF A NO. 2 FUEL OIL AND TWO CRUDE OILS ON THE GROWTH AND PHOTOSYNTHESIS OF MICROALGAE,**
Texas Univ., Port Aransas. Inst. of Marine Science.
W. M. Pulich, Jr., K. Winters, and C. Van Baalen.
Marine Biology, Vol 28, No 2, p 87-94, 1974. 3 fig, 5 tab, 10 ref.

Descriptors: *Oil, *Algae, *Growth rate, *Photosynthesis, *Sea water, *Toxicity, *Bioassay, Environmental effects, Analytical techniques, Toxicants, Diatoms, Dinoflagellates, Cyanophyta, Chlorophyta.
Identifiers: *Thalassiosira pseudonana, Crude oils, Microalgae, No 2 fuel oil.

Seawater, when equilibrated with a sample of No. 2 fuel oil, becomes toxic in varying degrees to growth of representative types of micro-algae, two blue-greens, a diatom, two greens and a dinoflagellate. For Thalassiosira pseudonana, a sensitive organism, if the toxic materials constitute 1-10% of the sample, 40-400 ppb is lethal. Growth and photosynthesis in other algae were affected at higher concentrations of oil-equilibrated seawater. Water solubles from Kuwait or Southern Louisiana crude oils were not toxic, however specific fractions obtained by distillation did show some water soluble toxicity. The growth of most organisms was inhibited by direct contact with these two crude oils. With both the seawater equilibrated with fuel oil and the crude oils, the toxic activity is mainly localized in medium and higher boiling fractions derived from distillation cuts from these materials. (Katz)
W75-10436

**THE BIOLOGICAL HALF-LIFE OF INORGANIC MERCURY IN THE DUNGENESS CRAB (CANCER MAGISTER),**
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
J. P. Sloan, J. A. J. Thompson, and P. A. Larkin.
Journal of the Fisheries Research Board of Canada, Vol 31, No 10, p 1571-1576, October 1974. 2 fig, 5 tab, 9 ref.

Descriptors: *Crabs, *Mercury, *Computer programs, Equations, *Commercial shellfish, Laboratory studies, Animal physiology, Water pollution effects.
Identifiers: *Dungeness crab, Cancer magister, *Biological half life, Tissue analysis.

Experimental data indicated that inorganic mercury has a biological retention time of 20-25 days in the Dungeness crab (Cancer magister). Three theoretical models to explain the mode of elimination were tested by computer program. The validity of the widely used negative exponential 'biological half-life' is left in some doubt from the results obtained. (Katz)
W75-10437

**TOXICITY OF TWO SYNTHETIC PYRETHRINS TO BROWN TROUT,**
New York State Dept. of Environmental Conservation, Albany.
J. C. Skea, H. J. Dean, C. Talbot, and C. N. Frisa.
New York Fish and Game Journal, Vol 22, No 1, p 62-67, January 1975. 2 fig, 3 tab, 6 ref.

Descriptors: *Toxicity, *Insecticides, *Lethal limit, *Bioassay, *Brown trout, *Fingerlings, *Environmental effects, Salmonids, Laboratory studies, Dissolved oxygen, Organic pesticides, Water pollution effects.
Identifiers: *Pyrethrins, LD50 values, Survival rates.

The toxicity of two synthetic pyrethrins, SBP 1382 EC (24.3 per cent active ingredient) and Formula 7067 (5 percent active ingredient) was determined for fingerling brown trout. By bioassay, it was found that the 24-hour TLm for SBP 1382 EC was approximately 1.2 micrograms per liter and that the 24-hour and 48-hour TLm for Formula 7067 were 4.9 and 3.5 micrograms per liter, respectively. Data also indicated that there was a breakdown of SBP 1382 EC when mixed with acetone in stock solutions and kept for more than 24 hours. (Katz)
W75-10438

**TOXICITY OF PAIRED MIXTURES OF CANDIDATE FOREST INSECTICIDES TO RAINBOW TROUT,**
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
L. L. Marking, and W. L. Mauck.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 5, p 518-523, May 1975. 1 tab, 19 ref.

Descriptors: *Toxicity, *Organophosphorus compounds, *Insecticides, *Rainbow trout, *Bioassay, Pesticides, Fish, Laboratory tests, Phosphorous compounds, Lethal limit, Carbamate pesticides, Forestry, Water pollution effects.
Identifiers: *Synergistic effects, *Additive index, Forest insects.

Seven forest insecticides were tested individually and in paired mixtures against rainbow trout. The carbamate zectran was the least toxic, and the synthetic pyrethroids were the most toxic. Nine of the mixtures produced less than additive toxicity, nine produced additive toxicity and two produced greater than additive toxicity (synergism). None of

the mixture toxicities deviated markedly from additive, and only two pairs of mixtures would pose a greater toxicological hazard to fish than the individual chemicals. (Katz)
W75-10439

**RESPONSE OF FRESHWATER PROTOZOAN ARTIFICIAL COMMUNITIES TO METALS,**
Virginia Polytechnic Inst. and State Univ., Blacksburg.
J. A. Ruthven, and J. Cairns, Jr.
Journal of Protozoology, Vol 20, No 1, p 127-135, 1973, Illus.

Descriptors: *Protozoa, Metals, *Zinc, *Copper, Toxicity, Water pollution effects, Daphnia, Heavy metals.
Identifiers: Amoeba-proteus, Blepharisma, Chaos-carolinensis, Chilomonas-paramecium, Chlamydomonas-reinhardtii, Euglena-acus, Euglena-gracilis, Paramecium-caudatum, Paramecium-multimicronucleatum, Peranema-trichophorum, Stentor-coeruleus, Tetrahymena-pyriformis.

An artificial freshwater protozoan (Chilomonas paramecium, Tetrahymena pyriformis, Peranema trichophorum, Euglena gracilis, E. acus, Paramecium multimicronucleatum, P. caudatum, Blepharisma, Chlamydomonas reinhardi, Amoeba proteus, Stentor coeruleus, Chaos carolinensis) community was subjected to different concentrations of Zn and Cu in a test system consisting of Plexiglas troughs through which pond water flowed continuously. Although the percent survival of colonizing species exposed to Cu or Zn fluctuated greatly at each concentration, the range of toxicity for each compound allowed comparison of protozoa with other organisms with respect to resistance to heavy metal toxicity. Individual protozoan species also were exposed for 3 hr to Zn, Cu, Cr, phenol Pb, Mn, Co, HNO3, acetic acid, Al, Sn, and HCl to derive time to death curves. Protozoa tested appeared to be more resistant than Daphnia to phenol, K2Cr2O7, and Cu; however, some species were more sensitive than Daphnia, to Zn, nitric acid, and HCl. This suggests that the sensitivity of protozoa to toxicants may be either more or less than that of macroinvertebrates and that information does not suffice to predict sensitivity. Moreover, the relative sensitivity of protozoa to various toxicants will not always be the same, i.e., species X may be twice as tolerant to a toxicant as species Y, but its relative sensitivity may be quite different for another toxicant.--Copyright 1973, Biological Abstracts, Inc.
W75-10440

**EXPERIMENTAL INVESTIGATION ON THE BIOLOGICAL CONCENTRATION OF MERCURY-I. ON THE RATE OF MERCURY TRANSFER THROUGH THE FOOD CHAIN FROM JACK MACKEREL TO YOUNG YELLOWTAIL (IN JAPANESE),**
Aichi Prefecture Fisheries Experimental Station, Miya (Japan).
T. Suzuki, and M. Hatanaka.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 40, No 11, p 1173-1178, November 1974. 2 fig, 4 tab, 10 ref.

Descriptors: Fish, *Marine fish, *Food chains, *Food webs, *Mercury, *Path of pollutants, Metals, Seawater, Environmental effects, Growth rates, Life cycles, Water pollution effects.
Identifiers: Bioaccumulation, *Yellowtail, Trachrus japonicus, Seriola quinqueradiata, *Jack mackerel, *Methyl mercury, Tissue analysis.

After being reared in methylmercury dosed seawater, jack mackerels, Trachrus japonicus, were fed to tagged yellowtail, Seriola quinqueradiata, for 18 days maintaining normal feeding and growth rate. The total amount of mercury incorporated by the yellowtail was determined on the basis of body weight and amount of mercury of the jack mackerels. The rate of mercury transfer, 66% to 130% (average-88%) was calculated from the remaining mercury in the yellowtail and the total. The food chain was suggested to play a significant role in the biological concentration of mercury. (Katz)
W75-10441

**ANALYSIS OF TRI-ARYL PHOSPHATE ESTERS AND THE DETERMINATION OF IMOL S-140 IN FISH TISSUE AND WATER SAMPLES BY GAS CHROMATOGRAPHY,**
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W75-10442

**EFFECT OF WATER HARDNESS ON THE TOXICITY OF A NONIONIC DETERGENT TO FISH,**
Unilever Ltd., Sharnbrook (England). Unilever Research Lab.
P. W. A. Tovell, C. Newsome, and D. Howes.
Water Research, Vol 9, No 1, p 31-36, January 1975. 8 tab, 7 ref.

Descriptors: *Toxicity, *Detergents, *Hardness(Water), *Rainbow trout, *Bioassay, *Absorption, Laboratory tests, Methodology, Domestic wastes, Carbon radioisotopes, Water pollution effects.
Identifiers: *Carassius auratus, *Ethoxylate detergents.

Trout and goldfish were placed in treatment solutions of different water hardnesses containing ethoxylate (EO) detergents. Survival times were recorded. 14C-labelled EO was used to assess absorption. The toxicity of ethoxylates to fish acclimatized and treated in different water hardnesses, and the effect of cations on ethoxylate toxicity were also investigated. EO is slightly less toxic in hard water than in soft water. The hardness of the treatment solution has no marked influence on the amount of EO absorbed by the fish. Evidence suggests that there is little relationship between the composition of cations constituting a particular hardness and the toxicity of EO. Acclimatization in different water hardnesses does not affect the susceptibility of fish to nonionic ethoxylate detergents. (Katz)
W75-10444

**SOME OBSERVATIONS ON SPAWNING OF BROOK TROUT (SALVELINUS FONTINALIS MITCHILL) IN LIME NEUTRALIZED IRON HYDROXIDE SUSPENSIONS,**
Pittsburgh Univ., Pa. Graduate School of Public Health.
J. L. Sykora, E. J. Smith, M. Synak, and M. A. Shapiro.
Water Research, Vol 9, No 4, p 451-458, April 1975. 1 fig, 8 tab, 12 ref.

Descriptors: *Spawning, *Neutralization, *Iron oxides, *Lime, *Acid mine water, *Fish eggs, Hatchability, *Brook trout, *Iron, *Reproduction, Laboratory tests, Environmental effects, Water quality, Growth rates, Mortality, Temperature, Fish behavior, Metals, Alkalis(Bases), Acid-Base Equilibrium.
Identifiers: Salvelinus fontinalis, Sublethal effects, Suspended iron.

The long-term effect of lime neutralized suspended iron on brook trout spawning and egg hatchability was assessed in a flow-through environment with a modified proportional diluter. Results of a two-year study reveal low survival of maturing fish and a decline in egg production at higher suspended iron concentrations. Brook trout egg hatchability was unaffected in concentrations of lime neutralized iron hydroxide ranging from 0.75 to 12 mg Fe/l. A comparison of data on survival, growth, and egg hatchability indicates that the safe level of lime neutralized iron suspe for brook trout in an enclosed, intermitten testing system presumably lies between 7. 12.5 mg Fe/l. (Katz)
W75-10445

**THE EFFECT OF HEAVY METALS PHOTOSYNTHESIS AND LOSS OF POTASSIUM IN TWO SPECIES OF MA ALGAE, DUNALIELLA TERTIOLECTA PHAEODACTYLUM TRICORNUTUM,**
Institute of Marine Biochemistry, Ab (Scotland).
J. Overnell.
Marine Biology, Vol 29, No 1, p 99-103, fig, 15 ref.

Descriptors: *Diatoms, *Heavy *Potassium, *Photosynthesis, *Marine *Algae, *Permeability, Oxygen, Zinc, Cad Lead, Copper, Laboratory tests, Inhibition cury respiration, Water pollution effects.
Identifiers: *Dunaliella teri *Phaeodactylum tricornutum, DCMU, evolution, Potassium.

The effects of various heavy metals on l duced oxygen evolution and on net pot release were studied in short-term exper using the unicellular marine algae Dunalie tiolecta and Phaeodactylum tricornutum. metals, except for copper and 3, dichlorophenol)-1, 1-dimethyl urea (DCMU) cause loss of potassium at concentrations to or less than those required for inhibit photosynthesis. At the concentrations us significant loss of potassium was observ Zn2+, Cd2+, Tl+, Pb2+, or DCMU. With potassium release occurred at a marginally concentration than did inhibition of photos is. No extreme sensitivity of light-induced evolution to inhibition by cadmium and le observed. (Katz)
W75-10447

**THE EFFECT OF TEMPERATURE SALINITY ON CADMIUM UPTAKE B BLUE CRAB, CALLINECTES SAPIDUS,**
South Carolina Univ., Columbia. Dept. of B M. S. Hutcheson.
Chesapeake Science, Vol 15, No 4, p 2 December 1974. 3 fig, 3 tab, 17 ref.

Descriptors: *Cadmium, *Salinity, *Temperature, *Absorption, Commercial ish, Shellfish, Pollutants, Wastes, Metals, ries, Statistical methods, Stress, Water p effects.
Identifiers: Callinectes sapidus, Tissue a Bioaccumulation, *Blue crabs.

Adult blue crabs were exposed to various trations of cadmium in sea water at differe mosaline regimes. Concentration and rates take of cadmium were greatest at low salini higher temperatures with major sites of tion in gill, hepatopancreas and carapac muscle was comparatively low in cadmium. W75-10448

**THALLIUM: OCCURRENCE IN TH VIRONMENT AND TOXICITY TO FISH,**
Fisheries Research Board of Canada, St. A (New Brunswick). Biological Station.
V. Zitko, W. V. Carson, and W. G. Carson.
Bulletin of Environmental Contaminati Toxicology, Vol 13, No 1, p 23-30, January fig, 3 tab, 20 ref.

Descriptors: *Toxicity, *Bioassay, *Algae wastes, *Heavy metals, Hardness(Water) trial wastes, Mine water, Water pollution Atlantic salmon, Lethal limit, A techniques, Copper, Water pollution effec
Identifiers: *Thallium.

is present in the effluents of the base-
ning industry, and its acute toxicity to ju-
tlantic salmon is approximately equal to
opper. The usual treatment of waste water
ali to remove heavy metals by precipita-
little effect on thallium. The limited use of
will not lead to a global contamination of
onment, but localized problems may exist
op in the future as a result of mineral
g. (Katz)
49

S OF PH ON TOXICITY OF ANTI-
TO FISH,
of Sport Fisheries and Wildlife, La
Vis. Fish Control Lab.
rking.
of the Fisheries Research Board of
Vol 32, No 6, p 769-773, June 1975. 3 fig,
ref.

rs: *Antibiotics(Pesticides), *Fish con-
nts, *Piscicides, *Organic compounds,
n ion concentration, *Hardness(Water),
Sunfishes, *Toxicity, Lethal limit, Mor-
boratory tests, Water pollution effects.
s: *Antimycin, *Detoxification,
carpio, Green sunfishes, Bluegill sunf-
pomis cyanellus, Lepomis macrochirus,
ates.

ation of antimycin at pH 9.5 was caused
factors. The piscicide was biologically
le at the high pH, and this unavailability
sed by decreasing the pH of water solu-
ultaneously antimycin detoxified with
the resulting loss in toxicity was irrever-
toxicity of antimycin was related to the
un-ionized molecules; however, the dis-
curve resulting from the published pKa
s not agree with the implied dissociation
ed on toxicity. Toxicity of antimycin
gradually from pH 6.5 to 8.5 and
rom 8.5 to 9.5 with carp (Cyrpinus car-
n sunfish (Lepomis cyanellus), and
Lepomis macrochirus). As previously
water hardness had little or no effect on
Katz)
)

TION OF THREE SIDE CHANNELS
MAIN CHANNEL BORDER OF THE
MISSISSIPPI RIVER AS FISH
,
Department of Conservation, Jefferson

and.
from the National Technical Informa-
e, Springfield, Va 22161 as AD-786 142,
per copy, $2.25 in microfiche. Prepared
ract for the U.S. Army Engineer Water-
riment Station, Vicksburg, Mississippi,
4. 62 p, 2 fig, 15 tab, 36 ref.

s: *Ecosystems, *Food webs,
*Food chains, *Biological communi-
sissippi River, *Channels, *Benthos,
River systems, Fish, Water quality,
Bluegill, Carp, Buffalo fish, Bass, Tur-
drogen ion concentration, Temperature,
ution effects.

ance of side channels and main channel
fish habitat was evaluated in three
ive areas of the Middle Mississippi
, benthos and plankton were collected
samples in 1972-73. Water quality was
Zooplankton occurred in greater num-
channels than in main channel border
o significant differences were detected
nkton numbers between the two habitat
thic organisms generally occurred in
mbers in the main channel border
nnows and small fish were nearly 6
abundant in seine collections from the
els than in main channel borders. Both
the side channels and main channel border areas were important as fish habitat. (Katz)
W75-10451

**OCEAN POLLUTANTS POSE POTENTIAL DANGER TO MAN,**
For primary bibliographic entry see Field 5B.
W75-10464

**INTERNATIONAL EXPLORATION LOCATES MINERALS AND OILS,**
National Science Foundation, Washington, D.C. Office for the International Decade of Ocean Exploration.
For primary bibliographic entry see Field 5B.
W75-10467

**TAR POLLUTION OF SIERRA LEONE BEACHES,**
Fourah Bay Coll., Freetown (Sierra Leone). Inst. of Marine Biology and Oceanography.
For primary bibliographic entry see Field 5B.
W75-10472

**PERSISTENCE OF CADMIUM-INDUCED METABOLIC CHANGES IN LIVER AND KIDNEY,**
Ottawa Univ. (Ontario). Dept. of Pharmacology.
For primary bibliographic entry see Field 5A.
W75-10478

**CHARACTERIZATION OF CADMIUM UPTAKE BY PLANT TISSUE,**
California Univ., Davis. Dept. of Agronomy and Range Science.
For primary bibliographic entry see Field 5B.
W75-10479

**SUPPRESSION OF NITROGEN FIXATION BY BLUE-GREEN ALAGE IN A EUTROPHIC LAKE WITH TRACE ADDITIONS OF COPPER,**
California Univ., Berkeley. Sanitary Engineering Research Lab.
A. J. Horne, and C. R. Goldman.
Science, Vol 183, No 4123, p 409-411, February, 1974. 1 fig, 1 tab, 19 ref.

Descriptors: *Pollution abatement, *Lakes, *Copper, *Chelation, *Eutrophication, Chemical reactions, Nitrogen, Plankton, Surface waters, *Cyanophyta, Water pollution effects, Water pollution control.

The specific effects of very low concentrations of added and indigenous copper on phytoplanktonic N2 fixation and photosynthesis in a lake where natural chelation should be high were reported. Nitrogen fixation by blue-green algae in highly eutrophic Clear Lake, California, was severely inhibited by trace amounts of copper. The chelation capacity of the lake was probably saturated by indigenous copper. Additions were only 1/200 of those normally used in algal control. Since nitrogen fixation provides half of the lake's annual nitrogen budget, economical eutrophication control appears possible. (Jernigan-Vanderbilt)
W75-10480

**ABSORPTION OF CADMIUM, COPPER AND ZINC BY DOG WHELKS IN THE BRISTOL CHANNEL,**
Bristol Univ. (England). School of Chemistry.
For primary bibliographic entry see Field 5B.
W75-10481

**LEAD METABOLISM IN THE NORMAL HUMAN: STABLE ISOTOPE STUDIES,**
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 5A.
W75-10484

**WATER-SOIL-PLANT INTERACTIONS WITH TERBACIL,**
Hawaii Univ.-Hilo Coll., Hilo.
B. A. Kratky, and G. F. Warren.
Weed Science, Vol 21, No 5, p 451-454, 1973. Illus.

Descriptors: *Toxicity, Water pollution effects, *Sorghum, *Soil-water-plant relationships, Soils, Loam.
Identifiers: Phytotoxicity, Sorghum-bicolor, *Terbacil.

The phytotoxicity of terbacil (3-tert-butyl-5-chloro-6-methyluracil) is not closely correlated with the amount applied, the amount in available soil solution, or the concentration in available soil solution since soil type has a pronounced effect on the levels necessary for phototoxicity. About 19 times more terbacil was needed in a Chalmers silty clay loam (24% organic matter) than in a Bloomfield fine sand (o.3% organic matter) to cause a 30% control of sorghum (Sorghum bicolor (L.) Moench 'R.S. 610'). However, the Bloomfield fine sand required twice as great a concentration of terbacil in the soil solution as the chalmers silty clay loam (0.314 micro-g/ml versus 0.157 micro-g/ml). The total adsorption of terbacil in the latter soil decreased 4.5 fold when the water: soil ratio was increased from 0.6:1 (approximately field capacity) to 32:1, but the ratio of the concentration adsorbed: concentration in the soil solution did not vary appreciably.--Copyright 1974, Biological Abstracts, Inc.
W75-10486

**ARSENATE UPTAKE AND REDUCTION BY POCILLOPORA VERRUCOSA,**
Rhode Island Univ., Kingston. Graduate School of Oceanography.
M. E. Q. Pilson.
Limnology and Oceanography, Vol 19, No 2, p 339-341, March 1974. 1 fig, 8 ref. NSF (GA-34097).

Descriptors: *Coral, *Arsenic compounds, *Sea water, *Reduction(Chemical), Inorganic compounds, Chemical reactions, Phosphate, Cycles, *Absorption.

A scleractinian coral removed arsenate from solution and converted some of it to arsenite, which reappeared in the ambient seawater. This suggests that organisms other than bacteria may be responsible for maintaining some of the arsenic in seawater in a reduced form. Reduction of arsenate may be a mechanism to allow the loss from the living cell of arsenate transported in along with phosphate. (Jernigan-Vanderbilt)
W75-10491

**EFFECT OF DIETARY SELENIUM ON GLUTATHIONE PEROXIDASE IN THE CHICK,**
California Univ., Davis. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 5A.
W75-10495

**PRODUCTION OF MICROBIAL PROTEIN FROM WASTE CELLULOSE BY THERMOMONOSPORA FUSCA, A THERMOPHILIC ACTINOMYCETE,**
Wisconsin Univ., Madison. Dept. of Bacteriology.
D. L. Crawford, E. McCoy, J. M. Harkin, and P. Jones.
Biotechnology and Bioengineering, Vol 15, No 5, p 833-843, 1973, Illus.

Descriptors: *Thermophilic bacteria, *Actinomycetes, Microbiology, Production, *Protein, *Cellulose, Pulp wastes.
Identifiers: Thermomonospora-fusca.

The growth characteristics of T. fusca, a cellulolytic thermophilic actinomycete, are described in terms of growth on pulping fines, a cellulosic waste of the paper industry. A fermentation was

developed which substantially degrades this waste, with the residual product of growth containing about 30% microbial protein. This protein, as shown by a preliminary feeding study with baby chicks and by amino acid analyses, appears to be of good nutritional quality and contains no strongly toxic materials. The extracellular cellulolytic enzymes present in the spent broth are discussed in relation to their potential recovery as a by-product of the fermentation as a waste disposal system.--Copyright 1974, Biological Abstracts, Inc.
W75-10538

**ENRICHMENT OF SURFACE FRESHWATER MICROLAYERS WITH ALGAE,**
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W75-10583

**WATER QUALITY CRITERIA FOR EUROPEAN FRESH-WATER FISH.**
Food and Agriculture Organization of the United Nations, Rome (Italy). European Inland Fisheries Advisory Commission.
Water Research, Vol 8, No 9, p 681, September 1974. 1 tab. EIFAC Technical Paper No. 20.

Descriptors: *Salmonids, *Chlorine, *Fish, *Invertebrates, Aquatic life, *Toxicity, *Water quality standards, Water pollution effects.
Identifiers: *Hypochlorous acid, *Chloramines, Bioaccumulation.

Toxicity of chlorine as hypochlorous acid and chloramines to aquatic life was studied. Coarse fish species, invertebrate organisms and plants were more resistant to chlorine than salmonids. Chlorine concentrations greater than 0.008 mg HOCl l(-1) were harmful or lethal within four days to both salmonids and coarse fish, whereas 0.004 mg HOCl l(-1) was endured by sensitive species of fish for five days. The effects of dissolved oxygen concentration, temperature, salinity, pH and water hardness on toxicity of chlorine were discussed. (Katz)
W75-10609

**WATER QUALITY CRITERIA FOR EUROPEAN FRESHWATER FISH.**
Food and Agriculture Organization of the United Nations, Rome (Italy). European Inland Fisheries Advisory Commission.
Water Research, Vol 8, No 9, p 683-684, September 1974. 1 tab. EIFAC Technical Paper No. 21.

Descriptors: *Freshwater fish, Salmonids, Atlantic salmon, Rainbow trout, Brown trout, Carp, *Fish behavior, *Zinc, *Metals, *Toxicity, *Water qualitystandards, Water pollution effects, Fish behavior, Environmental effects.
Identifiers: Gold fish, Bioaccumulation, Avoidance behavior.

The toxicity of solutions containing zinc was attributable to the zinc ion and possibly to particulate zinc present as the basic carbonate or the hydroxide held in suspension. It was modified by water quality, particularly by an increase in hardness, temperature, salinity, suspended solids and dissolved oxygen. The acute toxicity of zinc in the presence of other heavy metals and common pollutants seemed to be additive. The effect of zinc was reduced by acclimation and age of fish. Atlantic salmon, rainbow trout, carp, goldfish, brown trout in both field and laboratory studies demonstrated avoidance behavior patterns to certain zinc concentrations. For the maintenance of thriving populations of fish the annual 95 percentile of concentrations of zinc should be no greater than 0.1 of the appropriate 7-d LC50 at 15C. The criteria would depend on the water hardness and type of fish. (Katz)
W75-10650

**STUDIES ON THE METABOLISM OF CHLOROPHENOLS IN FISH-III ISOLATION AND IDENTIFICATION OF A CONJUGATED PCP EXCRETED BY GOLDFISH,**
Hyogo Prefecture Fisheries Experiment Station, Kobe (Japan).
For primary bibliographic entry see Field 5A.
W75-10611

**INHIBITION OF ATPASES ACITIVITY IN CHANNEL CATFISH BRAIN BY KEPONE(TRADE NAME) AND ITS REDUCTION PRODUCT,**
Mississippi State Univ., Mississippi State. Dept. of Biochemistry.
D. Desaiah, and R. B. Koch.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 2, p 153-158, February 1975. 1 fig, 3 tab, 19 ref.

Descriptors: Freshwater fish, *Catfish, *Fish, Physiology, Biochemistry, *Enzymes, Organic compounds, *Bioassay, Laboratory tests, Design, Methodology, Inhibition, Water pollution effects.
Identifiers: *Channel catfish, Ictalurus punctatus, *ATPases, *Kepone(Trade Name), DCPD, Tissue analysis, Brain.

The effects of Kepone(Trade Name) and its reduction product DCPD (decachloropentacyclo-decan-5-ol) on channel catfish, Ictalurus punctatus, brain ATPases in vitro were studied. The inhibition of Na+-K+ ATPase by Kepone(Trade Name) and DCPD was similar. Inhibition increased with increased concentration of the inhibitors. Oligomycin-sensitive (mitochondrial) Mg+2 ATPase from catfish brain showed greatest sensitivity to the inhibitors. Oligomycin-insensitive Mg+2 ATPase activity showed similar sensitivity to the inhibitors but inhibition was less than for mitochondrial Mg+2 ATPase. (Katz)
W75-10612

**COPPER, ZINC AND TOTAL PROTEIN LEVELS IN THE PLASMA OF SOCKEYE SALMON (ONCORHYNCHUS NERKA) DURING THEIR SPAWNING MIGRATION,**
Memorial Univ. of Newfoundland, St. Johns. Marine Sciences Research Lab.
G. L. Fletcher, E. G. Watts, and M. J. King.
Journal of the Fisheries Research Board of Canada, Vol 32, No 1, p 78-82, January 1975. 2 fig, 1 tab, 19 ref.

Descriptors: Salmonids, *Sockeye salmon, Heavy metals, *Proteins, Fish physiology, Bioassay, Growth stages, *Metabolism, *Spawning, Fish reproduction, *Fish Migration, Laboratory tests, Water pollution effects, Canada, *Zinc, *Copper.
Identifiers: Tissue analysis, Bioaccumulation, Plasma, Plasma proteins.

Concentrations of copper, zinc and total protein were measured in the plasma of sockeye salmon (Oncorhynchus nerka) during their migration to the Chilko spawning grounds, British Columbia. Concentrations of both metals and total protein declined during migration. Final values for all three parameters were 20-50% of those observed in seawater animals. Concentrations of zinc and copper were positively correlated with plasma protein concentrations. An examination of the metal: protein ratios revealed that only the zinc: protein ratios declined during migration, suggesting that zinc was being removed from the plasma independent of the proteins. (Katz)
W75-10613

**RESIDUE ANALYSES ON 2-AMINO-4 PHENYLTHIAZOLE, A PISCINE ANESTHETIC, IN FISHES-I A MODEL RADIO-TRACER EXPERIMENT WITH MEDAKA,**
Meiji Seiki Kaisha Ltd., Yokohama (Japan). Research Labs.
For primary bibliographic entry see Field 5A.
W75-10614

**ASPECTS OF THE WINTER ECOLOGY OF JU VENILE COHO SALMON (ONCORHYNCHU KISUTCH) AND STEELHEAD TROUT (SALM GAIRDNERI),**
British Columbia Univ., Vancouver Dept. Forestry.
D. R. Bustard, and D. W. Narver.
Journal of the Fisheries Research Board Canada, Vol 32, No 5, p 667-680, May 1975. 9 fig, tab, 15 ref.

Descriptors: *Salmonids, *Salmon, *Trout, Fi behavior, *Biorhythms, Streams, *Growth stage *Juvenile growth stage, Seasonal, Winter foo habits, Life cycles, Environmental effect Forests, Habitats, Water temperature.

The major physical characteristics of overwinte ing areas for juvenile coho salmon (Oncorhynch kisutch) and steelhead trout (Salmo gairdne were described for a small, unlogged stream. Me depths of water, maximum water velocities, wat temperatures, winter cover selection, feeding a hiding behavior, tributary movements and e vironmental change effects were discussed for t coho salmon and steelhead trout. (Katz)
W75-10615

**ON THE ACCUMULATION OF O GANOCHLORINE PESTICIDES, PCB AN CERTAIN HEAVY METALS IN FISH AN SHELLFISH FROM THAI COASTAL AND I LAND WATERS,**
Bundesforschungsanstalt fuer Fischerei, Hambu (West Germany). Isotopenlaboratorium.
For primary bibliographic entry see Field 5B.
W75-10616

**ADDITIONAL STUDIES OF THE FISH MACROINVERTEBRATES AND HYDROLO CAL CONDITIONS OF UPLAND CANALS TAMPA BAY, FLORIDA,**
National Marine Fisheries Service, St. Petersbu Fla. Southeast Region.
W. N. Lindall, Jr., W. A. Fable, Jr., and L. A. Collins.
Fishery Bulletin, Vol 73, No 1, p 81-85, Janu 1975. 5 fig, 1 tab, 7 ref.

Descriptors: *Canals, *Environmental effe Salinity, *Dissolved oxygen, Sampling, L management, Ecological distribution, *Flori Water pollution effects, Data collectio Hydrologic data.
Identifiers: *Upland canals, *Tampa Bay(F Comparative studies, Species.

Hydrological and biological data from a concl ing study of upland canals in Tampa Bay, Flor were presented and compared with those collec in the previous year. Critically low levels of solved oxygen occurred more frequently and a a longer period of time in the second year. Mos fected were the inland portions of the canal sys where the number of species declined mark over the previous year. Impoverishment of fa on or near the bottom was expected to recur ing summer months because of oxygen deple resulting from continuing accumulation of dec posing organic sediments, warm water, and l circulation in the dead-end canals. (Katz)
W75-10617

**DEVICES FOR TOXICOLOGICAL LO TERM STUDIES ON AQUATIC ORGANI (GERATE ZUR DURCHFUHRUNG T IKOLOGISCHER LANGZEITSTUDIEN WASSERORGANISMEN),**
Farbwerke Hoechst, Frankfurt am Main (W Germany).
For primary bibliographic entry see Field 5A.
W75-10618

TE TOXICITY OF AMMONIA TO
RAL DEVELOPMENTAL, STAGES OF
BOW TROUT, SALMO GAIRDNERI,
State Univ., Ohio. Dept. of Biological
ce.
Rice, and R. M. Stokes.
ry Bulletin, Vol 73, No 1, p 207-211, January
1 fig, 1 tab, 25 ref.

iptors: *Salmonids, *Rainbow trout,
vth stages, Fish eggs, *Embryonic growth
Nitrogen compounds, *Ammonia,
ssays, *Toxicity, Fish physiology, Laborato-
ts, Water pollution effects, Environmental
s, *Lethal limit.
fiers: Alevins, Tolerance limits, TLM, Sur-
ates, Bioaccumulation.

n tolerance limits derived from 24-h bioas-
emonstrated that fertilized eggs and alevins
ıbow trout, Salmo gairdneri, were not vul-
e to 3.58 ppm un-ionized ammonia at 10
s C (pH 8.3). At the end of yolk absorption,
w trout fry increased in susceptibility dra-
lly, their median tolerance limit values were
0.072 ppm, the same as for adult trout. Fer-
on of eggs was not prevented in un-ionized
nia solutions up to 1.79 ppm, the highest ex-
tested. Results indicated that rainbow trout
os and alevins were safer from ammonia
y than were older salmonids. (Katz)
0619

CONCENTRATION OF MERCURY,
ER, NICKEL, SILVER, CADMIUM AND
IN THE NORTHERN ADRIATIC
OVY, ENGRAULIS ENCRASICHOLUS,
ARDINE, SARDINA PILCHARDUS,
lian Inst. of Marine Sciences, Townsville.
mary bibliographic entry see Field 5B.
0620

PHENE EFFECTS ON GROWTH AND
LOPMENT OF BROOK TROUT
ELINUS FONTINALIS),
of Sport Fisheries and Wildlife, Columbia,
sh-Pesticide Research Lab.
Mehrle, and F. L. Mayer, Jr.
of the Fisheries Research Board of
, Vol 32, No 5, p 609-613, May 1975. 4 tab,

ptors: *Salmonids, *Trout, *Brook trout,
h stages, Fish eggs, Frys, *Fish physiolo-
owth rates, Bioassay, *Halogenateed pesti-
Water pollution effects, Environmental ef-
Laboratory tests, Calcium, Phosphorus,
y.
ers: *Toxaphene, Tissue analysis, Bioac-
tion, Organochlorine insecticides, Col-

-two days before hatching, eyed eggs of
rout (Salvelinus fontinalis) were placed in a
rough system and continuously exposed to
ene (0, 39, 68, 139, 288 and 502 ng/liter)
ey hatched and the resulting fry were ex-
or a further 90 days. Hatchability was not
d by toxaphene, but all of the fry exposed
nd 288 ng/liter of toxaphene died by 30 and
after hatch, respectively. Growth of fry
nificantly depressed at the 139 and 288
concentrations 30 days after hatch and at
centrations after 60 and 90 days of tox-
exposure. Whole body collagen of fry, as
ed by hydroxyproline, was significantly
ed in the four higher concentrations of tox-
within 7-15 days after hatch. Backbone
was significantly decreased ($P < 0.05$) in
and 90-day old fry exposed to toxaphene,
calcium and phosphorus concentrations
ackbone were increased ($P < 0.05$). The
collagen ratio was significantly increased
hene. (Katz)
521

**PCBS IN THE SPOTTED SHARKS, MUSTELUS MANAZO, FROM TOKYO BAY, (IN JAPANESE),**
Tokai Regional Fisheries Research Lab., Tokyo (Japan).
For primary bibliographic entry see Field 5A.
W75-10622

**EFFECTS OF TEMPERATURE ON DEVELOPMENT AND SURVIVAL OF RAINBOW TROUT, SALMO GAIRDNERI, IN ACID WATERS,**
Ontario Ministry of Natural Resources, Sault Ste. Marie (Ontario). Fish and Wildlife Research Branch.
W-H. Kwain.
Journal of the Fisheries Research Board of Canada, Vol 32, No 4, p 493-497, April 1975. 3 fig, 15 ref.

Descriptors: *Salmonids, *Rainbow trout, *Growth stages, *Embryonic growth stage, Fish eggs, *Mortality, *Toxicity, Hydrogen ion concentration, *Water temperature, Water quality, Water pollution effects, Laboratory tests, Lethal limit, Fish physiology, Acidic water.
Identifiers: Fingerlings, LC50, Survival rates, Bioaccumulation.

Differences in mortality of rainbow trout, Salmo gairdneri, embryos were significant ($P < 0.05$) when the eggs were exposed to 5,10, and 15C and pH levels from 3.0 to 6.0. Below pH values of 4.49 no embryos survived, regardless of temperature. The medium lethal pH values for rainbow embryos were 4.75 and 5.52 at temperatures of 10 and 5C, respectively. Differences in lethal pH values for fingerlings were significant ($P < 0.05$) when exposed to water temperatures of 5,10,15 and 20C and acclimation temperatures of 10 and 20C. The median lethal pH values of fingerlings were positively related to the test water temperatures and ranged from 3.86 to 4.49. Resistance of yearling trout to acid waters was higher than of fingerlings. (Katz)
W75-10623

**THE EFFECT OF SUBLETHAL CONCENTRATIONS OF COPPER AND ZINC ON VENTILATORY ACTIVITY, BLOOD OXYGEN, AND PH IN RAINBOW TROUT (SALMO GAIRDNERI),**
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
C. M. Sellers, Jr, A. C. Heath, and M. L. Bass.
Water Research, Vol 9, No 4, p 401-408, April 1975. 7 fig, 39 ref.

Descriptors: *Salmonids, *Rainbow trout, *Heavy metals, *Zinc, *Copper, *Fish physiology, *Respiration, *Bioassay, Ventilation, Hydrogen ion concentration, Oxygen requirements, Laboratory tests, Toxicity, Environmental effects, Water pollution effects, *Lethal limit.
Identifiers: Blood oxygen, Sublethal concentrations, Gills, Catherization, Coughing, Pressure pulses.

Changes in buccal and opercular pressure amplitude, as well as ventilation and coughing frequency were monitored in rainbow trout (Salmo gairdneri) using catheterization of respiratory cavities and pressure transducers. One or more of the ventilatory parameters measured were found to change under toxicant stress at concentrations of copper or zinc at or below the LC50. Possible synergistic effects were indicated when the two metal ions were tested together. Serial analyses of arterial P02 and pH in fish exposed to copper and zinc individually at concentrations approximating the LC50 showed that environmental zinc produced a sharp decrease in both P02 and pH. Copper, however, caused little effect other than a transient increase in pH. The toxic action of the two metals in low concentrations thus may not be the same. (Katz)
W75-10624

**HERBICIDES IN AQUATIC SYSTEMS,**
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station.
C. Newbold.
Biological Conservation, Vol 7, No 2, p 97-118, February 1975. 1 fig, 5 tab, 58 ref.

Descriptors: Environmental effects, *Primary productivity, *Ecosystems, *Secondary productivity, *Food chains, Water pollution sources, *Herbicides, Diquat, Paraquat, 2,4-D, *Dalapon, *Copper sulfate, *Spraying, *Fish, *Aquatic plants, Toxicity, Insect control, Aquatic habitats.
Identifiers: Dichlobenil, Chlorthiamid, Terbutryne, Diuron, *Asulam, Maleic hydrazide, Maleic hydrazide, 2,4-D chlorophan, *Aquatic herbicide properties, LC50, Britain.

The characteristics of twelve herbicides used in Britain - diquat, paraquat, dichlobenil, chlorthiamid, terbutryne, dalapon, diuron, asulam, copper sulphate, maleic hydrazide, maleic hydrazide,2,4-D,chlorpropham, and 2,4-D,amine were discussed. Properties including mode of action, persistence in muds, breakdown in water, form, treatment level, LC50 for fish and LC50 for Daphnia were presented for each herbicide. Short-term and long term effects resulting from herbicide spraying were discussed. (Katz)
W75-10625

**ABSORPTION, METABOLISM, AND EXCRETION BY GOLDFISH OF THE ANIONIC DETERGENT SODIUM LAURYL SULPHATE,**
Unilever Ltd., Sharnbrook (England). Unilever Research Lab.
P. W. A. Tovell, D. Howes, and C. S. Newsome.
Toxicology, Vol 4, No 1, p 17-29, 1975. 9 fig, 1 tab, 25 ref.

Descriptors: *Sulfates, *Sodium sulfate, *Freshwater fish, *Fish physiology, *Bioassay, *Metabolism, *Path of pollutants, *Detergents, *Absorption, Laboratory tests, Water pollution effects.
Identifiers: *Goldfish, Carassius auratus, Tissue analysis, Excretion, Bioaccumulation, Sodium lauryl sulphate, Anionic detergent, SLS, Gall bladder.

The route of absorption, tissue distribution, metabolism, route of excretion, and excretion rate of the anionic detergent sodium lauryl sulphate (SLS) in goldfish (Carassius auratus) was investigated using (35S) or (1-14C) SLS. Goldfish absorb SLS from solution principally through the gills. SLS is rapidly distributed throughout the body tissues, the highest concentration being found in the gall bladder. SLS was metabolized by the fish to butyric acid-4-sulphate, and was excreted by the kidney. Over a 24-h period 68% and 38% of a prescribed dose was excreted from freely fed and unfed fish, respectively. (Katz)
W75-10626

**THE EFFECT OF SOME HEAVY METAL IONS ON PHOTOSYNTHESIS IN A FRESHWATER ALGA,**
Institute of Marine Biochemistry, Aberdeen (Scotland).
J. Overnell.
Festicide, Biochemistry and Physiology, Vol 5, No 1, p 19-26, 1975. 3 fig, 1 tab, 22 ref.

Descriptors: *Heavy metals, Copper, Cadmium, Lead, Mercury, *Herbicides, *Photosynthesis, *Plant physiology, *Algae, *Ions, Path of pollutants, Laboratory tests, Bioassay, Water pollution effects, Environmental effects, Toxicity.
Identifiers: Methyl mercury, Thallium, 3(3-4-dichlorophenyl)1-1-dimethylurea, *Chlamydomonas reinhardii, Bioaccumulation, Light-induced oxygen evolution, *Hill reaction, Mehler reaction.

The effect of copper, cadmium, lead, mercury, methyl mercury, thallium and the herbicide 2(3-4-dichlorophenyl) 1, 1-dimethylurea on the light-induced oxygen evolution, the hill reaction and a modified Mehler reaction was studied with the freshwater alga Chlamydomonas reinhardii. The light-induced oxygen evolution of whole cells was very sensitive to the cadmium ion, but this ion was almost without effect on the Hill reaction and the modified Mehler reaction. The light-induced oxygen evolution was also very sensitive to methyl mercury and lead. (Katz)
W75-10627

**INFLUENCE OF A THERMAL EFFLUENT ON MOVEMENT OF BROWN BULLHEAD (ICTALURUS NEBULOSUS) AS DETERMINED BY ULTRASONIC TRACKING,**
Canada Centre for Inland Waters, Burlington (Ontario).
J. R. M. Kelso.
Journal of the Fisheries Research Board of Canada, Vol 31, No 9, p 1507-1512, September 1974. 5 fig, 2 tab, 7 ref.

Descriptors: *Bullheads, *Ultrasonics, *Marking techniques, *Thermal pollution, Effluents, *Fish physiology, Temperature, Nuclear powerplants, Water pollution effects, *Pollutant identification.
Identifiers: *Brown bullhead, Swimming characteristics, Movement patterns, Lake Ontario, Thermal plume.

Ten Brown bullhead (Ictalurus nebulosus) were captured within the influence of a thermal discharge in Lake Ontario, marked with ultrasonic transmitters and continuously tracked for 29-344 minutes. Five control bullheads were similarly monitored at a control site. Fish caught and released in the discharge area remained within 50-700m of the release point, turned frequently and sharply, and swam at an average speed of 30 cm/s. Control fish moved along shore, average speed 48 cm/s, in straighter paths up to 4200 m from the release point. On the morning following release, only 20% of the fish released in the discharge were still there, indicating that association with the plume was of short duration. The study indicates that the thermal discharge can interrupt or alter normal movement patterns of brown bullhead. (Katz)
W75-10628

**UPTAKE, ELIMINATION AND BIOTRANSFORMATION OF THE LAMPRICIDE 3-TRIFLUROMETHYL-4-NITROPHENOL (TFM) BY LARVAE OF THE AQUATIC MIDGE CHIRONOMUS TENTANS,**
Viterbo Coll., La Crosse, Wis. Dept. of Biology.
J. A. Kawatski, and M. A. Bittner.
Toxicology, Vol 4, No 2, p 183-194, May 1975. 3 fig, 5 tab, 9 ref.

Descriptors: *Aquatic insects, *Midges, *Toxicity, *Organic compounds, Hardness(Water), *Bioassay, Water quality, Laboratory tests, Water pollution effects.
Identifiers: Chironomus tentans, *Lampricides, *TFM, 3-Trifluoromethyl-4-nitrophenol, *Sublethal concentrations, Tissue analysis, Bioaccumulation, Biotransformation.

Accumulation of (14C) 3-trifluoromethyl-4-nitrophenol ((14C) TFM) by aquatic midge, Chironomus tentans, larvae from sublethal aqueous concentrations was rapid and dependent upon hardness of water. TFM was readily biotranformed to at least two polar derivatives, including sulfated TFM and TFM-glucuronide. Some TFM was also reduced to the phenol/amine. Chironomus tentans quickly eliminated all TFM derivatives as well as the parent (14C) TFM. (Katz)
W75-10629

**PHYSIOLOGICAL CHANGES IN THE SERUM AND HEPATOPANCREAS OF YELLOW TAIL INJECTED WITH CARBON TETRACHLORIDE, (IN JAPANESE),**
Hyogo Prefecture Fisheries Experiment Station, Akashi (Japan).
H. Sakaguchi, and A. Hamaguchi.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 41, No 3, p 283-290, March 1975; 2 fig, 6 tab, 14 ref.

Descriptors: Fish, Organic compounds, *Fish physiology, *Enzymes, *Bioassay, Laboratory tests, Water pollution effects.
Identifiers: *Carbon tetrachloride, *Yellow tail, Tissue analysis, Bioaccumulation, *Serum, *Hepatopancreas.

Yellow tail were injected with carbon tetrachloride at dosages of 0.05-0.2 ml/100 g body weight. Separation of cell cords, congestion of sinusoid and a decrease in the number and size of lipids in the hepatopancreas were observed. Activities of lactic dehydrogenase (LDH), glutamic oxaloacetic transaminase (GOT) and glutamic pyruvic transaminase (GPT) in serum increased. Serum triglyceride, total cholesterol, beta-lipoprotein and protein decreased after 2 to 6 hours, but recovered to control levels after 24 hours. (Katz)
W75-10630

**EFFECTS OF CHLORINATED HYDROCARBON POLLUTANTS ON GROWTH OF MARINE PHYTOPLANKTON IN CULTURE,**
State Univ. of New York, Stony Brook.
N. S. Fisher.
Available from University Microfilms, Inc., Ann Arbor, Michigan, 48106. Order No 74-27,824. PhD Thesis, 1974, 195 p.

Descriptors: *Toxicity, *Water pollutant effects, *Algae, *Chlorinated hydrocarbon pesticides, *DDT, Polychlorinated biphenyls, Cultures, *Phytoplankton, Organic compounds, Plant growth, Marine algae.

An evaluation was made of the applicability of batch and continuous culture toxicity tests to natural ecosystems. Six species of marine planktonic algae were subjected to polychlorinated biphenyls and DDT in various concentrations. The effect of these compounds on their growth was studied. Both artificial communities and natural communities of the algae were observed. Due to an impermanence of conditions in aquatic environments and the relatively low phytoplankton cell densities normally occurring, most phytoplankton species will adopt a density-dependent strategy, involving such mechanisms as allelochemics. By interfering with competitive abilities of some phytoplankton, chlorinated hydrocarbons disrupt successional patterns and alter species composition in algal communities in nature. Animal communities would be indirectly affected as many herbivores graze selectively. (Prague-FIRL)
W75-10636

**THE EFFECT OF CERTAIN ORGANIC POLLUTANTS ON COPPER TOXICITY TO FISH (LEBISTES RETICULATUS),**
Michigan Univ., Ann Arbor.
J. A. Black.
Available from University Microfilms, Inc., Ann Arbor, Michigan, 48106. Order No 74-25,152. PhD Thesis, 1974, 140 p.

Descriptors: *Water pollutant effects, *Organic wastes, *Toxicity, *Copper, Fish toxins, Bioassay, Sewage, Metals, Pollutant identification.
Identifiers: *Anodic stripping voltammetry, Organic pollutants.

Anodic stripping voltammetry (ASV) was used to measure the degree of copper-organic binding in bioassay solutions. The relative toxicities of several copper-organic complexes to fish and the relationship of these toxicities of the relative bin ing abilities of the organic ligands for copper we studied. Guppies were exposed to copper-orgar complexes during 96 hour bioassays conducted soft water at pH 7.5. Fish were analyzed by aton absorption spectrophotometry to determine t amount of copper accumulation in internal orga The organic compounds tested were chosen on t basis of their prevalence as pollutants. Glycir cysteine, EDTA, NTA, and citric acid were test in the concentration range of 1 to 3 times ten to t minus sixth power M. Albumin, humic acid, a secondary sewage effluents had concentrations 5.0 mg/liter. The organic compounds found reduce copper toxicity to fish included NT glycine, EDTA, and humic acid. Those with no fect on toxicity were albumin, sewage effluc cysteine, and citric acid. Organically bound cop is less toxic than unbound copper. The methodo gy of ASV is discussed as a possible technique predict metal toxicity in natural waters. (Prag FIRL)
W75-10637

**800 MILES TO GO,**
Alyeska Pipeline Service Co., Bellevue, Wash.
R. H. Merrett.
NLGI Spokesman, Vol 38, No 12, p 421-4 March, 1975. 14 fig.

Descriptors: *Pipelines, *Alaska, *Environmer effects, Water quality control, Oil wastes, Mo toring, Costs, Personnel, Oil pollution.
Identifiers: *Alaska pipeline.

The Alaska pipeline and its environmental effe are discussed. Both Federal and State agen have been assigned to monitor pipeline work two lane 360-mile road is being built along route of the pipeline as well as shorter auxill roads. The project is the largest privately fun construction effort ever undertaken, amountin $4.5 billion. The extreme terrain and temperatu along its 800 miles present unique problems in gineering and design. Water and air quality con facilities are described. All ballast water from kers which take on oil will be processed and rified before being returned to the harbor. W will be discharged with less than 8 ppm of Problems of long-term management such as monitoring, personnel management, and scheduling of inspections are detailed. (Pra FIRL)
W75-10638

**ICEBREAKING DRILLSHIP FOR OFFSH EXPLORATORY DRILLING IN THE ARCTI**
For primary bibliographic entry see Field 5G.
W75-10639

**OIL IN THE SEA.**
For primary bibliographic entry see Field 5B.
W75-10640

**THE EFFECT OF CRUDE OIL FRACTIONS THE SURVIVAL OF A TIDEPOOL COPEI TIGRIOPUS CALIFORNICUS,**
California State Univ., Northridge. Dept. of B gy.
C. J. Barnett, and J. E. Kontogiannis.
Environmental Pollution, Vol 8, No 1, p 4 January, 1975. 6 fig, 7 ref.

Descriptors: *Oil pollution, Oceans, *Cope Crustaceans, Invertebrates, Laboratory stu *Water pollution effects, Marine ani Gasoline, *Toxicity, *Oil wastes, Indu wastes, Organic compounds.
Identifiers: *Tigriopus californicus, Diese Kerosene, Benzene.

Oil pollution of oceans is a current ecol problem. The effects of petroleum produc various marine species are not well docum

e now under both field and laboratory in-
ation. In this case, the effects of four com-
crude oil fractions on the surface of a
ol copepod were studied in the laboratory.
igriopus californicus, four concentrations
f diesel oil, kerosene, gasoline, and benzene
ested. Diesel oil was the most detrimental; in
ntrations of 0.10 ml/liter, mortality resulted
five days. Gasoline showed the highest
ity within the first 24 hours while benzene
ost lethal between the first and second days.
rder of toxicity from greatest to least was
oil, kerosene, gasoline, benzene. The more
evaporating crude oil fractions present the
t hazards. The survival of this species is in-
proportional to the concentration of the
oil fraction in the environment. (Prague-

0641

**TS OF AN OFFSHORE CRUDE OIL UN-
ING TERMINAL ON THE MARINE EN-
MENT,**
A and M Univ., College Station. Environ-
Engineering Div.
ames, R. W. Hann, Jr., and F. Slowey.
Technology Society Journal, Vol 9, No 1,
January, 1975. 2 fig, 4 ref.

tors: *Oil spills, Oil pollution,
nmental effects, Sea water, Offshore plat-
Engineering structures, Pipelines, Con-
n, Water pollution effects, Texas.

mental aspects of a deepwater crude oil
ng terminal have been studied at two sta-
f the coast of Texas. The first study was
ted for the Council on Environmental
and the second for SEADOCK, Incor-
, both by Texas A and M University.
CK is a corporation formed to operate a
ter facility to handle very large crude car-
the 100,000 to 700,000 deadweight ton
he construction schedule and its impacts
ines. Field sampling has been conducted to
baseline information on the physical,
l, and biological characteristics of the
d to estimate the impact of the project on
arine environment. Fuel pipelines,
es, pumps, and mooring systems are
d. The existence of platform structures,
oys and such pipelines should have little
impact on the marine environment and
vide an artificial reef for colonization by
narine organisms. Oil spill hazards were
by models developed which provided in-
n on response time available for control,
of the coast requiring protection, and con-
ns of soluble oil fractions in the water
The location of an offshore terminal com-
s concluded to be the most sound choice
nentally, as any major spills would be less
s in an esturial inshore area. Transit time
re entrances should provide enough time
ctive action in the event of any oil spill.
FIRL)
42

**TY OF CHLORINATED MUNICIPAL
S TO FISH: AN EVALUATION BASED
HIGAN FIELD DATA,**
Dept. of Natural Resources, Lansing.
f Water Management.

edings of the 27th Industrial Waste Con-
May 2-4, 1972, Purdue University,
. Indiana, Engineering Extension Series
Part 2, p 639-648. 5 tab, 16 ref.

rs: *Chlorination, *Sewage treatment,
, *Fishkill, Chemical reactions,
*Michigan, Minnows, Rainbow trout,
nit, *Municipal wastes, Water pollution
ata collection.

Chlorinated municipal waste discharges were lethal to rainbow trout held downstream from three of four Michigan plants studied. The major factor affecting chlorinated waste toxicity was toxicity was dilution by river flow. At the Charlotte treatment plant the mean total residual chlorine concentration (TRC) of the effluent during exposure was 1.77 mg/l. Almost 100% kill of trout was observed 3200 ft downstream during exposure. The toxicity ceased between 3200-10,500 ft downstream, with extremely low TRC found toxic (an average of 0.007 mg/l). The West Branch treatment plant TRC exposure was 1.35 mg/l. This waste was toxic to 50% of the fish 500 ft downstream. The trout survived a mean TRC of 0.002 mg/l at another station. The Mason treatment plant TRC concentration was 2.64 mg/l. Toxicity was evident at least 4600 ft downstream. Extremely low concentration (0.046 mg/l) were toxic to the trout but they survived 0.013 mg/l at another station. The mean TRC during the chlorinated exposure at the Roscommon plant was 18.92 mg/l. No fish mortality was evident, apparently due to the high dilution of the waste in the river. It is recommended that in-plant monitoring of chlorine be performed with a more accurate means than the orthotolidine color comparator. (Auen-Wisconsin)
W75-10680

**WILL WASTEWATER TREATMENT STOP EUTROPHICATION OF IMPOUNDMENTS,**
Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 5D.
W75-10686

**ANALYSIS OF POLLUTION FROM MARINE ENGINES - STATUS REPORT,**
Environmental Control Technology Corp., Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W75-10688

**POPULATION DYNAMICS OF PROTOZOA IN WASTEWATER, AND IMPACT OF ENVIRONMENTAL CHANGES,**
Howard Univ., Washington, D.C. Bio-Environmental Engineering and Sciences Research Lab.
For primary bibliographic entry see Field 5D.
W75-10689

**FISHES OF THE HIWASSEE RIVER SYSTEM: ECOLOGICAL AND TAXONOMIC CONSIDERATIONS,**
Wapora, Inc., Washington, D.C.
R. K. Hitch, and D. A. Etnier.
J Tenn Acad Sci, Vol 49, No 3, p 81-87, 1974, Illus.

Descriptors: *Tennessee, *Fish, *Systematics, Ecology, Rivers, *Ecological distribution, Mine wastes, Tributaries, Water pollution effects.
Identifiers: Etheostoma camurum, *Hiwassee River(Tenn), Hypentelium-etowanum, Ichthyozon-hubbsi, Micropterus-coosae, Notropis-spectrunculus, Perca-flavescens, Percina-aurantiaca, Percina-burtoni, Percina-squa-ata, Phoxinus, *Fish diversity.

Collections of fishes (72) were made in the Hiwassee River Tennessee, and its tributaries between Aug. 1970-July, 1971. Greatest emphasis was placed on studies of the ecological relationships, distribution, and taxonomy of smaller species. Seventy-two species of fishes are known to occur in the Hiwassee system, with species of special significance including Ichthyomyzon hubbsi, Notropis spectrunculus, and undescribed dace of the genus Phoxinus, Hypentelium etowanum, Micropterus coosae, Perca flavescens, Etheostoma camurum, Percina aurantiaca, P. burtoni and P. squamata. Mining wastes were found to have greatly reduced the diversity of fishes in the Ocoee River and some of its tributaries.--Copyright 1974, Biological Abstracts, Inc.
W75-10694

**TOXICITY OF THE LAMPRICIDE 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) TO 10 SPECIES OF ALGAE,**
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
A. W. Maki, L. D. Geissel, and H. E. Johnson.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. In: Investigations in Fish Control, United States Department of the Interior, Fish and Wildlife Service, Washington, D.C. 1975, No 56. 17 p, 3 fig, 5 tab, 12 ref.

Descriptors: *Pesticides, *Algae, *Growth rates, *Toxicity, Laboratory tests, Environmental effects, Chlorophyta, Toxicants, Diatoms, Cyanophyta, Inhibition, Inhibitors, Analytical techniques, Primary productivity, Mortality.
Identifiers: *Lampricides, *TFM, *Sublethal effects, Anabaena ssp., Chlorella ssp.

The toxicity of analytical and field grades of the lampricide-3-trifluoro-methyl-4-nitrophenol (TFM), to unialgal cultures of four green algae, four blue-green algae and two species of diatoms was examined in 96-hour toxicity tests. A 50% inhibitation of growth occurred in concentrations less than 10 mg/liter of TFM for all species tested except Chlorella pyrenoidosa, which was resistance at concentrations greater than 15 mg/liter. Inhibition of growth was lowest in the blue-green species, generally intermediate in the green algae, and severe in diatoms (50% effect levels, 1-4 mg/liter). Field grade TFM tended to be more toxic than the analytical grades. Growth tests indicated that exposure to TFM at concentrations of 30 mg/liter for 96 hours did not destroy the viability of algae cells but temporarily inhibited growth. (Katz)
W75-10697

**ACUTE TOXICITIES OF 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) AND 2',5-DICHLORO-4'-NITROSALICYLANILIDE (BAYER 73) TO LARVAE OF THE MIDGE (CHIRONOMUS TENTANS),**
Viterbo Coll., LaCrosse, Wis. Dept. of Biology.
J. A. Kawatski, M. M. Ledvina, and C. R. Hansen, Jr.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. In: Investigations in Fish Control, United States Department of the Interior, Fish and Wildlife Service, Washington, D.C., 1975, No 57, 5 p, 2 tab, 11 ref.

Descriptors: *Toxicity, *Pesticides, *Midges, *Hardness(Water), Laboratory tests, Food chains, Environmental effects, Water quality, Invertebrates, Aquatic insects, Toxicants, Mortality.
Identifiers: *TFM, Bayer 73, *Synergistic effects, EC50(Immobility), *Chironomus tentans, Molluscides, Lampricides, Sublethal effects.

TFM (3-trifluoromethyl-4-nitrophenol) and Bayer 73 (2',5-dichloro-4'-nitrosalicylanilide) were tested individually and together for toxicity to fourth instar Chironomus tentans in laboratory static tests at 22C. The 24-hr EC50 (immobility) values in soft water (total hardness, 40-48 mg/l as CaCo3) were 1.55 mg/l of 95.7% TFM, 0.570 mg/l of 70% Bayer 73, and 0.658 mg/l of total toxicant for a 98:2 mixture of TFM and Bayer 73. As water hardness increased, toxicity of the materials individually and in mixtures decreased. Synergistic toxicity was apparent only in soft water at exposures of 24-72 hr; generally, the toxic effect was additive. Considerably greater concentrations of toxicant were required to kill than to immobilize. (Katz)
W75-10698

**ACUTE TOXICITY OF THE LAMPRICIDE 3-TRIFLUOROMETHYL-4-NITRO-PHENOL (TFM) TO NYMPHS OF MAYFLIES (HEXAGENIA SP.),**
Winona State Coll., Minn.
C. R. Fremling.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. In: Investigations in Fish Control, United States Department of the Interior, Fish and Wildlife Service, Washington D.C. 1975, No 58. 6 p, 1 fig, 16 ref.

Descriptors: *Toxicity, *Mayflies, *Pesticides, *Artifical substrates, *Hardness(Water), *Food chains, Temperature, Invertebrates, Environmental effects, Laboratory tests, Aquatic insects, Insects, Bioassay, Lethal limit, Hydrogen ion, Concentration, Toxicants.
Identifiers: *Lampricides, *TFM, *Hexagenia sp., LC50, Nymphs.

A recylcing test apparatus and burrow-containing artificial substrates were used to determine the toxicity of the lampricide TFM (3-trifluoromethyl-4-nitrophenol) against Hexagenia mayfly nymphs. Toxicity was relatively independent of temperature, but was greater in soft water than in hard water, and much greater at low than at high pH's; 12-hr LC50's were 4.0 at pH 6.5 and 270.0 at pH 9.5. (Katz)
W75-10699

**TOXICITY AND RESIDUE DYNAMICS OF THE LAMPRICIDE 3-TRIFLUORO-METHYL-4-NITROPHENOL (TFM) IN AQUATIC INVERTEBRATES,**
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
H. O. Sanders, and D. F. Walsh.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. In: Investigations in Fish Control, United States Department of the Interior, Fish and Wildlife Service, Washington, D.C. 1975, No 59. 7 p, 3 tab, 13 ref.

Descriptors: *Invertebrates, *Toxicity, *Pesticides, *Reproduction, *Mayflies, *Daphnia, *Crayfish, Pesticide residues, Environmental effects, Absorption, Aquatic insects, Lethal limit, Toxicants, Hardness(Water).
Identifiers: *TFM, *Lampricides, *Sublethal effects, Bioaccumulation, Scud, Damselfly, LC50.

Six species of aquatic invertebrates including scud, daphnid, crayfish, aquatic sowbug, damselfly nymph, and a mayfly nymph were exposed to TFM in toxicity tests in hard water at 21C. The 96-hr LC50 of field grade TFM (35.7%) was 57.0 mg/liter for scud and 110 mg/liter for crayfish; purified TFM (95.7%) was twice as toxic. The thirty-day LC50 of field grade TFM was 14 mg/liter for scud and 20 mg/liter for crayfish. LC50 values are based on whole formulation rather than active ingredient. Accumulation experiments employed 14C ring labelled TFM. All organisms accumulated TFM within 7 days. No reproductive impairment occurred in daphnids exposed to 2.4, 4.9 and 10 mg/liter field grade TFM for three generations. Reproduction stopped within the first generation when exposed to 18 mg/liter. (Katz)
W75-10700

**TOXICITY OF THE LAMPRICIDE 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) TO THE NONTARGET FISH IN STATIC TESTS,**
Bureau of Sport Fisheries and Wildlife, LaCrosse, Wis. Fish Control Lab.
L. L. Marking, and L. E. Olson.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. In: Investigations in Fish Control, United States Department of the Interior, Fish and Wildlife Service, Washington, D.C. 1975, No 60. 27 p, 23 tab, 10 ref.

Descriptors: *Pesticides, *Toxicity, *Bioassay, *Lethal limit, *Salmonids, Water quality, Hardness(Water), Hydrogen ion concentration, Warm-Water fish, Cold-water fish, Temperature, Laboratory tests, Fish, Perches, Bass, Carp, Salmon, Trout, Mortality, Testing, Water pollution effects, Pollutant identification.
Identifiers: *Lampricides, *TFM, *Static tests, LC50.

The toxicity of 3-trifluoromethyl-4-nitrophenol (TFM) to 15 species of coldwater and warmwater nontarget fish was tested in static tests. The toxicity of TFM is influenced by temperature, water hardness and pH, with pH being the most influential factor. In laboratory test water, TFM detoxifies slowly; solutions loss little or no activity over periods up to 8 weeks. The margin of safety (LC01 for fish/LC99 for lamprey) for rainbow trout in minimum lampricidal concentrations of TFM is influenced by pH and is greater in water of low pH (6.5) than in water of higher pH. Under laboratory conditions at pH 7.5 and 8.5, a 10% mortality of rainbow trout could be expected in lampricidal concentrations of field grade TFM. (Katz)
W75-10701

**TOXICITY OF THE LAMPRICIDE 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) TO NONTARGET FISH IN FLOW-THROUGH TESTS,**
Bureau of Sport Fisheries and Wildlife, LaCrosse, Wis. Fish Control Lab.
L. L. Marking, T. D. Bills, and J. H. Chandler.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. In: Investigations in Fish Control, United States Department of the Interior, Fish and Wildlife Service, Washington, D.C., 1975, No 61, 9 p, 4 tab, 13 ref.

Descriptors: *Laboratory tests, *Toxicity, *Salmon, *Trout, *Pesticides, Brown trout, Rainbow trout, Shiners, Brook trout, Lake trout, Perches, Water quality, Sunfishes, Channel catfish, Mortality, Lethal limits, Hydrogen ion concentration, Hardness(Water), Water pollution effects, Pollutant identification.
Identifiers: Flow-through tests, *Lampricides, *TFM, *Coho salmon, Oncorhynchus kisutch, Salvelinus ssp., LC50.

Field grade 3-trifluoromethyl-4-nitrophenol (TFM) was tested for acute and chronic toxicity to 11 species of nontarget fish in 4- and 30-day exposures, respectively. The species used were coho salmon, rainbow trout, brown trout, brook trout, lake trout, goldfish, catfish, blue-gill, red-ear sunfish, and yellow perch. The toxicity of the TFM formulation to two species of salmonids did not change significantly (P=0.05) between 1- and 30-day exposures. The results of simultaneous static and flow-through acute toxicity tests with channel catfish were not significantly different in two experiments. (Katz)
W75-10702

**TOXICITY OF THE LAMPRICIDE 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) TO SELECTED AQUATIC INVERTEBRATES AND FROG LARVAE,**
Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeastern Fish Control Lab.
J. H. Chandler, and L. L. Marking.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. In: Investigations in Fish Control, United States Department of the Interior, Fish and Wildlife Service, Washington, D.C. 1975, No 62, 7 p, 2 tab, 14 ref.

Descriptors: *Toxicity, *Pesticides, *Invertebrates, *Bioassay, *Frogs, Aquatic animals, Larval growth stage, Annelids, Shrimp, Mollusks, Lethal limit, Laboratory tests, Water pollution effects, Pollutant identification.
Identifiers: *TFM, *Lampricides, *LC50, Static tests, Flow-through tests, Soft-bodied invertebrates.

The lampricide 3-trifluoromethyl-4-nitrophen (TFM) was tested against various groups of n target aquatic organisms. Flatworms, annel backswimmers, daphnids, seed and glass shrim bivalve mollusks, snails and mosquito larvae w among the invertebrates tested. Vertebrates posed to TFM were larvae of gray tree fr leopard frog and bullfrog. Larvae of tree fr were the most sensitive organism to TFM (96 LC50 = 1.98 mg/l) and backswimmers were least sensitive (96-hr LC50 = 555 mg/l). S bodied invertebrates were less sensitive snails and bivalve mollusks to TFM. The inv tebrates tested were less susceptible to TFM t larval lampreys in similar tests. (Katz)
W75-10703

**COMBINED EFFECTS OF CADMIUM A SALINITY ON DEVELOPMENT AND S VIVAL OF HERRING EGGS,**
Biologische Anstalt Helgoland (West Germany)
H. Westerhhagen, H. Rosenthal, and K. R. Sperling.
Helgolander wissenschaftliche Meeresunters, 26, p 416-433, 1974. 9 fig, 1 tab, 40 ref.

Descriptors: *Herrings, *Cadmium, *Bioass *Fish eggs, *Salinity, *Toxicity, *Immat growth stage, Saline water, Sea water, Brack water, Embryonic growth stage, Hatch Growth rates, Mortality, Absorption, Water po tion effects.
Identifiers: *Clupea harengus, Baltic herring.

Eggs of Baltic herring (Clupea harengus) were cubated in cadmium-contaminated water (0, 0.5, 1.0, 5.0 ppm) at four salinities (0.5 percent, percent, 2.5 percent, 3.2 percent) in order to ev ate changes in cadmium toxicity. In diluted water deleterious effects of cadmium-c taminated water on herring embryos were m pronounced than in slightly brackish or natural water. Prehatching mortality and malforma rates were highest in the 0.5 percent salinity tr The cadmium content of eggs was generally hig in lower salinities than in more saline wate comparable Cd concentrations. (Katz)
W75-10704

**AN INVESTIGATION OF THE ECOLOGY A WATER QUALITY OF A LAKE OUTLET,**
Montana Univ., Missoula. Dept. of Zoology.
M. W. Oswood, and A. L. Sheldon.
Available from the National Technical Infor tion Service, Springfield, Va. 22161, as PB 631, $3.75 in paper copy, $2.25 in microfi Research Report No 63, Montana University J Water Resources Research Center, Bozer January 1975. 35 p, 34 ref. OWRT A-MONT(1).

Descriptors: *Spatial distribution, *Ecological tribution, Ecology, *Eutrophication, *Water q ty, *Nutrients, Outlets, Lakes, Seasonal, *Org loading, *Biomass, *Aquatic algae, *Aquatic sects, Seston, Periphyton, Biological comm ties, Water pollution effects.
Identifiers: *Stream enrichment, Clearwater system, Lake outlets, Enrichment, Hydropsy caddis larvae.

A generalized hypothetical model of the lake let system includes the following features: (1) densities of filter-feeders at the lake outlet a part a response to high seston loads. Filter-fe densities are determined by a complete feed loop in which high densities of filter-fe decrease seston load therby decre Hydropsychid densities. (2) There is a diverg of life history patterns in the Hydropsychid Filter-feeders appear to 'turn-over' nutrients i seston, producing a pulse of nutrients in the r of high filter-feeder density. (4) Nutrients rele are taken up by periphyton downstream fro outlet, therby increasing periphyton produ downstream. (5) The outlet community form

ely efficient filter of particulate organic l. As such, it is important in management atic systems that such filters not be d by pollution or overloaded, in that a decline in water quality downstream may

724

H IMPLICATIONS OF EXPOSURE TO METALS FROM COMBUSTION OF OIL,
mental Protection Agency, Washington,

ord, A. Colucci, D. I. Hammer, and J. B.

ceedings of the International Conference te Oil Recovery and Reuse, February 12-, Washington, D.C., Information Transfer rated, Washington, D.C., p 367-374, 1974. ref.

tors: Lead, *Public health, Oil wastes, ower plants, *Air pollution effects.
rs: *Waste oil reuse, Health effects, ollution.

th implications that would accompany use oil as a primary fuel by blending with vir- oil were examined, as well as economic of this application. Lead levels were mea- r El Paso where a population resides down m a smelter and in Philadelphia where are exposed to high traffic density and in- lead sources. To evaluate safe concentra- waste oil in fuel for power plants, the con- ns are: capacity of power plant; concen- f lead in the waste oil; frequency of waste ustion; fraction of lead emitted in waste nature of the population contiguous to the ant. No precise limit for allowable quanti- waste oil in power plant fuel has been . However, preliminary analysis, sug- t unless well regulated, the burning of in power plants could represent a serious populations residing in their vicinity due emission levels. (See also W75-10739) FIRL)
65

S OF FARMING - URBAN DRAINAGE H WATER,
County Pollution Control Dept., Orlando,

ry bibliographic entry see Field 5G.
02

VITY OF HUMAN DIPLOID EMB- LUNG CELLS FROM ISOLATION OF RUSES FROM SEWAGE,
gieny, Prague (Czechoslovakia).
ek.
f Hygiene, Epidemiology, Microbiology nology, Vol 18, No 1, p 2-8, 1974. 3 tab,

rs: *Sewage, *Viruses, *Epidemiology, ealth, *Pollutant identification, *Water sources, Diseases, Cytological studies, lution effects, Foreign research.
: *Enteroviruses, Prague(Czech).

ses from Prague, Czechoslavia, sewage ere isolated on a strain of human diploid : lung cells (HDLC) and on secondary idney cell cultures (MKC). The sewage ere obtained from ten Prague nursery d two main sewers of the city. Thirty-six strains of each of the three types and 47 us strains were isolated. Twenty-four of irus strains had a cytopathic effect on cultures only, while 31 ECHO virus l a cytopathic effect on HDLC cultures, ers produced a cytopathic effect on both ells. The parallel titration of the ECHO ns isolated on HDLC and MKC deter- mined that most of the strains, on the type of cells on which the virus strains were found, produced a cytopathic effect. The possibility was considered that a greater resistance of HDLC to the non-viral toxicity of some sewage samples influenced the success of the isolation of enteroviruses. (Leibowitz-FIRL)
W75-10836

GROUNDWATER PROTECTION IN HIGHWAY CONSTRUCTION IN THE CATCHMENT AREA OF THE CITY OF BERNE AT KIESEN (GRUNDWASSERSCHUTZ BEIM AUTOBAHN IM FASSUNGSGEBIET STADT BERN IN KIESEN),
H. Geiser.
Gas Wasser Abwasser, Vol 54, No 9, p 385-392, September, 1974. 7 tab, 4 ref.

Descriptors: *Highway effects, *Groundwater, *Construction, Oil wastes, Bacteria, Municipal water, Water pollution effects, Water pollution sources.
Identifiers: Berne(Germany), Groundwater contamination.

The effect of turnpike construction on groundwater quality in the catchment area of the city of Berne at Kiesen, and measures taken to prevent groundwater contamination in the protected zone along the turnpike, are described. Highway construction operations, including those involving vibrations, caused a temporary impairment of the groundwater that had originally been of high quality, resulting in a general rise in both the germ count and in the appearance of Coliform bacteria. The water quality returned to normal after completion of the turnpike construction. As it was impossible to bypass the protected zone, groundwater contamination due to spilled gasoline, oil, and other chemicals will be prevented by a tight drain system for water from the turnpke into an oil separation tank, from which the cleaned water is discharged directly into a river. (Takacs-FIRL)
W75-10837

THE EFFECT OF PROLONGED EXPOSURE TO ELEVATED TEMPERATURES ON THE BIOCHEMICAL CONSTITUENTS, GONADAL DEVELOPMENT AND SHELL DEPOSITION OF THE AMERICAN OYSTER, CRASSOSTREA VIRGINICA,
Connecticut Univ., Noank. Marine Research Lab.
G. M. Ruddy, S. Y. Feng, and G. S. Campbell.
Comp. Biochem. Physiol., Vol 51 B, p 157-164, 1975. 10 fig, 26 ref. OWRT A-040-CONN(2). 14-31-0001-3207.

Descriptors: *Aquiculture, Shellfish farming, *Oysters, Powerplants, *Heated water, Biochemistry, Water pollution effects, *Thermal pollution.
Identifiers: *Gonadal development, Condition index, Shell deposition, Crassostrea virginica.

This study was designed to determine how oysters raised in the heated effluent of a power plant compare in quality, gonadal development and shell deposition with their controls maintained at ambient temperatures. The oysters in the heated effluent averaged 56% higher in protein concentration, 109% higher in carbohydrate concentration and 22% higher in condition index that the control oysters during the winter and spring months. The warm temperatures in the discharge canal during this period (14-19C) permitted the oysters to feed during the very large spring phytoplankton bloom, while the control oysters in the ambient temperature (2-7C) remained relatively inactive. During the summer months, the control oysters attained levels of protein, carbohydrate and condition index that were similar to those of the warm-water grown oysters. The development of the gonads of the oysters in the heated effluent occurred 4 months earlier than the controls, but spawning took place only 1 month earlier. The warm-water grown oysters produced thicker shells than the control oysters. (deLara-Connecticut)
W75-10849

THE EFFECT OF THE QUANTITY OF SILT TO THE ATTACHED MICROORGANISMS OF THE KUZURYU-GAWA RIVER IN THE HOKURIKU DISTRICT, (IN JAPANESE),
Kanagawa Univ. (Japan). Biology Inst.
T. Watanabe, and H. Kamijo.
Japanese Journal of Limnology, Vol 35, No 2, p 73-81, 1974; 2 fig, 5 tab, 4 ref.

Descriptors: *Sampling, *Laboratory tests, *Silts, *Primary productivity, Water quality, Water pollution sources, *Microorganisms, *Bacteria, *Diatoms, *Sessile algae, *Cyanophyta, *Chlorophyta, *Bioassay, *Bioindicators, Environmental effects, Limnology, Hydrogen ion concentration, Temperature, Conductivity, Turbulence, Domestic wastes.
Identifiers: Biological assessments, Ignition residue, Ignition loss.

The microorganisms attached to stones and other materials were collected at 17 stations on the Kuzuryu-gawa River and examined. A biological assessment was made which included bacteria, diatoms, blue-green algae, and green algae. Water temperature, pH, electric conductivity, turbidity, and standing crops of microorganisms (represented by ignition loss) were determined. The quantity of silt covering the river bed was surveyed in regard to its effect on the attached microorganisms in areas of both domestic waste pollution and non-pollution. (Katz)
W75010696

## 5D. Waste Treatment Processes

CORROSION AND ITS COST IN SEWAGE TREATMENT,
For primary bibliographic entry see Field 8G.
W75-10364

PROBLEMS OF SPACE BIOLOGY, VOLUME 24. THE WATER SUPPLY OF SPACECRAFT CREWS,
S. V. Chizhov, and Yu. Ye. Sinyak.
Available from the National Technical Information Service, Springfield, Va. 22161, as N74-18795, $7.50 in paper copy, $2.25 in microfiche. Translation of Problemy Kosmicheskoy Biologii. Tom XXIV, Vodoobespecheniye Ekipazhey Kosmicheskikh Korabley, Nauka Press, Moscow, 1973. 268 p, 57 fig, 418 ref, 61 tab.

Descriptors: *Water supply , Water quality, Water conservation, *Water reuse, *Recycling, Reclaimed water, Waste water(Pollution), Ion exchange, Membrane processes, Water treatment, Odor, Sewage, Sewage treatment, *Waste water treatment, Urine, Potable water, Satellites(Artificial), Biology, *Resins.
Identifiers: *Spacecraft, Perspiration, Feces, *Ion exchange resins.

The problem of water supply aboard a spacecraft is discussed together with probable solutions. The medical and technical characteristics of the design of water supply systems for spacecraft are considered, with emphasis on water quality and conservation of drinking water. Various methods of regenerating water from moisture-containing products (feces, urine, and perspiration) of human vital activity and recycling of water used for sanitary and hygienic purposes are examined. Considerable attention is devoted to the regeneration of water by ion-exchange resins and absorbent materials, as well as semipermeable membranes. The problems involved in decontaminating and deodorizing recycled water are examined in detail. (Witt-IPC)
W75-10365

**STUDY OF SOLID WASTE MANAGEMENT PRACTICES IN THE PULP AND PAPER INDUSTRY.**
Gorham International, Inc., Maine.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-234 944, $7.00 in paper copy, $2.25 in microfiche. February 1974. 196 p, 17 fig, 20 ref, 11 tab.

Descriptors: *Pulp and paper industry, *Solid wastes, *Management, Water pollution sources, Waste disposal, Wood wastes, *Waste water treatment, Sludge, Economics, *Waste treatment, Wastes, Industrial wastes, Pollutants, Water pollution control, *Pulp wastes.
Identifiers: Waste paper, Chemical pulping, Mechanical pulping, Papermaking, Kraft mills, Sulfite mills, Coated papers, Uncoated papers, Kraft linerboard, Corrugating medium, Kraft pulps, Neutral sulfite semichemical pulps, Deinking mills.

The structure of the pulp and paper industry is reviewed, including pulps used for papermaking, production processes (pulping, pulp bleaching, and papermaking), paper products, industry production, and considers solid waste generation points and characteristics, solid waste management practices, and estimates the quantities of solid wastes generated in wood processing, power generation, waste water treatment, waste paper reclamation, pulping (chemical and mechanical), and specialty paper products manufacture. The economics of solid waste management and the impact of environmental legislation on solid waste management are discussed. Alternatives for existing solid waste management practices are examined. Case studies are presented showing solid waste management practices at mills producing bleached kraft pulp, paperboard, and converted paper products; neutral sulfite semichemical pulp, waste paper pulp, and corrugating medium; bleached kraft pulp and coated and uncoated papers; groundwood and bleached sulfite pulps and coated and uncoated papers; and unbleached kraft pulp and linerboard. (Witt-IPC)
W75-10366

**REDUCTION OF EFFLUENT POLLUTION AT THE ARKHANGEL'SK MILLS (SNIZHENIE ZAGRYAZNENNOSTI STOCHNYKH VOD NA ARKHANGEL'-SKOM KOMBINATE),**
Arkhangelsk Kombinat (USSR).
A. M. Rudakova.
Bumazhnaya Promyshlennost, No 3, p 23-24, March 1975.

Descriptors: *Water pollution control, *Pulp and paper industry, *Waste water treatment, *Water consumption, Sulfite liquors, Pulp wastes, Biological treatment, Sludge treatment, Dewatering, Drying, Evaporation, Water purification, Foreign countries, Pollution abatement, Water pollution sources, Industrial wastes, Wastes, Waste treatment, Recycling, Water conservation, Industrial water.
Identifiers: Woodroom effluents, Paper mills, Board mills, Soviet Union(USSR).

The Arkhangel'sk mill is actively engaged in research on pollution abatement. During the last decade large sums were invested in effluent purification equipment and much work had been done to reduce the volume of effluents as well as their pollution load. The capacity of the biological purification plant has been increased, a plant for dewatering and thermal drying of sludge has been constructed, the evaporation plant has been modernized to permit the full utilization of spent pulping liquors, including spent liquor from the neutral sulfite semichemical process, and equipment has been installed for the purification of bark-containing effluent from the wood preparation room. At the paper and board mills the consumption of fresh water has been reduced. (Stapinski-IPC)
W75-10368

**INCREASING THE EFFICIENCY OF FLOTATION SAVEALLS (POVYSHENIE EFFEKTIVNOSTI RABOTY FLOTATSIONNYKH LOVUSHEK),**
Ukrainskii Nauchno-Issledovatelskii Institut Bumagi, Kiev (USSR).
V. A. Kopylov, V. G. Pivovarov, and R. A. Solonitsyn.
Bumazhnaya Promyshlennost, No 3, p 21-23, March, 1975. 1 fig, 6 ref, 1 tab.

Descriptors: *Efficiencies, *Waste water treatment, *Flotation, Waste treatment, *Performance, Optimization, Water pollution treatment, Water purification, Sewage treatment, Air, Equipment, Valves, Construction, Design, Separation techniques, Water pollution treatment, Water pollution control, Filters, Aeration.
Identifiers: *Savealls.

An analysis of the operation of flotation savealls operating on the principle of pressure flotation has shown that the cause of the low efficiency of this type of equipment is an insufficient amount of air bubbles in the flotation part where the bubble-particle complexes rise to the surface. This is due mainly to insufficient air dissolved in the effluent, inadequate construction of the reducing valve which lowers the effluent pressure to atmospheric, intense coalescence of air bubbles in the receiving chamber, and strong currents generated when the effluent goes from the receiving chamber to the floatation chamber. The construction decribed in this article eliminates the above drawbacks and increases the efficiency of existing savealls. To dissolve air in the effluent and remove the excess air, a head tank was developed which makes it possible to fully saturate the effluent within 1-2 min. A specially constructed reducing valve corrected the problem of lowering the pressure to atmospheric and a redesigned receiving chamber shortened the residence time of the aerated effluent in the chamber to 3-5 sec, so that no coalescence of the air bubbles takes place. The efficiency of the savealls has bee increased from 50-79% to 85-96%. A diagram of the new saveall is given. (Stapinski-IPC)
W75-10369

**ACTIVATED SLUDGE,**
California Univ., Davis.
E. D. Schroeder.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1261-1269, June, 1975. 101 ref.

Descriptors: *Reviews, *Bibliographies, *Activated sludge, *Waste water treatment, Industrial wastes, Phosphorus, Nitrogen, Nutrient removal, Design, Operations, Mathematical models, Aeration, Waste treatment, Water pollution control, Pulp wastes, Control, Heavy metals, Biochemistry, Microbiology, Toxins, Sludge treatment, Sludge disposal, Economics, Costs.

The 1974 literature on the treatment of waste waters by the activated sludge process is reviewed. Topics discussed include: process models, control, and design and operation of activated sludge plants; microbiology and biochemistry of the process; removal of heavy metals and effects of toxicants; industrial waste water treatment; aeration; nitrogen and phosphorus removal; sludge thickening and disposal; and costs of activated sludge plants. Refinery, pulp and paper, and distillery wastes are cited as examples of some of the waste materials that are being treated by the activated sludge process. (Witt-IPC)
W75-10371

**WASTE WATER TREATMENT: WATER RECLAMATION AND REUSE,**
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
I. J. Kugelman, and J. N. English.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1338-1344, June, 1975. 76 ref.

Descriptors: *Reviews, *Bibliographies, *Water reuse, *Reclaimed water, Planning, Groundwater recharge, Potable water, Industrial water, Waste water treatment, Municipal water, Water resources, Water conservation, Water utilization, Effluents, Pulp and paper industry, Recycling.

The 1974 literature on water reclamation and reuse is reviewed. The topics covered include: reuse in water resources planning, industrial reuse of water (e.g., recycling water in the pulp and paper industry), reuse of treated waste water for irrigation and groundwater recharge domestic reuse, and reuse technology development (advanced waste water treatment methods applicable to the production of reusable water). (Witt-IPC)
W75-10372

**WASTE WATER TREATMENT: LAND DISPOSAL OF WASTE WATER,**
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5E.
W75-10373

**WASTE WATER TREATMENT: LAGOONS AND OXIDATION PONDS,**
Kansas Univ., Lawrence.
W. J. O'Brien.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1269-1273, June, 1975. 37 ref.

Descriptors: *Reviews, *Bibliographies, *Aerated lagoons, *Oxidation lagoons, *Waste water treatment, Industrial wastes, Municipal wastes, Water pollution control, Lagoons, Sewage treatment, Waste treatment.

The 1974 literature on the use of aerated lagoons and oxidation ponds for the treatment of industrial and municipal waste waters is reviewed. (Witt-IPC)
W75-10374

**CELLULOSE DEGRADATION IN WASTE WATER TREATMENT,**
Uppsala Univ. (Sweden). Inst. of Biochemistry.
N. Edberg, and B. V. Hofsten.
Journal Water Pollution Control Federation, Vol 47, No 5, p 1012-1020, May, 1975. 12 fig, 19 ref, 1 tab.

Descriptors: *Cellulose, *Biodegradation, *Waste water treatment, Bacteria, Organic compounds, Degradation(Consumption), Water pollution sources, Activated sludge, Fibers(Plant), Lignins, Testing procedures, Gravimetric analysis, Oxygen demand.
Identifiers: Sulfite pulp.

A considerable part of the organic matter in municipal waste water consists of cellulose fibers. A method of studying the bacterial degradation of these fibers has been developed. Sample fibers (sulfite pulp fibers) are enclosed in an inert nylon bag and immersed in environments encountered in an activated sludge process. The amount of degradation is determined by periodically retrieving the bags and weighing them. Such experiments show that degradation of cellulose fibers results in increased oxygen consumption. Fibers that are slowly degraded because of high lignin content or slow bacterial growth play only a minor role in the oxygen balance. (Witt-IPC)
W75-10376

**WISCONSIN TISSUE MILLS ONE YEAR AFTER STARTUP OF THE EFFLUENT PLANT**
Wisconsin Tissue Mills, Neenah, Wis.
W. Rice, and R. Van Soest.
In: TAPPI Environmental Conference, Denver, Colorado, May 14-16, 1975, Preprints Proceedings (TAPPI, Atlanta, Georgia), p 197-203, 3 fig, 4 tab.

tors: *Pulp wastes, *Treatment facilities, nd paper industry, *Waste water treat- Wisconsin, Capital costs, Operating Costs, Operation and maintenance, Sulfur com- Odor, Anaerobic conditions, Degrada- composition), Hydrogen ion concentra- ssolved oxygen, Biological treatment, In- wastes, Wastes, Waste treatment, Water sources, Water pollution treatment, llution control.
rs: *Zurn-Attisholz process, Hydrogen , Sodium hypochlorite, Tissue paper, Tis- , Waste paper, Deinking wastes.

n-Attisholz process has been operational nsin Tissue Mills (Neenah, Wisconsin) for n one year with satisfying results. Capital rating costs of the system are detailed. nal experiences indicate that deinking contain sufficient sulfur compounds to or generation if prolonged anaerobic con- e encountered. Odors from sulfur decom- can be controlled by high pH, proper dis- ygen level, hydrogen peroxide or sodium rite, and also by biological means. A brief on of the effluent treatment plant is in- Visconsin Tissue Mills manufactures tis- mainly from waste paper. (Sykes-IPC) 78

OF TEMPERATURE AND SLUDGE G ON 5-DAY BOD REMOVAL AND SETTLEABILITY IN ACTIVATED SYSTEMS TREATING BLEACHED FFLUENTS,
earch Ltd., Vancouver.
ee, J. C. Mueller, and C. C. Walden.
l 58, No 6, p 100-103, June, 1975. 6 fig, ab.

rs: *Pulp wastes, *Bleaching wastes, d sludge, *Waste water treatment, Tem- Wastes, Industrial wastes, Water pollu- ces, Water pollution treatment, Waste , Effluents, Biological treatment, nisms, Foods, Suspended solids, Water pollution control, *Biochemical demand, Zooplankton, Aquatic life, icroorganisms.
: Kraft mills.

of BOD, sludge settling characteristics, es in zooplanktonic populations were as functions of food/microorganisms os ranging from 0.1 to 2.4 and tempera- 6-40 C is six laboratory activated sludge Overall BOD removal was good at all res and F/M, ratios; a slight drop oc- en temperature and F/M ratios were in- emperature significantly affected sludge y, although F/M ratios did not. The pro- nonsettleable mixed liquor suspended the suspended solids in the effluents tri- temperature was increased from 16 to ll F/M ratios. Sludge volume indices tle variation with changes in tempera- M ratio, whereas significant changes in nic populations were observed with in- mperature. The largest populations of nd metozoa occurred at 16 and 30C but icantly reduced at 36C and virtually dis- t 40C. (Sykes-IPC)

PER (COMPANY, IYOMISHIMA, XPANDS TO 1,000,000 TONS/YEAR,
ans.
aper International, Vol 17, No 5, p 45- , 1975. 5 illus.

: *Pulp wastes, *Waste water treat- ter reuse, Recycling, Pulp and paper in- reign countries, Asia, Settling basins, solids, Activated sludge, Aerated ltration, Water purification, Water con- Water consumption(Except consump- tive use), Water pollution control, Pollution abatement, Water supply, Treatment facilities, Water pollution treatment.
Identifiers: *Japan, Alum, Sodium hydroxide, Wood supply, Mill site, Linerboard mill, Newsprint mill, Kraft linerboard, Newsprint, Board mills.

A new mill producing virgin kraft linerboard and newsprint was built on Shikoku Island beside the existing mill of Taio Oaper Co. which produces corrugating medium and fine papers in addition to linearboard and newsprint. Major problems dealt with before the expansion included wood supply, mill site, fresh water supply, and effluent treatment. Wood is imported from the U.S. Pacific Northwest, Australia, U.S.S.R., and Southeast Asia. A mill site was obtained by dredging and building on reclaimed land. Additional fresh water was not readily available, but installation of extensive effluent treatment systems permitted reuse of much of the water. The effluent intended for recycling is first sent to a settling basin for reduction of suspended solids and then to an activated sludge aeration basin. It then passes through two second-stage settling basins where alum, caustic soda, and flocculating agents are added. The effluent for recycling is then sent to a filter. The remaining effluent goes to two clarifiers where insoluble compounds which precipitate out as a result of the chemical reactions are removed. Treatment of effluent for discharge into the sea is similar but with elimination of the activated sludge treatment. Fresh water consumption has been reduced by one-half, i.e., to 35 cu m/ton of finished paper, after installation of these treatment systems. (Sykes-IPC)
W75-10380

**ANALYTIC CHARACTERIZATION OF SEWER LOADING BY SPENT LIQUORS OF THE PULP INDUSTRY (ANALYTISCHE KENNZEICHUNG DER BELASTUNG DER VORFLUTER DURCH ABLAUGEN DER ZELLSTOFFINDUSTRIE),**
W. Leithe.
Das Papier, Vol 29, No 5, p 195-197, May, 1975. 1 ref.

Descriptors: *Pulp wastes, *Biochemical oxygen demand, *Chemical oxygen demand, Analytical techniques, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Oxidation, Waste water(Pollution), Water pollution, Organic loading, *Pollutant identification, *Waste water treatment.
Identifiers: Total organic carbon.

Spent liquors from pulp production burden the effluent predominantly via the oxygen demand during biological decomposition of organic material. For rapidly decomposing materials, especially carbohydrates, 5-day DOD determination is applied, for which a simplified differential method is indicated. For the determination of the total (long-term) oxygen demand (COD), the postassium dichromate method is adequate. A value especially suited for relative determinations is the total organic carbon content (TOC value). It advantage consists in the short testing time and the completeness of the oxidation. However, a direct comparison with the 5-day BOD is not possible, since the COD/TOC relationship is variable. (Speckhard-IPC)
W75-10381

**STUDIES ON POSSIBILITIES OF BIOCHEMICAL PURIFICATION OF EVAPORATOR CONDENSATE OCCURRING DURING SULFITE PULP MANUFACTURE (UNTERSUCHUNGEN UEBER DIE MOEGLICHKEIT DER BIOCHEMISCHEN REINIGUNG DES BEI DER SULFITZELLSTOFFHERSTELLUNG ANFALLENDEN EINDAMPFKONDENSATES),**
Technische Universitaet, Dresden (East Germany).
H.-J. Walther, and D. Knaack.
Fortschritte der Wasserchemie und Ihrer Grenzebiete, Vol 15, p 251-272, 1973. 1 fig, 26 ref, 4 tab.

Descriptors: *Activated sludge, *Waste water treatment, *Pulp wastes, *Sulfite liquors, Industrial wastes, Water pollution sources, Pulp and paper industry, *Biological treatment, Digestion, Waste dilution, Phosphorus, Nitrogen, Water pollution control, Waste treatment, Biodegradation, Microbial degradation.
Identifiers: *Evaporator condensates, Acetic acid, Formic acid, Furfural, Sulfur dioxide, Sulfite pulp mills.

Studies are reported concerning biochemical treatment (activated sludge process) of evaporator condensates from sulfite pulping using a model condensate containing acetic acid, formic acid, furfural, and sulfur dioxide. The condensate was shown to be highly digestible following dilution in the presence of a nitrogen and phosphorus source, although the morphology of the biological system was changed considerable from the conventional concept of an activated sludge process. Furfural, which should be regarded as especially dangerous with respect to effects on receiving waters, was completely eliminated by the biochemical treatment. (Speckhard-IPC)
W75-10382

**USE OF ORGANIC FLOCCULANTS FOR TEXTILE PLANT WATER TREATMENT (POUZITI ORGANICKYCH FLOKULANTU K CIRENI VODY PRO TECHNOLOGII TEXTILNI VYROBY),**
For primary bibliographic entry see Field 5F.
W75-10383

**NEW LEGISLATIVE TENDENCIES FOR CONTROL OF WATER POLLUTION (NUEVAS TENDENCIAS LEGISLATIVAS EN EL CONTROL DE LA CONTAMINACION DE LAS AGUAS),**
Centros de Estudios, Investigaciones y Aplicaciones del Agua, Granada (Spain).
For primary bibliographic entry see Field 5G.
W75-10384

**SERPAFLO: ORIGINAL SOLUTION TO CLEANING PAPER MILL EFFLUENTS (SERPAFLO; LA SOLUTION ORIGINALE D'EPURATION DES EAUX PAPETERIES),**
J. Moreau.
La Papeterie, Vol 97, No 5, p 281-287, May, 1975. 13 fig.

Descriptors: *Waste water treatment, *Pulp wastes, *Flotation, Wastes, *Industrial wastes, Water pollution sources, Water pollution treatment, Water purification, Recycling, Water reuse, Equipment, Performance, Sewage treatment, Tertiary treatment, Effluents, Design, Treatment facilities, Waste treatment, *Cleaning.
Identifiers: *Serpaflo, Fiber recovery, Filler recovery, Paper machines, White water.

After discussing in some detail the general characteristics of paper mill effluent treatment (including fiber and filler recovery, purification of effluent from the paper machine secondary and tertiary circuits, and recycling of clarified water), the design and performance characteristics of the (Serpaflo' flotation unit are examined. The unit can be used in treating both secondary and tertiary effluents in the paper mill. (Speckhard-IPC)
W75-10389

**ROTATING BIOLOGICAL DISK TREATMENT OF KRAFT MILL EFFLUENTS,**
B. C. Research Ltd., Vancouver. Div. of Applied Biology.
E. G-H. Lee, and J. C. Mueller.
Water Pollution Control, Vol 113, No 5, p 25-29, May, 1975. 8 fig, 5 ref, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Biological treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Laboratory tests, Biochemical oxygen demand, Suspended solids, Toxicity, Fish, Efficiencies, Operation and maintenance, Sludge, Foaming, Capital costs, Costs, Waste treatment, Water pollution control, Water purification, Reliability, Performance, Equipment.
Identifiers: *Rotating biological disk.

The rotating biological disk (RBD) system offers a novel technique for the treatment of kraft mill effluents. It combines simplicity, reliability, and efficiency of operation into one system. To verify the advantages claimed by this system, a laboratory study was undertaken with a 7 liter bench-scale RBD unit. Combined bleached kraft mill effluents (5-day BOD = 165 to 185 mg/liter) were tested at retention times of 2 to 16 hr, equivalent to hydraulic loadings of 0.26-0.33 gal/sq ft/day, respectively. The BOD removal was better than 90%. The BOD of the treated effluent was less than 20 mg/liter and the suspended solids content was less than 33 mg/liter throughout. All acute toxicity to fish was removed at retention times as short as 2 hr. The high efficiency obtained implies that the system could handle loadings larger than 0.00046 lb BOD/sq ft/day without significant change in effluent quality. The RBD system was simple to operate requiring little attention. Sludge built up rapidly on the disk surface. No foaming problems occurred and no sludge washout was experienced. Capital costs for a 10 million gal/day plant are $6000,000-1,000,000. (Witt-IPC)
W75-10390

**SPENT LIQUOR FROM PEROXIDE BLEACHING OF GROUNDWOOD PULP FROM SPRUCE,**
Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5A.
W75-10392

**COLOR OF PULP INDUSTRY WASTE LIQUORS. (6). BEHAVIOR OF COLOR DURING WASTE TREATMENTS (IN JAPANESE),**
Kyushu Univ., Fukuoka (Japan).
K. Sameshima, T. Ishizaki, M. Sumimoto, and T. Kondo.
Journal of the Japan Wood Research Society (Mokuzai Gakkaishi), Vol 21, No 3, p 182-187, March 1975. 5 fig, 11 ref, 4 tab.

Descriptors: *Pulp wastes, *Color, *Bleaching wastes, *Waste water treatment, Industrial wastes, Wastes, Waste treatment, Hydrogen ion concentration, Dialysis, Activated carbon, Adsorption, Coagulation, Lime, Activated sludge, Sulfite liquors, Water pollution sources, Water pollution treatment, Pulp and paper industry.
Identifiers: Alum.

Effluents from bleached and unbleached kraft and sulfite cooks were treated for color removal by pH adjustment, dialysis, activated carbon adsorption, alum coagulation, lime treatment, and activated sludge treatment. The color of all waste waters changed over all pH ranges. Dialysis indicated that color substances in bleaching wastes have higher molecular weights than those in pulping effluents. Alum and lime treatments effectively removed bleaching and kraft effluent color. Activated carbon was most effective in decoloring neutral sulfite semichemical effluents. Activated sludge treatment of pulping wastes intensified rather than diminished the color. In general color bodies of all wastes did not parallel the other characteristics of the effluents, such as Mn-based COD, 5-day BOD, and absorbance at 280 nm. (See also W75-10394, W75-01271, W74-12924, W74-04512, W73-01428, and W73-15189) (Brown-IPC)
W75-10393

**COLOR OF PULP INDUSTRY WASTE LIQUORS. (7). COLOR REDUCTION BY ULTRAVIOLET TREATMENT (IN JAPANESE),**
Kyushu Univ., Fukuoka (Japan).
K. Sameshima, M. Sumimoto, and T. Kondo.
Journal of the Japan Wood Research Society (Mokuzai Gakkaishi), Vol 21, No 3, p 188-193, March 1975. 12 fig, 14 ref, 1 tab.

Descriptors: *Pulp wastes, *Color, *Ultraviolet radiation, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Sulfite liquors, Bleaching wastes, Pulp and paper industry, Chemical oxygen demand, Hydrogen ion concentration, Lignins, Water pollution control, Water pollution treatment, Waste treatment, Acids, Degradation(Decomposition).

Nine types of wood cooking and bleaching wastes were irradiated with ultraviolet radiation (mercury lamp) to reduce their color. Color reductions varied with different wastes. The colors of kraft and sulfite mill effluents were intensified at the start of irradiation, then reduced. Sulfite effluents decolored faster than kraft effluents. The colors of bleaching and neutral sulfite semichemical effluents were reduced from the start of irradiation. The Mn-based COD and absorbance at 280 nm of all wastes were reduced from the start. The pH of irradiated wastes dropped at the start, showing formation of some acids, and then rose gradually with further degradation of acids. Isolated lignin preparations subjected to the same treatment showed the same patterns of color reduction as the original wastes. (See also W75-10393, W75-01271, W74-12924, W74-04512, W73-01428, and W73-15189) (Brown-IPC)
W75-10394

**WASTE WATER TREATMENT: SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL,**
Delaware Univ., Newark. Dept. of Civil Engineering.
R. I. Dick.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1306-1323, June 1975. 255 ref.

Descriptors: *Reviews, *Bibliographies, *Sludge treatment, *Sludge disposal, Sludge, Dewatering, Incineration, Industrial wastes, Drying, Water treatment, *Waste water treatment, Properties, Toxins, Nutrients, Nutrient removal.

The 1974 literature on the treatment, utilization, and disposal of sludges from waste water treatment and water treatment plants is reviewed. The topics covered include: sludge properties; toxic, industrial, nutrient-laden, and water treatment sludges; conditioning; thickening; dewatering; combustion and heat drying; reclamation; and ultimate disposal. (Witt-IPC)
W75-10395

**PROCESS DESIGN MANUAL FOR UPGRADING EXISTING WASTE WATER TREATMENT PLANTS.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
Environmental Protection Agency, Technology Transfer. October 1974. 394 p, 78 fig, 105 tab, 371 ref.

Descriptors: *Treatment facilities, *Municipal wastes, *Publications, Waste treatment, Water pollution treatment, *Costs, Equipment, Organic loading, *Operations, *Waste water treatment, Water pollution sources, Water pollution control, Facilities.

Situations that necessitate upgrading of existing municipal waste water treatment plants are examined, and the corrective actions that are required to upgrade these existing plants are discussed and evaluated. Upgrading to overcome organic and hydraulic overloadings and/or to meet more stringent treatment requirements is considered. The manual emphasizes that operatio
improvement and modifications to existing u
operations be considered as the logical initial st
proach to upgrading existing treatment plants,
fore major expansion of facilities is implement
The capabilities, limitations, and interrelationsh
of the various unit operations commonly usec
municipal waste water treatment plants are
amined in depth. Hypothetical situations requir
upgrading of unit operations are also examin
and costs associated with the upgrading
described. One chapter presents case histories
upgrading of existing treatment plants to illustr
the approaches actually used in these circu
stances. (Witt-IPC)
W75-10396

**INDUSTRIAL WASTES: PAPER AND ALL
PRODUCTS,**
National Council of the Paper Industry for Air
Stream Improvement, Inc., New York.
G. W. Gove, and I. Gellman.
Journal Water Pollution Control Federation, 47, No 6, p 1402-1446, June 1975. 298 ref.

Descriptors: *Reviews, *Bibliographies, *
and paper industry, *Waste water treatm
Water quality standards, *Pulp was
Economics, Capital costs, Industrial wa
Water pollution sources, Analytical techniq
Membrane processes, Alcohols, Sulfite liqu
Water conservation, Water reuse, Irrigat
Lime, Color, Water pollution, Activated car
Ozone, Coagulation, Filtration, Waste treatm
Aerated lagoons, Activated sludge, Sludge t
ment, Sludge disposal, Water pollution con
Water pollution effects.
Identifiers: Chemical recovery, Sulfate soap,
oil, Turpentine, Black liquor, Kraft mills.

The 1974 literature on the treatment of wa
from the manufacture of pulp and paper and a
products is reviewed. It covers United S
government policies regarding waste water t
ment; the cost of meeting the water quality re
tions; sources and treatment of effluents in
pulp and paper industry; effects of paper ind
wastes on receiving streams; instrumentation
monitoring paper mill effluents; effluent ana
techniques; chemical recovery from effluent
membrane processes; by-product reco
(including alcohol by fermentation of yeas
spent sulfite liquor, chemical recovery from s
sulfite liquors, and sulfate soaps, tall oil, and
pentine from kraft mill effluents); solids rec
from and renovation and reuse of pulping
papermaking effluents; color reduction of
pulp mill effluents by treatment with lime
tivated carbon and ozone and by chemical c
lation, filtration, flotation and ion-exch
processes; sludge dewatering and disposal;
secondary effluent treatment (activated s
plants, aerated stabilization basins, rot
biological disks, and land irrigation). (Witt-IP
W75-10397

**PROBLEMS ENCOUNTERED IN SLU
TREATMENT AND SOME ADVANCED S
TIONS,**
National Environmental Research Center, C
nati, Ohio. Advanced Waste Treatment Res
Lab.
For primary bibliographic entry see Field 5E.
W75-10398

**COLOR REMOVAL FROM BLEACHED K
EFFLUENTS,**
Dow Chemical Co., Midland, Mich.
T. A. Chamberlin, G. C. Kolb, S. F. Brown, a
H. Philp.
In: TAPPI Environmental Conference, D
Colorado, May 14-16, 1975, Prep
Proceedings (TAPPI, Atlanta, Georgia), p
13 fig, 19 ref, 6 tab.

rs: *Pulp wastes, *Color, *Ion exchange, water treatment, Wastes, Industrial Vater pollution sources, Sulfite liquors, wastes, Waste treatment, Chemical oxmand, Fish, Toxicity, Separation s, Water pollution treatment, Resins, rification, Water quality control, Comgrams.
s: Resin XD-8704.

tion of color, COD, and fish toxicity in each, decker, and neutral sulfite ical effluent streams with resins is based on results of field and laboratory ions. The contaminants are removed process streams by Dow Chemical Co.'s tal resin XD-8704 in the pH range 2-9. ion is accomplished by treating the resin wash water followed by effluent from nation stage. Experimental field data are ered by an on-site automated mini-plant ffluent from the caustic extraction and n stages (the pH is controlled by apcombination of the two effluent A computer program is being developed ine the economics involved for various cess parameters (pH and temperature of nd process effluent, residence time, and ntent). (Sykes-IPC)
9

S OF ALTERNATIVES FOR L OF SUSPENDED SOLIDS IN PULP ER MILL EFFLUENTS,
hern Paper Co., Cedar Springs, Ga.
h, R. M. Stein, and C. E. Adams, Jr.
I Environment Conference, Denver, May 14-16, 1975, Preprinted gs (TAPPI, Atlanta, Georgia), p 85-96. 7 tab.

s: *Pulp wastes, *Suspended solids, vater treatment, Wastes, Industrial ater pollution sources, Coagulation, Fildimentation, Costs, Economics, Water n, Water pollution treatment, Water control, Pulp and paper industry, goons.
: Kraft mills, Neutral sulfite semichemills, Cross-recovery.

thern Paper Co. operates an integrated l kraft-neutral sulfite semichemical pulp mill at Cedar Springs, Georgia. The ment system includes a 300 ft diameter 00 million gal aerated lagoon, and a 160 holding pond. The latter is necessary ill discharges into a river regulated by a ric navigation dam. A study was made tive methods of increasing effluent solids removal. The investigation inagulation analyses of the effluent solids, clarification of aerated stabiliza- effluent, and multi-media filtration of t from the settling basin. Both sedimenmulti-media filtration appeared capable ng reductions in effluent suspended as noted that there was little or no orval in conjunction with the suspended oval. Economic analyses indicate that ne of the systems might make them imr full-scale operation. (Sykes-IPC)

EUSE IN A PAPER REPROCESSING

Univ., Norman. School of Civil End Environmental Science.
, G. Reid, P. Law, C. Hogan, and J. ger.
Environmental Conference, Denver, May 14-16, 1975, Preprinted s (TAPPI, Atlanta, Georgia), p 147-159. 8 tab.

Descriptors: *Water reuse, *Pulp and paper industry, Water conservation, Water supply, *Waste water treatment, Costs, Productivity, Corrosion, Slime, *Oklahoma, Economics, Recycling, Water costs, Water demand, Water requirements, Water pollution control, Water pollution sources, Quality control, Closed conduit flow, Drainage.
Identifiers: Organic felt, Waste paper, Asphalt felt, Roofing felt.

The feasibility of water reuse was explored at Big Chief Roofing Co. (Ardmore, Oklahoma), a waste paper-reprocessing plant manufacturing organic felt (most of which is saturated with asphalt and converted to shingles and other roofing products). Before the project began, the mill was discharging 125 gal/min of water. Normal operation is now zero discharge, with approximately 12 gal/min of fresh water replacing evaporative losses. A favorable cost/benefit ratio experienced at the mill demonstrates advantages of in-plant control over end-of-pipe treatment. Economic benefits observed during zero-discharge operation include reduced water supply and waste water treatment costs, improved yield, improved drainage, and greater capacity of the dryer section due to increased operating temperatures, and resultant increased production. The benefits were partially offset by shorter felt lives, increased corrosion and slime control costs, and process modification cost. No degradation of product quality was noted. (Sykes-IPC)
W75-10401

ORGANIC COMPOUNDS IN PULP MILL LAGOON DISCHARGE,
Washington Univ., Seattle. Coll. of Forest Resources.
B. F. Hrutfiord, T. S. Friberg, D. F. Wilson, and J. R. Wilson.
In: TAPPI Environmental Conference, Denver, Colorado, May 14-16, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 181-184. 3 fig, 6 ref, 6 tab.

Descriptors: *Pulp wastes, *Organic compounds, *Aerated lagoons, *Discharge(Water), Wastes, Industrial wastes, Water pollution sources, Phenols, Acids, Liquid wastes, Aromatic compounds, Organic wastes, Waste treatment, Waste water treatment, Water pollution treatment, Water pollution control, Pulp and paper industry, *Washington, Pacific Northwest US.
Identifiers: Terpenes, Resin acids, Fatty acids, Sugar acids, Alpha-terpineol, Camphor, Kraft mills.

Organic compounds entering and leaving aerated lagoons of Weyerhaeuser Company's bleached kraft mill at Everett, Washington, have been identified and determined quantitatively. The compounds found were terpenes, resin and fatty acids, phenols, and sugar acids. The terpenes, resin and fatty acids are similar to those present in the wood species being pulped. About 8 ppm total terpenes were found in the lagoon influent and 1 ppm or less in the effluent. Alpha-terpineol was the major compound entering the lagoon, and camphor was the main terpene in the effluent. The total resin acid concentration entering the lagoon was 3.2 ppm, with 0.6 ppm leaving. Fatty acids were lower both entering and leaving the lagoon. Sugar acids were entering at about 100 ppm total, but were usually eliminated in the lagoon. Terpenes can be controlled by in-process stripping, and the other compounds can be partially controlled by in-plant spill containment. (Sykes-IPC)
W75-10402

PLANT PERFORMANCE USING DISSOLVED OXYGEN CONTROL,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. F. Roesler.
Journal of the Environmental Engineering Journal, Vol 100, No EE5, Proceedings of ASCE, Paper No. 10841, p 1069-1076, October 1974. 6 fig, 2 tab, 2 equ, 3 ref.

Descriptors: *Waste water treatment, *Aeration, *Automation, *Dissolved oxygen, *Water pollution control, *Environmental engineering, Frequency, Distribution, Sludge, Instrumentation, Air demand, Suspended solids, Graphical analysis, Oxygen requirements, Operations, *Performance, Control, Treatment facilities, Washington.
Identifiers: Renton(Wash).

The Renton Sewage Treatment Plant offered a unique opportunity to obtain unbiased, comparative, performance evaluation data for both automatic and manual dissolved control. The data were ranked in ascending order and plotted on logarithmic probability paper to obtain a frequency distribution. The parameters that were considered were BOD in the effluent, BOD and COD removals, sludge volume index, and settleability. All the parameters showed an improvement when the operation was changed to automatic dissolved oxygen control with the exception of COD values, which reflected little change. A rate constant that considered BOD removals, hydraulic flow, and the concentration of mixed liquor suspended solids was used to determine the overall efficiency of the process. In changing from manual to automatic dissolved oxygen control, the rate constant changed from 0.0260 - 0.1018, which reflects an improvement of 391%. This study indicates that automatic DO control can maintain excellent operational performance in a conventional activated sludge plant. The operators claim that there are less problems with filamentous bulking and that the sludge is easier to settle and handle. (Bell-Cornell)
W75-10452

WATER-QUALITY REQUIREMENTS FOR THE PETROLEUM INDUSTRY,
Neptune MicroFloc, Inc., Corvallis, Oreg.
R. H. Evers.
Journal of the American Water Works Association, Vol 67, No 2, p 60-64, February 1975. 2 fig, 10 tab, 5 ref.

Descriptors: *Water reuse, Water quality standards, Oil, Waste water, Organic compounds, Waste discharge, Industrial wastes.
Identifiers: *Petroleum industry.

A review of water reuse, water quality requirements, current effluent standards and treatment practices for water from the petroleum refinery industry is given. Water usage is divided into cooling and condensing, boiler feed, and process and other uses. Water quality guidelines have been compiled by the American Petroleum Institute. Requirements vary depending upon the future use of the recovered water, whether for potable use or washdown purposes. General guidelines indicate that water should be clear, colorless, free of iron, manganese, hydrogen sulfide, and organic growth. Tables illustrate the quality characteristics of untreated cooling waters, water use and reuse by refinery classification, raw water and reused water for steam and processing, guidelines for boiler feed water tolerances and cooling water tolerances, water quality requirements of water at point of use for the petroleum industry and treatment systems used for refinery raw waters. Effluent standards as established by the EPA are described. Future plans for waste water discharge and for reuse within the industry are being made. (Prague-FIRL)
W75-10465

MANUAL FOR PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS FOR WASTEWATER TREATMENT WORKS,

**FACILITIES PLANS, AND 208 AREAWIDE WASTE TREATMENT MANAGEMENT PLANS,**
Environmental Protection Agency, Washington, D.C. Office of Federal Activities.
P. L. Cook, and N. Cronin.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-235 280, $3.75 in paper copy, $2.25 in microfiche. EPA Report, August, 1973. 35 p, 3 fig.

Descriptors: *Federal jurisdiction, *Environmental effects, *Treatment facilities, Waste water treatment, Waste discharges, Publications, Pollutant effects, Planning, Publications.
Identifiers: *Environmental Impact Statements.

Detailed guidance is given for the preparation of Environmental Impact Statements (EIS) on waste water treatment works. The National Environmental Policy Act of 1969, Public Law 91-190, requires all Federal agencies to prepare environmental impact statements before acquiring Federal funds to produce a project. The requirements of the Council on Environmental Quality (CEQ) are outlined. A flowchart for the systematic gathering of information for the EIS has been drawn. Various treatment alternatives are listed, depending upon whether the facility is a treatment work, a facilities plan, or a 208 plan. Techniques such as treatment and discharge to surface waters, waste water reuse, land application, and sludge disposal alternatives are described. Alternatives are given. The review of the EIS by a Federal or State Agency representative is also discussed. (Prague-FIRL)
W75-10473

**FEASIBILITY TEST PROGRAM OF APPLICATION OF COALESCING PHASE OIL/WATER SEPARATORS TO SELF COMPENSATING FUEL TANKS IN SURFACE SHIPS,**
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
For primary bibliographic entry see Field 5G.
W75-10474

**PROCESS DESIGN MANUAL FOR SLUDGE TREATMENT AND DISPOSAL.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
Report EPA 625/1-74-006, October, 1974. 389 p, 155 fig, 105 tab.

Descriptors: Publications, *Capital costs, *Operating costs, *Maintenance costs, *Sludge treatment, *Sludge disposal, *Design criteria, Pilot plants, Liquid treatment, Reviews, Systems analysis, Waste treatment, Treatment facilities.

A review is provided of current sludge processing technology as well as procedures to be considered, modified, and applied for specific design situations and unusual conditions. Regulations now require the design and construction, as well as cost-effective operation, of municipal treatment facilities to remove at least 85% of influent BOD. Discussed are the capital, operating, and maintenance costs for both primary and higher levels of treatment. Since higher treatment levels are more costly, there is an economic incentive for optimal design. Advanced waste treatment sludges and complex industrial wastes present unique problems. Secondary treatment produces biological sludges in increasing amounts. Because of a lack of regulations on sludge disposal, design has focussed on liquid treatment handling. This has caused the sludge disposal methods, often disproportionate in terms of cost, to be inefficiently designed. Newer liquid treatment and sludge treatment unit processes in secondary plants are better interrelated and should be studied together. Optimum innovative design by the engineer is discussed. It is recommended that the designer: develop and maintain a thorough knowledge of various sludge treatment unit processes; continually study plant operation for feedback for future cost saving design modifications; study pilot plants of alternate prescreened systems; and use systems analysis to compare alternate complete systems. (Prague-FIRL)
W75-10475

**GRAVITY DEWATERING OF METAL HYDROXIDE SLUDGES,**
Permutit Research and Development Center, Princeton, N.J.
J. R. Anderson, L. B. Luttinger, and W. L. Schwoyer.
Reprint from Plating, December 1972. 5 p, 10 fig.

Descriptors: *Dewatering, *Metals, *Hydroxides, *Sludges, Catalysts, Coagulation, Precipitation, Filters, Concentrations, Flocculation, Neutralization, Flotation, Settling, Turbulence, Reynolds number, Slurries, Clarification, Laminar flow, Drag, Influent, Discharge, *Waste water treatment, *Sludge treatment.
Identifiers: Backwash.

The pH adjustment of metal finishing wastes to the range where they will be acceptable for discharge to a sewer or stream generally results in the formation of a precipitate, usually metal hydroxide. The concentration of a hydroxide, several hundred ppm, is usually too low for direct removal by most mechanical dewatering devices. The normal progression of treatment is to concentrate from the several hundred ppm range to the 0.5 to 1 per cent range by flotation or settling devices; to further dewater to the 8 to 15 per cent range by use of a liquid-solid separator; and finally secondary dewatering to the 13 to 20 per cent range by means of a press. The material at this point is a damp solid which can be hauled to a land fill or another source of ultimate disposal without drippage. The three types of devices are discussed. This system is equally applicable to crystalline solids as well as amorphous flocs. (Rowe-Vanderbilt)
W75-10500

**COPING WITH URBAN RUNOFF IN THE UNITED STATES,**
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
R. Field.
Water Research, Vol 9, No 5/6, p 499-505, May-June 1975. 2 tab, 8 ref.

Descriptors: *Urban runoff, *Combined sewers, *Separated sewers, *Storm water, *Overflow, Waste water disposal, Filtration, Flow measurement, Infiltration, Sewage treatment, Water storage, Flow, Regulation, Disinfection.
Identifiers: Microstraining, Dissolved-air flotation, Porous pavement, Rotating biological contractor.

Combined sewers are a source of water pollution problems, but even flows of stormwater alone can seriously affect water quality. Sewer separation is very costly and solves only about 50% of the problem. Current approaches involve control of combined overflows, treatment, and combinations of the two. Control can involve maximizing of treatment with existing facilities, improvement of regulator maintenance, control of infiltration and extraneous inflows, surface sanitation, and addition of flow-increasing polymers, as well as flow regulation and storage, use of porous pavement, and vacuum and pressure-type sewer systems. A number of treatment methods are being evaluated. The most promising are microstraining at high rates, ultrahigh rate filtration on various media, screening and dissolved-air flotation, and the rotating biological contractor. Disinfection processes also can be adapted to storm flows. (Lardner-ISWS)
W75-10541

**HEAT TREATMENT OF SEWAGE SLUDGES,**
Millaquin Sugar Mill, Queensland (Australia).
R. B. Brooks.
Water (Journal of the Australian Water and W water Association) Vol 2, No 1, p 15-18, M 1975. 6 fig, 5 tab, 5 ref.

Descriptors: *Sludge treatment, *Sewage sl *Heat treatment, Sewage treatment, Filtra *Waste water treatment.

Heat conditioning of sludges, as a metho enabling more complete dewatering, has se potential advantages over chemical conditi (including sterility of the product, and econo of using pressed sludge as fuel). However, it has been limited; one reason for this has b lack of understanding of the processes invo with consequent unreliability of the operation results of a series of laborator experiment vestigating the physical and chemical changes ing heat conditioning of activated and h sludges are presented. The process is predict reliable, and understandable, and thus suitab industrial application. (CSIRO)
W75-10644

**THE MUTUAL DESTRUCTION OF POL ING FACTORS IN WASTE LIQUORS,**
Victoria State Rivers and Water Supply Co sion, Melbourne (Australia).
W. M. Drew, and W. R. B. Martin.
Water (Journal of the Australian Water and W water Association) Vol 2, No 1, p 9-14, M 1975. 7 fig, 5 tab, 18 ref.

Descriptors: *Industrial wastes, *Biological ment, *Sulfates, *Sulfur bacteria, *Waste treatment, Microbial degradation, Anaerobic teria, Thermal powerplants, Pulp wastes, Da dustry, *Australia.
Identifiers: Desulfovibrio-desulfuricans, La River(Vic).

Three major industries of the Latrobe drainage basin (Victoria, Australia) - p generation from brown coal, pulp milling, an processing - each produce effluents which, in of existing treament facilities, are causing tion problems, notably the production of tionable odors from open disposal channels. ysis of the organic and chemical compositi these wastes suggests that an appropriate m of the three types would provide a suitable um for the growth of the bacterium Desulfo desulfuricans, which anaerobically re sulphates. Exploratory laboratory experi with batch and continuous fermentation hav firmed that this process could be used in a su designed plant to reduce the sulfate levels, a odor problem in consequence, and recover in saleable form. Complete treatment of t fluents to acceptable discharge standards require the integration of this process with treatments to remove color. (CSIRO)
W75-10645

**PROGRESS IN AUSTRALIAN HYDRO 1965-1974.**
For primary bibliographic entry see Field 2A.
W75-10646

**ENVIRONMENTAL PROBLEMS ASSOCI WITH THE USE OF COOLING TOWERS,**
Purdue Univ., Lafayette, Ind. School of Ci gineering.
D. L. Brenchley, and P. R. Westlin.
In: Proceedings of the 27th Industrial Wast ference, May 2-4, 1972, Purdue Univ Lafayette, Indiana, Engineering Extension No 141, Part 1, p 55-66. 7 tab, 29 ref.

Descriptors: *Cooling towers, *Environmen fects, *Local precipitation, *Pollution abat Ice, Fog, Rain, Clouds, Pollutants, Design, Air pollution effects.
Identifiers: *Cooling tower plumes.

oling towers will be increasingly used as a relia- method of rejecting waste heat without causing rmal pollution of rivers and lakes. The moisture m cooling towers can and has caused local ging, icing, cloudiness, resulting in reduction of mal daily temperature variations. Also chemi- additives to inhibit biological growth, corro-, and deposition of dissolved salts within the ers may be discharged through airborne 'drift' ay. Process cooling waters often pick up impu- s which are also discharged from towers. ently developed equations for cooling tower nes, intended as tools to assit in tower design location, are analyzed. Abating a plume blem on an existing tower is difficult and ex- sive. Care must be taken in the selection, loca- and design of the towers to minimize at- pheric side effects and the plume problem. e dispersion equations to assit in such deci- s are now available. While the ultimate selec- might be dry cooling towers, these units ently are prohibitive in construction and rating costs; only where the water supply is ricted could such a unit be justified. Within the few years improved dry towers and combina- wet-dry units will be commercially produced h will enhance the efficiency of rejecting te heat without deleterious side-effects. en-Wisconsin)
-10671

**NCENTRATION OF DILUTE WASTE EAMS BY ION EXCHANGE TECHNIQUES,**
nutit Research Center, Princeton, N.J.
Hamilton.
Proceedings of the 27th Industrial Waste Con- nce, May 2-4, 1972, Purdue University, yette, Indiana, Engineering Extension Series 41, Part 1, p 80-84. 4 fig, 2 tab, 3 ref.

criptors: *Waste water treatment, *Ion ange, Resins, Separation techniques, Liquid es.

minimum regenerant waste volume produced he various types of ion exchange resins is olished and correlated with the respective exchange capacities in order to determine a centration factor' for any specific influent entration. This 'concentration factor' can be used as a guide for deciding if ion ange is a suitable treatment technique. The eration characteristics for both the weak acid n type resin and the weak base anion type are very similar. The weak group resins can generated with 1.1 times the stoichiometric nt of regenerant and are easily rinsed with 2 ed volumes. The ease of regeneration of the group resins has a significant process ad- ge over the strong group resins in that the erant quality can be very poor and yet still be ently used and reused. Although the concen- n factor versus influent concentration for al types of resin is illustrated and provides a to the feasibility of ion exchange as a treat- method, engineering and design will require for determining capacity and regeneration ef- cy to be carried out for all waste streams in to compensate for each waste stream's in- ial characteristics. (Auen-Wisconsin)
10672

**ATMENT OF MILK TRUCK WASHING TES BY ANEROBIC DIGESTION,**
elaer Polytechnic Inst., Troy, N.Y. Bio-En- nental Engineering Div.
Aulenbach, and R. V. Hallock.
oceedings of the 27th Industrial Waste Con- ce, May 2-4, 1972, Purdue University, ette, Indiana, Engineering Extension Series 1, Part 1, p 126-136. 1 fig, 6 tab, 1 ref.

iptors: *Dairy industry, *Waste water treat- *Aerobic treatment, Transportation, New *Anerobic digestion, Farm wastes.
fiers: *Milk truck washings.

Wastes from washing trucks delivering milk to the Hood Milk Transfer Station at Eagle Bridge, New York, contain 10% caustic, a specially formulated high phosphate detergent, a mild neutralizer, a solution containing sodium hypochlorite, and total a waste flow of approximately 5000 gpd of high alkaline discharge. Waste analysis showed an average 11.15 pH value, BOD mean value of 779, COD approximately double the BOD, and total solids of a mean value of 1768, half of which were volatile. They contain a barely adequate nitrogen supply for aerobic decomposition of the BOD while total phosphate is present in excess. A basic digestion system is illustrated and operations methodology is discussed and compared. The loadings of the two most representative systems were in the range of 0.008 lbs of BOD cu ft/day. The septic effluent from the digestor underwent a one-hour aeration, sufficient to raise the DO level and dispel odors, but does not further reduce the organics nor produce sludge. Anaerobic digestion for milk truck washings can effect a better than 85% reduction in BOD and COD at a 7-day detention time at 36C, by either single or two stage digestion. Additional nitrogen is not necessary for successful treatment. (Auen-Wisconsin)
W75-10673

**SLUDGE DISPOSAL ON AGRICULTURAL SOIL,**
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
R. K. White, and M. Y. Hamdy.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 1, p 191-201. 3 fig, 1 tab, 9 ref.

Descriptors: *Waste disposal, *Sludge disposal, Agriculture, *Soil disposal fields, Application equipment, Technology, Transportation, *Waste treatment, Application methods, Costs, Facilities, Mathematical models.

Alternative equipment and processes in a system for the treatment, transportation, and disposal of sludge on agricultural soil is delineated. Selection factors, such as concentration of nitrogen or toxic elements in the sludge, are considered as constraints on a 'typical' sludge disposal system. Other cost and system constraints are considered relative to annual sludge production, seasonal distribution, sludge characteristics, geography and climate, and government regulations. A typical sludge disposal system is diagrammed, different treatment processes (depending on the disposal method) are discussed, and the selection of the proper transportation mode weighed. A mathematical model is proposed for a disposal system which puts the various concepts and constraints in a qualitative form that lends itself to optimization techniques. If the cost and constraint coefficients are constant over a sufficiently long period of time, linear programming techniques could be utilized; if one or most cost coefficients of a given process change with the amount of sludge processed, or if the constraints on a given process change with the amount of sludge processed, the resolution required nonlinear programming techniques; if the cost function or constraints change with time, the solution of the mathematical model would require dynamic programming techniques. (Auen-Wisconsin)
W75-10674

**HEAVY METALS REMOVAL FROM WOOD PRESERVING WASTEWATER,**
Russell and Axon, Inc., Daytona Beach, Fla.
E. H. Teer, and L. V. Russell.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 1, p 281-286. 2 fig, 7 tab, 7 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Heavy metals, *Wood preservatives(Pesticides), Chromium, Copper, Arsenicals(Pesticides), Fluorides, Aquous solutions, Phenols, Ammonia, *Georgia.

In 1971, the Dixie Wood Preserving Company at Thomson, Georgia installed the first of its kind wastewater treatment system in the wood preserving industry, subsequently approved by the Georgia Water Quality Control Board. The design objective was to treat the concentrated waste excess from two 5000 gallon tanks so that further degradation of the Dixie Pond would cease; and when the treater is not needed for the more concentrated wastes, treat the pond water itself to lower the level to eliminate discharge and to remove toxic materials from the pond in order to enhance its biological viability. While the treater must remove chromium, copper, arsenic, fluorides, phenols, and ammonia from the wastewater, the effluent also contains some residual oxygen demand from the wood steaming and a vegetable dye used to mark the wood. Although these are negligible relative to the quantities of toxic materials, it is planned to eventually use the pond as a final polishing pond for the treater effluent. This will provide oxygenation and protection for downstream users from eutrophication induced by traces of ammonia-nitrogen and phosphate. The treatment system is described. The total investment cost was $50,000; the treater itself, labor and materials, cost below $30,000. (Auen-Wisconsin)
W75-10675

**RECLAMATION OF TEXTILE PRINTING WASTEWATERS FOR DIRECT RECYCLE,**
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
W. M. Kachel, and T. M. Keinath.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 1, p 406-419. 10 fig, 4 tab, 8 ref.

Descriptors: *Industrial wastes, *Waste water treatment, *Water reuse, *Pigments, *Separation techniques, Dyes, Flocculation, Design flow, Cost comparison, Chemical precipitation, *Recycling.
Identifiers: *Textile printing effluents.

Technical and economic feasibility studies are described for textile printing wastewater pigment destabilization through pH control (which proved inapplicable) and destabilization with metallic salts. A schematic flow diagram of a proposed printing wastewater renovation and reclamation system is detailed, which provides for the addition of a metallic coagulant and caustic to the printing wastewaters for destabilization, for the mixing and flocculation of the destabilized suspension for particle aggregation, for flotation for solids/liquid separation, for recycling of the renovated water to the printing machines, for addition of make-up water, and for solids disposal by incineration. Provision is also made in the diagram for blowdown of dissolved solids and varsol, if required. Clarification efficiencies in excess of 98% were attained when either ferric chloride, ferric sulfate, or aluminum sulfate was employed as the coagulant, supplemented by pH control. Projected costs for three system alternatives, indicate that the alternative which centers on the water reuse concept has distinct economic advantages over those in which treated wastewaters are discharged to a receiving stream. Process costs for reclamation and reuse of these waters for printing equipment rinsing operations were estimated at 2.32 cents/1000 gal. (Auen-Wisconsin)
W75-10676

**LAGOONS PLUS SPRAY IRRIGATION FOR EFFECTIVE BEAN CANNERY WASTE TREATMENT,**
Syracuse Univ., N.Y. Dept. of Civil Engineering.
N. L. Nemerow, and J. D. Scott.

In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 1, p 555-562. 5 fig, 5 tab, 3 ref.

Descriptors: *Waste treatment, *Waste water treatment, *Food processing industry, Beans, Canneries, Sprinkler irrigation, Sewage lagoons, Organic wastes, Odors, Oxidation lagoons, New York, Industrial wastes.
Identifiers: Bean cannery wastes, Eden(NY).

The design of a three-stage lagoon system for treating bean cannery effluents was based on the following criteria: (1) The organic wastes were readily oxidizable, (2) adequate land was available, (3) no municipal treatment facilities were accessible, (4) best usage of the receiving stream was for irrigation water, and (5) a short, 10-week, packing season. The ponds were built at varying depths and over a four year period effected removals of 68-85% BOD and 60-85% suspended solids, which was ample to prevent odors. Raw waste BOD, COD, and SS were about 450, 1000, and 300 mg/l, respectively, and were reduced by the ponds to values of approximately 110, 127, and 70 mg/l. The daily hydraulic raw waste loading amounted to 216,000 g/day. The total waste load was 810 lbs of BOD per day of the three pond system with the unit loading on the entire system of 260 lbs of BOD per acre/day. The pond system-treated effluent was successfuly spray irrigated on a rye grass field of loadings of 72,000 gallons per acre/day over a 3 acre field at a BOD load of 67 lbs/acre/day. The operational problems and corrective measures taken are described. (Auen-Wisconsin)
W75-10678

**DISPOSAL OF LIQUID EFFLUENT BY LAND IRRIGATION AT LAGRO CELOTEX PLANT,**
Celotex Corp., Lagro, Ind.
C. D. Synder.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 1, p 563-568.

Descriptors: *Waste water treatment, Irrigation, *Industrial wastes, *Irrigation systems, *Indiana, Sprinkler irrigation, Costs, Irrigation design, Drainage, Organic wastes, *Waste disposal.
Identifiers: *Land irrigation, Lagro(Ind).

The Celotex plant at Lagro, Indiana disposes their effluent by land spraying. The effluent contains residues of organic matter from the production of building materials products. The major raw materials used are steel mill slag, foundry coke, gravel, clay, and starch. The process effluent is collected by the usual system of floor drains and underground pipes converging to one stream which is directed to a transfer pump. The spray irrigation system is installed on a 12-acre, gently sloping field. The complete disposal system consists of two pipe networks, one of which distributes the effluent to a series of sprinkler heads, while the other pipe network underlays the entire irrigation field to remove the underground drainage. The underdrain discharge joins an open ditch with the resulting flow following both open and closed ditches to the Wabash River. The design, operation, maintenance, and costs are detailed. Tests indicated that the quality of the effluent from this disposal system compares favorably, or is superior to, the river water supply. Two other spray irrigation systems installed by this corporation, one in Michigan, purified the waste effluent 99% and the Pittston, Pennsylvania plant, has used this disposal system for 10 years with satisfactory results. (Auen-Wisconsin)
W75-10679

**TOXICITY OF CHLORINATED MUNICIPAL WASTES TO FISH: AN EVALUATION BASED ON MICHIGAN FIELD DATA,**
Michigan Dept. of Natural Resources, Lansing. Bureau of Water Management.
For primary bibliographic entry see Field 5C.
W75-10680

**VACUUM FILTRATION COST OPTIMIZATION,**
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
E. R. Bennett, K. D. Linstedt, and D. A. Rein.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 649-664.

Descriptors: *Optimization, *Sludge treatment, *Sewage treatment, Vacuum drying, Sludge disposal, Capital costs, Operating costs, Dewatering, Costs, *Filtration, *Waste water treatment.
Identifiers: *Vacuum filtration.

In a typical large-scale operation the solids processing system is often comprised of vacuum filtration facilities for sludge dewatering with associated incineration or landfilling capability for disposal of the dewatered sludge. The optimum operating conditions of a vacuum filter are dictated by the total sludge processing and disposal systems. The relationship between machine variables and input and output parameters are shown. The solids processing costs are very sensitive to adequancy of design and optimization of operation. This sensitivity develops in several areas of the sludge processing system through: the use of relatively large chemical doses for sludge conditioning; the effect of dewatered sludge characteristics on the capacity and auxiliary fuel requirements for incineration; and, moisture consideration in defining the conveyance capacity and costs for land disposal. This study investigated the relationship of the dose, yeild, and cake moisture variables in a vacuum filter operation, with emphasis on the means of improving cake dryness. Filtration costs and disposal costs are analyzed in detail. The vacuum filter operation is fairly insensitive to most of the machine parameters. The major factors influencing the cost of the process are the amount of activated sludge in the sludge mixture and the solids content of the feed sludge. (Auen-Wisconsin)
W75-10681

**DISPOSAL OF DIGESTED SEWAGE SLUDGE BY LANDFILL,**
Washington Univ., Seattle. Dept. of Civil Engineering.
B. W. Mar, and C. Henry.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 673-678. 9 ref. EPA WPRD-180-01(R).

Descriptors: *Waste disposal, *Landfills, *Sludge disposal, *Washington, Land development, Economic feasibility, Intertidal areas, Seashores, Feasibility studies, *Waste treatment.
Identifiers: Puget Sound(Wash), Seattle(Wash), Demonstration project.

The purpose of this demonstration project was to develop a process that would employ wet digested sewage sludge to reclaim seashore land, particularly attrative since the treatment plant is located on the shores of Puget Sound and Seattle had expressed an interest in developing a parkway along that intertidal zone. The research goal was to investigate the economic feasibility and environmental acceptability of this concept. Laboratory feasibility studies investigated the dewatering and settling capabilities of the sludge. Bench scale studies investigated the problems and characteristics of centrifuging digested sludge and explored the natural drying of sand/sludge mixtures, consolidation of the mixtures, pollutional aspects of the fill, and the operation of the dewatering facility. Centrate treatment either by addition of chemicals to increase solids recovery in the cake or by direct treatment of centrage will double dewatering costs, yet the effectiveness of the chemicals is not readily predictable. A stable fill can be developed using 50% water content sludge cake. Leachate impacts of the fill can be minimized by dewatering the sludge to at least 50% solids. Public health and safety hazards were unresolved. It is recommended that the fill should be monitored for five years before this process is evaluated. (Auen-Wisconsin)
W75-10682

**TREATABILITY OF LEACHATE FROM SANITARY LANDFILLS,**
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
W. C. Boyle, and R. K. Ham.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 687-704. 5 fig, 17 tab, 3 ref. EPA 5-R01-EC-0041.

Descriptors: *Leachate, *Landfills, *Treatment, Sanitary engineering, Biological treatment, Aerobic treatment, Activated sludge, Chemical precipitation, *Wisconsin, Anaerobic digestion, *Waste water treatment.
Identifiers: *Leachate treatment, Madison(Wis), Milwaukee(Wis).

The characteristics and the quantity of leachate generated from a sanitary landfill site are highly variable. The described laboratory studies were designed to evaluate the ability of anaerobic and aerobic biological leachate treatment by aerobic treatment of selected combinations of leachate and domestic wastewater in a simulated activated sludge sewage treatment plant; anaerobic followed by aerobic polishing; and chemical precipitation, oxidation, and coagulation. Anaerobic treatment of raw leachate provided greater than 90% BOD reduction for detention times greater than 10 days at 23-30C. Aerobic treatment also resulted in BOD removals in excess of 90% at approximately 23C and at loadings of less than 0.03 lb BOD5/cu ft/day. Foaming and poor solids-liquids separation did occur, however. Leachate could be added to domestic wastewater in an extended aeration activated sludge plant at a level of at least 5% by volume without seriously impairing effluent quality. Lime, sodium sulfide, chlorine, potassium permanganate, alum, and ferric chloride were tested. Chemicals alone will not provide efficient removal of organics, however, good removals of multivalent cations and color may be expected with lime, the oxidants, and coagulants. Chemical treatment requires high dosage and generally produces large amounts of sludge but seems to be particularly useful in treating biological process effluent. (Auen-Wisconsin)
W75-10683

**AN EFFLUENT STUDY OF A FRESH WATER FISH PROCESSING PLANT,**
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
M. J. Riddle, and L. L. Murphy.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 777-791. 9 fig, 8 tab, 3 ref.

Descriptors: *Food processing industry, *Freshwater fish, *Waste water treatment, *Biological treatment, *Canada, Perches, Smelts, Industrial wastes.
Identifiers: Stickliquor.

A statistical analysis to determine if difference existed between perch and smelt wastewater of

water fish processing plant indicated that no ficant difference could be established for 5, COD, filtered TOC, SS or TS. Similarly nutrient values appeared comparable. The ined wastewater have higher mean values the separate wastewaters of the perch or . The mean BOD5:N:P ratio of the combined e was approximately 150:7:1. The discharge e high strength stickliquor to a biological nent system is not recommended; stickliquor d be recovered by evaporation or trucked . The pollution of the wastewater increased increased contact time between the solid material and the liquid thus dry capture iques for transporting the fish and offal d be considered. Batch studies showed that 10 days 90% of the total BOD5 and approxi- y 70% of the soluble organic carbon had been ved. The addition of 5% by volume of iquor to the batch biological systems ased the reaction rates for both BOD5 and SOC. Maximum treatment of the combined water could be obtained in a reactor with a tion time in excess of 5 days with no sludge le or a 7.5 hr detention time with sludge recy- Auen-Wisconsin)
10684

TMENT OF WINERY WASTES BY TED LAGOON, ACTIVATED SLUDGE, ROTATING BIOLOGICAL CONTRAC-

r Engineers, Inc., Rochester, N.Y.
Labella, I. H. Thaker, and J. E. Tehan.
oceedings of the 27th Industrial Waste Con- ce, May 2-4, 1972, Purdue University, ette, Indiana, Engineering Extension Series 1, Part 2, p 803-816. 8 fig, 6 tab, 20 ref.

iptors: *Waste water treatment, *Industrial s, Organic matter, *Biological treatment, bility studies, Aerobic treatment, *Activated , Design, *New York, Costs, Operating *Aerated lagoons.
fiers: *Winery wastes, *Rotating biological ctor, Hammondsport(NY).

erated lagoon, activated sludge, and Rotating tical Contactor (RBC) were evaluated to op a treatment process for winery wastes. on this investigation the RBC process was ed for construction by the Gold Seal ards, Hammondsport, New York to treat the GD flow. A summary of the treatment n is presented and the design for the treat- facility is illustrated. The RBC process ed under hydraulic loadings from 0.6 gal/sq to 1.86 gal/sq ft/day, obtained 96 to 83.3% removal and 94.5 to 81.5% COD removal. BC successfully obtained reductions in suc- e stages in series at a hydraulic loading rate al/sq ft/day. The activated sludge process erated lagoon would have obtained similar als if the required nutrient balance was ined in the waste feed. The sludge produced C settled easily and displayed the fastest g rate. Capital costs of the activated sludge s and RBC were found to be approximately but the yearly operating cost of RBC was /yr less. The RBC process design was d on the basis of technical advantages, sim- of operation and economic efficiency. -Wisconsin)
0685

WASTEWATER TREATMENT STOP OPHICATION OF IMPOUNDMENTS,
a Polytechnic Inst. and State Univ., burg.
rizzard, and E. M. Jennelle.
ceedings of the 27th Industrial Waste Con- e, May 2-4, 1972, Purdue University, tte, Indiana, Engineering Extension Series , Part 2, p 851-866. 9 tab, 34 ref. NSF GK-

Descriptors: *Eutrophication, *Pollution abatement, *Waste water treatment, *Waste water(Pollution), Municipal wastes, Nutrients, Water pollution sourses, Runoff, Sewage effluents, Reservoirs, Tributaries, *Virginia, Phosphorus, Nitrogen, Carbon, Drainage basins, Impoundments, Water pollution effects.
Identifiers: *Nutrient sources, Roanoke River(Va), Smith Mountain Lake(Va), Roanoke(Va).

Wastewater discharges from Roanoke, Virginia and environs account for 64% of the total phosphorus, 72% of the total nitrogen, and 54% of the organic carbon entering Smith Mountain Lake. Macronutrient yields from land drainage alone were found to be adequate to maintain eutrophication in this impoundment. A reduction in the nutrient yield from wastewater discharges will materially reduce the nutrient inflow to the lake, but this will not significantly improve water quality, as shown in the comparison of limiting concentrations if tertiary treatment of all wastewater is required. Becasue of the morphology and relative low inflow to volume relationship for this lake the movement of nutrients is slow, resulting in a high nutrient retention in the upper reaches. The continual increase in both population and industrial activity will also significantly increase the yield of metal cations and other nutrients. Calculations of nutrient yields by watershed type, by the drainage area of Roanoke River and tributaries, the wastewater loading to the basin, land runoff, and comparison of concentrations entering the impoundment to accepted limiting concentrations indicate that a program of total environmental management is needed if the recreational potential of downstream impoundments is to be preserved. (Auen-Wisconsin)
W75-10686

**ANALYSIS OF WASTEWATER TREATMENT SYSTEMS FOR A MEAT PROCESSING PLANT,**
Iowa Univ., Iowa City. Dept. of Civil (Environmental) Engineering.
W. L. Paulson, L. D. Lively, and J. L. Witherow.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 879-893. 3 fig, 9 tab, 5 ref.

Descriptors: *Waste water treatment, *Food processing industry, *Design, Treatment facilities, Feeds, Recycling, Activated sludge, Sludge treatment, Industrial wastes.
Identifiers: *Meat processing wastes, Animal feed supplement.

The results of a demonstration project, to determine the effectiveness of the oxidation ditch activated sludge (Pasveer) process are described. The project was located at the John Morrell and Company meat processing plant, Ottumwa, Iowa, where from 3.25 to 3.5 MGD wastewater would require treatment. The daily (5-day week) BOD loading was predicted to be 38,000 lbs. Based on the flow rate, effluent quality (BOD5) would have to be between 75 and 80 mg/l. The overall treatment plant efficiency (BOD) required would be approximately 95%. A schematic flow diagram of the plant design, a plant drawing listing the units, and plant features are given. The evaluation of the feasibility of using waste activated sludge as an animal feed supplement showed potential. The design and operation of the primary treatment units proved inadequate. More efficient grease and SS removal were needed prior to the aeration process. The tubular conveyors used were unsatisfactory as sludge removal mechanisms. The process is capable of achieving organic removals of 90-95% from meatpacking wastewater; however, effluent ammonia levels are of concern. Improvements in pretreatment, aeration system capacity, and final sedimentation were needed. Mechanical equipment should be properly located and protected to minimize icing. (Auen-Wisconsin)
W75-10687

**POPULATION DYNAMICS OF PROTOZOA IN WASTEWATER, AND IMPACT OF ENVIRONMENTAL CHANGES,**
Howard Univ., Washington, D.C. Bio-Environmental Engineering and Sciences Research Lab.
M. M. Varma, H. E. Finley, and G. H. Bennett.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 994-1003. 7 fig, 2 tab, 24 ref. EPA 5P1-WP-178-02.

Descriptors: *Aquatic animals, *Protozoa, *Waste water treatment, *Sewage treatment, Animal behavior, *Environmental effects, Activated sludge, *District of Columbia, Systematics, Sewage bacteria.
Identifiers: Vorticella, Opercularia, Colpoda, Calpidium.

The relative importance of bacteria and protozoa in wastewater/sewage treatment was investigated by identifying the dominant protozoa in the various segments of the treatment process at the Water Pollution Control Plant of the District of Columbia; then the behavior of these protozoa in the secondary effluent, under uncontrolled environmental variables, with particular attention to the relation of pH was observed; followed by the behavior of the protozoa under some controlled variables. Vorticella and Opercularia were conspicuously successful in secondary effluent because of the presence of a large number of bacteria and high dissolved oxygen. Probably not only the number of bacteria present, but possibly also the kinds of bacteria present exert some influence as to which protozoa are dominant. While more research is recommended to determine the actual purification mechanism, i.e., is it catalase activity, protozoan activity, or a combination of both, and which is more important, these research results indicated that Vorticella, responsible for clarification, was dominant in secondary effluent; the death rate of Opercularia was not significantly affected by changes in pH (6.8-8.3); Vorticella was more sensitive within the same pH range; and that Opercularia population increased in number when glutamic acid was added to the medium. (Auen-Wisconsin)
W75-10689

**WATER POLLUTION PROBLEMS ASSOCIATED WITH CONTROL OF STACK GAS EMISSION,**
National Lime Association, Washington, D.C.
For primary bibliographic entry see Field 5B.
W75-10691

**TREATMENT PROCESSES FOR COPING WITH VARIATION IN RAW-WATER QUALITY,**
National Environmental Research Center, Cincinnati, Ohio. Water Supply Research Lab.
For primary bibliographic entry see Field 5F.
W75-10705

**DOMESTIC WASTE WATER REUSE--ASPECTS OF THE TREATMENT SYSTEM,**
Netherlands Waterworks, Rijswijk. Testing and Research Inst.
D. Kuiper, and R. Wechsler.
Water Research, Vol 9, No 7, p 655-657, July, 1975. 1 tab, 1 ref.

Descriptors: *Water reuse, *Water supply development, *Waste water treatment, *Water purification, Reclamation, Water treatment, Activated carbon, Water quality control, Reverse osmosis, *Sewage treatment, Water analysis, Potable water, *Domestic wastes, Domestic water.

The general requirements of a waste water reuse system--that it produce water meeting the highest existing drinking water standards, that it remove any conceivable pollutant, and that the process be

highly reliable--can be met now. Increasing deterioration of water supply sources requires advanced treatment processes while environmental legislation requires improved sewage treatment. From 50 to 80% of the water supplied returns as effluent. Relative independence from increasingly polluted sources could be gained by closing the cycle and reusing this water. The very high standards necessary to prevent contaminant build-up can be met by a treatment system consisting of several processes which rely on different and unrelated mechanisms working in series with overlapping functions. Overload capacity, quality control, and good design to prevent cross infection are essential. A proposed system works with effluent from conventional primary plus secondary biological treatment. This treated water is fed through lime clarification which disinfects at high pH and removes colloidal matter and calcium salts. Hyperfiltration (reverse osmosis) next removes substances with molecular weight over 200. Low molecular weight dissolved organics are next removed by activated carbon treatment. Finally, chlorine disinfection removes any residual ammonia and protects against quality deterioration. This combined sewage and water treatment process could be competitive with conventional water supplies. (Herr-North Carolina)
W75-10708

**WATER AND WASTEWATER FACILITIES FOR FLORIDA HOUSING DEVELOPMENTS,**
Singer Co., Bridgeport, Conn. Water Resources Div.
B. W. Valentine.
Public Works, Vol 104, No 10, p 98-99, Oct 1973. 1 tab.

Descriptors: *Waste water treatment, *Florida, *Water purification, *Water supply development, *Sewage treatment, Water quality control, Aquifers, Chlorination, Waste disposal wells, Water wells, Aeration, Sludge treatment, *Treatment facilities.
Identifiers: Delray Beach(FL), West Palm Beach County(FL).

Near Delray Beach, Florida, 3,400 residents in 3 new developments are being served by a combined water supply and wastewater treatment facility. Phase I of the project, now complete at a cost of $800,000, includes 2 water supply wells, a 1 MG reservoir for treated water, treatment facilities, and a control building. Water supply is from 2 12-inch diameter wells 150 ft deep delivering over 1 mgd. Water of the best available quality is from this depth, although treatment for hardness, filtering, and chlorination are required before it meets potable standards. Treated water is distributed over the 3,000 developed acres through 105,000 ft of main. Gravity and force mains collect wastewater which is treated in the 1 mgd plant and piped to 3 evaporation-percolation ponds. Expansion plans call for injection of treated effluent into the 'Bolder Zone Aquifer' which is already contaminated by water of high salinity, or discharge into the Atlantic Ocean. Phases II and III will more than quadruple the capacities of the Phase I construction. The control building houses water treatment equipment and controls, a laboratory, and a loading dock to serve both plants. An isolated portion of the building houses chlorination equipment to serve both. West Palm Beach County has agreed to assume ownership and operation of the facility upon completion. (Herr-North Carolina)
W75-10717

**STOCKHOLM PUTS SEWAGE PLANTS UNDERGROUND,**
Stockholm Municipal Services Dept. (Sweden). Div. of Treatment Plant Design.
S. Edlund, and G. E. Sandstrom.
Civil Engineering - ASCE, Vol 43, No 9, p 78-83, Sept 1973. 5 fig.

Descriptors: *Underground structures, *Waste water treatment, *Tunnel construction, Environmental sanitation, Tunnels, *Sewage treatment, Tunnel linings, Municipal wastes, Tunnel design, Engineering geology, *Treatment facilities.
Identifiers: *Sweden.

To conserve surface land and eliminate sewage odors, 3 of the 4 treatment plants in Stockholm have been built underground. The Henriksdal plant, the city's largest with a 97.8 mgd capacity, is potentially less expensive than a conventional plant would be if surrounded by a 500 m (1640 ft) buffer of expensive land to protect neighbors from the odor. Construction costs of $306/1000 gallons of plant capacity are from 1.35 to 1.45 times the cost of a similar activated sludge plant built on the surface. (Cost comparison with U.S. facilities is difficult since higher U.S. labor prices would raise costs for both surface and underground facilities.) The heating plant, digestor, and buildings for personnel and workshops are built on the surface. Below at least 10 m (33 ft) of rock cover are settling and aeration tanks which are actually chambers roughly 10 m by 10 m and up to 135 m (545 ft) long. The tanks are lined with poured-in-place concrete bolted to the rock walls and punctured to allow groundwater seepage into the tanks. Groundwater pressure prevents sewage seepage out of the tanks and tunnels. The ventilation system, using a series of tunnels and fans to exchange the underground air three times per hour, exhausts up a smoke stack along with sludge odors and diesel fumes. Air pressure is kept low in foul smelling areas of the plant to prevent odors from spreading. (Herr-North Carolina)
W75-10718

**LAND TREATMENT OF MUNICIPAL SEWAGE,**
K. A. Godfrey, Jr.
Civil Engineering-ASCE, Vol 10, No 9, p 103-109, Sept, 1973. 1 fig, 6 tab.

Descriptors: *Water reuse, *Waste water treatment, *Soil disposal fields, *Application methods, *Soil treatment, Treatment facilities, Oxidation, Sludge treatment, Tertiary treatment, Waste assimilative capacity, Municipal wastes, Soil chemical properties, Sanitary engineering, Michigan, Arizona.
Identifiers: *Muskegon(MI), Flushing Meadows(AZ).

Land treatment of municipal sewage, after secondary treatment and chlorination, is a viable method of tertiary treatment when designed with necessary safeguards. Used in the arid southwest to augment water supply, land treatment may be used increasingly throughout the country. Treated feedwater is applied in three ways. Spray irrigation on crops, grassland, or woodlands on nearly level land may need underdrains to avoid waterlogging and/or salt buildup. Municipal sewage is treated at Muskegon, Michigan, in this way at the first major U.S. regional and complete land treatment system. On gentle slopes where clay soils prohibit percolation, a 'spray runoff' overland flow technique has effectively treated food processing plant waste. Both methods require extensive land area and thus large initial capital costs, but such land might serve multiple purposes including recreation, open space, agricultural production, power plant site. Income from other uses could offset operating costs, normally lower because large chemical dosages are not required. Infiltration, the third method, uses land far more intensively, requiring only 2 to 10% of the land the others need. Treated effluent is percolated in large amounts (up to 400 ft per year) through permeable soils to recharge groundwater. Nitrate, heavy metals, and viruses need further study, but present knowledge can design successful systems. (Herr-North Carolina)
W75-10719

**WATER SUPPLY FROM RENOVATED WASTE WATER--A RESOURCE MANUAL FOR MASSACHUSETTS PLANNERS, PUBLIC OFFICIALS AND CITIZEN GROUPS.**
Clark Univ., Worcester, Mass.
1972. 207 p, 43 fig, 16 tab, 142 ref. Kasperson, R E and Eichen, M., eds.

Descriptors: *Water reuse, *Reclaimed water, *Water supply development, *Water treatment, *Dependable supply, Public health, Water pollution, Water costs, Consumptive use, Environmental engineering, Water resources, Impaired water use, Irrigation water, Alternative costs, *Massachusetts.
Identifiers: *Dual water supply systems, Metropolitan District Commission(Boston MA).

Metropolitan Boston, although situated in the humid northeast, is faced with the prospect of water shortages due to growing population and per capita use. This study examines one source of supply--reclaimed water--in general terms and as it might be applied to Boston. Treatment techniques are analyzed for their abilities to deal with heavy metals and toxic organic materials, and for their costs. Complete purification of waste water for all uses is expensive, lacks public support, and may pose long-term health hazards even when it meets current standards. Instead of treating waste water to make it potable, a heirarchy of water used is proposed. Higher order uses, including drinking, cooking, and bathing, require much more stringent standards than lower order uses such as irrigation or industrial application. Eighteen locations currently using renovated wastewater in municipal, industrial, recreation, or irrigation uses are listed and two in California, Santee and Lake Tahoe, are described, as well as the Windhoek, South Africa reclamation plant which supplies 1/3 of the city's water. The Metropolitan District Commission's Quabbin Reservoir in cental Massachusetts is being depleted by 12 million gallons per day. Immediate and long range plans are discussed, and a dual water supply system using reclaimed waste water for major lower order uses is proposed. (Herr-North Carolina)
W75-10722

**LIQUEFYING REFRIGERANT FOR WATER DESALINATION WITH LIQUEFIED NATURAL GAS AND AN INTERMEDIATE ENERGY CYCLE,**
Nuovo Pignone S.p.A., San Donato Milanese (Italy). (assignee)
For primary bibliographic entry see Field 3A.
W75-10725

**INTEGRAL CIRCULAR WASTEWATER TREATMENT PLANT,**
Union Carbide Corp., New York. (assignee)
L. M. LaClair, J. R. McWhirter, and W. L. Ross.
US Patent No 3,890,231, 12 p, 17 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 935, No 3, p 1206, June 17, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution control, Water quality control, Aeration, Equipment, *Treatment facilities.
Identifiers: Clarification.

A method of and apparatus for treating waste water by aeration with at least 50 percent oxygen in an integral circular plant is disclosed. The wastewater treatment apparatus comprises a circular tank outer wall, a circular inner wall concentric with and spaced from the outer wall forming an inner volume and an intermediate volume between the inner and outer walls such that the ratio of the inner wall radius to the outer wall radius is between 0.25 and 0.70. A first radial partition extends across the intermediate volume between and joined at opposite edges to the inner and outer walls, and a second radial partition also extends across the intermediate volume between

joined at opposite edges to the inner and outer
s. First fluid mixing and recirculation are pro-
d within the outer wall in a first part to form a
aeration zone. Second fluid mixing and recir-
lion means are provided within the outer wall
second part other than the first arcuate portion
orm a second aeration zone. Gas and liquor
ages are provided between and means for
ormly distributing oxygenated liquor around
clarifier inner wall for radial flow toward the
r wall are also provided. (Sinha-OEIS)
-10729

**HOD OF TREATING ALUMINUM-CON-
NING WASTE WATER,**
ta Water Industries Ltd., Osaka (Japan).
gnee)
anami, and Y. Fukuyama.
Patent No 3,890,226, 5 p, 4 ref; Official
tte of the United States Patent Office, Vol
No 3, p 1205, June 17, 1975.

riptors: *Patents, *Waste water treatment,
ustrial wastes, *Water pollution control, Alu-
m, Precipitation, Neutralization, Acids.
ifiers: Acid wastes, Alkali wastes, Aluminum
facturing.

e waters from the aluminum surface treating
ss of aluminum manufacturing factories are
cted to a neutralization treatment in order to
n dischargeable treated waters and also to
er aluminum hydroxide sludge having a
ure content of less than 60 percent, espe-
less than 50 percent. Aluminum sludge is
ered from alkali and acid waste waters which
gh in aluminum concentration as well as from
eneral waste water (rinsing waste water)
is low in aluminum concentration. The
od treats aluminum-containing waste waters
ding acid waste water to the aluminum-con-
g alkali waste water to neutralize those waste
s. The neutralization reaction is charac-
d by adding the acid water slowly after the
num hydroxide begins to precipitate, and
nging the netralization time. (Sinha-OEIS)
10730

**CESS FOR REMOVING HEAVY METAL
IN WATER,**
jiyama.
Patent No. 3,890,225, 5 p, 4 fig, 6 ref; Official
te of the United States Patent Office, Vol
No 3, p 1205, June 17, 1975.

iptors: *Patents, *Waste water treatment,
strial wastes, *Heavy metals, *Water pollu-
treatment, Adsorption, Filtration,
stones, Soil contamination.
fiers: Coral fossil limestones.

cess is described for preventing water and
llution. Coral fossil lime stone is used in the
g apparatus. The coral fossil consists
of limestone, abundantly occurring in
on the coral reefs of the South Sea Islands,
kinawa Islands and the Tokunoshima Island,
ground into grains of sand-like or pebble-
ze. This coral fossil is mineralogically com-
of calcite containing a certain amount of
nite and has a different mineral composition
hat of the lime stone of compact structure,
ing in Japan proper. The coral fossil is
d of the remains of coral, Foraminifera, lime
Mollusca, etc. of the Quaternary period of
ic time, and is extremely porous. Industrial
sewage, sludge deposits or soil polluted
eavy metals is poured into the filtering ap-
s directly or with water to adsorb and
e the heavy metal ions such as Cu, Cd, Hg,
n, etc. The treating material that has ad-
heavy metal ions may be heated to convert
tals into their oxides, or may be treated with
acid to liberate and recover the heavy
. The regenerated adsorbing materials can
sed for the removal of heavy metal ions.
-OEIS)

W75-10731

**AIR AND WATER POLLUTION CONTROL,**
El Paso Southern Co., Tex. (assignee)
W. H. Chapman, and J. F. Eichelmann, Jr.
U.S. Patent No. 3,890,207, 6 p, 1 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 935, No 3, p 1200-1201, June 17, 1975.

Descriptors: *Patents, *Gases, *Air pollution, *Industrial wastes, *Waste water treatment, *Separation techniques, *Water quality control, Water pollution treatment, Distillation, Evaporation.
Identifiers: Water scrubbers, Wet dust collectors.

A process is described for the purification of industrial effluent gases by means of water scrubbers, wet dust collectors and the like. The scrubber water, rather than being discarded and thereby creating another pollution problem, is itself purified and reused for industrial and domestic purposes. The suspended contaminants in the water effluent are separated and the resultant water effluent is freed of dissolved noxious gases and fumes and is substantially distilled to give a pure water condensate and a concentrated effluent containing dissolved solids. The concentrated water effluent is mixed with a circulating, relatively non-volatile carrier liquid, the water is evaporated and recovered as an industrial water condensate, and the precipitated solids are removed from the carrier liquid. (Sinha-OEIS)
W75-10732

**ROTARY DESALINATION ENGINE AND SYSTEM,**
Frontier Engineering Corp., Houston, Tex.; and Zachry (H. B.) Co., San Antonio, Tex. (assignees)
For primary bibliographic entry see Field 3A.
W75-10733

**CLOSED RECYCLING SYSTEM FOR WATER PURIFICATION AND WASTE REDUCTION,**
D. W. Stout.
U.S. Patent No. 3,892,662, 6 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 936, No 1, p 225, July 1, 1975.

Descriptors: *Patents, Water purification, *Waste water treatment, Water quality control, Water pollution control, *Separation techniques, *Freezing, *Centrifugation, Incineration, Industrial wastes, Domestic wastes, Equipment, *Recycling.
Identifiers: Water crystals.

A waste purification and reduction, water purification and recycling process comprises collecting and storing household, commercial or industrial waste, homogenizing the waste and reducing the solid content to uniform fine particle size. The homogenized waste is injected through an atomizing nozzle. Then the atomized waste is cryogenically frozen into minute crystalline particles consisting essentially of water crystals and crystals of solid waste. The crystalline particles are homogenized and the size of the particles reduced to produce a crystalline particle mass having the flow characteristics of a liquid. The water crystals are centrifugally separated from the solid waste crystals and the water crystals are heated to steam and the steam is condensed into water for recycling for household use. The solid waste crystals are heated to combustion gas and ash which are then separated and the gas is vented and the ash is collected. (Sinha-OEIS)
W75-10735

**REMOVAL OF POLLUTANTS FROM WATER,**
Melbourne Univ., Parkville (Australia). (assignee)
N. G. Siviour, G. M. Pearson, and G. V. Cullen.
U.S. Patent No. 3,892,661, 5 p, 7 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 936, No 1, p 225, July 1, 1975.

Descriptors: *Waste water treatment, *Patents, *Water pollution treatment, *Water purification, *Water quality control, Absorption, Lignite, Coals, Chemical Oxygen Demand.
Identifiers: Brown coal chars.

Described is the use of brown coal and especially brown coal chars as absorbents for pollutant materials, including microbial organisms and non-living pollutant substances. Brown coal will remove pollutant organisms from water with a high degree of efficiency; however brown coal itself is not particularly effective in the removal of other pollutant substances (as measured by C.O.D.). Brown coal chars will effect substantially reduction in the C.O.D. of polluted waters, without resorting to any special procedures for activation of the chars. Chars may be produced from brown coals by heating at any temperature between about 200 deg and 1200 deg C. (Sinha-OEIS)
W75-10736

**METHOD OF PURIFICATION OF WASTE WATER PRODUCED FROM THE PACKING OF MEAT AND AQUATIC ANIMALS,**
Zenkoku Reitogyoniku Kyokai, Hokkaido (Japan). (assignee)
M. Furuta.
U.S. Patent No. 3,892,640, 7 p, 4 fig, 3 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 936, No 1, p 219, July 1, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution control, *Water quality control, *Water purification, *Electrolysis, Biochemical oxygen demand, Chemical oxygen demand, Electrolytes, Separation techniques, Equipment.
Identifiers: Slaughter and processing waste water.

A method is disclosed of purifying the contaminated waste water that is produced in the slaughter and processing of livestock and aquatic animals and containing water-soluble colloidally dispersed materials selected from at least one of water soluble protein, visceral matter or blood. The method includes passing the waste water through the compartments of at least one electrolytic tank containing a number of compartments; each compartment is separated from the next adjacent compartment by an electrically insulated partitioning plate. Each compartment contains at least one pair of electrode plates comprising a solid metallic anode selected from iron, stainless steel or aluminum and a cathode. At least one electrolyte is added to the waste water, selected from the group consisting of the halides, halogen acid salts and nitrates of the alkali metals, alkaline earth metals and ammonium in an amount such that the concentration of the electrolyte in the waste water is 0.03 - 1.7% by weight. The waste water is agitated and waste matter adhering to the surfaces of the electrodes is removed after passing a direct-current through the electrolyte-added waste water to effect its electrolysis. (Sinha-OEIS)
W75-10737

**MULTIPLE CYCLE PROCESS FOR WASTE-WATER PURIFICATION,**
Airco, Inc., Montvale, N.J. (assignee)
B. S. Kirk.
U.S. Patent No. 3,892,659, 6 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 936, No 1, p 224, July 1, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Water quality control, Oxygenation, *Activated sludge, *Biological treatment, *Recycling.
Identifiers: Clarification.

An improved and economical multiple-pass wastewater treatment system using the activated sludge biological process is capable of increasing the effective reactor detention time as required for effective water purification without decreasing the

correct flow velocity required for efficient mixing of the reacting liquid. A mixing vessel or well receives influent waste-water and activated sludge. The mixture is continuously withdrawn and mixed with oxygen as it goes successively through a plurality of contained reaction stages for predetermined detention and oxygenation of the mixed liquor. After detention and before clarification, the mixed liquor is divided into two streams, one of which goes to a clarifier, the other being recycled directly to the mixing vessel. The recycled stream which is subject to control for compensating significant variations in flow rate of incoming wastewater, is at least equal to the volume of the clarifier stream and may be greater, depending on the desired number of recycling passes of the mixed liquor through the detention-reaction stages. A generally continuous turbulence of the mixed liquor is induced during the reaction-detention period for optimizing the BOD reduction. Activated sludge from the clarifier is recycled to the mixing well and the clarifier effluent after disinfection is discharged for return to natural waters. (Sinha-OEIS)
W75-10738

**PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON WASTE OIL RECOVERY AND REUSE.**
Association of Petroleum Re-Refiners, Washington, D.C.
Held February 12-14, 1974, Washington, D.C. Published by Information Transfer Inc., Washington, D.C., 1974. 418 p.

Descriptors: *Recycling, Oil, *Oil wastes, Oil spills, *Oil pollution, *Waste treatment, Water pollution control, *Pollution abatement, Water reuse, Separation techniques, Waste water treatment, Water pollution sources, *Industrial wastes, *Waste disposal.
Identifiers: *Waste oil recovery, *Waste oil reuse.

During the three day conference papers were presented on the technical, institutional and economical aspects of spent and waste oil recovery. The attributes of reuse of waste oil as a fuel oil as well as the institutional problems and potentials by detrimental aspects were fully considered. The latest information has been reviewed on the magnitude of the problem, the sources of the problem, technical solutions, institutional problems, examples of recycle and reuse, and national, state, and municipal programs. (See also W75-10740 thru W75-10768).
W75-10739

**OIL REUSE--A NATIONAL NEED,**
Environmental Quality Systems, Inc., Rockville, Md.
L. W. Weinberger.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 5-7, 1974.

Descriptors: Oil, *Oil wastes, *Oil industry, Fuels, Water pollution sources, *Oil pollution, Waste disposal, Recycling, Industrial wastes.
Identifiers: *Waste oil recovery, *Waste oil reuse, Re-refining.

Oil waste is one of the few pollutional problems whose solution would meet the criteria of: improving environmental quality of water, air, and land; conserving energy; conserving resources; and, making economic sense. Waste oils can be re-refined. They are a resource which can be utilized to reduce energy and oil shortages. They are currently being disposed of in ways which cause environmental degradation. Certain practices related to oil disposal such as uncontrolled use as a fuel should be prohibited. Most oil re-refiners in business ten years ago have gone out of business. Both the Federal Water and Air Quality Acts put tighter controls on disposing of waste oils. An effective waste oil collection, treatment, and reuse system must include storage, collection, treatment, distribution and sale, licensing, monitoring and surveillance, financing and legislation, as well as roles for all segments of society to play in the development of such a system. The reason there is presently no viable oil reuse system is that no one seems to have the responsibility or is willing to assume the responsibility of putting the necessary programs together. The institutional aspects appear to be of more significance than the technical or economic aspects. (See also W75-10739) (Orr-FIRL)
W75-10740

**THE SOURCE AND SUPPLY OF VIRGIN LUBES,**
Sun Oil Co., Philadelphia, Pa.
For primary bibliographic entry see Field 5B.
W75-10741

**WASTE OIL MANAGEMENT--THE ENVIRONMENTAL PROTECTION AGENCY'S ROLE,**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10742

**DISPOSAL OF USED CRANKCASE AND OTHER OILS IN CANADA,**
Department of the Environment, Ottawa (Ontario).
D. J. Skinner, and P. L. Strigner.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-24, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 29-41, 1974. 11 ref.

Descriptors: *Oil, *Oil wastes, Oil industry, Legislation, Governments, *Canada, *Waste disposal, Foreign research, Industrial wastes.
Identifiers: Re-refining.

The waste oil problem in Canada is discussed. The formation of the Petroleum Association for Conservation of the Canadian Environment (PACE) is described. More than 40,000,000 gallons of used crankcase oil are generated in Canada annually; when all waste oil is considered the amount may be as much as 70,000,000 gallons. A variety of storage/collection techniques are operative. Disposal of waste service station and other crankcase oils is varied--road oiling is most common, followed by re-refining, land fill, combustion as fuel and incineration. Undesirable features of the disposal methods are environmental pollution and irretrievable loss of resource. Investigations to improve some of the disposal methods are increasing. Legislation is aimed largely at controlling pollutional aspects. Governments and the petroleum industry are showing an increased interest in disposal because of antipollution pressures and also the energy shortage. Recommendations include: the creation of an active, voluntary, national body comprising representative personnel from the oil industry, oil disposal firms, and various levels of government; Statistics Canada and PACE should gather more detailed statistics on the availability of used oils with emphasis as to the types and source; and, extension of change periods for oils to prolong their use should be studied. (See also W75-10739) (Orr-FIRL)
W75-10743

**WASTE OIL IN MARYLAND: A POLLUTANT OR A RESOURCE,**
Maryland Environmental Service, Annapolis.
For primary bibliographic entry see Field 5B.
W75-10744

**WASTE OIL: THE RECAPTURE OF AN ENERGY RESOURCE (THE GENERATION,**

**DISPOSAL AND RECOVERY OF WASTE O IN THE NEW YORK METROPOLITAN AREA**
Council on the Environment of New York City.
S. Maltezou.
In: Proceedings of the International Confere on Waste Oil Recovery and Reuse, February 14, 1974, Washington, D.C., Information Transf Inc., Washington, D.C., p 55-69, 1974. 5 tab.

Descriptors: *Oil, *Oil wastes, *Waste dispos Oil industry, New York, Industrial wastes, Wa pollution sources.
Identifiers: *New York(NY), Re-refining.

Although the data collection of this study w restricted to the New York Metropolitan area, importance of this area as an industrial, comm cial, urban and suburban center permits the obs vations and methodology at this local level to used to assess the waste oil situation in compa ble areas, both nationally and internationally. main findings are in the following categor quantities of waste oil generated by type and lo tion of users of oils; methods of disposing of wa oil by users of oil, approximate quantities of wa oil disposed of, and cost of each method disposal; systems of collection and outlets for collected waste oil and percentages of waste diverted to the outlets of collection; ways of re ing waste oil, such as re-refining, dust and w control, and percentage of oil used in each w quantities of waste oil processed by re-refine and reprocessors in the New York metropoli area; quantities of fuel and lubricants used in New York metropolitan area and the degree which an optimal recovery system of availa waste oil could supplement them; and, gen trends in the disposal, recovery and reuse of wa oil. (See also W75-10739) (Orr-FIRL)
W75-10745

**WASTE LUBRICATING OIL CHARA TERISTICS--DO THEY VARY GEOGRAP CALLY, SEASONALLY, AND WITH ORIGIN**
American Petroleum Inst., New York. Task Fo on Utilization of Waste Lubricating Oils.
For primary bibliographic entry see Field 5B.
W75-10746

**CONTAINMENT, COLLECTION A RECYCLING OF OILY WASTES,**
For primary bibliographic entry see Field 5G.
W75-10747

**ENVIRONMENTAL ACTION AT PO AUTHORITY AIRPORTS,**
Port Authority of New York and New Jersey.
For primary bibliographic entry see Field 5G.
W75-10748

**DISPOSAL AND/OR RECYCLE OF AIR FOR WASTE PETROLEUM OILS AND LUB CANTS,**
R. H. Kroop, and M. Lieberman.
In: Proceedings of the International Confere on Waste Oil Recovery and Reuse, February 14, 1974, Washington, D.C., Information Trans Inc., Washington, D.C., p 117-129, 1974. 4 fi tab.

Descriptors: *Oil wastes, *Recycling, *Wa disposal, *Waste treatment, *Oil pollution, Po tion abatement, Aircraft, Airports, Water po tion sources.

The disposal of Air Force waste petroleums, and lubricants (POL) is a complex and ser problem. Efforts to determine how waste P products could be more effectively disposed o recycled are discussed. Topics considered incl the generation of waste POL's at Air Force ins lations, the collection and segregation of wastes, disposal and recycle alternatives, and reprocessing of synthetic turbine lubricants. N

ıe several disposal and recycle alternatives
ıable is universally applicable. A highly desira-
olution at one installation may not be feasible
ınother installation even though both installa-
may generate the same types and volumes of
e POL's. Contractor pickup for ultimate
ɔsal or recycle involves the least effort for
personnel, but provides only a low, if any,
etary return. On-base disposal by fuel
ıgrading on combustion in existing boilers in-
es extra handling but can be widely applied
contributes to solving both environmental
lems and energy shortages. The reprocessing
recycle of synthetic turbine lubricants shows
ite potential and must be evaluated from the
points of product reliability and economics.
also W75-10739) (Orr-FIRL)
-10749

NAVY'S OILY WASTES HANDLING AND
OSAL PROGRAM,
l Material Command, Washington, D.C.
Kinney, and M. G. Grant.
roceedings of the International Conference
Vaste Oil Recovery and Reuse, February 12-
974, Washington, D.C., Information Transfer,
Washington, D.C., p 133-147, 1974. 3 fig, 4
1 ref.

riptors: *Oil wastes, *Oily water, Equipment,
te treatment, Oil spills, Construction, Waste
sal, Facilities, Ships, Fuels, Oil, Pollution
ment, Water pollution sources, Treatment
ies.
ifiers: Waste oil management.

utline is given of the Navy's oily wastes han-
and disposal program. The program has two
goals: to prevent the generation of these
es; and, to use a total system approach at
complexes to provide maximum utilization
existing, modified, and new
sal/reclamation facilities. In the fiscal year
the Navy used more than 90 million barrels
el oil and related petroleum products. Due to
ature of the total oil management system and
ation requirements within the Navy, a variety
wastes are produced, both ashore and afloat.
neasures being taken to prevent oil spills and
duce the volumes of oily wastes to be
sed of will have a significant effect on the
rements for waste oil treatment and disposal
ies. The facilities will require a total system
ept including collection, transportation,
ge and treatment/disposal. Corrective action
astes from naval ships includes: installation
pe risers from bilge pumps to deck connec-
on the main deck to offload oily wastes; in-
es in waste oil holding tank capacities; instal-
of reliable tank level indicators; modifica-
of aviation fuel reclamation systems; and,
tion of the volume of bilge wastes. In fiscal
1974, a military construction program was
rized which includes the improvement of the
llection and reclamation facilities at Norfolk,
onville, and Oakland. The ship to shore
fer of oily wastes is being improved through
nstruction of 17 donuts of the closed bottom
ept and the design of an oil/water separator
n to provide clean-out services for the
s. (See also W75-10739) (Orr-FIRL)
10750

RECEPTION AND TREATMENT FACILI-
FOR OILY WASTE FROM VESSELS,
ime Administration, Washington, D.C.
rimary bibliographic entry see Field 5G.
10751

BILGE FROM COMMERCIAL VESSELS,
onmental Quality Systems, Inc., Rockville,

rimary bibliographic entry see Field 5B.
10752

**SHIPYARD PROBLEMS WITH OILY WASTES,**
For primary bibliographic entry see Field 5B.
W75-10753

**CHARACTERISTICS OF OIL POLLUTION IN AND AROUND U.S. WATERS,**
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5B.
W75-10754

**A PROGRAM FOR HANDLING EMERGENCY OIL SPILLAGES IN THE PORT OF BALTIMORE,**
Maryland Port Authority, Baltimore.
For primary bibliographic entry see Field 5G.
W75-10755

**QUALITY PRODUCTS FROM USED PETROLEUM OILS,**
B. R. Williams.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 239-243, 1974.

Descriptors: *Oil wastes, *Oil, *Recycling, *Oil industry, Natural resources, Conservation, Resources development, Pollution abatement, Water pollution sources, Industrial wastes.
Identifiers: *Re-refining, Re-refining industry.

The feasibility and desirability of producing reusable products from waste oil is discussed. A review of the re-refining industry and a profile of the capabilities and benefits of re-refining are presented. The preservation of reusable waste oil to recover the most valuable elements as well as re-refining as a contributor to the solution of the energy shortage are also discussed. The production of reusable products from waste oil is feasible because of the seemingly perpetual characteristics of petroleum oil and it is desirable from the standpoints of both the conservation of irreplaceable natural resources and the abatement of pollution potential. (See also W75-10739) (Orr-FIRL)
W75-10756

**THE ECONOMICS OF RE-REFINING,**
For primary bibliographic entry see Field 5G.
W75-10757

**POLLUTION CONTROL WITH A COMPREHENSIVE WASTE OIL PROCESSING PLANT,**
Environmental Quality Systems, Inc., Rockville, Md.
G. D. Gumtz.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 261-279, 1974. 2 fig, 9 tab.

Descriptors: *Oil wastes, *Waste treatment, *Pollution control, Facilities, Design, Maryland, Ultimate disposal, Incineration, Distillation, Filtration.
Identifiers: *Waste oil recovery/disposal plant.

The design of a plant for the reuse or disposal of waste oils generated in Maryland is discussed. For preliminary design purposes, a single processing facility was postulated which has the potential to treat all the waste oils generated on a state-wide basis. The following design needs were considered: treatment or disposal of all types of waste oils that are collected within Maryland; production of fuel oil; the total waste oil recovery and reuse system need not produce a profit; compliance with all current and projected State and Federal environmental standards; use of existing technology; and, capacity of the plant to be based upon 1975 estimates. Plant design and the specification of unit operations depend on the expected flow(s) for the process in question and the product(s) desired. The following processes were selected to be included in the preliminary design of waste oil processing facility: chemical treatment; settling; flash distillation; absorbent treatment; solvent extraction; and, filtration. Ultimate disposal of process residues and non-recoverable waste oils must be as efficient and environmentally sound as other operations of the plant. Of the six ultimate disposal methods considered, total incineration was chosen because it minimizes the environmental impact of ultimate disposal, produces a concentrated relatively pure residual, places ultimate disposal practices primarily under the control of the processing facility, increases the flexibility of the facility for comprehensive waste oil recovery/disposal, and eliminates any possible oil pollution problems due to process residues. (See also W75-10739) (Orr-FIRL)
W75-10758

**EXPERIENCE WITH THE IFP PROPANE CLARIFICATION PROCESS IN RE-REFINING SPENT CRANKCASE OILS,**
Institut Francais du Petrole, Paris.
D. Vu Quang, J. W. Andrews, G. Carriero, R. Schieppati, and A. Compte.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 281-287, 1974. 2 fig, 7 tab.

Descriptors: *Oil wastes, *Waste treatment, *Recycling, *Lubricants, Economics, Oil industry, Sludge, Waste disposal, Pollution abatement.
Identifiers: *Re-refining, Propane/acid/clay treatment.

A process is described which was developed by the French Petroleum Institute (IFP) for propane clarification of spent lube oils prior to conventional acid/clay treatment. The process is simple, and can easily fit into overall re-refining operations. Viscolube Italiana, an IFP licesee, has shown that the IFP process lowers the amounts of acid and clay needed, reduces sludge formation and associated pollution, and improves product quality. The yields are much higher than for conventional acid/clay treatment alone and the plant investment and operating costs are low. The process is well suited for re-refining multigrade motor oils formulated with high concentrations of pour point improvers, viscosity index improvers and other additives, and containing large amounts of varnish, gums and other asphaltic compounds. Four grade of re-refined oil are produced by Viscolube Italiana. These are compared with corresponding lube oils derived from virgin stocks. The color, acid number, and Conradson carbon are better for the propane-clarified oils. Viscolube Italiana has been able to market re-refined oils on a competitive basis with lubricants prepared from virgin stocks. Three industrial plants have been licensed by IFP (Viscolube Italiana, Magnisi Italiana, and a Yugoslavian plant) which are designed for a total of 121,000 tons/year. (See also W75-10739) (Orr-FIRL)
W75-10759

**OIL CONTAMINATED WATER RECYCLING SYSTEM,**
J. L. Overfield, and J. W. Richard.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 289-294, 1974.

Descriptors: *Oily water, *Recycling, *Waste water treatment, Equipment, Separation techniques, Oil-water interfaces, Pollution abatement.
Identifiers: Filter/coalescer unit.

Results are discussed of a program to demonstrate an oil contaminated water recycling system which will remove oil from contaminated water to ten ppm and remove solids. The system consists of a filter/coalescer, a solids cleaner, and accessories. The filter/coalescer unit is the main component and is composed of the following principal sections: filter/coalescing cartridges; a backflush system; and, automatic oil discharge system for separated oil. The filter/coalescer unit differs from other similar units in that the automatic backflush mode greatly reduces possible solids plugging of the cartridge; the backflush mode can be operated while the unit is in full service; the unit is mounted horizontally rather than vertically; and, the unit can be used on shore, on board ship or submerged. The water, oil, and solids are first sent into the filter/coalescer unit. The solids are captured in the core of the cartridges and the water and oil pass through the cartridges to the tank of the unit. The oil collects in the oil boot and the water flows out the clean water outlet. The solids are backflushed to the solids cleaner where the oil is removed. Clean water and solids are discharged and the oily water is returned to the filter/coalescer unit. Final testing of the filter/coalescer unit was performed using fresh water and crude oil, simulated sea water and crude oil, and offshore production brine water with oil and production chemicals. (See also W75-10739) (Orr-FIRL)
W75-10760

**RE-REFINED DIESEL LOCOMOTIVE LUBRICATING OIL,**
W. F. Liebenow.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 295-297, 1974.

Descriptors: *Oil wastes, *Recycling, *Waste treatment, *Railroads, Economics, Lubricants, Conservation, Pollution abatement.
Identifiers: *Re-refining, Diesel fuel, *Lube oil.

The success that the C and O Railway has had in using re-refined lube oil in their diesel locomotives is described. The C and O from 1952 to 1959, re-refined its own lube oil drainage from diesel locomotives. A batch volume distillation unit with press frame filter was used. Additives were added in mixing tanks and the oil pumped into new oil supply tanks. The oil that was produced by this process met the same specifications that were used for new oil and worked in a diesel locomotive in regular service over a long-period of time as well as new oil. No lubrication problem has ever been discovered that was caused by re-refined lube oil. Economics and an exploded plant caused the C and O to start sending their waste oil out to be re-refined in 1959. The control measures for re-refined oil should be the same as for new oil-- for both products the C and O runs tests to insure compliance with their specification. Disadvantages of re-refining include: collecting and transporting the drainage to the re-refiner and returning the finished product; the necessary close control of the collected material; and, the bias of locomotive builders against re-refined oil. Advantgaes of using re-refined oil include: a net saving over new oil of between 15 to 20 percent; the product varies less than new oil since the C and O gets back their own drainage; the re-refiner will add the additive of the C and O choice; and, re-refining conserves oil. (See also W75-10739) (Orr-FIRL)
W75-10761

**WASTE OIL--SOLUTION TO MARYLAND'S ENERGY CRISIS,**
Maryland Environmental Service, Annapolis.
J. C. Uhrmacher, and B. L. Pollack.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Incorporated, Washington, D.C., p 301-308, 1974. 1 fig, 6 ref.

Descriptors: *Oil wastes, *Oil, *Maryland, Costs, Environmental effects, State jurisdiction, Legislation, Waste disposal, Ultimate disposal.
Identifiers: Waste reuse.

The possibility of the use of reprocessed waste oil as fuel oil is considered. Technical questions regarding such an application are whether reprocessed waste oil can be burned in presently available furnaces, whether furnace maintenance would then be adversely affected, what environmental effects of burning reprocessed waste oil might be, and what short term and long term market prospects exist for waste oils as fuels. Maryland's Environmental Service is re-assessing the ban on the use of lead-bearing fuels and is at the same time working to provide a state-controlled source of alternative, lead-free fuel oil manufactured at a state-controlled facility. The facility would eventually accept all oily wastes in the state and either provide conversion or ultimate disposal of them. The Maryland Environmental Service hopes to see State legislation passed requiring all waste oils picked up in Maryland to be deposited at State-owned facilities. (See also W75-10739) (Prague-FIRL)
W75-10762

**MASSACHUSETTS WASTE OIL MANAGEMENT ACTIVITIES,**
Massachusetts Water Resources Commission, Boston. Div. of Water Pollution Control.
D. L. Corey.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse February 12-14, 1974, Washington, D.C., Information Transfer, Incorporated, Washington, D.C., p 309-325, 1974. 1 fig, 6 tab, 4 ref, 1 append.

Descriptors: *Waste disposal, *Oil wastes, *Legislation, *Massachusetts, Industrial wastes, Costs, Planning, Federal jurisdiction, State jurisdiction.
Identifiers: *Re-refining, *Waste management.

Waste oil disposal problems in Massachusetts are discussed. The Massachusetts Division of Water Pollution Control has the level responsibility of controlling collection and disposal of waste oil as well as carrying out management activities. The licensing of waste oil collection and disposal firms is required. The largest volume of waste oil comes from the automotive oil; other sources include hydraulic oils, cutting oils, separators in terminals, railyards, airports, and industrial facilities. Due to economic disincentives such as labelling and exise tax rulings, re-refining of lube oil is no longer practiced in New England, although limited reprocessing of selected waste from fuel oils for special markets still occurs. The research and development programs for oil production control and waste oil disposal were conducted; future planning includes a review of licensing requirements and the use of advanced technology to convert waste oil to valuable products. In addition, the Commonwealth of Massachusetts is hoping that the Federal government will act to remove legal and economic obstructions to re-refining. (See also W75-10739) (Prague-FIRL)
W75-10763

**WASTE AUTOMOTIVE LUBRICATING OIL AS A MUNICIPAL INCINERATOR FUEL,**
GCA Corp., Bedford, Mass. GCA Technology Div.
S. Chansky, B. McCoy, N. Surprenant, and J. Sahagian.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer Incorporated, Washington, D.C., p 327-365, 1974. 8 fig, 8 tab, 54 ref.

Descriptors: *Municipal wastes, *Oil, Costs, Environmental effects, Oil wastes, Design criteria, Incineration, Monitoring, *Waste treatment.
Identifiers: Automotive lubrication oil, Waste oil, Waste reuse.

The physical and combustion properties of automotive waste oils were demonstrated to be suitable for auxiliary fuel in a municipal incinerator. It was recommended that the effectiveness of burning waste oil be evaluated for alternative designs, locations, and number of waste oil burners necessary. Criteria for effectiveness include stack emissions levels, residue quality, and burner and incineration maintenance problems. It will then be necessary to quantify the waste oil needed in relation to refuse composition and moisture level; to demonstrate and evaluate monitoring and control systems for firing waste oil burners; to demonstrate and evaluate the waste oil storage and feed system performance; and to verify economic estimates as compared to real costs. (See also W75-10739) (Prague-FIRL)
W75-10764

**RUNOFF OF OILS FROM RURAL ROADS TREATED TO SUPPRESS DUST,**
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 5B.
W75-10766

**THE WASTE OIL INDUSTRY: A DISCUSSION OF SOME ISSUES TO CONSIDER IN PERFORMING AN ECONOMIC ANALYSIS,**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10767

**AN ECONOMIC MODEL OF WASTE OIL RECOVERY, REPROCESSING AND DISTRIBUTION SYSTEMS,**
Environmental Quality Systems, Inc., Rockville, Md.
E. J. Martin, and L. McMillan.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Incorporated, Washington, D.C., p 405-418, 1974. 4 fig, 4 tab.

Descriptors: *Model studies, *Mathematical models, *Costs, Waste disposal, *Maryland, Operating costs, Capital costs, Profit, *Waste water treatment, Waste treatment.
Identifiers: *Waste oil recovery, Re-refining.

A mathematical model for the economics of waste oil recovery and re-refining has been developed by the Maryland Waste Oil Recovery and Reuse Program. Called the Cost, Revenue, and Profit (CRP) Model, this model calculates the cost of recovery, re-refining and distribution of waste oils. Additionally, it calculates revenues generated by the sale of these products to determine profit or loss. Cost components include: initial investment for real estate, the re-refining plant, collection and distribution systems, and capital for project startup; annual operating cost of the system; annual cost of collection and distribution of oils; cost of insurance; the depreciation of the plant and capital equipment; and cost of operating and investment capital. The model employs interactive factors whereby alternative systems are possible, dependent upon impact. A description of not only costs but also the revenue section of the model is given. Measures such as operating profit, net profit, cash flow, and return on investment dollar indicate the economic viability of any given system. (See also W75-10739) (Prague-FIRL)
W75-10768

**UTILIZATION OF SEWAGE EFFLUENT FOR IRRIGATION,**
L. C. Halpenny.
In: Agricultural and Urban Considerations In Irrigation and Drainage; Selected Papers from the

and Drainage Division Speciality Con-Fort Collins, Colorado, April 22-24, 1973. Society of Civil Engineers, New York, , 1974. 1 fig, 4 tab.

ors: *Water reuse, *Sewage effluents, n, *Crops, *Arizona, *Southwest U.S., , Liquid wastes, Sewage treatment, ater disposal, Water reuse, Agriculture, ral engineering, Irrigation programs, Ir-vater, Water requirements, Water alloca-y).
s: *Phoenix(Ariz), *Buckeye(Ariz).

eye Irrigation Company is a nonprofit or-n which supplies irrigation water to about res which lie in a strip 19 miles long and o miles wide along the right bank of the r at the western end of the Salt River Val-ntral Arizona. The town of Buckeye is vithin the irrigated area, and is 30 miles hoenix. The area has been under irriga-1887, and has had a long and difficult maintaining an irrigation water supply. contract agreement was signed with the Phoenix under which sewage effluent made available to supplement the irriga-supply of the Buckeye lands. Under this t 2500 acre-feet of effluent each month is for irrigation for a term of 40 years. (See 10769) (Sims-ISWS)
8

**R POWER PLANT COOLING SYSTEM ON,**
gineers, Oakland, Calif.
ry bibliographic entry see Field 6C.
2

**TIC DEVICE FOR THE OPERA-CONTROL OF THE FILTRATION OF SUSPENSIONS(AUTOMATISCHE HTUNG ZUR TECHNISCHEN KON-DER FILTRATIONSGESCHWINDIG-N SUSPENSIONEN),**
Univ., Lodz (Poland). Inst. of Chemical nologies.
zki.
t fuer die Zuckerindustrie, Vol 24, No 8, August, 1974. 1 fig, 10 ref.

rs: *Filtration, *Automation, *Filters, solutions, Design, Construction, on(Chemical), *Waste water treatment, s.
: Suspensions.

city of a suspension being filtered is a decisive factor in filtration. Causes of s encountered in the filtering process iverse structure of a precipitate or cer-rties of a solution. Continuous control of f filtration of suspensions enables mea-e taken rapidly, thus improving condi-the processes preceding filtration. A automatic and continuous control of the f suspensions for being filtered has been constructed, and tested. The apparatus measures the rate of filtration of ns through a filtration wall at a known The filtration wall may then be automati-ed and the rate of filtration of the next n portion measured. (Prague-FIRL)
)

**T TREATMENT EQUIPMENT.**
g, Vol 20, No 11, p 55-56, November

rs: *Equipment, *Effluents, Waste tment, Water treatment, Sludge, Costs, quality, Legislation.
: Waste discharge, Effluent treatment, tion.

Equipment is described which emphasizes the reduction of costs of effluent treatment. With new legislation on water quality of waste discharge streams, efficient treatment is necessary as well as some recovery of waste streams. A system for separating oil from washwater was designed to suit specific effluents and the level of purity required by individual regulations. William Boulton, Ltd., packaged a system for connection to existing drains; the costs are about 40 percent less than existing systems. A small scale interceptor for lighter-than-water pollutants has been manufactured by Conder Hardware Ltd. and offers easy installation and straightforward operation. Its tanks are made of glass-reinforced plastics and PVC connecting pipes and ring seal sockets. Other systems described for effluent treatment are used for solids removal. Two new pieces of equipment are the Accelerator, from the G. F. Dickson Environmental Engineering Ltd. and the Flockation process from Neckar Water Engineering Ltd. These operate by coagulation followed by floc removal and save a great deal of time, space, and capital costs over conventional processes. Sludges produced by water treatment systems can be dewatered by a Winklepress, designed by Simon-Hartley Ltd. and Gebr. Bellmer KG. (Prague-FIRL)
W75-10832

**PRINCIPLES OF ESTABLISHING SEWER SYSTEMS IN THE RURAL SETTLEMENTS OF MAGDEBURG COUNTY (GRUNDLAGEN FUER DIE ABWASSER-TECHNISCHE ERSCHLIESSUNG VON LANDGEMEINDEN IM BEZIRK MAGDEBURG),**
G. Boelsch, L. Baersch, H. Winter, and S. Petzold.
Wasserwirtschaft-Wassertechnik, Vol 24, No 6, p 199-201, 1974. 1 tab.

Descriptors: *Sewerage, *Rural areas, Percolation, Pipes, Rainfall-runoff relationships, Rain water.
Identifiers: *Magdeburg County(East Germany), Retention basins, Gravity flow.

The principles of establishing sewer systems in the rural settlements of Magdeburg county, East Germany, are presented. The rural sewer systems will be designed to minimize costs and with the possibility of extensive volunteer work. The sewer systems will incorporate pipes 200 or 300 mm in diameter for gravity flow. There will be no discharge possibility from cellars and basements. An improved mixed sewer system with rainwater retention and rainwater purification basins will be adopted. These basins will be designed for a retention time of 10-20 min. (Takacs-FIRL)
W75-10833

**INVESTIGATIONS ON THE PRODUCTION OF HYGIENIC COMPOST FROM AIR-DRIED SEWAGE USING DIFFERENT ADDITIVES (VERSUCHE ZUR HERSTELLUNG VON HYGIENISCH EINWANDFREIEM KOMPOST AUS LUFTGETROCKNETEM FAULSCHLAMM UNTER VERWENDUNG VERSCHIEDENER ZUSAETZE),**
D. Gaul, D. Strauch, W. Scholl, W. Mueller, and K. Miersch.
Umwelthygiene, Vol 25, No 10, p 227-236, 1974. 5 tab.

Descriptors: *Water purification, *Sewage sludge, Waste disposal, Municipal wastes, Industrial wastes, Sludge drying, Bacteria, *Waste treatment.
Identifiers: Germany, Compost, Biorott.

In the purification plant at Neureut, Germany, the waste water from the Karlsruhe population of 310,000 is purified, along with waste water from 250 industrial facilities. After mechanical separation the sludge is pumped into two digestion towers where it is stored. Liquid sapropel with a water content of 98% is then pumped into earth basins where part of the water is lost through normal drainage. When the water content reaches 75%, the sludge is lifted from the basins and placed in small piles for further drying. This material undergoes drying processes lasting roughly a year and is ground and composed in clumps measuring 2.0 m x 5.0 m x 1.5 m. Various types of typhus or paratyphus bacteria are added to each clump. A substance called Biorott, made of vegetable origin and consisting 80% of various proteins, was tested for its ability to produce pathogen-free compost of dried sewage sludge; it proved to be the most effective substance tested. A pathogen-free compost could only be produced during the warm season between April and October, and additives were necessary for this production. (Nave-FIRL)
W75-10834

**WATER QUALITY FACTORS IN DESIGNING A SEWAGE PLANT BASED ON PUBLIC DRAINAGE STATISTICAL DATA, (IN JAPANESE),**
S. Ebina.
Gesuido Kyokai-shi, (Journal of Japan Sewage Works Association), Vol 12, No 129, p 36, February 1975. 9 tab, 8 ref.

Descriptors: *Waste water treatment, *Water quality control, Sewage, *Design criteria, *Treatment facilities, Suspended solids, Biochemical oxygen demand, Drainage, Data analysis.
Identifiers: Sewage plants, Sludge volume index.

Data on sewage water quality collected from over 200 sewage plants were treated statistically to design guidelines for future plant constructions. The average rate of waste water discharge per person in 1970 was 500 liter/day reaching to the average capacity of sewage plants of 700 liter/day person. The BOD value in untreated sewage water was almost the same in 1969 and 1970 (134 mg/liter and 125 mg/liter respectively); however, the suspended solids in corresponding years were 197 mg/liter and 175 mg/liter. The average contributions of BOD and SS to the sewage water in 1970 were 44 g/day person and 40 g/day person respectively. The stability of water treatment efficiency is related to the capacity of tanks used for treating sludge, such as conventional and step-aeration tanks. The sludge volume index value in 1970 ranged between 50 to 150. Therefore, future plants must have the tank capacity to provide for a sludge volume index of 300. The digestion tanks in the future plants are estimated to provide for 50 to 60 percent conversion efficiency of organic materials in untreated sludges. (Katayama-FIRL)
W75-10838

**RATE OF PHOSPHORUS UPTAKE BY ACTIVATED SLUDGE,**
San Antonio Municipal Wastewater Treatment Plant, Tex.
W. N. Wells.
Water and Sewage Works, Vol 122, No 1, p 36-39, January, 1975. 10 fig, 9 ref.

Descriptors: Phosphorus, *Waste water treatment, *Recycling, Nutrient removal, Laboratory investigations, Activated sludge, Sewage treatment, Texas, Absorption.
Identifiers: *Phosphorus uptake rate, *Phosphorus removal, Waste activated sludge, San Antonio(Tex).

A method of recycle of phosphorus from waste water is described, utilizing waste activated sludge as the stream for phosphorus removal. The rate at which phosphorus is taken up by an activated sludge appears to be an important characteristic in phosphorus removal. Determination of the uptake rate has been standardized in the laboratory whereby: a sample of sludge is mixed with primary effluent and aerated; samples are drawn at intervals and filtered through qualitative filter paper;

the filtrate is analyzed for orthophosphate; a curve of phosphorus remaining in the filtrate versus time is plotted; and the steepest portion of the curve is taken to be uptake rate in mg/liter/hr. Two criteria for effective phosphorus removal are considered. These are that enough solids be produced and that phosphorus can be incorporated into the sludge. Experiments to condition activated sludge to increase its amount of phosphorus uptake are discussed, particularly those from a San Antonio, Texas, sewage treatment plant. (Prague-FIRL)
W75-10839

**TREATMENT OF SERVICE WATER WITH OZONE,**
N. Tabata, and M. Mori.
Mitsubishi Denki-Giho, Vol 48, No 5, p 639-645, May, 1974. 17 fig, 6 ref.

Descriptors: *Ozone, *Activated carbon, *Waste water treatment, Chemical treatment.
Identifiers: *Service water, *Deodorisation, *Japan.

Ozone treatment of service water is being practiced in European countries. In Japan, it is being studied as a method to deodorise service water. Ozone treatment presents several technical problems which require further investigation because of the differences in conditions of Japanese and European service water. The first question asked was whether ozone treatment or activated carbon treatment is superior in its deodorising effect. Reports on the study of this question show that the ozone treatment is more effective than activated carbon. Many problems of treatment technique such as the nitric acid radical, residual ozone in water, and ozone decomposition of exhaust gas are discussed. The performance of a contact tank of gas and liquid which is the most important part of a study of treatment devices is also discussed. (Orr-FIRL)
W75-10840

**THE CONSEQUENCES OF ACCEPTING INDUSTRIAL WASTES INTO SEWERS; WATER POLLUTION RESEARCH AT STEVENAGE,**
Water Pollution Research Lab., Stevenage (England).
J. Borne.
Chemistry and Industry, No 1, p 1, 13-17, January 4, 1975. 2 fig, 1 tab, 5 ref.

Descriptors: *Legislation, *Waste disposal, *Industrial wastes, Sewers, Laboratory tests, Pretreatment, Water quality, Sewage, Organic matter, *Waste water treatment.
Identifiers: Great Britain, Physico-chemical treatment.

Possible legislation governing the discharge of effluents from various industries into municipal sewers was discussed. One aspect of this work was a series of laboratory investigations conducted by the Water Research Centre at Stevenage. In compliance with legislation, a form of Consent is necessary for any industry to discharge into sewer waters. The Consent specifically restricts materials such as petroleum spirit and organic solvents, as well as controlling temperature, flow rate, and pH. Difficulties and high costs associated with accepting such trade effluents are related to three aspects of sewage treatment--anaerobic sludge digestion and dewatering of sewage sludge, biological oxidation, and disposal of the treated effluent. The Laboratory has the biodegradability of constituents of industrial waste waters in admixture with sewage, using batch tests in several proportions. They also investigated the possible effects of inhibitory chemicals on the process of nitrification. Techniques are discussed for physio-chemical partial pre-treatment methods, so as to reduce the strength of industrial wastes before their discharge to a local authority sewer. Evaluations have also been made of disposal of the treated effluent in the framework of water reuse and stricter water quality requirements for sewage effluents. (Prague-FIRL)
W75-10842

**THE TOXICITY OF HEAVY METAL IONS TO ANAEROBIC DIGESTION,**
Water Pollution Research Lab., Stevenage (England).
F. E. Mosey, and D. A. Hughes.
Water Pollution Control, Vol 74, No 1, p 18-39, 1975. 16 fig, 2 tab, 10 ref.

Descriptors: *Toxicity, *Heavy metals, *Anaerobic digestion, *Sewage treatment, Sludge, Sulfides, *Pollutant identification, Analytical techniques, Ions, *Waste water treatment, Enzymes.
Identifiers: Heavy metal ions.

Certain heavy metal ions can inactivate enzymes by reacting with their sulphydryl groups, thus inhibiting the growth of organisms. It was implied that a relationship exists between the concentration of sulfide ions and the degree of inhibition by metals. This degree of inhibition must be ascertained for the control of anaerobic digesters. Sludge from detergent-free sewage was examined. Digesters were each charged with 2 liters of actively digesting sludge from a breeder digester and operated; solutions of various metal salts were each added 19 days later. Feed to each digester was 80 ml of raw sludge plus the required volume of salt solution; the mixtures were then stirred and let stand for an hour. Rate of feeding corresponding to a mean period of detection of sludge in the digester of 20 days. Raw and digested sludges were analyzed and volume of gases produced daily and per unit of volatile matter destroyed by digestion recorded. The silver/silver sulfide electrode was a reliable analytical tool to measure sulfide ion concentration(ps) values. A pS value over 14.0 in a digesting sludge indicated the presence of inhibitory concentrations of the heavy metal ions Zn++, Cd++, Fe++, Cu++, or Cu++, when oxidizing agents were absent. Neutralization of zinc toxicity by precipitation of zinc as zinc carbonate requires a pH value of about 7.6. Ferric ions are reduced to ferrous ions and cupric ions to cuprous ions during anaerobic digestion. (Prague-FIRL)
W75-10843

## 5E. Ultimate Disposal Of Wastes

**STUDY OF SOLID WASTE MANAGEMENT PRACTICES IN THE PULP AND PAPER INDUSTRY.**
Gorham International, Inc., Maine.
For primary bibliographic entry see Field 5D.
W75-10366

**WASTE WATER TREATMENT: LAND DISPOSAL OF WASTE WATER,**
New York State Dept. of Environmental Conservation, Albany.
T. J. Tofflemire, and R. A. Farnan.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1344-1352, June , 1975. 111 ref.

Descriptors: *Reviews, *Bibliographies, *Waste water disposal, *Irrigation, Irrigation effects, Technology, Nutrients, Underground waste disposal, Waste disposal wells, Injection wells, Municipal wastes, Industrial wastes, Soil disposal fields, Flow, Dispersion, Pollutants, Arizona.
Identifiers: Flushing Meadow Project(Arizona).

This is a review of the 1974 literature dealing with land disposal of waste waters. It covers general principles, surveys and conferences on land disposal, individual land waste water disposal systems (e.g., Flushing Meadow Project west of Phoenix, Arizona), technical aspects (soil clogging, water flow, dispersion of pollutants, etc.), nutrient travel in the soil, and deep disposal. (Witt-IPC)
W75-10373

**WASTE WATER TREATMENT: SLU TREATMENT, UTILIZATION, AND DISPO**
Delaware Univ., Newark. Dept. of Civil Engi ing.
For primary bibliographic entry see Field 5D.
W75-10395

**PROBLEMS ENCOUNTERED IN SLU TREATMENT AND SOME ADVANCED S TIONS,**
National Environmental Research Center, C nati, Ohio. Advanced Waste Treatment Res Lab.
J. E. Smith, Jr.
In: TAPPI Environmental Conference, De Colorado, May 14-16, 1975. Prep Proceedings (TAPPI, Atlanta, Georgia), p 1 fig, 25 ref, 15 tab.

Descriptors: *Sludge treatment, *Sludge dis *Pulp and paper industry, *Waste treat Water pollution sources, Wastes, Indu wastes, Solid wastes, Sludge, Stabilizatio watering, Activated sludge, Phosphorus pounds, Lime, Aerobic treatment, Thermo bacteria, Sludge digestion, Filtration, Pre Capillary action, Waste disposal.

Current problems faced in sludge handlin disposal are reviewed, and some new techn for sludge handling are enumerated. The d sion covers alternative sludge stabilizatio conditioning processes, dewatering techn reduction processes (processes that reduc volatile sludge solids), and disposal method sources, quantity, and characteristics of slud the pulp and paper industry are specified, with handling and disposal processes and Waste sludges originating from the act sludge process and newer effluent trea methods (e.g., those used for phosphorus re or upgrading of plant performance) prese greatest challenge in dewatering. Re developed treatment methods which show p for more efficient sludge handling are detail cluding lime stabilization, thermophilic a digestion, ash conditioning of sludge for imp dewatering, top-feed rotary vacuum filt capillary dewatering, and pressure filt (Sykes-IPC)
W75-10398

**GUIDELINES FOR LANDFILL OF TOXI DUSTRIAL SLUDGES,**
New York State Dept. of Environmental C vation, Albany. Div. of Pure Waters.
For primary bibliographic entry see Field 5G
W75-10487

**PROGRAM FOR CONTROL OF DISCHA OF POLLUTANTS TO NAVIGABLE WAT**
For primary bibliographic entry see Field 5G
W75-10608

**JETTISONING OF LNG AT SEA--AN RESOLVED POLLLUTION HAZARD.**
For primary bibliographic entry see Field 5G
W75-10633

**SLUDGE DISPOSAL ON AGRICULT SOIL,**
Ohio State Univ., Columbus. Dept. of Agric Engineering.
For primary bibliographic entry see Field 5E
W75-10674

AL OF LIQUID EFFLUENT BY LAND
TION AT LAGRO CELOTEX PLANT,
Corp., Lagro, Ind.
ıary bibliographic entry see Field 5D.
579

AL OF DIGESTED SEWAGE SLUDGE
DFILL,
ton Univ., Seattle. Dept. of Civil En-
g.
ıary bibliographic entry see Field 5D.
582

TREATMENT OF MUNICIPAL
E,
ıary bibliographic entry see Field 5D.
719

EDINGS OF THE INTERNATIONAL
RENCE ON WASTE OIL RECOVERY
USE.
ion of Petroleum Re-Refiners, Washing-
.
ary bibliographic entry see Field 5D.
539

AL AND/OR RECYCLE OF AIR FORCE
PETROLEUM OILS AND LUBRI-

ary bibliographic entry see Field 5D.
549

VY'S OILY WASTES HANDLING AND
AL PROGRAM,
aterial Command, Washington, D.C.
ary bibliographic entry see Field 5D.
550

TION CONTROL WITH A COM-
NSIVE WASTE OIL PROCESSING

nental Quality Systems, Inc., Rockville,

ary bibliographic entry see Field 5D.
558

ENCE WITH THE IFP PROPANE
ICATION PROCESS IN RE-REFINING
CRANKCASE OILS,
Francais du Petrole, Paris.
ary bibliographic entry see Field 5D.
559

OIL--SOLUTION TO MARYLAND'S
Y CRISIS,
d Environmental Service, Annapolis.
ary bibliographic entry see Field 5D.
562

CHUSETTS WASTE OIL MANAGE-
CTIVITIES,
usetts Water Resources Commission,
Div. of Water Pollution Control.
ary bibliographic entry see Field 5D.
563

AUTOMOTIVE LUBRICATING OIL AS
CIPAL INCINERATOR FUEL,
orp., Bedford, Mass. GCA Technology

ary bibliographic entry see Field 5D.
564

AGRICULTURAL DRAINAGE DESIGN
STS,
Water Engineers, Inc., Denver, Colo.
ary bibliographic entry see Field 4A.
597

**UTILIZATION OF SEWAGE EFFLUENT FOR IRRIGATION,**
For primary bibliographic entry see Field 5D.
W75-10798

**INVESTIGATIONS ON THE PRODUCTION OF HYGIENIC COMPOST FROM AIR-DRIED SEWAGE USING DIFFERENT ADDITIVES (VERSUCHE ZUR HERSTELLUNG VON HYGIENISCH EINWANDFREIEM KOMPOST AUS LUFTGETROCKNETEM FAULSCHLAMM UNTER VERWENDUNG VERSCHIEDENER ZUSAETZE),**
For primary bibliographic entry see Field 5D.
W75-10834

## 5F. Water Treatment and Quality Alteration

**ORGANIC MATTER IN NATURAL WATER AND WATER TREATMENT,**
New Hampshire Univ., Durham. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W75-10351

**PROBLEMS OF SPACE BIOLOGY. VOLUME 24. THE WATER SUPPLY OF SPACECRAFT CREWS,**
For primary bibliographic entry see Field 5D.
W75-10365

**USE OF ORGANIC FLOCCULANTS FOR TEXTILE PLANT WATER TREATMENT (POUZITI ORGANICKYCH FLOKULANTU K CIRENI VODY PRO TECHNOLOGII TEXTILNI VYROBY),**
J. Stanek.
Textil, Vol 30, No 1, p 17-18, 1975.

Descriptors: *Water treatment, *Flocculation, *Pre-treatment(Water), Water purification, Textiles, Separation techniques, Filtration, Zeta potential, Suspended solids, Organic compounds, Filters, Sands, Particle size, Industrial water, Surface waters, Waste water treatment.
Identifiers: Sand filters, Textile industry, Nalco 600 flocculant.

The mechanism of water contact filtration includes formation of a positively charged layer of polycoagulant on the filter sand particles. Negatively charged suspended and colloid particles in water passing through the sand layer are then held on the sand particle surfaces due to electrokinetic forces. Laboratory-scale tests with contact filtration were carried out using two sizes of sand particles in the filter model. With regard to the removal of undissolved solids from raw surface water, the Nalco 600 polyflocculant gave the best results. (Trubacek-IPC)
W75-10383

**HOW TO PURIFY EFFLUENTS, RECOVER BYPRODUCTS WITH REVERSE OSMOSIS,**
Union Carbide Corp., Tuxedo, N.Y.
I. K. Bansal.
Pulp and Paper, Vol 49, No 5, p 118-121, May 1975. 4 fig, 7 ref, 3 tab.

Descriptors: *Reverse osmosis, *Waste water treatment, *Sulfite liquors, *Bleaching wastes, *Byproducts, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Membrane processes, Separation techniques, Water purification, Design, Membranes, Water quality control, Water pollution treatment, Lignins, Carbohydrates, Organic compounds, Equipment, Recycling.
Identifiers: Sugars, Spent sulfite liquor, Lignosulfonates.

Reverse osmosis is the term used for the process of filtering solute molecules or particles of the same order of magnitude as those of the solvent (normally water), while ultrafiltration refers to filtering of solute molecules at least 1-2 orders of magnitude larger than the solvent molecules. The fundamentals of membranes processes are explained with the aid of diagrams, and it is pointed out that one of the major problems facing users of a reverse osmosis process is the limited life of the membrane elements. An improved membrane design called the sand matrix module has been developed by Westinghouse Electric Corp. to overcome many weaknesses of the older type of membranes. The results of experimental studies are presented and discussed, showing that membrane processes are feasible for purifying the caustic extraction stage effluent from a bleached kraft mill and for recovering sugars and lignosulfonates from spent sulfite liquor. For industrial usage, membrane modules must have a minimum life expectancy of 12 months, and preferably 3 years. Experimental work at The Institute of Paper Chemistry has indicated that the newer type membrane modules may be close to reaching the life expectancies and throughput rates required for continuous commercial operations. (Witt-IPC)
W75-10391

**SAFE DRINKING WATER HAS BECOME A FEDERAL CASE.**
For primary bibliographic entry see Field 5G.
W75-10469

**REMOVAL OF TRACE METALS DURING CONVENTIONAL WATER TREATMENT,**
G. M. Zemansky.
Journal of the American Water Works Association, Vol 66, No 10, p 606-609, October 1974. 5 fig, 3 tab, 16 ref.

Descriptors: *Trace elements, *Water treatment, *Heavy metals, *Water pollution treatment, Water pollution, Toxins, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Zinc, Pollutant identification.

Twelve water-treatment plants were sampled. Treatment plant performance was evaluated on its ability to remove a given trace metal. Percentage removals were also calculated for individual components, such as clarifiers and filters. Analyses by both x-ray emission and atomic-absorption spectrophotometer (AA) wet chemistry were performed, so the methods could be compared. Chromium appeared to be slightly removed by microstrainers and clarifiers but generally not removed by filters. Cu was slightly removed by microstrainers and removed increasingly well by clarifiers and filters. For both iron and manganese, relatively high percentage removals in the clarifier were followed by higher percentage removal in the filters. Consistently low percentage removals of Molybdenum were obtained with all components and the plant as a whole. For nickel, only a limited number of data points were obtained and these indicated negligible removal by microstrainers and moderate removal by clarifiers and filters. The zinc percentage removal data were scattered. Detectable concentrations of cadmium and silver were not observed in the source waters analyzed. (Pulliam-Vanderbilt)
W75-10501

**TREATMENT PROCESSES FOR COPING WITH VARIATION IN RAW-WATER QUALITY,**
National Environmental Research Center, Cincinnati, Ohio. Water Supply Research Lab.
J. M. Symons, and G. G. Robeck.
Journal of the American Water Works Association, Vol 67, No 3, p 142-145, March, 1975. 1 tab, 36 ref.

Descriptors: *Water purification, *Demineralization, *Water quality control, *Water treatment, Aeration, Desilting, Chlorination, Disinfection, Flocculation, Desalination processes, Filtration, Electrodialysis, Reverse osmosis, Oxidation, Water softening, Nutrient removal, Waste water treatment.

Available treatment techniques for removing about 20 different raw water contaminants to meet drinking water standards are presented to help plant designers and operators understand the problems. Treatment feasibility rather than cost is considered. Some common time-varying problems, such as turbidity, discoloration, and hardness can best be dealt with through close monitoring of raw water with frequent jar tests. Good operations records show how much of which treatment produces good quality finished water from a given condition of raw water. Other problems such as odor are best dealt with by continual use of activated carbon beds. Chlorine disinfection requires close monitoring of organic matter, ammonia, and reducing substances so that the dosage will provide a target chlorination residual. Raw water contaminants particular to a specific location are a plant design problem. Turbidity removal by recently improved mixing, flocculation, settling, and sand filtration methods is discussed. Adsorption and oxidation variations for removal of organics are presented. Inorganics, such as calcium hardness, iron, manganese, nitrates, mercury, hydrogen sulfide, and 5 geochemical contaminants are examined. Reverse osmosis and electrodialysis are suggested for removal of sulfates, chlorides, and sodium which have soluble salts and are therefore not susceptible to precipitive techniques. (Herr-North Carolina)
W75-10705

**THE MASTER PLAN FOR WATER-SUPPLY IN THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON,**
Ottawa-Carleton Regional Municipality, Ottawa (Ontario).
For primary bibliographic entry see Field 3D.
W75-10710

**DETERIORATION OF WATER QUALITY IN DISTRIBUTION SYSTEMS,**
Missouri Univ., Columbia. Dept. of Civil Engineering.
J. T. O'Connor, L. Hash, and A. B. Edwards.
Journal of the American Water Works Association, Vol 67, No 3, p 113-116, March 1975. 4 fig, 4 tab.

Descriptors: *Distribution systems, Water supply development,*Water quality control, *Deterioration, *Corrosion, *Bacteria, *Water treatment, *Microorganisms, Decomposing organic matter, Deaeration, Nutrient removal, Aquatic bacteria, Yeasts, Water purification, Chlorination, Carbon filters, *South Dakota, Water pollution sources.
Identifiers: *Sioux Falls(SD).

The Sioux Falls, South Dakota, water-supply system was thoroughly examined to determine the role of bacteria in water quality deterioration. The water in Sioux Falls is treated for softening and iron and manganese removal. It is chlorinated. flouridated, and treated with glassy zinc phosphates. Sampling shows that after distribution it has a higher iron content indicating corrosion of cast-iron mains. The chlorine residual which starts at approximately 1 mg/l and dissolved oxygen both diminish with distance from the plant. Samples from main flushing were analyzed. Over 30 microorganism types were found, indicating a stable population that cannot easily be eradicated. Through bioflocculation bacterial growths can accumulate a biological slime in pipes containing iron particles, calcium carbonate, and other debris. During high flow these accumulations are dislodged and go into suspension. Bacterial wastes and decomposition produce off-tastes. Bacteria can reduce sulfates to hydrogen sulfide and also produce methane which destroy chlorine residuals and ruin water quality. Corrosion can be accelerated by CO2 generation. Chlorination, especially with lowered pH, can inhibit bacteria but rechlorination may be needed in the system. Removal during treatment of substances which promote bacterial growth, particularly organic carbon (measured as COD) may be most effective. Main flushing is the other alternative. (Herr-North Carolina)
W75-10711

**WATER AND WASTEWATER FACILITIES FOR FLORIDA HOUSING DEVELOPMENTS,**
Singer Co., Bridgeport, Conn. Water Resources Div.
For primary bibliographic entry see Field 5D.
W75-10717

**WATER SUPPLY FROM RENOVATED WASTEWATER--A RESOURCE MANUAL FOR MASSACHUSETTS PLANNERS, PUBLIC OFFICIALS AND CITIZEN GROUPS.**
Clark Univ., Worcester, Mass.
For primary bibliographic entry see Field 5D.
W75-10722

## 5G. Water Quality Control

**THEORETICAL AND APPLIED CONCEPTS OF WATER RESOURCES FOR SOCIAL WELFARE.**
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W75-10354

**THE ECONOMIC IMPACT OF MERCURY POLLUTION ON FISHERIES AND OTHER RELATED BUSINESSES AROUND PICKWICK LAKE,**
Auburn Univ., Alabama. Dept. of Economics.
J. W. Granade, and D. R. Street.
School of Business Research Series 4, November 1973, p 8-41, 6 fig, 21 tab, 2 ref.

Descriptors: *Economic impact, *Commercial fishing, *Water pollution effects, Mercury, Income analysis, Recreation.
Identifiers: *Opportunity cost, Recreation industry, Pickwick Lake(Ala).

A ban on commercial fishing in Pickwick Lake, Alabama was imposed as a result of the discovery by the FDA of mercury concentrations exceeding prescribed limits. The economic effects of the mercury pollution and the subsequent fishing ban on the income of commercial fishermen and recreation related businesses are assessed. Holders of commercial fishing licenses who fished for added income were surveyed to determine these effects. Each fisherman was asked to estimate the proportion of his total income derived from fishing and his net income per month before and after the ban. A loss of total fishing income occurred in Pickwick Lake and in the adjacent Wilson and Wheeler Lakes. An analysis to determine the opportunity cost of the pollution indicated that total income increased for two fishermen, remained the same for five and decreased for fifteen as a result of post-ban alternative employment oppportunities. The effects on recreation related businesses were determined for the communities of Waterloo, Florence, Cherokee and Tuscumbia by comparing retail sales figures for the six months prior to the ban to those for the six months after the ban. No sizeable decline in sales was observed in any of the four communities. (See also W75-10354) (Becker-Wisconsin)
W75-10356

**INTERNATIONAL PRODUCTION ASPECTS WATER AND ENVIRONMENTAL QUALI CONTROL,**
Auburn Univ., Alabama. Dept. of Economics
A. W. Lacy.
School of Business Research Series 4, Nover 1973, p 42-57, 10 ref. OWRT B-037-ALA(1).

Descriptors: *Economic impact, *Water qu control, *Pollution abatement, *Foreign tr Tariff, Pollution taxes(Charges), National inco Identifiers: *Externalities, *Social equilibri *Exchange rates, Transboundary spillovers, vironmental quality control.

Pollution abatement need not necessarily des the international competivity of the dome economy that wishes to protect its environ The question of whether businessmen who c pete in international markets and whose cost production are increased by pollution control should be protected from competition from po ing, lower cost producers is discussed. The d tility caused by pollution must be covered by price paid by the consumers if social equilibri to be attained. The assumption is made that impossible to compare the utility gain of those whould benefit by the removal of the extern with the utility loss of those who must pay hi prices. If the employment of the best techn method of production to remove the extern (pollution) is forced, economically penalized f must be aided if they are to remain competitiv ternationally. Pros and cons of tariffs and adju ble exchange rates between countries presented. If transboundary spillovers do exist, fluctuating exchange rates will restore s equilibria without the administrative and eq problems of a tariff. The existence of transb dary spillovers necessitates the imposition tariff whose success is curtailing the spillover pends on all countries acting in concert against polluting country. (See also W75-10354) (Bec Wisconsin)
W75-10357

**INDUSTRIAL INTERDEPENDENCIES AND TERNAL DISECONOMIES OF WA RESOURCES,**
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W75-10358

**POLLUTION CONTROL AND OPTIMAL TA TION: A STATIC ANALYSIS,**
University Coll., London (England). Dept Political Economy.
For primary bibliographic entry see Field 6E.
W75-10359

**NEW LEGISLATIVE TENDENCIES FOR C TROL OF WATER POLLUTION (NUEVAS T DENCIAS LEGISLATIVAS EN EL CONTI DE LA CONTAMINACION DE LAS AGUAS)**
Centros de Estudios, Investigaciones y Ap ciones del Agua, Granada (Spain).
I. Aparicio Ferrater.
Investigacion y Tecnica del Papel, Vol 12, N p 319-365, April, 1975. 23 ref, 6 tab.

Descriptors: *Legislation, *Water pollution trol, *Europe, Foreign countries.
Identifiers: France, Belgium, Holland, C Britain, Czechoslovakia.

Legislation for water pollution control which been enacted in France, Belgium, Holland, G Britain, and Czechoslovakia within the past years is summarized. (Sykes-IPC)
W75-10384

**WATER-QUALITY REQUIREMENTS FOR PETROLEUM INDUSTRY,**
Neptune MicroFloc, Inc., Corvallis, Oreg.
For primary bibliographic entry see Field 5D.

5-10465

CG SETS BROADER USE OF POLLUTION NTROL SYSTEMS,
ıst Guard, Washington, D.C. Office of Marine vironment and Systems.
. Price.
Technology, Vol 16, No 1, p 30-31, January 5.

criptors: *Water pollution control, Legisla-, *Oil spills, *Oil pollution, Water pollution rces, Equipment, Water quality standards, Pol-on abatement, *Pollutant identification, Instru-ıtation.
ntifiers: Offshore facilities, *Pollution sensors, recovery.

ompliance with new discharge regulations ef-ive since July 1, 1974, a system of surveillance required to insure earliest possible notice of harges of oil. The Coast Guard has developed Airborne Oil Surveillance System. The proto-e consists of four pollution sensors. A system orensic identification and classification of oil s should make the identification of source e reliable. If the discharge source is among the rces samples, the system should identify the rce 99.9% of the time. Further research and elopment is planned, including new high seas arriers, and modification of recovery and con-ment equipment for use in Arctic climates. h these systems, oil discharge prevention and n-up from both onshore and offshore facilities sferring oil in bulk to or from vessels should be mplished. (Prague-FIRL)
-10466

IL ENGINEERING LABORATORY VELOPS UNIVERSAL CONNECTOR FOR BOOMS.
Technology, Vol 16, No 1, p 16, January 1975.

criptors: *Oil spills, *Water pollution control, pment, Design criteria, California, Oceans, ollution, *Pollution abatement.
tifiers: *Oil booms, *Universal connectors.

ntial factors in containing an oil spill are d and efficiency in completing the operation. is often inhibited by the time required to con-most commercial oil booms with the variable interconnecting devices. The Civil Engineer-Laboratory (CEL), Naval Construction Bat-n Center at Port Hueneme, California, has loped a universal boom connector. This piece quipment allows sections of different types sizes to be connected quickly. The CEL n has been accepted by the Navy as a connec-or all new booms; presently 200 commercial s are making these booms. The CEL design ists of extruded aluminum male and female ectors configured for simple attachment to nds of already available boom sections. The ooms can be connected in one minute by two working from a boat, even in rough seas, use the connectors do not have to be aligned. connector is then attached to the boom by and a metal plate; the connector is held up to oom under tensile loads by a rod running the eight of the boom. (Prague-FIRL)
-10468

E DRINKING WATER HAS BECOME A ERAL CASE.
nical Week, Vol 115, No 22, p 46, 51, mber 1974.

riptors: *Public health, *Potable water, dards, *Legislation, Water supply, Water nent, Water purification, Chlorine, Ozone, ical industry, Oil industry, *Water quality ards.
ifiers: *Safe Drinking Water Act, Car-ens, Hydrogen peroxide.

The discovery of alleged carcinogens in drinking water from the Mississippi River is accelerating the demand for federal drinking water standards. The Safe Drinking Water Act of 1974 was passed by the Senate late last year; the House has recently enacted their version. The bills do not specify drinking water standards or methods of treatment. Instead they require the EPA to propose standards within 90 days of enactment, and make the standards final within another 90 days. The House version of the bill requires the EPA, with the assistance of the National Academy of Sciences, to determine maximum contaminant levels as well as the contaminants which may have an adverse effect on the health of humans. Federal drinking water standards could be a mixed blessing for the chemical industry--sales of water treatment chemicals would be boosted but new restrictions on plant effluents and on use of some chemicals might also result. The oil industry is objecting to the bill as it would prohibit underground water injection which is currently used to help extract oil from depleted wells. Disinfection by chlorination is also under investigation. It is thought that some of the byproducts of chlorination might possibly be carcinogenic. Ozone and hydrogen peroxide can be used as substitutes for chlorine. Ozone has been used to eliminate phenols from Whiting, Indiana, water for almost 20 years. Costs of meeting new water quality standards, that will result if the new bill becomes a law, will be high, perhaps a doubling or tripling of existing costs. (Orr-FIRL)
W75-10469

**EPA'S EFFLUENT GUIDELINES HAVE THEIR DAY IN COURT.**
Chemical Week, Vol 115, No 18, p 33-34, October 30, 1974.

Descriptors: *Legislation, Federal jurisdiction, Water Pollution Control Act Amendments, Industrial wastes, Effluents, Chemicals, Environmental effects, *Water pollution control, *Water quality standards.
Identifiers: Chemical process industry, *Effluent guidelines.

Out of 30 guidelines issued by the EPA under its interpretation of the Water Pollution Control Act Amendments, 21 have been challenged in court. The major challengers are the chemical process industries, who disagree with the legal interpretations of 'best practical' (for 1977) and 'best available' (for 1983) pollution controls. Inorganic chemicals guidelines have already been challenged in court and other petitions for future review include those against guidelines for organic chemicals, soaps, detergents, phosphates, plastics and synthetics, rubber, nonferrous metals, petroleum refining, fertilizers, pulp and paper, and textiles. Three main arguments have been set forth: although Congress intended guidelines for use by states and regional EPA offices in setting effluent limits for individual permits, the guidelines for existing plants have been treated by EPA as mandatory national standards; EPA did not follow the 1972 Act amendments in carrying out cost-benefit analyses to determine whether the proposed additional cleanup costs bring sufficient return in environmental improvement; and EPA based its pollution control guidelines on a few exemplary plant operations, not considering problems of older plant performance, or of climatic and regional differences. Discharge permits for industrial plants were to have all been issued by December 31, 1974. It was expected that less than two-thirds of these will have been issued by the deadline. Legal maneuvering is expected to continue, due to the ambiguities of the Act. (Prague-FIRL)
W75-10470

**P. L. 92-500 (TWO YEARS LATER) IS NOT THE ANSWER,**
C. W. Heckroth.
Water and Wastes Engineering, Vol 11, No 12, p 34-40, December, 1974.

Descriptors: *Federal Water Pollution Control Act, Waste water, Industrial water, Federal jurisdiction, State jurisdiction, Water pollution control, Costs, Legislation, *Water quality standards, Industrial wastes.
Identifiers: Effluent guidelines, *P. L. 92-500.

P. L. 92-500 (the Federal Water Pollution Control Act) industrial cost recovery provisions have been called discriminatory against industry unless residential and commercial connectors also are required to return their share of federal grants for facilities construction. At the annual meeting of the Water Pollution Control Federation in Denver, both P. L. 92-500 and the EPA position were criticized for the ambiguity of zero discharge provisions, the substantial demands imposed upon the States, the missed or unrealistic deadlines, the uncooridinated planning requirements, almost total federal control of the programs, paperwork in huge proportions, and the lack of practical experience of water pollution control of a large number of personnel at the Washington EPA level. Recommendations supported by State water pollution control administrators included: EPA regulations and guidelines be simplified; more responsibility be given to states and regions; planning requirements be made realistic; State Program Grants be restructured so that funds are provided to States to develop their own individual programs; and a simple program for monitoring progress be devised. (Prague-FIRL)
W75-10471

**FEASIBILITY TEST PROGRAM OF APPLICATION OF COALESCING PHASE OIL/WATER SEPARATORS TO SELF COMPENSATING FUEL TANKS IN SURFACE SHIPS,**
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
J. B. Arnaiz, and E. Batutis.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-784 105, $7.25 in paper copy, $2.25 in microfiche. Coast Guard Report CG-D-88-74, May, 1974. 90 p, 17 fig, 7 tab, 6 ref. DOT-CG-24,290A.

Descriptors: *Oily water, *Separation techniques, *Water pollution control, *Oil-water interfaces, Oil wastes, Oil pollution, Fuels, Feasibility studies, Pollution abatement.
Identifiers: Coalescing plates, *Oil/water separators.

An evaluation was performed of the General Electric Coalescing Plate Oil/Water Separator concept as applied to ballast water discharged from a ship that has self compensating fuel tanks. Flow rates of up to 1200 gallons per minute were processed. At all times, the amount of oil discharged in the effluent of the separator was 5 ppm or less. The influent oil values to the separator were as high as 800 ppm and at the end of the test the influent to the separator contained almost 100 percent oil. A commercially available General Electric OPC-100 oil/water separator was chosen for the tests because it has a cross sectional area and volume very close to the equivalent of a DE-1040 forward fuel tank. On-line measurements of entrained particle size and number were obtained for both the influent and effluent; on-line turbidity was measured for the effluent only. The data from these measurements substantiated those obtained by chemical analysis. This test program demonstrated the technical feasibility of the proposed self compensating fuel tank coalescing plate oil/water separator concept for reducing the water pollution during fueling operations. Fuel which was previously discharged with the ballast water can now be retained in the ship's fuel tank and used. (Orr-FIRL)
W75-10474

**GUIDELINES FOR LANDFILL OF TOXIC INDUSTRIAL SLUDGES,**
New York State Dept. of Environmental Conservation, Albany. Div. of Pure Waters.

N. A. Curry.
Presented at Twenty-eighth Industrial Waste Conference, May 1-3, 1973 Purdue University, W. Lafayette, Indiana, 25 p, 2 graph, 1 append.

Descriptors: *Landfills, *Solid wastes, *Sludge wastes, *Sludge disposal, *Industrial wastes, *Water pollution control, Public health, Toxicity, Sludge, Pollutants, Waste disposal.

Guidelines were given for the use of toxic industrial sludges in landfills. These are intended for use only where reclaiming is not practical and disposition to a landfill is the best remaining method available. The following requirements for adequate landfilling are suggested: (1) detailed knowledge of the sludges, (2) precautions to insure continued insolubility of pollutants, (3) maintenance of surveillance to check efficacy of handling, (4) treatment of leachate if contaminated. Since various sludges become soluble under different and sometimes conflicting conditions, no one universal procedure will suffice. Guidelines for landfilling of toxic industrial sludges require information on composition, conditions for removal to meet non-toxic limits refusal of unacceptable wastes, pretreatment of some wastes, precautions to be taken to maintain insolubility, segregation into safely mixed classes, protection aganist water infiltration, surveillance of results and treatment of leachate if toxic. (Jernigan-Vanderbilt)
W75-10487

**NBS ADDS FOREIGN WRINKLE TO STANDARDS WORK,**
For primary bibliographic entry see Field 5A.
W75-10490

**COPING WITH URBAN RUNOFF IN THE UNITED STATES,**
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-10541

**THE LOXAHATCHEE - A RIVER IN DISTRESS, SOUTHEAST FLORIDA,**
Geological Survey, Miami, Fla.
For primary bibliographic entry see Field 4C.
W75-10588

**REPORT ON THE RIVER MASTER OF THE DELAWARE RIVER FOR THE PERIOD DECEMBER 1, 1973-NOVEMBER 30, 1974,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W75-10589

**PROBLEMS RELATED TO WATER QUALITY AND ALGAL CONTROL IN LOPEZ RESERVOIR, SAN LUIS OBISPO COUNTY, CALIFORNIA,**
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W75-10601

**THE LAWS AND THEIR ENFORCEMENT; PROGRESS AMIDST PROBLEMS,**
L. J. White.
Chemical Engineering, Vol 81, No 22, p 7-10, October 21, 1974. 3 tab.

Descriptors: *Federal Water Pollution Control Act, Water pollution control, Effluents, Industrial wastes, Legislation, *Water quality standards, Chemical wastes
Identifiers: Chemical process industries, Effluent guidelines

Guidelines set under the 1972 Federal Water Pollution Control Act have been challenged by the chemical industries on three grounds: procedural challenges (that is, which court has jurisdiction); claims of factual mistakes; and arguments against the Environmental Protection Agency's interpretation of the Act. For example, a controversy in interpretation is the use of 'guidelines' and 'limitations'. One viewpoint is that Congress intended the EPA to use general guidelines for effluents to define a range of discharge levels. These figures would then be used to write NPDS permits, which would give limitations for each individual situation. The EPA, however, uses limitations as standards or requirements for a particular industry. Guidelines were issued in 1974 for thirty industries; a standard or regulation, once issued, must be challenged within 90 days or be accepted. The industries, listed in the order for which guidelines were made in 1974 are: fiberglass insulation, beet sugar, feedlots, glass, cement, phosphates, rubber, ferroalloys, asbestos, meat products, inorganic chemicals, cane sugar refining, grain mills, fruits and vegetables, electroplating, plastics and synthetics, nonferrous metals, fertilizers, leather tanning, soaps and detergents, timber products, organic chemicals, petroleum refining, builders paper, dairy, pulp and paper, seafood, iron and steel, textiles, and stream and electric. (Prague-FIRL)
W75-10607

**PROGRAM FOR CONTROL OF DISCHARGES OF POLLUTANTS TO NAVIGABLE WATERS.**
Federal Register, Vol 39, No 244, p 43759, December 18, 1974.

Descriptors: *Waste discharge, *Federal jurisdiction, *State jurisdiction, *Hawaii, Federal Water Pollution Control Act, Administration, Navigable waters, Permits, *Water quality standards, Water pollution control, Pollution abatement.
Identifiers: Pollutant discharge.

The United States Environmental Protection Agency has granted the State of Hawaii's request for approval of its program for controlling discharges of pollutants to navigable waters in accordance with the National Pollutant Discharge Elimination System (NPDES). This is in accord with section 402(b) of the Federal Water Pollution Control Act, as amended, and provides that a state may administer its own permit program for discharges into navigable waters within its jurisdiction after approval of such a program by a Federal Administrator. On August 30, 1974, Hawaii submitted a program for carrying out the NPDES. On October 10, 1974, EPA conducted a public hearing on the proposed approval of Honolulu, Hawaii. As of November 29, 1974, the Hawaii NPDES permit program was approved, to be administered by the Hawaii State Department of Health. (Prague-FIRL)
W75-10608

**WATER QUALITY CRITERIA FOR EUROPEAN FRESH-WATER FISH.**
Food and Agriculture Organization of the United Nations, Rome (Italy). European Inland Fisheries Advisory Commission.
For primary bibliographic entry see Field 5C.
W75-10609

**WATER QUALITY CRITERIA FOR EUROPEAN FRESHWATER FISH.**
Food and Agriculture Organization of the United Nations, Rome (Italy). European Inland Fisheries Advisory Commission.
For primary bibliographic entry see Field 5C.
W75-10610

**BIOLOGICAL ACTIVITY OF ORGANOPHOSPHORUS COMPOUNDS AND SYNTHETIC PYRETHROIDS AGAINST IMMATURE MOSQUITOES,**
California Univ., Riverside. Dept. of Entomology.
H. A. Darwazeh, and M. S. Mulla.
Mosqito News, Vol 34, No 2, p 151-155, 1974.

Descriptors: Organic compounds, *Phosphorus compounds, Mosquitoes, *Larvicides, Larvae, Mortality, *Insect control, Insecticides.
Identifiers: Anopheles-albimanus, Culex-peus, Culex-pipiens-quinquefasciatus, Culex-tarsalis, Culiseta-inornata, *Pyrethroids(Synthetic), *Organophosphorus compounds, *Mosquito control.

The synthetic pyrethroids NIA-18739 (5-benzyl-3-furyl)methyl(+)-trans-2,2-dimethyl-3-(2-methyl-1-propenyl)cyclopropane-1-carboxylate, NIA-2411(RU-11679) (5-benzyl-3-furyl)methyl 1R-2((cyclopentylidene)methyl)-3,3-dimethyl-cyclopropane-carboxylate and NIA-26021 (component of SBP-1382) at the rate of 0.01 ppm produced complete mortality of 4th-stage larva od Aedes aegypti Linnaeus, Anopheles albimanu Wiedemann and Culex pipiens quinquefasciatu Say in the laboratory within an hour after treatment. Organophosphorus larvicides which displayed high biological activity against 4th-stag larvae of these species at the rate of 0.05 ppm o less were Bay SRA-7660, N-2596 (O, ethyl-S-(p chlorophenyl ethane phosphonodithioate), M-319 (O,O-dimethyl O-3,5,6-trichloro-2 pyridylphosphorothioate, Cidial (ethyl mercap tophenyl-acetate, O,O-dimeth phosphorodithioate) and Bay HOX-1619. Larva and pupae of Culex tarsalis Coquillett, C. pe Speiser and Culiseta inornata Williston in fie breeding ponds were controlled by the pyrethroid applied at the rate of 0.25 lb/acre active ingredien N-2596 and Bay ZUM-0677 gave complete contr of larvae in these ponds at the rate of 0.01 a 0.025 lb/acre respectively.--Copyright 197 Biological Abstracts, Inc.
W75-10631

**JETTISONING OF LNG AT SEA--AN U RESOLVED POLLLUTION HAZARD.**
Marine Week, Vol 2, No 5, p 23, January 31, 197

Descriptors: *Oil spills, Waste disposal, *Wat pollution control, Liquid wastes, Gases, Jetsa Pollutant abatement.
Identifiers: *Liquified natural gas(LNG Shipping, Vaporization.

Liquefied natural gas (LNG) may be spilled or j tisoned onto the ocean as a result of collisi damage or if there is a need to lighten a LNG ca er, such as a disabled vessel. Another possi source of leakage is if liquefied natural gas is lowed to contact the structural steel of a hull d ing loading, the cryogenic temperature might le to an eventual brittle fracture. Tests on LNG sp lage have been conducted by the Bureau of Min the U.S. Coast Guard and the American Gas A sociation. Results showed vaporization effects a indicated that the ignition point for an explosion dependent upon the ratio of propane-to-ethane discharge of 10,000 cu m would form a cloud feet deep and a mile wide in less than fift minutes. If such a cloud should drift over ot vessels, an oil terminal, or a city, while burni serious danger would exist. Another pollut hazard with LNG is the disposal of the boil-o especially when the carrier is in the harbor. Ar ments in favor of atmospheric venting of LNG sist that the methane content is below the exp sive limit and that discharge is heated and its d sity is lower than that of air. Port authorities ar that no matter how much preheating, if there is inversion over the port, gas will not rise. Si 1974, the U.S. COast Guard has prohibited L venting in port. (Prague-FIRL)
W75-10633

**MARINE FLOATING SCREEN.**
Water and Waste Treatment, Vol 18, No 2, p February, 1975. 1 fig.

scriptors: *Oil pollution, *Oil spills, *Water lution control, Oil-water interfaces, Oily water, uipment, *Screens, Separation techniques.
ntifiers: *Seabooms, Floating screens.

e million tons of oil enter the sea annually. The of floating screens would greatly restrict the ape of this oil. A floating screen called aboom' is composed of elements each 24 feet g and consisting of a 36 inch high and 1/4 inch k vinyl plate, which floats on a tube, standing ght in the water and extending 12 inches above surface. The synthetic resins which comprise screen are resistant to seawater, ice, heat and ls under stormy conditions. The Seaboom can sed to contain oil spilt through transport and shipment, oilwell drilling and waste disposal of neries and industry. The Seaboom is available oating and submersible versions. The submer- Seaboom has made it possible to seal off har- and water areas in case of soil hazard in a ter of minutes. (Orr-FIRL)
5-10634

COVERING OIL SPILLS FROM WATER.
er and Sewage Works, Vol 122, No 4, p 73, il, 1975.

criptors: *Oil pollution, *Oil spills, *Water ution control, Oil-water interfaces, Oily water, paration techniques, Water pollution, Equip- t, Pollution abatement.

ew oil sweeper ship and oil-water separator em has been introduced by Hydrovac Systems rnational, Inc. The system has been success- tested in the port of Rotterdam, the Nether- s. The major function of the system is to col- oil that is lost because of tanker leaks and ship sions as well as from leakage and accidents at erminals and offshore drilling sites. The oil- r mixture is collected by the oil sweeper boom pumped through hoses to the oil-water tank the purified water is discharged overboard. Hydrovac oil-water separator divides oily r automatically into oil and essentially oilfree r. The separation is effected by mechanical ods and requires no chemicals, electronics, or rvision. When used to full capacity, the rator meets the 1973 specifications of the In- overnmental Maritime Consultative Organiza- With a smaller throughput, the separator is ble of meeting the stringent U.S. requirements n effluent water with less than ten ppm oil. -FIRL)
-10635

MILES TO GO,
ska Pipeline Service Co., Bellevue, Wash.
primary bibliographic entry see Field 5C.
-10638

BREAKING DRILLSHIP FOR OFFSHORE LORATORY DRILLING IN THE ARCTIC,
. Jones, and J. C. Schaff.
nal of Petroleum Technology, Vol 27, No 4, p 44, April, 1975. 9 fig, 1 tab, 14 ref.

riptors: *Oil, *Drilling, Oil industry, Oil es, Environmental effects, *Arctic, Cold re- , Waste disposal, Oil spills, Equipment, r pollution control.
ifiers: *Offshore drilling.

ical techniques and equipment for drilling hore oil must be coupled with an application ecific environmental problems. In the Arctic rticular, a technology involving a drillship and eaker combination was required. Environ- al protection necessitated the establishment ecological baseline, considering variations in temperature, salinity, dissolved oxygen, nutrients, plankton, trace elements, and tur- . Icebreaking energy regulations were fol- d and vessel testing was carefully conducted. Primary pollutant sources from the drillship are discharge of oily ballast, bilge pumping, and disposal of personnel's garbage and sewage. Products of bilge pumping and ballast tank discharge are to be run through a coalescer before being pumped overboard. Disposal plants and incinerators are provided on-ship for sewage treatment. Emergency equipment includes oil-absorbent materials and chemical and mechanical containment means for use in the case of accidental oil spillage. (Prague-FIRL)
W75-10639

**EFFECTS OF AN OFFSHORE CRUDE OIL UNLOADING TERMINAL ON THE MARINE ENVIRONMENT,**
Texas A and M Univ., College Station. Environmental Engineering Div.
For primary bibliographic entry see Field 5C.
W75-10642

**PREDICTING THE CONCENTRATION OF AQUATIC HERBICIDE RESIDUES IN WATERWAYS,**
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
For primary bibliographic entry see Field 5B.
W75-10648

**ENVIRONMENTAL PROBLEMS ASSOCIATED WITH THE USE OF COOLING TOWERS,**
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-10671

**BIOLOGICAL BASES FOR WATER QUALITY STANDARDS,**
Rice Univ., Houston, Tex. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W75-10677

**BIOLOGICAL BASES FOR WATER QUALITY STANDARDS,**
Rice Univ., Houston, Tex. Dept. of Biology.
C. H. Ward, and E. M. Davis.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 1, p 438-446. 4 fig, 1 tab, 22 ref.

Descriptors: *Water quality standards, Aquatic life, *Lethal limit, Pollutants, Toxicity, Water pollution effects.

The application of the medium tolerance limit, the median lethal concentration, or any other test of acute toxicity is not conclusive that any pollutant concentration is safe for aquatic life. Much of the data on the toxicities of many compounds and most elements to one or another type of fish are generally available in some form, and are reported as 'threshold concentration' or 'incipient lethal levels,' both meaning 'the level of lethal agent the animals could be expected to tolerate indefinitely'. These levels, then, should be close to the 'safe' concentrations, but they are generally not recognized as such. The authoritative sources most frequently cited as justification for particular water quality standards are the Ohio River Valley Water Sanitation Commission report on Stream-Quality Criteria and Minimum Conditions, Water Quality Criteria by McKee and Wolf, and the National Technical Advisorty Commission report on Water Quality, although none of these reports were intended to be data sources for establishing water quality standards. Standards should be set that fall in the middle range of well-documented toxicity, then the levels appropriate to ensure maintenance of desired water quality should be determined by toxicological testing and the results used to reevaluate the standards previously established. (Auen-Wisconsin)
W75-10677

**AUTOMATED SEQUENTIAL COMPOSITE SAMPLING. A NEW TECHNIQUE FOR WATER POLLUTION STUDY AND CONTROL,**
N-Con Systems Co., Inc., Larchmont, N.Y.
For primary bibliographic entry see Field 5A.
W75-10690

**RIVERS IN THE CITY,**
For primary bibliographic entry see Field 6B.
W75-10723

**OIL AND DEBRIS REMOVAL UNIT,**
P. Condit, Jr.
US Patent No 3,891,558, 4 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 935, No 4, p 1652, June 24, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, Water pollution treatment, *Water pollution control, *Water quality control, *Separation techniques, Flotsam, Jetsam, Equipment, Conveyance structures, Pollution abatement.
Identifiers: Belt conveyors.

The removal of oil films and flotsam and jetsam from water is accomplished by providing an endless belt conveyor to which the oil is intended to adhere and which is characterized by a plurality of scoops that are attached to the surface of the belt for retrieving and dumping the flotsam and other debris of a solid or quasi solid nature. A particular advantage resides in an endless conveyor which may be pivotly mounted and is therefore adapted to assume multiple angular relationships in which one lower end is intended to be in contact with the water and the other upper end in adjacent relation to receptacle means. The conveyor may be positioned at varying angles so that the receptacle may be at any height above the water. A further advantage is in the provision for adjustable wiper blades intended to clean oil from the undersurface of the belt and for modified wiper blades which may clean the upper surface of the belt even though debris scoops are attached. Adjustable tensions means at one end of the conveyor frame varies the belt tension under different operating conditions. (Sinha-OEIS)
W75-10726

**OIL SEPARATION AND RECOVERY DEVICE,**
F. Galicia.
US Patent No 3,890,234, 4 p, 9 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 935, No 3, p 1208, June 17, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Water pollution control, Water pollution treatment, *Separation techniques, Mechanical control, Mechanical equipment, Heating, Pollution abatement.

An oil separation and recovery device is described which may be towed or otherwise propelled over, or left stationary on, the surface of a body of intersect the liquid surface causing the oil polluted water to flow into an inner chamber as the oil rises to the trough vertices. If stationary, high pressure water is used to force the oil polluted water along the troughs to the inner chamber as a vacuum is created. In either case, but particularly the latter, the contaminated water flow path is improved by utilizing depolluted discharging water to induce a surface current of oil polluted water to flow toward the troughs. Also, the utilization of a heating means keeps the oil flowing expeditiously through the troughs. (Sinha-OEIS)
W75-10728

**PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON WASTE OIL RECOVERY AND REUSE.**
Association of Petroleum Re-Refiners, Washington, D.C.
For primary bibliographic entry see Field 5D.
W75-10739

**WASTE OIL MANAGEMENT--THE ENVIRONMENTAL PROTECTION AGENCY'S ROLE,**
Environmental Protection Agency, Washington, D.C.
P. B. Lederman, and K. Jakobson.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 19-27, 1974. 11 ref.

Descriptors: Oil, *Oil wastes, *Oil industry, *Water pollution sources, Waste disposal, Oil pollution, Foreign research, Recycling, Industrial wastes.
Identifiers: Re-refining, France, Germany.

The Environmental Protection Agency has been concerned with waste oil for the past three years. The concern started with reports that these oils were entering water courses. The current EPA program emphasizes resource recovery with environmental control. The two primary sources of waste oil are crankcase oil and industrial oil. Other sources include oil recovered from spills, tank cleanings, and ballast water. EPA has had a multifaceted program in waste oil management. Programs funded include waste oil management studies, development of institutional programs, and evaluation of existing technology and methodology. EPA has funded a major program to develop a non-polluting process for re-refining and recovering waste oils for use as diesel fuel and/or lubricants. A major problem is the disposal of the sludge remainders from re-refining; therefore EPA is sponsoring work to develop acceptable means of disposing the re-refining sludges. The EPA is also sponsoring programs to develop waste oil collection systems and models. The EPA has contracts to obtain data on waste oil generation, waste oil utilization, and the engineering evaluation of current waste oil re-refining processes. French and German methods of dealing with waste oils are also discussed. (See also W75-10739) (Orr-FIRL)
W75-10742

**CONTAINMENT, COLLECTION AND RECYCLING OF OILY WASTES,**
T. Dalton.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 91-97, 1974. 1 fig, 1 tab.

Descriptors: *Oily water, *Oil wastes, *Recycling, *Oil spills, *Water pollution sources, Oil pollution, Water pollution, Industrial wastes, Pollution abatement, Waste treatment.
Identifiers: Waste oil recycling.

The basic nature of the problem of containing, collecting and recycling oily wastes is reviewed. Of primary concern is the determination of an oil balance for each specific plant location. A waste oil analysis should be performed. An oil spill contingency program should be devised for those plant situations where emergency spills may occur. Spills are broadly grouped into two categories: land spills and waterborne spills. Ekoperl and Conwed Sorbers are described; these can be used for containing and absorbing spills on land. MP Boom specifications are given; this boom can be used for containing waterborne spills. The waterborne spills, after they have been contained, can be removed by appropriate skimming devices, absorbent materials, or manual skimming. All plants should have the supplies and equipment necessary for combating oil spills readily available in the same way fire equipment is available. If the collected oil is of high quality and expensive, it should be placed in a segregated system and treated either chemically or mechanically for recycling and reuse. If the oil is of poor quality and inexpensive, it can be mixed with fuel oil and removed through the combustion process. (See also W75-10739) (Orr-FIRL)
W75-10747

**ENVIRONMENTAL ACTION AT PORT AUTHORITY AIRPORTS,**
Port Authority of New York and New Jersey.
A. M. Attar.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 99-116, 1974. 19 fig, 5 tab.

Descriptors: *Oily water, *Oil wastes, *Pollution abatement, Water pollution sources, *Airports, Oil pollution, Oil spills, Oil, Fuels, Industrial wastes, *Port Authority of New York, New York, New Jersey.

The Port Authority of NY and NJ is conducting a comprehensive program to protect and improve the environment around the airports under its jurisdiction. In 1971, Calspan Corporation of Buffalo was retained by the Port Authority as a consultant on a far-reaching program developed to provide analysis of airport discharges, recommendations for short-term control measures and proposals for long-term preventive solutions. Short-term recommendations are: increase water pollution control unit staff; intensify tenant education programs; increase inspection and surveillance; establish sanctions against deliberate and inexcusable abuse of tenant leases; establish policy of imposing established sanctions; perform oil water separator testing; segregate wash waters from other wastes in hangars; use vacuum pick up scrubbers for ramp washing; test high pressure water systems for runway cleaning; perform experiments to test surface spray disposal of cresylic acid runway washing solutions; encourage reporting of accidental spills. Long-term recommendations include: treatment of all hangar and maintenance facility wastes; centralized deicing facilities with holding tanks for used ethylene glycol-melted ice solutions; derubberizing runways; design and install tide gates at various outfalls; install belt skimmers in sumps; install chlorination systems; install upstream booms to aid in spill tracing; install upstream booming areas for spill cleanup; install French wells where leaks are detected; and, install a centralized monitoring system. (See also W75-10739) (Orr-FIRL)
W75-10748

**PORT RECEPTION AND TREATMENT FACILITIES FOR OILY WASTE FROM VESSELS,**
Maritime Administration, Washington, D.C.
A. S. Armstrong, and K. J. Randall.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 149-184, 1974. 2 fig, 10 tab, 12 ref.

Descriptors: *Oily water, *Waste disposal, Ships, *Oil wastes, Water pollution sources, Waste treatment, Governments, Governmental interrelations, Recycling, *Pollution abatement, Harbors, *Treatment facilities, Waste water treatment.

The scope of the oily waste problem is described in terms of quantifying the waste oil volumes which may be expected by U.S. ports. The various methods for removing oily waste from vessels and disposing of the treated water and recovered oil are described. Also discussed is the economic viability of waste oil recovery disposal operations from vessels, and the roles of the various government agencies in preparing for shoreside handling of vessel-generated oily wastes. Conclusions and recommendations are presented in regard to collection/separation entrepreneurial potential and oil processing entrepreneurial potential. The cost associated with collection, treatment, and disposal of oily waste from vessels will eventually lead to an increase in ocean steamship freight rates or required freight rate. The role of the Federal Government should be to facilitate the growth of current oily waste facility and service capabilities to meet the requirements of maritime pollution abatement. The role of state governments is interrelated with Federal grant programs. Local government roles may be investments by communities in the construction and ownership of treatment facilities which are then operated by entrepreneurs. Local governments could also be responsible for the enforcement of bans on certain kinds of waste disposal practices. (See also W75-10739) (Orr-FIRL)
W75-10751

**CHARACTERISTICS OF OIL POLLUTION IN AND AROUND U.S. WATERS,**
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5B.
W75-10754

**A PROGRAM FOR HANDLING EMERGENCY OIL SPILLAGES IN THE PORT OF BALTIMORE,**
Maryland Port Authority, Baltimore.
R. Wilcox.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 225-235, 1974. 8 fig.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, *Oily water, Equipment, Oil-water interfaces, Maryland, Ships, Port authorities, Cleaning.
Identifiers: *Baltimore Harbor(Md), Baltimore(Md), Oil spill clean up.

The Maryland Port Administration has been responsible for the removal of debris and oil from the waters of Baltimore Harbor. A State law passed in 1970 gave it the additonal responsibility of developing a program which would enable the State to respond to an emergency oil spillage in the Baltimore Harbor area. The Maryland Port Administration has assembled an inventory of sophisticated equipment designed to remove oil and debris from the harbor waters with maximum efficiency and effectiveness, and has taken a primary role in encouraging and coordinating the work of governmental agencies and private industry to assist in the minimization of the incidence of spills in the Baltimore Harbor area. In 1962, the PORT SERVICE, a small tank vessel with an oil recovery system, was acquired. In the bow of the vessel is a four-roller, hydraulically powered device which separates and removes oil from the surface of water by the principle of adhesion and cohesion; the oil clinging to the surface of the rotating aluminum drums is wiped off and flows by gravity into the vessel's 3000 gallon cargo tank. The recovered oil is off-loaded via the PORT SERVICE's own cargo discharge system. The PORT RETRIEVER, purchased in 1966, is a self-propelled waterborne front end loader. This boat removes more than one million pounds of debris from the waters of Baltimore Harbor annually. By attaching a hardware cloth insert in the scoop, the PORT RETRIEVER is capable of removing the more viscous oil spills without prior application of any sorbent materials. A water-borne dump truck has also been designed to work in conjunction with the PORT RETRIEVER. (See also W75-10739) (Orr-FIRL)
W75-10755

**THE ECONOMICS OF RE-REFINING,**
N. J. Weinstein.

edings of the International Conference Oil Recovery and Reuse, February 12- Washington, D.C., Information Transfer, hington, D.C., p 245-260, 1974. 4 fig, 4

rs: *Oil wastes, *Waste disposal, g, Economics, Waste treatment, Lubri- ls, Pollution abatement.
: *Re-refining, Acid/clay treatment.

mics of re-refining waste oils and alter- thods of disposing of crankcase waste iscussed. Although re-refining cannot mpete on an economic basis with road ist control or with the direct use of drain fuel component, these methods of lo not overcome the environmental of disposal. Alternatives to the above re: re-refining to produce lubricating oil ocks; processing to produce clean fuel led combustion to produce steam; and, uel where adequate particulate control xist or can be economically installed. presented for the following re-refining acid/clay treatment; propane extrac- ay treatment; distillation/clay treat- , distillation/hydrotreating. Vacuum and recovery of fuel products, leaving fraction containing solid residues and raw crankcase oil under carefully con- ditions to recover energy in the form of lso examined. Acid/clay treatment is a rocess for producing lube oil; alterna- ses are available which are more attrac- the distillation/hydrotreating process be an economically attractive process no waste products. Distillation to ean fuels does not seem attrative in to lube oil production. Controlled with steam recovery can be attrative eam market exists. Refining of crank- oils to produce lube oil stocks can be ly feasible and desirable way to recycle 500 million gallons of this waste oil. 75-10739) (Orr-FIRL)

**AMINATED WATER RECYCLING**

bibliographic entry see Field 5D.

**E OIL INDUSTRY: A DISCUSSION ISSUES TO CONSIDER IN PER- AN ECONOMIC ANALYSIS,**
tal Protection Agency, Washington,

ings of the International Conference il Recovery and Reuse, February 12- shington, D.C., Information Transfer, d, Washington, D.C., p 395-404, 1974.

*Oil wastes, *Waste disposal, Indus- Federal jurisdiction, Legislation, *Oil

Re-refining, Waste oil industry.

view is given of some of the issues an ould consider in undertaking an anal- vaste oil industry. Waste oil disposal, ollection, waste oil re-refining, and dustry analysis are considered. Two ories of waste oils are industrial and The first is easier to recover because ntration is at the place of use. Of the allons of waste oil produced annually, 100 million gallons are re-refined or 200 million gallons are used as road rned as fuel oil, and about 750 million sed of with no specific assurances of roundwater or surface water pollu- venue comparisons of production of ls as opposed to re-refining waste oils are being delineated. Federal Trade Commission and Internal Revenue Service requirements have contributed to a decline in re-refining. Decision making involves an analysis of economic implications and impacts of policy options. Such options for cost-effective and environmentally effective decisions include: paying subsidies to recover waste oil; changing current tax laws which encourage use of virgin oil over recovered oil (such as depletion allowances); or specification of federal oil waste recovery policies. (See also W75-10739) (Prague-FIRL)
W75-10767

**AGRICULTURAL AND URBAN CONSIDERATIONS IN IRRIGATION AND DRAINAGE.**
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 4A.
W75-10769

**THE PERIMETER CANAL - A NEW APPROACH TO DISCHARGE URBAN WATER INTO A COASTAL MANGROVE AREA,**
Greiner (J.E.) Co., Inc., Tampa, Fla.
For primary bibliographic entry see Field 4A.
W75-10773

**WELLTON-MOHAWK DRAINAGE AND THE MEXICAN SALT PROBLEM,**
Wellton-Mohawk Irrigation and Drainage District, Ariz.
For primary bibliographic entry see Field 4A.
W75-10783

**ENVIRONMENTAL ISSUES, EFFECTS, AND SOLUTIONS,**
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 6G.
W75-10795

**EVALUATION OF AGRICULTURAL DRAINAGE IN WATER QUALITY MANAGEMENT,**
Water Resources Engineers, Inc., Walnut Creek, Calif.
T. C. Lyons, D. P. Russell, and R. G. Fry.
In: Agricultural and Urban Considerations In Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 529-555, 1974. 2 fig, 8 tab, 18 ref.

Descriptors: *Water quality, *Agricultural runoff, *Agricultural chemicals, *Model studies, *California, Fertilizers, Nutrients, Simulation analysis, Drainage water, Wastes, Pollutants, Soils, Irrigation, Crops, Agriculture, Land use, Mathematical models.

Changing priorities and patterns of land and water uses have given rise to new drainage and groundwater quality problems; consequently, engineers and systems analysts have developed new analytical techniques in response to these time-varying problems. One of the more promising of these techniques is mathematical simulation modeling on high speed digital and hybrid computers. The development of these techniques, however, has pushed data input requirements beyond the state-of-the-art of the traditional methods of evaluating the environmental effects of agricultural practices. Water-quality constituents returned to groundwater basins from irrigated agriculture constitute one of these illusive data sets. A procedure has been developed and used on three entire river basins in California for handling and evaluating changing land use patterns, including agricultural cropping patterns and cultural practices, and for determining the quantity of water and quality constituents contained in irrigation drainage. Discussed were the systems analysis conceptual representation of changing land and water use patterns, the procedures developed for generating the necessary agricultural drainage water quality systems input data, and the data management techniques necessary to handle the time and space-varying input data system developed. (See also W75-10769) (Sims-ISWS)
W75-10796

**IRRIGATION MANAGEMENT FOR SALT CONTROL,**
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 3C.
W75-10800

**EFFECTS OF FARMING - URBAN DRAINAGE ON FRESH WATER,**
Orange County Pollution Control Dept., Orlando, Fla.
C. W. Sheffield, and W. M. Bishop.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 691-709, 1974. 6 ref.

Descriptors: *Drainage practices, *Urban drainage, *Agricultural runoff, *Water pollution control, *Florida, Nutrients, Eutrophication, Lakes, Freshwater, Surface runoff, Surface waters, Water pollution effects, Storm runoff, Agricultural watersheds, Agriculture, Farm wastes, Drainage engineering.
Identifiers: *Lake Apopka(Fla).

The discharge from the 9000 acre organic soil vegetable farms on the north shore of Lake Apopka have contributed to the nutrification of this lake. The net nutriet load from these farms is approximately 2400 lbs/day total inorganic nitrogen-N. Water quality sampling in 1970 indicated that the total PO4 in the northern portion of the lake was, on an average, 0.12 mg/L higher than the southern shore. Similarly, there was 0.21 mg/L more total nitrogen. The continual supply of nutrients into the lake, not only from the agricultural interests but all sources, has caused the accelerated eutrophication of this lake to the extent that it is currently not beneficial for anyone's use. The pollution effects of storm water drainage were reviewed with regard to concentration and possible means to reduce the amount of pollution entering receiving waters. Present and proposed practices for reducing the pollution load into Lake Apopka were discussed. (See also W75-10769) (Sims-ISWS)
W75-10802

**PROBLEMS OF WATER QUALITY MANAGEMENT IN WESTERN RIVER BASIN SYSTEMS,**
California Univ., Los Angeles. Coll. of Engineering.
A. F. Pillsbury.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 729-751, 1974. 25 ref.

Descriptors: *Water quality, *Salinity, *Rivers, *Ecosystems, *United States, Irrigation, Soils, Drainage, Salts, Pollutants, Farm wastes, Imported water, Water sources, Salt balance, Tile drainage, Food chains, Fish food organisms, Algae, Nuclear powerplants, Cooling water, Political aspects, Social aspects, Agriculture, Flow augmentation.
Identifiers: *Western United States.

Today's ecology movement, which is halting water development in the western states, is the key to the future destruction of our civilization. Only water development has made it possible for the

west to bloom. Without continued development, deterioration will set in. If the quality of the environment is to be preserved for many generations to follow, the total environmental system - physical, social, and economic - must be considered together as a system. The principles that must be adhered to to optimize that total environment were discussed. The salinity problems of the rivers in the western United States were emphasized, and solutions were proposed. It was concluded that technology has the solution to problems of water quality management, or can develop the solutions needed. Those solutions must involve augmentation and the export of salts to the ocean or other sink to achieve salt balance. (See also W75-10769) (Sims-ISWS)
W75-10804

**EFFECT OF AGRICULTURAL USE ON WATER QUALITY FOR DOWNSTREAM USE FOR IRRIGATION,**
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
J. E. Christiansen.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 753-785, 1974. 11 tab, 28 ref, 1 append.

Descriptors: *Irrigation, *Water quality, *Drainage, *Salinity, *Rio Grande River, *Colorado River, Salts, Salt balance, Irrigation effects, Irrigation practices, Classification, Leaching, Irrigation efficiency, Mineralogy, Soils, Rivers, Agriculture, Downstream.
Identifiers: *Imperial Valley(Cal), *Sevier River(Utah).

An historical review of various proposals for classifying irrigation waters was presented. Limitations of some of the more commonly used criteria were mentioned. Salt balance and the need for a favorable salt balance in an irrigated area was explained. Leaching requirement was included in the discussion because of its relationship to the management of irrigation water. A study of the composition of irrigation water along several stream systems in relation to various criteria for classifying water was presented for the Rio Grande, the Sevier River in Utah, the Upper Basin of the Colorado River in Utah, and the Imperial Irrigation District. The discussion was limited to downstream uses for irrigation. Some conclusions were: (1) the development of irrigation projects along any river system where return flow enters the river results in some deterioration in the quality of downstream flow; (2) more efficient management of irrigation water should, at least temporarily, provide some improvement in the downstream water quality and possibly increase the downstream flow; and (3) from the long-term point of view, however, relatively little can be done in the way of more efficient management of the water resources on developed projects to improve the downstream water quality. (See also W75-10769) (Sims-ISWS)
W75-10805

**METHODOLOGICAL APPLICATION OF THE STRAW MAN DECISION STRUCTURE TO A HYPOTHETICAL CASE: THE DORFMAN-JACOBY WATER QUALITY MODEL,**
California Univ., Riverside.
For primary bibliographic entry see Field 6A.
W75-10811

**SOCIAL INDICATORS AND CONNECTIVES,**
California Univ., Riverside.
For primary bibliographic entry see Field 6A.
W75-10812

**METHODOLOGICAL PROBLEMS IN APPLYING THE STRAW MAN TO REAL LIFE PROBLEMS,**
Arizona Univ., Tucson.
For primary bibliographic entry see Field 6A.
W75-10814

**EFFLUENT TREATMENT EQUIPMENT.**
For primary bibliographic entry see Field 5D.
W75-10832

**AMENDMENTS TO THE WATER ACT,**
B. O'Brien.
Mining Congress Journal, Vol 60, No 8, p 54-55, August, 1974.

Descriptors: *Toxicity, *Water pollution, Water law, Federal government, Regulation, Standards, Control.
Identifiers: The Water Act.

The Environmental Protection Agency has recommended to Congress that ammendments to the Water Act be made. An extension to three years for compliance with the toxic water pollution limitations will be requested. It is expected that the EPA will also ask for a transformation of the present formal hearings on proposed toxic regulations into informal proceedings. Russell Train, EPA Administrator, states that his organization is considering asking for authority to grant exemptions from the toxic limitations for a plant which is unable to meet the requirements due to no available technology for the treatment of the particular waste. The amendments should be submitted by the EPA to Congress in January of 1975. (Leibowitz-FIRL)
W75-10835

**WATER QUALITY FACTORS IN DESIGNING A SEWAGE PLANT BASED ON PUBLIC DRAINAGE STATISTICAL DATA, (IN JAPANESE),**
For primary bibliographic entry see Field 5D.
W75-10838

**THE CONSEQUENCES OF ACCEPTING INDUSTRIAL WASTES INTO SEWERS; WATER POLLUTION RESEARCH AT STEVENAGE,**
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5D.
W75-10842

# 6. WATER RESOURCES PLANNING

## 6A. Techniques Of Planning

**ANALYSIS OF A LARGE WATER DISTRIBUTION SYSTEM USING ADVANCED COMPUTER SOFTWARE,**
Orlando Utilities Commission, Fla.
For primary bibliographic entry see Field 4A.
W75-10720

**GROUNDWATER MODEL AS A TOOL IN PLANNING AND MANAGEMENT,**
CH2M/Hill, Portland, Oreg.
For primary bibliographic entry see Field 4B.
W75-10781

**EVALUATION OF AGRICULTURAL DRAINAGE IN WATER QUALITY MANAGEMENT,**
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5G.
W75-10796

**PANEL REVIEW OF THE TAXONO STRUCTURE OF THE STRAW MAN.**
California Univ., Riverside. Program in Env mental Economics.
For primary bibliographic entry see Field 6B
W75-10806

**PANEL EVALUATION OF THE LOG STRUCTURE, CONSISTENCY, AND UN LYING ASSUMPTIONS OF THE 'STRAW METHODOLOGY.**
California Univ., Riverside. Technical Com of the Water Resources Centers of the Th Western States.
For primary bibliographic entry see Field 6B.
W75-10807

**COMMENTS ON THE STRAW MAN,**
California Univ., Riverside. Dept. of Philoso
For primary bibliographic entry see Field 6B
W75-10808

**REPORT TO THE TECHNICAL COMMI OF THE WATER RESOURCES CENTE THE THIRTEEN WESTERN STATES,**
Princeton Univ., N.J. Dept. of Philosophy.
For primary bibliographic entry see Field 6B
W75-10809

**PROCEEDINGS OF THE GRADUATE DENT SYMPOSIUM OF THE TECH COMMITTEE OF THE WATER RESOU CENTERS OF THE THIRTEEN WES STATES.**
California Univ., Riverside. Program in E mental Economics.
Available from the National Technical In tion Service, Springfield, Va 22191 as PB-2 $7.00 in paper copy, $2.25 in microfiche. No. DACW31-72-C-0060, Planning and Eva for the Straw Man Research Project, PRWG-120-1, September 1972. 187 p, 25 fig 31 ref. OWRT C-3377(3721)(3).

Descriptors: *Water resources develo *Social aspects, *Planning, *Metho *Evaluation, Water policy, Computers, tion analysis, Water pollution control, D making, Effects, Economics, Environmen collections, Equations, Assessment, Algo Mathematical models, Systems analysis, studies.
Identifiers: *Straw Man model, Social ind Action variables, Connectives, Disaggr Economic opportunity, Recreational oppor

The Technical Committee of the Water Re Research Centers of the Thirteen Weste initiated a study to develop a water re planning methodology which would includ sessment or prediction of social achi resulting from investment in water development and use. Achievements pressed in terms of progress toward imp explicit national goals. Developed has Straw Man model, a hierarchical array broad goals disaggregated into layers of which are eventually linked to water polic variables through social indicators. Thi consists of papers resulting from the wor Phase II of the study. Since Phase I ident defined explicit national and regional g searched for connectives between these water-related activities, Phase II opted and quantize these connectives and analy important resource constraints to achi sistency in the model framework. The o jective was to narrow the gap between t tion of national goals and the implemen action programs to achieve such goals. T herein include a broad range of topics: ap of the Straw Man to the Dorfman-Jacob problems of methodology in applying Man; application of the methodology to

ndicators and connectives; application of mic modeling to the Straw Man ology; developing a significant information sharpening the definition of action varia- d questions and discussions relating to g and distribution. (See W75-10811 W75-10820) (Bell-Cornell)
10

DOLOGICAL APPLICATION OF THE MAN DECISION STRUCTURE TO A HETICAL CASE: THE DORFMAN- WATER QUALITY MODEL,
a Univ., Riverside.
er, T. Munnecke, and R. C. d'Arge.
edings of the Graduate Student Symposi- he Technical Committee of the Water es Centers of the Thirteen Western States, September 1972. 13 fig, 3 append.

ors: *Water resources development, aspects, *Water pollution control, Al- , Decision making, Water policy, Political Alternative planning, Simulation analysis, ical oxygen demand, Dissolved oxygen, efit analysis, Waste treatment, Mathe- models, Equations, Systems analysis, on.
rs: *Straw man, *Social goals, *Social in- Disaggregation, General welfare, Phelps model, Multi-objective, Economic ity, Disaggregation.

s been done to elucidate the important ween water resources development and vment of regional and national social s. The Straw Man planning methodolo- ver, attempts to describe regional and na- ls and to identify their relation to water . It disaggregates the over-arching goal l welfare into nine general goals (e.g., opportunity) which are successively by expanding strata of subgoals. Each e.g., employment opportunity) is linked olicy action variables by means of its so- tor (e.g., employment percentages). The tended as a predictive model or informa- tem, after quantitative connnectives water policy action variables and social are established and qualitative connec- ween social indicators and goals are preliminary transformation of the Dorf- by water supply and quality model into Man format is achieved. The Dorfman- odel is a political decision making st approach. Herein, the political varia- he model is sacrificed, while the single stic weighting scheme is retained. Use of an-Jacoby model in Straw Man format early demonstrates the role water play in the attainment of social objec- cidating the connectives between dif- ter development alternatives and com- als satisfaction. (See also W75-10810) ell)
1

NDICATORS AND CONNECTIVES,
Univ., Riverside.

dings of the Graduate Student Symposi- e Technical Committee of the Water Centers of the Thirteen Western States, ptember 1972. 4 ref, 1 append.

s: *Water resources development, ogy, *Planning, *Water quality control, ects, Rivers, Dissolved oxygen, Gross oduct, Export, Income, Least squares egional analysis, Colorado River, Costs, Water utilization, Mathematical models, Systems analysis, Evaluation.
Social indicators, Connectives, *Straw nal goals, Linear regression, Economic y, Environmental quality, Disaggrega-

The nature of social indicators is examined, their use in the framework of the Straw Man methodology is discussed, and the dangers inherent in their interpretation are described. A social indicator is defined as 'a measure of any phenomenon that is socially significant,' such as employment percentages. It can be a scalar, vector, or a matrix, depending on the variables used in its construction. In the case of river pollution control, the social indicators expressing DO should be time and location specific. Social indicators used by various government agencies occasionally are less than representative of the information they are meant to portray. Ambiguity in interpretation is another problem inherent in the deciphering of social indicators. The social indicator is the most important link in the Straw Man system, allowing both flexibility and precision in measurement. In the collection of social indicators from existing research for use in the Straw Man model, their position in the disaggregation framework and their potential model use should be identified. The appendix includes examples of the collection format being used at UCR and Utah State. Considered are: regional export income as a social indicator; connective between gross national product and regional export income; connective between TDS and gross regional income in the lower Colorado River Basin; and the benefits of water quality enhancement. Connectives should be identified as to form, e.g., linear regression. (See also W75-10810) (Bell-Cornell)
W75-10812

**TOWARDS A SHARPER CONCEPT OF AN ACTION VARIABLE,**
Colorado State Univ., Fort Collins.
J. T. Davenport, and H. P. Caulfield, Jr.
In: Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States, p 65-84, September 1972. 3 fig, 1 tab, 7 ref, 1 append.

Descriptors: *Water resources development, *Methodology, *Planning, *Projects, *Water law, Federal jurisdiction, Flood control, Water quality control, Federal government, Multiple-purpose, Irrigation, Water policy, Social aspects, Economics, Graphical analysis, Recreation, Systems analysis.
Identifiers: *Straw Man, Action variables, Connectives, Social indicators, Public sector, Private sector, Environmental agencies.

Four key concepts are central to the Straw Man methodology: action variables, social indicators, subgoals and goals, and connectives. A more concise definition of an action variable is presented in the context of federal water law. The two central elements to an action variable are: (1) who is acting (actor), and (2) what general field of water resources development activity they are engaged in (action program). The actor can be a federal agency, a non-federal agency or private interests. Action programs can be irrigation, flood control, water quality enhancement, etc. The study of federal actors and their activities indicates that an action variable may be characterized by four components: (1) specific action of the actor, e.g., advise, design, operate, etc.; (2) legal constraints, e.g., the excess land provisions of the 1902 Reclamation Act; (3) alternative and supplementary action sets of other actors within the action program; and (4) other action programs possibly related to the primary action program, in light of multipurpose projects. Connectives between action variables and social indicators are best defined by studying the effects of employing action variables. An example is given wherein three graphs display a before-and-after effect on flood damage (expressed in dollars) of three different types of flood control measures. An appendix is included of several examples of federal and non-federal (public and private) action variables outlined in detail; considered are flood control, irrigated agriculture, outdoor recreation enhancement, and water quality enhancement. (See also W75-10810) (Bell-Cornell)
W75-10813

**METHODOLOGICAL PROBLEMS IN APPLYING THE STRAW MAN TO REAL LIFE PROBLEMS,**
Arizona Univ., Tucson.
R. M. Judge, F. H. Dove, and W. L. Everett.
In: Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States, p 85-103, September 1972. 1 fig, 2 ref, 1 append.

Descriptors: *Water resources development, *Methodology, *Planning, *Water pollution control, *Social aspects, Population growth, Environment, Shellfish, Industries, Management, Solid wastes, *Arizona, Projects, Systems analysis.
Identifiers: *Straw Man, Social indicators, Connectives, Environmental security, Individual security, Collective security, Disaggregation, Long Island.

Application of the Straw Man methodology to Pima County, Arizona and Suffolk County, New York water and solid waste management plans has revealed problems in definition, classification, and data collection for the Straw Man. Data collection requires much research to establish and describe the relationships between variables, many of them in the biological sphere. The data problem appears in two forms: the collection of information from primary, secondary or other sources and the definition of relationships between input variables and effects. Most problems occur in the physical-economic sphere where a physical impact, e.g., pollution, is to be related to an economic effect. An example concerns the effects of pollution on the shellfish industry of Long Island. Another problem of the Straw Man is one of editing. Study objectives include identifying those social indicators that are appropriate to the Straw Man in general and delineating a subset of these as appropriate to the two-county study. Considered are environmental, individual, and collective security. The two different demographic areas, drawing from groundwater supplies under different geological formations and historical management philosophies, have been studied in detail to estimate connectives between population increases, water and waste management actions and the social indicator set. Included is an appendix which gives a revision of the disaggregation of security goals. (See also W75-10810) (Bell-Cornell)
W75-10814

**QUALITATIVE SIGN MATRIX MANIPULATION,**
California Univ., Riverside.
T. Munnecke.
In: Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States, p 104-118, September 1972. 5 tab, 1 append.

Descriptors: *Water resources development, *Planning, *Evaluation, Decision making, Conferences, Computers, Social aspects, Equations, Mathematical models, Systems analysis.
Identifiers: *Straw Man, *Algebra of signs, Analysis of consistency, Qualitative information, Delphi method.

Presented are some possible mechanisms which may be used to integrate qualitative information into the Straw Man planning process. Qualitative specification of interactions within the Straw Man is a fairly tractable method of registering first order effects; however, the method fails when one tries to apply standard linear algebraic techniques. Social indicator and action variable connectives are qualitative values and may be handled using conventional linear algebra. Described is an algebra of sign matrices which will allow similar manipulations in the qualitative realm. The algebra

defined and properties described must be considered to be 'building blocks' of a system larger in scope. The most direct outcome of the algebra of signs is the identification of conflicting signs, from which other decision making methods may take over. The Delphi method is briefly described as a possible method to be interfaced to the problem. The literature describing this method seems to be a good base from which to begin further study. The appendix on an analysis of consistency presents a method which may be used to point out inconsistent decisions on the part of a planner. Also, it presents some theoretical concepts by which new information may be extrapolated from old. (See also W75-10810) (Bell-Cornell)
W75-10815

**NECESSARY ADAPTATIONS FOR SIGNIFICANT UTILIZATION OF THE INFORMATION SYSTEM,**
Colorado State Univ., Fort Collins.
K. Takeuchi.
In: Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States, p 119-127, September 1972. 1 fig, 1 ref.

Descriptors: *Planning, *Methodology, *Assessment, Decision making, Alternative planning, Computers, Operations, Research, River basins, Regions, Water policy, Water resources development.
Identifiers: *Straw Man, *Information systems, Disaggregation, Action variables, Connectives.

Although the structure of the Straw Man methodology has been conceptualized in detail, the utilization of it has not been conceived very adequately. The difficulties expected in operating the system in the real planning process are discussed; the planning information system is assessed as a planning methodology. Two shortcomings of the system are low information content and no analytical capability; the former is inevitable by nature and the latter can be improved technically. The current information system is not helpful in the real planning process. Two major research directions to pursue are suggested: (1) make the system capable of producing information for any action alternatives of interest, and (2) create an action alternative generating system. In order to develop a consequence generating system and alternative generating system, further classification and disaggregation of action variables into a small number of basic components and the determination of connective rules between and/or among components are of primary necessity. (See also W75-10810) (Bell-Cornell)
W75-10816

**A METHOD OF DISAGGREGATION,**
Nevada Univ., Reno.
W. Jenkins.
In: Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States, p 128-141, September 1972. 1 tab, 4 ref.

Descriptors: *Water resources development, *Planning, *Methodology, *Evaluation, *Social aspects, Effects, Systems analysis.
Identifiers: *Straw Man, *Disaggregation, Interrogatives, Goals, Subgoals, Objectives, Aesthetic opportunity, Social indicators, Connectives.

A hierarchy of goals is a necessary part of an evaluation methodology for water resources planning and social goals which attempts to make proper connections between natural resource development and the nation's multitude of goals and objectives. Two basic conditions are required for the successful implementation of the goal hierarchy within a methodology such as the Straw Man: the goals and objectives must be accurately identified, and they must be represented adequately in an organized manner so that connectives may be made between goals and social indicators and between the goals themselves. It is felt that the second condition for implementation has not been satisfied in the Straw Man. Reviewed are some properties which should be included in the Straw Man and the reasons they are necessary to successful implementation of the goal hierarchy. A method of disaggregation is proposed as an aid to restructuring the Straw Man, and an example of application of this method to reconstruct the goal of aesthetic opportunity is presented. Considered in the example are highly- and little-developed areas, wilderness preserves, and recreational areas. The method of interrogatives used to disaggregate the goal into one level of subgoals is to ask a question designed to reveal pertinent information about the goal, so as to derive an answer which directly yields the subgoals of the disaggregation. Ultimately, the general goals can be successively described by expanding strata of subgoals which are eventually linked to potential water policy variables through social indicators. (See also W75-10810) (Bell-Cornell)
W75-10817

**EGALITARIANISM,**
Washington Univ., Seattle.
G. Jewett.
In: Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States, p 142-151, September 1972. 7 ref.

Descriptors: *Water resources, Economics, Education, Political aspects, Social aspects, Planning, Methodology, Regional analysis, Costs, Benefits, Environment, Natural resources, Systems analysis.
Identifiers: *Egalitarianism, Straw Man, Social justice, Equal distribution, Delphi method, National equality, Regional equality, Equal distribution, Diversity, Natural/social system.

Presented is a brief review of literature on egalitarianism. Highlighted are the conflict between the two fundamental American values of equality and achievement, and unfulfilled expectation that equality of results would follow from equality of opportunity, and distributive justice. It is suggested that we perhaps conceive of distributive justice in terms of equality -- egalitarian distribution of the good things in life. Indicators for economic, educational, and political equality are suggested. Questioned is how assessment of regional or national equality should be made in terms of equal distribution of costs and benefits, environmental trade-offs to natural systems, and natural systems in interaction with man/social systems. Recommendations are made concerning egalitarianism and the Straw Man. Considered are diversity/control interfaces: can equality and diversity co-exist within the same natural/social system. The Committee should investigate the possibilities and merits available to them in using a Delphi policy consensus methodology. (See also W75-10810) (Bell-Cornell)
W75-10818

**A CONNECTIVES MODEL RELATING WATER POLICY ACTION VARIABLES TO RECREATIONAL OPPORTUNITY SOCIAL INDICATORS,**
Utah State Univ., Logan.
R. Fletcher.
In: Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States, p 152-169, September 1972. 7 fig, 1 tab.

Descriptors: *Water resources, *Recreation, *Supply, Model studies, Analytical technique, Demand, *Water policy, Measurement, Swimming, Data collections, Economics, Evaluation, Alternative planning, Systems analysis, Computer models, Methodology.
Identifiers: Recreation opportunity, Social ind tors, Connectives, Tradeoff coefficient ma Compatibility matrix, Physical aspects, Biolog aspects.

Due to population growth and the interest i environment, demands on the water resource from all sectors have led to the need for redefi national goals and priorities concerning resource. This study considers the interac between the recreation sector and its w resource base. A supply model is proposed for swering the question, 'What kinds of, amounts and tradeoffs between recreational activities possible, given a condition of water quality, q tity, and distribution, and the nature of adja land and vegetation.' In developing the mo recreational activities are defined in terms of t general characteristics and/or limitations and further rated by a set of physical and biolog parameters which disqualifies or qualifies them good, fair, or poor activities. The model has parameters relevant to the qualification of ele activities. Then this activity 'kinds' m becomes an 'amounts' model, determining terms of the amount of user units per day, in w quantity the qualified activities can be perfor Two subsequent models consider the interact and tradeoffs between activities: (1) a trad coefficient matrix, and (2) a compatibility ma These matrices provide formulae from whic comprehensive set of feasible alternatives ma developed; supply costs, demand, and so economic inputs may be considered. (See W75-10810) (Bell-Cornell)
W75-10819

**ALGORITHMIC MODELING AND THE STR MAN,**
Utah State Univ., Logan.
M. McKee.
In: Proceedings of the Graduate Student Symp um of the Technical Committee of the W Resources Centers of the Thirteen Western St p 170-185, September 1972. 6 ref.

Descriptors: *Water resources developm *Planning, *Simulation analysis, *Methodol Computer models, Decision making, Water po Evaluation, Social aspects, Comprehen planning, Alternative planning, Long-planning.
Identifiers: *Straw Man, Linkage mode Resiliency, System behavior, Sensitivity anal Boundary conditions, Prediction.

Failures in planning and decision ma processes occur sometimes from not unders ing the behavior of particular systems. A resou planning methodology, especially one as prehensive as the Straw Man, cannot rely s on the traditional means of data collection synthesis. Two important considerations, us ignored are discussed: (1) problems and im tions of integrating the concept of resiliency such planning methodology; and (2) the need sume a position of relative ignorance as to range and indirect consequences when pla resources usage. Resiliency refers to the sta or absorptive ability of a system. Examples o cost housing and pest control policies are where the implicit assumption of infinite s resiliency resulted in exceedence of the sys resiliency and ultimate collapse of the sy Ignorance refers to accepting the uncertaint policy implementation; the above policies because decisions were based on informatio sumed as being complete but found later to been incomplete and/or inaccurate. Consid therefore, is a method of systems simu potentially useful in predicting and understa complex physical/biological/social s behavior, especially regarding boundary c tions, affected by water resources develop An algorithmic method, developed at Utah University for studying desert ecosysten being utilized in conjunction with the Straw

methodology. (See also W75-10810) (Bell-

20

L SIZING OF URBAN FLOOD-CON-
YSTEMS,
gic Engineering Center, Davis Calif.
Analysis Branch.
ary bibliographic entry see Field 4A.
21

ER SIMULATION OF WATER DIS-
ON NETWORKS,
omputer Services, Inc., Seattle, Wash.
ticals and Modeling Unit.
ry bibliographic entry see Field 4A.
3

## aluation Process

ING REIMBURSEMENT
ISMS FOR RESOURCE DEVELOP-
OJECTS,
Univ., Laramie. Div. of Agricultural
s.
ry bibliographic entry see Field 6C.
3

TICAL AND APPLIED CONCEPTS OF
ESOURCES FOR SOCIAL WELFARE.
niv., Alabama. Dept. of Economics.
from the National Technical Informa-
ce, Springfield, Va. 22161, as PB-243
in paper copy, $2.25 in microfiche.
Business Research Series 4, November
, 7 fig, 22 tab, 14 ref. OWRT B-037-

s: *Welfare(Economics), *Water
*Standards, *Evaluation, *Value en-
Industrial production, Industrial water,
ution effects, Economic impact, Water
ntrol, Foreign trade, Tariff, Planning,
pact, Regional analysis, Commercial
come analysis, *Alabama, Cost analy-
tion, Pollution taxes(Charges), Income,
and, National income, Diseconomies of
ount rates, Economic efficiency, U.S.
urces Council.
*Externalities, Opprtunity cost,
interdependencies, *Social equilibri-
ange rates, Transboundary spillovers,
industry, *Pickwick Lake(Ala),
and Standards' (1973).

on and interpretation of the Water
Council's (WRC) new principles and
s followed by one empirical and two
economic analyses of water resources.
of the empirical work, which center
economic effects of closing the com-
ery in Pickwick Lake, Alabama due to
ntamination, are appraised in terms of
ectives and four accounts of the WRC
Effects of the fishing ban on fishermen
eation related businesses are assessed
rtunity cost and relative retail sales
nparison analyses, respectively. The
approaches the question of whether
n who compete in international mar-
ose production costs are increased by
ntrol laws should be protected from
from polluting, lower cost producers.
ns of tariffs and adjustable exchange
en countries as means for protecting
n are presented. The final paper is a
treatment of industrial interdepen-
the chain effects of water pollution.
t of esternal effects in water-using
ained using input-output analysis. The
vater pollution on water-using, non-
and public sectors are discussed in
veral theoretical examples. (See W75-
75-10358) (Becker-Wisconsin)

W75-10354

**PRINCIPLES AND STANDARDS FOR WATER PLANNING,**
Auburn Univ., Alabama. Dept. of Economics.
D. R. Street.
School of Business Research Series 4, November 1973, p5-7.

Descriptors: *Standards, *Welfare(Economics), *Planning, *Environment, *Regional development, Water resource development, Gross National Product, Discount rates, Economic efficiency, U.S. Water Resources Council.
Identifiers: *Opportunity cost, 'Principles and Standards'(1973).

Economic implication of the set of guidelines promulgated by the Water Resources Council, entitled 'Water and Related Land Resources--Establishment of Principles and Standards for Planning,' effective as of October 25, 1973 are discussed. 'Priciples and Standards' outline two objectives: (1) to enhance national economic development by increasing the GNP and by improving national efficiency, and (2) to enhance the quality of the environment by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems. Four accounts to be used in developing alternative plans are delineated: one for each of the two objectives, one for regional development, and one for social well-being. The accounts of the new system are not additive and are not mutually exclusive. The national and regional economic development accounts use menetary measures, while the environmental quality and social factors accounts are largely attribute-type. The application of the objectives and accounts to specific projects is controversial. The qualitative nature of the regional development and social well-being data makes both difficult to evaluate. The WRC application of the concept of opportunity cost is a departure from the procedures of some accountants, especially with regards to discount rates. (See also W75-10354) (Becker-Wisconsin)
W75-10355

**THE ECONOMIC IMPACT OF MERCURY POLLUTION ON FISHERIES AND OTHER RELATED BUSINESSES AROUND PICKWICK LAKE,**
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-10356

**INTERNATIONAL PRODUCTION ASPECTS OF WATER AND ENVIRONMENTAL QUALITY CONTROL,**
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-10357

**INDUSTRIAL INTERDEPENDENCIES AND EXTERNAL DISECONOMIES OF WATER RESOURCES,**
Auburn Univ., Alabama. Dept. of Economics.
M. M. Baker, M. M. Yarbrough, and D. R. Street.
School of Business Research Series 4, November 1973, p 58-72, 3 fig, 1 tab, 4 ref. OWRT B-037-ALA(1).

Descriptors: *Industrial production, *Industrial water, *Water pollution effects, *Economic impact, Water utilization, Income, Water demand, Regional analysis, Diseconomies of scale, Water quality, Input-output analysis.
Identifiers: *Industrial interdependencies, *Externalities.

External effects are present whenever a firm's production function depends on the activities of another firm. The concept of external effects in water-using firms is explained using input-output analysis. Economic sectors are specified in terms of the interdependence between water-using, non-water-using, and final demand sectors. For every acre-foot of water not available for use, the water-using sector will reduce purchases, which in turn reduces both income payments for the households and income spent on consumption goods. The case of the non-water-using sector being completely dependent on the raw material inputs from the water-using sector is discussed. The types of interdependency effects are: (1) a household income effect, (2) a business income effect on suppliers of production inputs and related sectors, and (3) on accumulative effect on the public sector through loss of revenues and reduction in use of public facilities. Specifically, the regional external effects on the public sector from water pollution include underutilization of public facilities in declining areas and the resulting economies and diseconomies of providing services. Externality effects are present to the extent that factors of production are immobile and unable to replace the income losses due to the decline in purchases by the water-using sector. (See also W75-10354) (Becker-Wisconsin)
W75-10358

**VALLEY DESIGN IN URBAN GROWTH CENTRES,**
University of New South Wales, Kensington (Australia). Faculty of Military Studies.
A. J. Bonham.
Water (Journal of the Australian Water and Wastewater Association) Vol 2, No 1, p 21-23, March 1975. 1 fig, 10 ref.

Descriptors: *Urban drainage, *City planning, *Flood protection, *Recreation facilities, *Flood plains, Storm drains, Urban runoff, Cities, Land use, Design, Valleys, Natural streams, *Australia.
Identifiers: Canberra(ACT).

A criticial study of the design of major storm drainage systems has been made with special reference to new urban growth centers, and with Canberra (Australia) as a model. The study reveals that public open spaces may be located on designed flood plains, thus preserving the environmental quality of the valley, reducing the storm peak discharges downstream and at the same time substantially reducing the overall cost of storm drainage works. (CSIRO)
W75-10643

**THE MASTER PLAN FOR WATER-SUPPLY IN THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON,**
Ottawa-Carleton Regional Municipality, Ottawa (Ontario).
For primary bibliographic entry see Field 3D.
W75-10710

**WATER SUPPLY FROM RENOVATED WASTEWATER--A RESOURCE MANUAL FOR MASSACHUSETTS PLANNERS, PUBLIC OFFICIALS AND CITIZEN GROUPS.**
Clark Univ., Worcester, Mass.
For primary bibliographic entry see Field 5D.
W75-10722

**RIVERS IN THE CITY,**
R. Mann.
Praeger Publishers, New York New York, 1973. 256 p.

Descriptors: *Environmental control, *Rivers, *Land use, *Water resources development, *Harbors, *Canals, *Tunnels, *Highway effects, Potomac River, Hudson River, *Regional development, River basin development, *Urbanization, Recreation, United States, Europe, *Cities, City planning, *Water quality.

Identifiers: Arno River, Amstel River(Netherlands), Limmat/Sihl Rivers(Aurich), Rhine River(Netherlands), Seine River, Ruhr River(Germany), Oise River, Marne River(France), Thames River, Lea River(London England), Tyne River(England), Charles River(Mass).

The most intensively used and abused resource on earth--the urgan river--is surveyed in terms of the crises of mismanaged rivers and wasteland riversides and the important aspects of progress in the conservation of the river landscape. A brief discussion is presented of the historical, economic, sociological, aesthetic and technical aspects of the problem. How fifteen major urban regions have utilized their river landscapes in the process of urban and regional development is described. The urban regions are: Florence (Arno); Venice (the canals); Amsterdam (Amstel/the canals); Paris (Seine); Paris region (Seine/Oise/Marne); Lyons (Saone/Rhone); Zurich (Limmat/Sihl); London (Thames); London (Lea); Ruhr region (Ruhr); Rotterdam (Rhine/Meuse); Tyneside (Tyne); Washington, D.C. (Potomac); Boston (Charles); New York (Hudson). Linking the old and new to provide recreational facilities and aesthetic setting by utilizing urban river landscapes (Amsterdam and Paris) is contrasted with situations created by heavy industrialization and growth problems along urban river banks (London and Tyneside). Encroachment of high-rise buildings, expressways, parking lots and ill-designed creation structures threaten riversides of Washington, D.C., Boston, Paris and Zurich. Use of knowledge and experience, sufficient funds, and planning on the broadest scale must be employed to preserve and promote urban riversides of high environmental quality. (Hufschmidt-North Carolina)
W75-10723

**ROLE OF THE PUBLIC IN WEATHER MODIFICATION,**
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 3B.
W75-10777

**PANEL REVIEW OF THE TAXONOMIC STRUCTURE OF THE STRAW MAN.**
California Univ., Riverside. Program in Environmental Economics.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 892, $3.75 in paper copy, $2.25 in microfiche. Project No. DACW31-72-0-0060, Planning and Evaluation for the Straw Man Research Project Report, PRWG-120-3, University of California, Riverside, April, 1973. 40 p, 11 ref. OWRT C-3377(3721)(2).

Descriptors: *Water resources development, *Methodology, *Planning, *Evaluation, *Social aspects, Mathematical models, Systems analysis, Behavior, Technology, Decision making, Alternative planning, Constraints, Costs, Benefits, Ethics.
Identifiers: *Straw Man, *Social indicators, Connectives, Action variables, Tree structures, Metatheory, Axiomatic value theory, Disaggregation.

The Technical Committee, under the auspices of the Directors of the Water Resources Research Centers of the Thirteen Western States, initiated the development of a methodology relating water resources planning to the achievement of national and regional goals. The Committee developed the Straw Man, a model framework of connectives between social goals and water-related activities. In order to justify its logical structure, consistency, completeness, and underlying assumptions, a small review panel was asked to evaluate the taxonomic structure of the Straw Man. This volume, composed of three documents, is the resulting report. The first article is that of the Technical Committee -an introduction to the Straw Man methodology and a list of issues to be considered by the panel members. The second and third documents are evaluation reports by panel members. The Committee believes the interchange to have been helpful to the entire Straw Man project, particularly in distinguishing a prior issue in the methodology from ad hoc issues arising in its application. (See W75-10807 thru W75-10809) (Bell-Cornell)
W75-10806

**PANEL EVALUATION OF THE LOGICAL STRUCTURE, CONSISTENCY, AND UNDERLYING ASSUMPTIONS OF THE 'STRAWMAN' METHODOLOGY.**
California Univ., Riverside. Technical Committee of the Water Resources Centers of the Thirteen Western States.
In: Panel Review of the Taxonomic Structure of the Straw Man. Project No. DACW31-72-C-0060, Planning and Evaluation for the Straw Man Research Project. Report PRWG-120-3, University of California, Riverside. April, 1973. 6 p, 1 ref.

Descriptors: *Water resources development, *Methodology, *Evaluation, *Planning, *Social aspects, Behavior, Technology, Mathematical models, Systems analysis, Economics, Water policy.
Identifiers: *Straw Man, Disaggregation, Social indicators, Connectives, Action variables, Subgoals.

The Technical Committee of the Water Resources Centers of the Thirteen Western States has devised the Straw Man model for relating national and regional social goals to water resources planning and use decisions. The model is a hierarchical set of nine overarching general societal goals arrived at independently of water resources development. In the model, the goals are disaggregated into subgoals which are eventually linked to water policy action variables through social indicators (changes or events having social significance). The methodology is introduced and a list of issues to be considered by members of a panel formed to evaluate the taxonomic structure of the Straw Man is given. Since the set of nine general goals has not been tested for the degree of its completeness, a sharper delineation of each goal is recommended. (See also W75-10806) (Bell-Cornell)
W75-10807

**COMMENTS ON THE STRAW MAN,**
California Univ., Riverside. Dept. of Philosophy.
D. Harrah.
In: Panel Review of the Taxonomic Structure of the Straw Man. Project No. DACW31-72-C-0060, Planning and Evaluation for the Straw Man Research Project, Report PRWG-120-3, University of California, Riverside, April 1973. 17 p, 6 ref.

Descriptors: *Water resources development, *Methodology, *Evaluation, *Decision making, Planning, Social aspects, Mathematical models, Systems analysis, Water policy.
Identifiers: Straw Man, Disaggregation, Utility function, Decision theory, Tree structure, Axiomatic value theory.

The Technical Committee of the Water Resources Centers of the Thirteen Western States devised the Straw Man model for relating national and regional goals to water resources planning and decision making. The Straw Man methodology is evaluated and suggestions are made for extending and strengthening it. The Technical Committee's main aim is the development of a methodology for a two-level decision system appropriate in the context of decisions affecting water resources. Discussed are decision theory for the Straw Man goal system and the elements of a utility function suitable to the methodology. In the Straw Man, the utility function is constructed as a hierarchy of goals and subgoals, with utility weights assignable to the component goals and subgoals; t
hierarchy has a simple tree structure. Simplic
and clarity have been allowed to dominate t
need for theoretical richness and precision; t
value theory has been cast in too simple a for
and the requirements imposed on interpretatio
of the theory have been too strict. The theory
goals should be formulated as a hypothetic
deductive theory in axiomatic form--as an emp
cal theory of the value system of the social gr
in question. The tree structure would then
developed as a simplified representation of
theory, useful for computational and heuristic p
poses. Answers are included to questions posed
the Committee. (See also W75-10806) (Bell-C
nell)
W75-10808

**REPORT TO THE TECHNICAL COMMITT
OF THE WATER RESOURCES CENTERS
THE THIRTEEN WESTERN STATES,**
Princeton Univ., N.J. Dept. of Philosophy.
T. Nagel.
In: Panel Review of the Taxonomic Structure
the Straw Man. Project No. DACW31-72-C-0
Planning and Evaluation for the Straw
Research Project, Report PRWG-120-3, Univ
ty of California, Riverside, April 1973. 14 p, 1 r

Descriptors: *Water resources developm
*Methodology, *Decision making, *Evaluat
Planning, *Social aspects, Mathematical mo
Systems analysis, Water policy, Cost-benefit
ysis, Ethics, Value, Constraints.
Identifiers: Straw Man, Primary values, Equ
Individual rights.

The Straw Man methodology has been devis
relate national and regional goals to
resources development. The overall conce
that, by taking certain actions, decision m
can realize particular goals and their assoc
values. The ethical assumptions of the Straw
methodology are considered. The method pr
poses an idea of how decisions are made,
values are assigned, and of how results can b
tained by balancing multiple relevant consi
tions. This idea is too simple, with not en
thought given to the relation between th
dividual factors. The methodology has bee
fered as a replacement for the crude eco
cost-benefit analysis which has until re
governed public water policy decisions. Th
has been to extend the range of consideration
will influence decision making by including
other than economic ones, with hopes of bala
the costs against benefits. More complex
tures are needed to accomplish this. Cons
tions which determine a rational choice are d
into three categories: (1) assignment of pr
values; (2) distributional factors; and (3) pro
straints on means to be used in pursuit of
These considerations are discussed in de
terms of human values, equality, and ethic
amined are utilitarianism, satisfactio
preferences, and individual rights. Recomm
tions are made for improving the Straw
ideology, and thus methodology. (See also
10806) (Bell-Cornell)
W75-10809

**PROCEEDINGS OF THE GRADUATE
DENT SYMPOSIUM OF THE TECH
COMMITTEE OF THE WATER RESOU
CENTERS OF THE THIRTEEN WE
STATES.**
California Univ., Riverside. Program in E
mental Economics.
For primary bibliographic entry see Field 6
W75-10810

**METHODOLOGICAL APPLICATION O
STRAW MAN DECISION STRUCTURE
HYPOTHETICAL CASE: THE DOR
JACOBY WATER QUALITY MODEL,**
California Univ., Riverside.

y bibliographic entry see Field 6A.

NDICATORS AND CONNECTIVES,
Univ., Riverside.
y bibliographic entry see Field 6A.

A SHARPER CONCEPT OF AN AC-
IABLE,
tate Univ., Fort Collins.
bibliographic entry see Field 6A.

OLOGICAL PROBLEMS IN APPLY-
STRAW MAN TO REAL LIFE
S,
iv., Tucson.
bibliographic entry see Field 6A.

IVE SIGN MATRIX MANIPULA-
Jniv., Riverside.
bibliographic entry see Field 6A.

Y ADAPTATIONS FOR SIGNIFI-
LIZATION OF THE INFORMATION
ate Univ., Fort Collins.
bibliographic entry see Field 6A.

OF DISAGGREGATION,
v., Reno.
bibliographic entry see Field 6A.

IANISM,
Univ., Seattle.
bibliographic entry see Field 6A.

TIVES MODEL RELATING WATER
CTION VARIABLES TO RECREA-
PPORTUNITY SOCIAL INDICA-
Jniv., Logan.
bibliographic entry see Field 6A.

MIC MODELING AND THE STRAW
niv., Logan.
bibliographic entry see Field 6A.

N OF RESERVOIR OPERATING
CONOMIC ANALYSIS,
ater Resources Inst., Lexington.
bibliographic entry see Field 4A.

OF RESERVOIR RECREATION
ater Resources Inst., Lexington.
, Jr.
m the National Technical Informa-
Springfield, Va 22161 as PB-244 546,
r copy, $2.25 in microfiche. Research
, 1967. 158 p, 26 fig, 28 tab, 39 ref.
-KY. 14-01-0001-787.

Recreation, *Recreation demand,
facilities, Reservoirs, *Regression
nefits, Evaluation, *Kentucky, *Cost
mating.

Identifiers: Dewey Reservoir(Kent), Rough River Reservoir(Kent).

Recreation visitation to two Kentucky reservoirs (Rough River and Dewey) constructed by the U.S. Army Corps of Engineers was studied to develop mathematical expressions for estimating numbers of visitors and recreation benefits. Regression analysis was used to relate characteristics of 168 origin areas (120 Kentucky counties, the District of Columbia, and the remaining states excluding Hawaii and Alaska) to visitation from that area to Rough River Reservoir. The resulting equations were than applied to Dewey to test their generality. Good results were obtained when only air distance and population were used as the independent variables. Correlations including the age and income of the population, urbanization, highway quality, and competition from other reservoirs did not significantly improve the results for Rough River and resulted in a worse correlation when applied to Dewey. Recreation benefits from the two reservoirs were estimated from a demand curve where the cost of effective travel distance was used to estimate price and the regression equation was used to estimate visitation. The effective or out-of-the-way distance (as contrasted with total distance) to the reservoir was estimated. (Huffsey-Kentucky)
W75-10826

**THE EFFECT OF LANDOWNER ATTITUDE ON THE FINANCIAL AND THE ECONOMIC COSTS OF ACQUIRING LAND FOR A LARGE PUBLIC WORKS PROJECT,**
Kentucky Water Resources Inst., Lexington.
J. M. Higgins, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 536, $6.25 in paper copy, $2.25 in microfiche. Research Report No 3, 1967. 153 p, 10 fig, 16 tab, 28 ref. OWRR A-006-KY. 14-01-0001-787.

Descriptors: Land appraisals, Land use, *Econometrics, Financial feasibility, *Attitudes, *Kentucky, Costs, *Property values, Cost analysis, Reservoirs.
Identifiers: Landowners.

The purpose is to examine the various economic and financial costs relating to the acquisition of property required for the construction of three reservoirs and to determine if any correlation could be made between the attitudes of the landowners selling property and the costs. Rough River Reservoir, Dewey Reservoir, and West Fork of Mill Creek Reservoir were studied. The costs involved in purchasing right-of-way were classified qualitatively and quantified to the extent possible. A procedure was devised to quantify 15 factors influencing attitude and an equation was derived to predict the landowner's attitude from these determining factors. Two plots were made of attitude versus the associated costs in order to observe the effect of attitude on costs. The results indicate that although the problem is complex, it is possible and practical to quantify the landowner's attitude and to define the relationship between this attitude and the associated costs. (Huffsey-Kentucky)
W75-10827

**REVIEW OF THE ECONOMIC BENEFITS AND COSTS RESULTING FROM DEWEY RESERVOIR,**
Kentucky Water Resources Inst., Lexington.
D. H. Rosenbaum.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-244 485, $5.75 in paper copy, $2.25 in microfiche. Research Report No 5, 1967. 118 p, 14 fig, 37 tab, 24 ref. OWRR A-006-KY. 14-01-0001-1085.

Descriptors: Reservoirs, Tax rates, Taxes, Flood control, Recreation, *Cost-benefit ratio, *Kentucky, Economics, *Income analysis, *Income distribution, Benefits, Taxes, Flood damage, Reviews.
Identifiers: Dewey Reservoir(Kent).

The economic effects of the construction of Dewey Reservoir in Floyd County, Kentucky were evaluated. Primary emphasis was placed on determining the degree the project had shifted income to this economically underdeveloped area by determining the incomes of those receiving project benefits and those paying project costs. The income redistribution effects of all benefits and costs associated with Dewey Reservoir were evaluated by assuming that the Federal income tax structure indicates the marginal value of income to individuals in the various income brackets. Major benefits from the Dewey Project have been: flood control, $722,166 annually, and recreation, $814,720 annually. Comparing these benefits with the average annual cost of the project yeilds a direct benefit cost ratio of 1.58. The flood damage reduction benefits have negative redistribution effects (-$77,670), because those receiving the benefits have incomes higher than that of the average taxpayer. The positive income redistribution benefits in decreasing order resulted from: repayment incidence ($197,860), recreation benefits ($133,720), project expenditures ($26,618), and Mississippi River benefits ($294). (Huffsey-Kentucky)
W75-10828

## 6C. Cost Allocation, Cost Sharing, Pricing/Repayment

**ANALYZING REIMBURSEMENT MECHANISMS FOR RESOURCE DEVELOPMENT PROJECTS,**
Wyoming Univ., Laramie. Div. of Agricultural Economics.
T. L. Dobbs, and C. E. Huff.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 917, $3.25 in paper copy, $2.25 in microfiche. Wyoming Agricultural Experiment Station Journal Article No 652, 1974, 25 p, 2 tab, 22 ref. OWRT C-4351(9063)(2).

Descriptors: *Water resources development, *Cost repayment, *Economic impact, *Social impact, Inter-basin transfers, Regional development, Economic efficiency, Equity, Wyoming, Methodology, Decision making.
Identifiers: Development cost reimbursement, Case study.

Policies proposed by the National Water Commission will create a need for a systematic examination of possible reimbursement mechanisms for project bonded indebtedness and operation and maintenance costs. Increased reliance on the assessment of beneficiaries and the necessity of integrating project evaluation and cost-sharing formulation for water resource development projects are stressed. A framework for analyzing regional resource development projects is developed around an impact matrix and a reimbursement matrix. The impact matrix includes the various development, environmental/recreational, and socical effects of a project on various sectors within the region of concern, while the reimbursement matrix accounts for all user charges, taxes, and other repayment mechanisms. The analytical framework is applied to a proposed interbasin water transfer project involving water transfer from Wyoming's Green River to its North Platte River Basin for municipal and industrial (coal development) purposes. Positive and negative regional effects of the project were estimated from secondary sources for one county to be affected. Criteria set forth to be used in evaluating reimbursement mechanisms are: (1) efficiency, (2) equity, (3) revenue raising ability, and (4) administrative feasibility. The framework presented facilitates examination of marginal-cost pricing, public finance, and public utility-type reimbursement mechanisms. (Becker-Wisconsin)

W75-10353

**DERIVED DECISION RULES FOR POLLUTION CONTROL IN A GENERAL EQUILIBRIUM SPACE ECONOMY,**
Williams Coll., Williamstown, Mass. Dept. of Economics.
T. H. Tietenberg.
Journal of Environmental Economics and Management, Vol 1, No 1, p 3-16, 1974.

Descriptors: *Pollution abatement, *Decision making, *Pollution taxes(Charges), *Theoretical analysis, Resource allocation, Costs, Tax rates, Welfare(Economics), Mathematical models, Equations, Intangible costs.

The conventional externality model is expanded to include spatial detail and by using this model theorems are provided (which require no information on either damage costs or control costs) as the basis for reducing the information content of desirable pollution control policies. This spatially defined general equilibrium model defines and characterizes cost minimizing and efficient resource allocation. Institutional content is introduced and resource allocations which characterize decentralized equilibria are described in the context of a private ownership space economy containing a government which imposes specific taxes on emitters. Three theorems of the allocations are proven under alternative assumptions, two of which provide a basis for easily computable tax structures. The modified model includes a description of an externality which is related to meteorology and hydrology of air and water pollution. The model was also used to derive a theorem concerning efficient externality control using specific taxes. It is demonstrated that several decision rules which require considerably less information can be derived from this model by sacrificing some but not all of the properties of efficiency. Thus, while there is no focus on optimality of any of the derived decision rules, they do represent alternatives with somewhat more clearly delineated properties. (Auen-Wisconsin)
W75-10360

**POLITICAL PARTICIPATION AND WATER RATES. A CLOSER LOOK,**
California Univ., Santa Barbara.
L. J. Mercer, and W. D. Morgan.
Water Resources Bulletin, Vol 10, No 6, p 1302-1307, 1974. 1 tab, 4 ref.

Descriptors: *Water rates, *Political aspects, *Mathematical models, Average prices, Pricing, Income, Costs, Water districts, Metropolitan Water Dist. of So. Cal.
Identifiers: Public participation.

Patrick Mann's (Water Resources Bulletin Vol 9, No 5: 976-984, Oct 1973) conclusions that increased political activity results in lower water rates are questioned because of potential misspecification of his underlying model and the general weakness of this political variable. Among some other equations evaluated are (1) his results for the Mountain, Pacific, and West North Central states, which are based on the dominance of the Western sub-region without considering the institutional characteristics which exist in the West, particularly in the arid West; the Western states receive water supplied by the Bureau of Reclamation at a price lower than resource costs thus the rate structures would be lower. (2) Some states, particularly California, have granted water agencies access to additional revenue by permitting them to levy a property tax, which Mann's model misspecified by omitting the variable for other revenue sources. (3) The dependent variable should be the average water rate since the quantity for which the minimum rate applies varies widely across water agencies. (4) The political proxy variable used could distort the actual level of political activity. It is concluded that the case for the hypothesis that political influence of residential consumers (as measured by Mann) has significant impact on water rates is less than satisfactory. (Auen-Wisconsin)
W75-10361

**ON THE PEAK-LOAD PRICING OF URBAN WATER SUPPLY,**
Clark Univ., Worcester, Mass. Graduate School of Geography.
S. L. Feldman.
Water Resources Research, Vol 11, No 2, p 355-356, April 1975. 10 ref.

Descriptors: *Water demand, *Prices, Flow measurement, *Peak loads, *Elasticity of demand, Water allocation(Policy), Water costs, *Water supply, Economics, Instrumentation, Data collections, Telemetry, Water measurement, Equity, Pressure head, Water distribution(Applied).
Identifiers: *Peak-load pricing, Maximum day, Peak-hour, *Urban water supply.

Since summer lawn sprinkling water demands account for a large portion of water supply system design, a seasonal commodity charge has been suggested by Hanke and Davis. A more 'responsive' system of charges is proposed that has maximum day and peak-hour (plus fire flow) parameters which account for 85% of municipal water system costs. Thus a peak-hour pricing scheme would encourage restricted consumption at the specific peaks rather than throughout the summer. Fire flow pressure and the social externalities of green lawns could be assured in a more equitable peak-load pricing. Commercial and industrial users and residences with irrigable areas would be fitted with peak load meters if their water use justified the expense. A completely mechanical meter which shifts to different register scales with the decrease in pressure occurs during periods of greater demand could increase the price per gallon during these peak flows periods. Alternatively, remote control telemetering techniques now being used for meter reading could enable the utility to change its customers' meters to a different scale during maximum day and peak-hour periods. Consumers would be encouraged to sprinkle at incentive prices during off-peak hours. Average rates could be lowered as system demand peaks were shaved and troughs filled and the system used more efficiently. (Herr-North Carolina)
W75-10706

**WATER RATES: AN ASSESSMENT OF CURRENT ISSUES,**
California Univ., Berkeley.
S. H. Hanke.
Journal of the American Water Works Association, Vol 67, No 5, p 215-219, May, 1975. 1 fig, 21 ref.

Descriptors: *Water rates, *Pricing, *Water costs, *Water demand, *Economic efficiency, Economics of scale, Unit costs, Average costs, Economic impact, Elasticity of demand, Planning, Financing, Equity, Cost allocation, Incremental income.
Identifiers: Washington Suburban Sanitation Commission(MD), Denver Water Board(CO), East Bay Municipal Utilities District(Oakland CA), Fairfax County Water Authority(VA).

Tradiational water pricing policies have been based on accounting costs. Rate structures have had a fixed charge per unit time and declining-block commodity charges designed to generate needed revenue. Physical and financial planning have been separate activities, as pricing was based on historical average costs. The economic approach bases pricing on marginal or incremental costs, insuring more efficient resource allocation. Prices reflect the value of resources used or saved by a change in consumption. Demand, and therefore physical planning, depends in part on the price per unit of water. Rate structures u
average costs create the illusion of uniform co
Most major water system facilities are desig
for maximum day demands determined
seasonal use The greatest use peak is du
summer lawn irrigation. Uniform prices aver
over the seasons understate peak-load increme
costs, inefficiently encouraging peak-load
sumption. Likewise over space, costly distribu
to low density development, when charged
uniform rates of less expensive high density
tribution areas, tends to understate costs and
sidize population diffusion and urban sprawl.
Washington Suburban Sanitation Commis
Denver Water Board, East Bay Municipal U
District, and Fairfax County Water Auth
economic-based rate structures are outlined
cited as important steps toward conserva
equity, and economic efficiency objectives. (H
North Carolina)
W75-10707

**FINANCING WATER WORKS,**
Studley Shupert and Co., Inc., Boston, Mass.
For primary bibliographic entry see Field 3D.
W75-10712

**AN ECONOMIC MODEL OF WASTE RECOVERY, REPROCESSING AND DISTR TION SYSTEMS,**
Environmental Quality Systems, Inc., Rock
Md.
For primary bibliographic entry see Field 5D.
W75-10768

**NUCLEAR POWER PLANT COOLING SYS SELECTION,**
Kaiser Engineers, Oakland, Calif.
S. C. Ko.
Journal of the Power Division, Proceedin
ASCE, Vol 101, No PO1, Proceedings pap
11405, p 55-67, July 1975. 6 tab, 6 ref.

Descriptors: *Nuclear powerplants, *C
water, *Alternative planning, *Decision m
Optimization, Quality control, *Cooling
Evaluation, Economics, Constraints, Lan
Recreation, Systems analysis, Water resour
Identifiers: *Cooling systems, *Environmen
pact statements, *Cost-effectiveness, *Fix
fectiveness approach, Sensitivity analysis
minimization, Cooling efficiency, Spray cha

A slightly modified version of Kazan
method of cost-effectiveness was used to i
the optimal cooling system for a 4,40
nuclear power plant. Three alternate
systems were analyzed: (1) recirculating
pond; (2) recirculating spray channel; an
combination of spray channel and cooling
Each of the three alternative cooling syste
evaluated and analyzed against a set of cri
satisfy the goals of minimal environmental i
least-cost expenditure, and maximum cooli
ciency. Since the fixed-effectiveness appro
opposed to the fixed-cost approach, was
all alternate systems were designed and op
for meeting thermal performance and efflue
trol specifications. The following effecti
criteria were used to evaluate the differen
fectiveness of each system: ecological i
thermal performance, recreational potenti
system flexibility. The pitfalls of making a
endorsement of a system were examined
sensitivity analysis; considered was a fourt
native, a closed cooling pond with sufficie
face area to dissipate the heat load require
supplemental system for cooling the blown
The dangers and fallacies of weighting and
were considered. This cost-effectiveness
with a tabular display presented facts to d
makers both quantitatively and qualitative
conclusions focused on specific items. (B
nell)
W75-10822

IVATION OF RESERVOIR OPERATING
ES BY ECONOMIC ANALYSIS,
tucky Water Resources Inst., Lexington.
primary bibliographic entry see Field 4A.
-10825

LYSIS OF RESERVOIR RECREATION
EFITS,
ucky Water Resources Inst., Lexington.
rimary bibliographic entry see Field 6B.
-10826

EFFECT OF LANDOWNER ATTITUDE ON
FINANCIAL AND THE ECONOMIC
TS OF ACQUIRING LAND FOR A LARGE
IC WORKS PROJECT,
ucky Water Resources Inst., Lexington.
rimary bibliographic entry see Field 6B.
10827

EW OF THE ECONOMIC BENEFITS AND
'S RESULTING FROM DEWEY RESER-
,
ucky Water Resources Inst., Lexington.
rimary bibliographic entry see Field 6B.
10828

## Water Demand

STRIAL INTERDEPENDENCIES AND EX-
AL DISECONOMIES OF WATER
URCES,
n Univ., Alabama. Dept. of Economics.
imary bibliographic entry see Field 6B.
0358

ENOUS PEOPLES OF POLAR DESERTS,
tment of Indian Affairs and Northern
opment, Ottawa (Ontario).
Rowley.
lar Deserts and Modern Man, T. L. Smiley
H. Zumberge, eds., University of Arizona
Tucson, p 99-101, 1974. 18 ref.

ptors: *Polar regions, Social mobility,
g, *Government supports, *Lakes, Fishing.
iers: Eskimos, Tree-line, Whales, Walrus,
Kayak.

ligenous people of the Arctic are discussed,
mphasis on their means of survival and
e. In the Arctic man cannot live totally on
roduction, but must depend heavily upon
d sea-mammals from rivers, lakes and the
North America the indigenous people are
imos, who depend upon seals, whales, and
for fuel, clothing, and food. Main charac-
s of the North American Eskimos that have
them are (1) skill in hunting and technolo-
nobility, (3) social structure, (4) mutual de-
ce, and (5) patience and emotional control.
ment services such as schools, nursing sta-
nd housing have been provided to help the
. Major governmental problems in the
esert today are (1) helping to strengthen
nal ways by providing amenities for the
s who wish to follow this lifestyle, and (2)
those who wish to make the difficult
on to the technological age. (Garrettson-
)
460

ATION OF GROUND WATER
RCES: SACRAMENTO COUNTY,
ia State Dept. of Water Resources, Sacra-

ary bibliographic entry see Field 2F.
546

**WATER FOR INDUSTRIAL DEVELOPMENT IN ALCORN, ITAWAMBA, PRENTISS, AND TISHOMINGO COUNTIES, MISSISSIPPI,**
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 3E.
W75-10581

**ON THE PEAK-LOAD PRICING OF URBAN WATER SUPPLY,**
Clark Univ., Worcester, Mass. Graduate School of Geography.
For primary bibliographic entry see Field 6C.
W75-10706

**WATER RATES: AN ASSESSMENT OF CURRENT ISSUES,**
California Univ., Berkeley.
For primary bibliographic entry see Field 6C.
W75-10707

**THE MASTER PLAN FOR WATER-SUPPLY IN THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON,**
Ottawa-Carleton Regional Municipality, Ottawa (Ontario).
For primary bibliographic entry see Field 3D.
W75-10710

**WATER WORKS IMPROVEMENTS--SPRINGFIELD, VERMONT,**
Dvfresne-Henry Engineering Corp., North Springfield, Vt.
For primary bibliographic entry see Field 3D.
W75-10713

**ECONOMIC IMPACT OF THE CONVERSION OF WATER FROM IRRIGATION TO MUNICIPAL AND INDUSTRIAL USE IN THE RIO GRANDE BASIN OF NEW MEXICO,**
New Mexico State Engineer, Santa Fe.
E. A. Lewis.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 67-84, 1974. 18 ref.

Descriptors: *Water policy, *Irrigation water, *Municipal water, *Industrial water, *New Mexico, *Rio Grande River, Projections, Planning, Urbanization, Estimating, Water allocation(Policy), Model studies, Mathematical models, Economics, Irrigation, Industry, Agriculture, Rivers, Groundwater, Water utilization, Water requirements.

The preparation of a planning report on the New Mexico State Water Plan is under way. Assuming augmentation is not available and if projected requirements are to be met, there will have to be changes in water use. An economic model may provide a means of measuring the economic impacts of such changes. This model is a linear programming model designed to represent New Mexico's economy. Retiring irrigation water rights to meet municipal, industrial, and recreational water demands is presently taking place in the state. It is assumed this will continue. The logic of this assumption is based on economics and the fact that irrigation is the only use which is large enough to supply the anticipated increased demands for water. The model is being used to project the water uses in the Rio Grande Basin of New Mexico to 1980, 2000, and 2020, using 1970 data as input, The economic impacts of these changes in water uses are being evaluated. Due to some difficulties in model building, reasonable results were not obtained in time for this paper. The water problems of the Rio Grande Basin were discussed, and the model was described. (See also W75-10769) (Sims-ISWS)
W75-10771

**IMPACTS OF RURAL TO URBAN WATER USE,**
Texas Office of the Governor, Austin. Water Task Force.
J. O. Williams.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 85-98, 1974. 2 fig, 3 tab, 1 ref.

Descriptors: *Water policy, *Urbanization, *Water demand, Urban sociology, Land use, Economics. Water importing, Groundwater, Irrigation, *Municipal water, Environmental effects, Social impact, Social change, Political aspects, Federal government, State governments, Governmental interrelations, Population, Distribution patterns, Water use, Water supply.

In 1930, 43.7% of the nation's population was classified by the Bureau of Census as residing in rural areas, with the remaining 56.3% identified as urban dwellers. By 1970, the rural population had dropped to 26.5% and the percentage of urban inhabitants had climbed to 73.5%. In 1930, out of a total water withdrawal of 110 billion gallons per day for all purposes, 60 billion gallons per day were used in irrigated agriculture, 8 billion gallons per day for public water utilities, 2.9 billion gallons per day for rural domestic uses, 21 billion gallons per day for industrial and miscellaneous, and 18 for steam electric utilities. By 1970, total water withdrawal had more than tripled to 370 billion gallons per day, irrigation use had more than doubled to 130 billion gallons per day, and public water utilities accounted for 27 billion gallons per day. A substantial research effort should go into the development of methodologies that would enable the state and federal levels of government to address the entire spectrum of land and water use problems that have been associated with or caused by the rural to urban shift that has taken place in this nation. (See also W75-10769) (Sims-ISWS)
W75-10772

## 6E. Water Law and Institutions

**INTERNATIONAL PRODUCTION ASPECTS OF WATER AND ENVIRONMENTAL QUALITY CONTROL,**
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-10357

**POLLUTION CONTROL AND OPTIMAL TAXATION: A STATIC ANALYSIS,**
University Coll., London (England). Dept. of Political Economy.
W. Beckerman, and A. Markandya.
Journal of Environmental Economics and Management, Vol 1, p 43-52, 1974. 3 ref.

Descriptors: *Pollution taxes(Charges), Marginal costs, Resource allocation, Mathematical studies, Tax rates, Marginal costs.

Those concerned with controlling pollution by taxation face the difficulty of identifying the optimum tax and often there is the problem of deciding how it is more economical to clean up pollutants by some collective private or public facility than to induce polluters to abate their own effluent in an uncoordinated manner in response to a pollution tax or direct regulation. A theoretical model is devised which features the introduction, into both the comsumption and production function of the economy of (1) the pollutant and (2) some 'anti-pollutant,' such as water purification facilities or soundproofing--to be regarded as 'bads' and 'anti-bads,' which contribute to the identification of an optimum tax for the generation of pollutants when both 'anti-bands' and 'bads' are included in the utility function. 'Bads' and 'anti-bads' are introduced via a technological tradeoff relationship

with substitution allowed. In some instances in order to determine the optimum tax it may not be important to know the marginal damage function. The tradeoffs between private actions to reduce the effect of pollutants and collective provisions for pollutant control are analyzed. Under certain circumstances the appropriate tax on polluters can be calculated from observed defensive behavior of the receptors. (Auen-Wisconsin)
W75-10359

**NEW LEGISLATIVE TENDENCIES FOR CONTROL OF WATER POLLUTION (NUEVAS TENDENCIAS LEGISLATIVAS EN EL CONTROL DE LA CONTAMINACION DE LAS AGUAS),**
Centros de Estudios, Investigaciones y Aplicaciones del Agua, Granada (Spain).
For primary bibliographic entry see Field 5G.
W75-10384

**THE LOWER COLORADO RIVER: A BIBLIOGRAPHY,**
Arizona Western Coll., Yuma.
For primary bibliographic entry see Field 10C.
W75-10453

**SAFE DRINKING WATER HAS BECOME A FEDERAL CASE.**
For primary bibliographic entry see Field 5G.
W75-10469

**EPA'S EFFLUENT GUIDELINES HAVE THEIR DAY IN COURT.**
For primary bibliographic entry see Field 5G.
W75-10470

**P. L. 92-500 (TWO YEARS LATER) IS NOT THE ANSWER,**
For primary bibliographic entry see Field 5G.
W75-10471

**MANUAL FOR PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS FOR WASTEWATER TREATMENT WORKS, FACILITIES PLANS, AND 208 AREAWIDE WASTE TREATMENT MANAGEMENT PLANS,**
Environmental Protection Agency, Washington, D.C. Office of Federal Activities.
For primary bibliographic entry see Field 5D.
W75-10473

**INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.**
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W75-10547

**INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.**
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W75-10548

**INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.**
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W75-10549

**INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.**
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W75-10550

**REPORT ON THE RIVER MASTER OF THE DELAWARE RIVER FOR THE PERIOD DECEMBER 1, 1973-NOVEMBER 30, 1974,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W75-10589

**THE LAWS AND THEIR ENFORCEMENT; PROGRESS AMIDST PROBLEMS,**
For primary bibliographic entry see Field 5G.
W75-10607

**PROGRAM FOR CONTROL OF DISCHARGES OF POLLUTANTS TO NAVIGABLE WATERS.**
For primary bibliographic entry see Field 5G.
W75-10608

**DISPOSAL OF USED CRANKCASE AND OTHER OILS IN CANADA,**
Department of the Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 5D.
W75-10743

**ENVIRONMENTAL ACTION AT PORT AUTHORITY AIRPORTS,**
Port Authority of New York and New Jersey.
For primary bibliographic entry see Field 5G.
W75-10748

**WASTE OIL--SOLUTION TO MARYLAND'S ENERGY CRISIS,**
Maryland Environmental Service, Annapolis.
For primary bibliographic entry see Field 5D.
W75-10762

**MASSACHUSETTS WASTE OIL MANAGEMENT ACTIVITIES,**
Massachusetts Water Resources Commission, Boston. Div. of Water Pollution Control.
For primary bibliographic entry see Field 5D.
W75-10763

**USERS' VIEW OF WEATHER MODIFICATION,**
Kansas State Senate, Topeka. 39th District.
For primary bibliographic entry see Field 3B.
W75-10776

**WELLTON-MOHAWK DRAINAGE AND THE MEXICAN SALT PROBLEM,**
Wellton-Mohawk Irrigation and Drainage District, Ariz.
For primary bibliographic entry see Field 4A.
W75-10783

**AMENDMENTS TO THE WATER ACT,**
For primary bibliographic entry see Field 5G.
W75-10835

**THE CONSEQUENCES OF ACCEPTING INDUSTRIAL WASTES INTO SEWERS; WATER POLLUTION RESEARCH AT STEVENAGE,**
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5D.
W75-10842

## 6F. Nonstructural Alternatives

**FLOOD PLAIN INFORMATION: OUACHITA RIVER, HOT SPRINGS CREEK, STOKES CREEK, MOLLY CREEK, GULPHA CREEK, CITY OF HOT SPRINGS, ARKANSAS.**
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W75-10559

**FLOOD PLAIN INFORMATION: BUSHKILL CREEK, VICINITY OF EASTON, PENNSYLVANIA.**
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W75-10560

**FLOOD PLAIN INFORMATION: BLOOMSBURG, COLUMBIA COUNTY, PENNSYLVANIA-SUSQUEHANNA RIVER.**
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W75-10561

**FLOOD PLAIN INFORMATION: BRANDYWINE CREEK, CHESTER COUNTY, PENNSYLVANIA.**
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W75-10562

**FLOOD PLAIN INFORMATION: GOLDSMITH GULCH, DUTCH CREEK, LILLEY GULCH, AND COON CREEK, VOLUME VI, DENVER METROPOLITAN REGION, COLORADO.**
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W75-10563

**FLOOD PLAIN INFORMATION: MEADOW CREEK, ALBEMARLE COUNTY AND CHARLOTTESVILLE, VIRGINIA.**
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-10564

**FLOOD PLAIN INFORMATION: MACON COUNTY, ILLINOIS.**
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 4A.
W75-10565

**FLOOD PLAIN INFORMATION: EAST FORK ONE HUNDRED AND TWO RIVER, BEDFORD, IOWA.**
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4A.
W75-10566

**FLOOD PLAIN INFORMATION REPORT: SENECA CREEK, MONTGOMERY COUNTY, MARYLAND.**
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W75-10567

**FLOOD PLAIN INFORMATION: MILL RUN BLAIR COUNTY, PENNSYLVANIA.**
Army Engineer District, Baltimore.
For primary bibliographic entry see Field 4A.
W75-10568

**SPECIAL FLOOD HAZARD INFORMATION REPORT: CHICKASAWHAY RIVER WAYNESBORO, WAYNE COUNTY, MISSISSIPPI.**
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 4A.
W75-10569

**FLOOD PLAIN INFORMATION: BROOKINGS BROOKINGS COUNTY, SOUTH DAKOTA VOLUME I - DEER CREEK.**
Army Engineer District, Omaha, Neb.
For primary bibliographic entry see Field 4A.
W75-10570

OD PLAIN INFORMATION: WHITE CLAY
EK, NEW CASTLE COUNTY, DELAWARE.
Engineer District, Philadelphia, Pa.
rimary bibliographic entry see Field 4A.
10571

OD PLAIN INFORMATION: SHABAKUNK
K, WEST BRANCH SHABAKUNK AND
LE SHABAKUNK CREEKS, MERCER
TY, NEW JERSEY.
Engineer District, Philadelphia, Pa.
imary bibliographic entry see Field 4A.
0572

D PLAIN INFORMATION: CATOMA
K, VICINITY OF MONTGOMERY,
AMA.
Engineer District, Mobile, Ala.
imary bibliographic entry see Field 4A.
0574

D PLAIN INFORMATION: UPPER RIVER
E, MINNOW POND DRAIN, BELL
CH AND TARABUSI CREEK, WAYNE
AKLAND COUNTIES, MICHIGAN.
Engineer District, Detroit, Mich.
mary bibliographic entry see Field 4A.
0575

D PLAIN INFORMATION: WEST
CH SUSQUEHANNA RIVER, LYCOMING
TY, PENNSYLVANIA.
Engineer District, Baltimore, Md.
mary bibliographic entry see Field 4A.
0576

D PLAIN INFORMATION: FALLING
K, CHESTERFIELD COUNTY, VIR-
Engineer District, Norfolk, Va.
nary bibliographic entry see Field 4A.
577

D PLAIN INFORMATION: JAMES
EAGLE ROCK TO LICK RUN,
OURT COUNTY, VIRGINIA.
ngineer District, Norfolk, Va.
nary bibliographic entry see Field 4A.
578

PLAIN INFORMATION: JOHNSON
AND TRIBUTARY, CHESTERFIELD
Y, VIRGINIA.
ngineer District, Norfolk, Va.
nary bibliographic entry see Field 4A.
579

ONMENTAL ISSUES, EFFECTS, AND
ONS,
servation Service, Washington, D.C.
nary bibliographic entry see Field 6G.
95

## cologic Impact Of
## ter Development

ETICAL AND APPLIED CONCEPTS OF
RESOURCES FOR SOCIAL WELFARE.
Univ., Alabama. Dept. of Economics.
ary bibliographic entry see Field 6B.
54

S. TRUMAN DAM AND RESERVOIR,
RIVER, MISSOURI, APENDIX A
ENVIRONMENTAL IMPACT STATE-
gineer District, Kansas City, Mo.
ary bibliographic entry see Field 8A.

W75-10363

**MANUAL FOR PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS FOR WASTEWATER TREATMENT WORKS, FACILITIES PLANS, AND 208 AREAWIDE WASTE TREATMENT MANAGEMENT PLANS,**
Environmental Protection Agency, Washington, D.C. Office of Federal Activities.
For primary bibliographic entry see Field 5D.
W75-10473

**EFFECTS OF AN OFFSHORE CRUDE OIL UNLOADING TERMINAL ON THE MARINE ENVIRONMENT,**
Texas A and M Univ., College Station. Environmental Engineering Div.
For primary bibliographic entry see Field 5C.
W75-10642

**LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION, PHYSICAL MODEL FEASIBILITY STUDY,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10670

**RIVERS IN THE CITY,**
For primary bibliographic entry see Field 6B.
W75-10723

**ENVIRONMENTAL ISSUES, EFFECTS, AND SOLUTIONS,**
Soil Conservation Service, Washington, D.C.
L. A. Brown.
In: Agricultural and Urban Considerations In Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 511-528, 1974. 10 ref.

Descriptors: *Environmental effects, *Channel improvement, *Flood control, *Engineering structures, Environment, Environmental engineering, Project planning, Erosion control, Sediment control, Soil conservation, Economic justification, Costs, Project benefits, Trees, Wetlands, Drainage, Ecology, Hardwood, Streams, Water table.
Identifiers: Bottomland clearing.

Conservationists and environmentalists feel strongly that channel projects are in many cases unnecessarily damaging the natural amenities of streams and streamsides. Most frequent criticisms concern draining of wetlands, cutting off oxbows and meanders, clearing bottomland hardwoods, and altering water tables. Criticism has extended to the economic justification, formulation, and operation and maintenance of federally assisted projects. This concern is countered by the need to protect and improve the human environment, the quality of other natural resources, and our standard of living. Compromise between these values is essential if we are to maintain our standard of living and reasonably protect our environment. About 34,240 miles in 1630 federal or federally assisted projects have been modified or planned for modification by the Corps of Engineers and the Soil Conservation Service. Beginning largely with the National Environmental Policy Act of 1969, major changes began taking place in the formulation of federally assisted water development projects. Engineers can substantially minimize adverse environmental impacts by using imaginative designs. Cost sharing for nonstructural measures should be equated with those for structural measures to promote objective development in the best interest of the public. (See also W75-10769) (Sims-ISWS)
W75-10795

**PROBLEMS OF WATER QUALITY MANAGEMENT IN WESTERN RIVER BASIN SYSTEMS,**
California Univ., Los Angeles. Coll. of Engineering.
For primary bibliographic entry see Field 5G.
W75-10804

**NUCLEAR POWER PLANT COOLING SYSTEM SELECTION,**
Kaiser Engineers, Oakland, Calif.
For primary bibliographic entry see Field 6C.
W75-10822

# 7. RESOURCES DATA

## 7A. Network Design

**HOURLY RAINFALL GENERATION FOR A NETWORK,**
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 2B.
W75-10515

**AN AUTOMATIC DATA ACQUISITION AND REDUCTION SYSTEM,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
R. A. Sommerfeld.
Research Note RM-260, April 1974. 4 p, 5 fig.

Descriptors: On-site data collection, Data processing, Instrumentation, Automation.
Identifiers: Data acquisition, Data reduction.

A system for recording and automatically reducing up to 41 channels slowly varying data has been designed. For recording, the data are multiplexed into a very slow speed, analog tape recorder. Playback can be done at speeds up to 1000 times as fast as the recording speed, using a 60 IPS tape playback unit. A digital clock provides time control and the data are digitized and punched onto paper tape at playback. The paper tape can then be used to input the data to conventional computer systems for various analysis and editing operations. The cost of the system is comparable to high reliability strip charts, for the same number of channels. Total system accuracy for input voltages in the ranges plus or minus 0.1 to plus or minus 10 v is plus or minus 0.3 percent. (Forest Service)
W75-10652

## 7B. Data Acquisition

**MULTICHANNEL TOXICANT INJECTION SYSTEM FOR FLOW-THROUGH BIOASSAYS,**
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 5A.
W75-10443

**LABORATORY MEASUREMENT OF SURFACE TEMPERATURE FLUCTUATIONS INDUCED BY SMALL AMPLITUDE SURFACE WAVES,**
TRW Systems Group, Redondo Beach, Calif. Engineering Sciences Lab.
For primary bibliographic entry see Field 2L.
W75-10505

**MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF PEATS,**
Guelph Univ. (Ontario). Dept. of Botany and Genetics.
T. S. Dai, and J. H. Sparling.
Canadian Journal of Soil Science, Vol 53, No 1, p 21-26, 1973, Illus. (Fr. summ.).

Descriptors: *Hydraulic conductivity, *Peat, *Canada, Measurement, Darcys Law, Bogs, Fen, Piezometers, Piezometry.

The measurement of hydraulic conductivity of peats in a northeastern Ontario, Canada, peatland is described. Several sizes of piezometer were tested and revealed little effect on the hydraulic conductivity. Various lengths of piezometer chamber were used to measure both vertical and horizontal components of hydraulic conductivity at a number of sites. Open bog sites had a higher vertical component of hydraulic conductivity than the poor fen site. The poor fen site exhibited a greater dependence of the hydraulic conductivity on piezometer chamber length than the open bog site, indicating a greater horizontal component of the hydraulic conductivity. A significant correlation between the differential heads and hydraulic conductivity is demonstrated. This indicates a deviation of Darcian flow in the peatland. The ratios of differential heads in piezometer are constant however, and therefore the proportionality of Darcy's Law is exhibited by the piezometer method.--Copyright 1973, Biological Abstracts, Inc.
W75-10536

**ERROR ANALYSIS OF DOBSON SPECTROPHOTOMETER MEASUREMENTS OF THE TOTAL ATMOSPHERIC OZONE CONTENT,**
National Aeronautics and Space Administration, Wallops Island, Va. Wallops Station.
A. C. Holland, and R. W. L. Thomas.
Available from the National Technical Information Service, Springfield, Va 22161 as NASA TN D-7877, $3.75 in paper copy, $2.25 in microfiche. NASA Technical Note D-7877, March 1975. 29 p, 8 fig, 6 tab, 13 ref, 1 append.

Descriptors: *Ozone, *Measurement, *Spectrometers, *Radiation, Spectrophotometry, Model studies, Atmosphere, Absorption, Solar radiation, Monte Carlo method, Mathematical studies, Aerosols, Remote sensing.
Identifiers: *Dobson spectrophotometer, Error analysis.

The amount of ozone present in the earth's atmosphere is of considerable interest to the scientific community because of its role in the transfer of solar energy in the atmosphere, absorbing harmful ultraviolet radiation, and providing a source of thermal energy in the stratosphere. The Dobson spectrophotometer has served as a standard ground-based instrument for the measurement of total atmospheric ozone for over two decades. In order to assess the accuracy of the total ozone inferred from Dobson measurements a study was initiated several years ago. The first phase of that study concluded that single and multiple scattering can contribute significant errors to the amount of ozone inferred from direct sun measurements. This report described the second phase of the study which was concerned with the errors in the total ozone amount estimated from Dobson direct sun measurements for standard atmospheres ranging from tropical through subarctic conditions. (Sims-ISWS)
W75-10545

**DEVICES FOR TOXICOLOGICAL LONG-TERM STUDIES ON AQUATIC ORGANISMS (GERATE ZUR DURCHFUHRUNG TOXIKOLOGISCHER LANGZEITSTUDIEN AN WASSERORGANISMEN),**
Farbwerke Hoechst, Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 5A.
W75-10618

**ANALOG TEMPERATURE RECORDS FROM A LINEARIZED THERMISTOR NETWORK,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
R. A. Schmidt.
Research Note RM-286, May 1975. 4 p, 5 fig, 2 ref.

Descriptors: *Temperature, *Thermometer, *Air temperature, Instrumentation, Meteorology, Integrated circuits, Measurement, Networks.
Identifiers: Thermistor network, Analog temperature records.

To overcome the inherent disadvantage of nonlinear output, a system was developed consisting of a thermistor network and operational amplifiers to produce a linear analog temperature record, either on strip charts or magnetic tape. (Forest Service)
W75-10650

**AUTOMATED SEQUENTIAL COMPOSITE SAMPLING. A NEW TECHNIQUE FOR WATER POLLUTION STUDY AND CONTROL,**
N-Con Systems Co., Inc., Larchmont, N.Y.
For primary bibliographic entry see Field 5A.
W75-10690

**A GRAVITY-FLOW COLUMN TO PROVIDE PESTICIDE-LADEN WATER FOR AQUATIC BIOASSAYS,**
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W75-10844

## 7C. Evaluation, Processing and Publication

**REMOVAL OF PERIODICITIES BY DIFFERENCING AND MONTHYL MEAN SUBTRACTION,**
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-10352

**GENERAL ASPECTS OF MULTIVARIATE ANALYSIS WITH APPLICATIONS TO SOME PROBLEMS IN HYDROLOGY,**
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 2A.
W75-10510

**DEVELOPING REGIONAL STOCHASTIC DATA BASES,**
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 2E.
W75-10528

**A TWO-DISTRIBUTION METHOD FOR FITTING MIXED DISTRIBUTIONS IN HYDROLOGY,**
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2E.
W75-10531

**DAILY TEMPERATURE AND SALINITY OF SURFACE WATER OF PATUXENT RIVER AT SOLOMONS, MARYLAND, BASED ON 30 YEARS OF RECORDS (1938-1967),**
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 2E.
W75-10535

**NONLINEAR CHANNEL ROUTING BY COMPUTER,**
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-10543

**INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.**
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W75-10547

**INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.**
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W75-10548

**INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.**
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W75-10549

**PEDOLOGIC COVER OF THE WATERSHED OF THE PORECKA RIVER,**
Institute for Soil Research, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 2A.
W75-10551

**FLOOD PLAIN INFORMATION: OUACHITA RIVER, HOT SPRINGS CREEK, STOKES CREEK, MOLLY CREEK, GULPHA CREEK, CITY OF HOT SPRINGS, ARKANSAS.**
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W75-10559

**FLOOD PLAIN INFORMATION: BUSHKILL CREEK, VICINITY OF EASTON, PENNSYLVANIA.**
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W75-10560

**FLOOD PLAIN INFORMATION: BLOOMSBURG, COLUMBIA COUNTY, PENNSYLVANIA-SUSQUEHANNA RIVER.**
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W75-10561

**FLOOD PLAIN INFORMATION: BRANDYWINE CREEK, CHESTER COUNTY PENNSYLVANIA.**
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W75-10562

**FLOOD PLAIN INFORMATION: GOLDSMITH GULCH, DUTCH CREEK, LILLEY GULCH AND COON CREEK, VOLUME VI, DENVER METROPOLITAN REGION, COLORADO.**
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W75-10563

**FLOOD PLAIN INFORMATION: MEADOW CREEK, ALBEMARLE COUNTY AND CHARLOTTESVILLE, VIRGINIA.**
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-10564

**FLOOD PLAIN INFORMATION: MACON COUNTY, ILLINOIS.**
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 4A.
W75-10565

PLAIN INFORMATION: EAST FORK
NDRED AND TWO RIVER, BEDFORD,

gineer District, Kansas City, Mo.
ary bibliographic entry see Field 4A. .
56

PLAIN INFORMATION REPORT:
CREEK, MONTGOMERY COUNTY,
ND.
gineer District, Baltimore, Md.
ry bibliographic entry see Field 4A.
7

PLAIN INFORMATION: MILL RUN,
OUNTY, PENNSYLVANIA.
gineer District, Baltimore.
ry bibliographic entry see Field 4A.
8

FLOOD HAZARD INFORMATION
CHICKASAWHAY RIVER,
BORO, WAYNE COUNTY, MISSISSIP-

gineer District, Mobile, Ala.
ry bibliographic entry see Field 4A.
9

LAIN INFORMATION: BROOKINGS,
NGS COUNTY, SOUTH DAKOTA,
I - DEER CREEK.
ineer District, Omaha, Neb.
ry bibliographic entry see Field 4A.
0

LAIN INFORMATION: WHITE CLAY
NEW CASTLE COUNTY, DELAWARE.
ineer District, Philadelphia, Pa.
ry bibliographic entry see Field 4A.
1

LAIN INFORMATION: SHABAKUNK
WEST BRANCH SHABAKUNK AND
SHABAKUNK CREEKS, MERCER
NEW JERSEY.
ineer District, Philadelphia, Pa.
ry bibliographic entry see Field 4A.
2

PLAIN INFORMATION: CATOMA
VICINITY OF MONTGOMERY,
A.
ineer District, Mobile, Ala.
ry bibliographic entry see Field 4A.
3

LAIN INFORMATION: UPPER RIVER
MINNOW POND DRAIN, BELL
AND TARABUSI CREEK, WAYNE
LAND COUNTIES, MICHIGAN.
ineer District, Detroit, Mich.
ry bibliographic entry see Field 4A.
4

PLAIN INFORMATION: WEST
SUSQUEHANNA RIVER, LYCOMING
PENNSYLVANIA.
neer District, Baltimore, Md.
y bibliographic entry see Field 4A.
5

PLAIN INFORMATION: FALLING
CHESTERFIELD COUNTY, VIR-

neer District, Norfolk, Va.
y bibliographic entry see Field 4A.

**FLOOD PLAIN INFORMATION: JAMES RIVER, EAGLE ROCK TO LICK RUN, BOTETOURT COUNTY, VIRGINIA.**
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-10578

**FLOOD PLAIN INFORMATION: JOHNSON CREEK AND TRIBUTARY, CHESTERFIELD COUNTY, VIRGINIA.**
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-10579

**FLOOD HAZARDS IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,**
Geological Survey, Tacoma, Wash.
B. L. Foxworthy, and E. G. Nassar.
Open-file report (Basic-data contribution 5), 1975. 1 sheet, 2 fig, 11 ref.

Descriptors: *Floods, *Flood damage, *Flood control, *Washington, Streamflow, Runoff, Maps, Snowmelt, Mudflows, Glaciers, Volcanoes, Hydrologic data, Evaluation, Planning, Urban hydrology.
Identifiers: *Flood hazards, *Seattle-Tacoma area(Wash), Coastal flooding.

This one-sheet atlas of the Seattle-Tacoma urban area, Washington, Briefly describes flood hazards, including some that may be unique to the Puget Sound basin; indicates the parts of the area for which flood-hazard data are available; and lists the main sources of hydrologic information that is useful for flood-hazard analysis in conjunction with long-range planning. By far the most common type of flooding in the Pudget Sound basin is that caused by excessive runoff from storm precipitation, often augmented by melting of snow. This is the type of flooding to which most of the existing flood-hazard data pertain. As the floodwaters rise and spread farther across the flood plain, increasingly larger floodflows can be accommodated with only small additional rises in water levels. Accordingly, a flood having a recurrence interval of 100 years may not inundate much more land than a flood of 50-year recurrence interval. The relative flood stages of a typical, unregulated stream are shown diagrammaticall. (Woodard-USGS)
W75-10580

**GROUND-WATER LEVELS IN NEW MEXICO, 1972,**
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4B.
W75-10582

**INDEX TO WATER RESOURCES DATA FOR LOUISIANA: SURFACE WATER RECORDS; WATER-QUALITY RECORDS.**
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 5A.
W75-10590

**HYDROGEOLOGIC DATA FOR THE FARMINGTON RIVER BASIN, CONNECTICUT,**
Geological Survey, Hartford, Conn.
H. T. Hopkins, and E. H. Handman.
Connecticut Water Resources Bulletin No 28, 1975. 49 p, 1 fig, 1 plate, 5 tab, 9 ref.

Descriptors: *Hydrologic data, *Groundwater resources, *Basic data collections, *Test wells, *Connecticut, Massachusetts, Water wells, Drilling, Well data, Water levels, Pumping, Water yield, Drawdown, Observation wells, Drillers logs, Aquifer characteristics, Geology, Water utilization.
Identifiers: *Farmington River basin(Conn).

Hydrologic and geologic data were collected and compiled by the U.S. Geological Survey in cooperation with the Connecticut Department of Environmental Protection as part of a water resources investigation of the Farmington River basin, Connecticut. The Farmington River drains a 601-square-mile area in southwestern Massachusetts and north-central Connecticut. As defined for this report the Farmington River basin is restricted to 416 square miles in Connecticut. Some supporting data were collected in Massachusetts. The study area includes all or parts of the following towns: Avon, Barkhamsted, Bristol, Burlington, Canton, Colebrook, East Granby, Farmington, Granby, Hartland, Harwinton, New Hartford, Norfolk, Plainville, Plymouth, Simsbury, Suffield, Torrington, Winchester, and Wolcott. Data were collected from July 1970 to December 1972 and are supplemented by data collected during previous investigations. Fifty-three test holes were augered in areas of stratified drift. Logs are tabulated for these test holes and sieve analyses are shown for samples collected from selected holes. (Woodard-USGS)
W75-10591

**HYDROLOGICAL DATA FROM WELLS IN SOUTHWEST HILLSBOROUGH COUNTY, FLORIDA, 1950-74,**
Geological Survey, Tallahassee, Fla.
A. D. Duerr.
Open-file report FL 74031, 1975. 53 p, 3 fig, 4 tab, 5 ref.

Descriptors: *Hydrologic data, *Water wells, *Florida, *Basic data collections, Water levels, Water quality, Chemical analysis, Well data.
Identifiers: *Southwest Hillsborough County(Fla).

A study of the water resources of southwest Hillsborough County, Fla., was made during 1971-74 to determine the hydrologic effects of groundwater withdrawals on water levels and water quality in a coastal area undergoing rapid urbanization. The study area includes about 200 square miles of southwest Hillsborough County adjacent to Tampa Bay and Manatee County. Data from 258 wells tapping the artesian aquifers include tables of well records, water-level measurements, and water-quality analyses of samples collected. In addition, earlier data published by Peek (1959) and Menke, Meredith, and Wetterhall (1961 and 1964) are included to show water-level and water-quality changes in selected wells over a 20-year period. (Woodard-USGS)
W75-10593

**MAP OF THE ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA, SHOWING GROUND-WATER SUBUNITS AND AREAS, LOCATION OF WELLS, AND WATER-LEVEL CONTOURS FOR SPRING 1974,**
Geological Survey, Menlo Park, Calif.
J. H. Koehler.
Open-file map, 1974. 1 sheet, 1 map.

Descriptors: *Maps, *Water levels, *Groundwater, *Water wells, *California, Contours, Sites, Stations, Aquifers, Groundwater basins.
Identifiers: *Antelope Valley area(Calif).

This map, scale 1/2 inch equals approximately 1 mile, of the Antelope Valley -- East Kern Water Agency Area, California, shows groundwater subunits and areas, location of wells, and water-level contours for spring 1974. Well locations for monitoring water-quality changes also are shown. (Woodard-USGS)
W75-10595

**HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS METROPOLITAN AREA, 1973,**
Geological Survey, Austin, Tex.
B. B. Hampton.

Open-file report, May 1975. 129 p, 3 fig, 5 tab.

Descriptors: *Hydrologic data, *Urban hydrology, *Floods, *Urbanization, *Texas, Flood frequency, Flood peak, Flood profiles, Data collections, Rainfall, Runoff, Storms, Evaluation, Mass curves, Hydrographs.
Identifiers: *Fort Worth(Tex).

In October 1968, the Geological Survey in cooperation with the city of Fort Worth Department of Public Works began a program of hydrologic investigations on several small streams in Fort Worth, Tex. The investigations are designed to evaluate factors affecting floods on small streams in the metropolitan area. Studies of additional streams, one of which drains beneath the impervious area of a shopping center, were added to the program in October 1969. The objectives of the program are: (1) To determine, on the basis of historical data and hydrologic analyses, the magnitude and frequency of floods; (2) to document and define the areal extent of floods of greater than ordinary magnitude; and (3) to determine the effect of urban development on flood peaks and volume. Basic hydrologic data collected in four study areas during the 1973 water year (October 1, 1972-September 30, 1973) are presented. The four study areas are Sycamore Creek, Sycamore Creek tributary, Dry Branch, and Little Fossil Creek. The Sycamore Creek tributary study area includes the highly impervious area of the Seminary South Shopping Center as a subarea. (Woodard-USGS)
W75-10596

**A PREDICTIVE COMPUTER MODEL OF THE LOWER CRETACEOUS AQUIFER, FRANKLIN AREA, SOUTHEASTERN VIRGINIA,**
Geological Survey, Richmond, Va.
For primary bibliographic entry see Field 2F.
W75-10599

**TEMPERATURES OF WYOMING STREAMS,**
Geological Survey, Cheyenne, Wyo.
H. W. Lowham, J. E. Kircher, and F. C. Boner.
Wyoming State Water Planning Program, Cheyenne, Report No 15, July 1975. 114 p, 2 fig, 6 ref.

Descriptors: *Water temperature, *Basic data collections, *Streams, *Wyoming, Gaging stations, Sites, Measurement.

These data were assembled in response to a growing need for baseline information concerning water temperatures of Wyoming streams. Water temperatures are important to many water users. Beginning in about 1950, observations of water temperature in Wyoming were obtained whenever discharge measurements were made by the U.S. Geological Survey. Most of these temperature observations have never been published. Previously unpublished data are presented in graphical form for 207 streamflow stations. (Woodard-USGS)
W75-10604

**GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1975,**
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 2F.
W75-10606

**FLOOD WAVES AND SUSPENDED SEDIMENT PULSES IN URBANIZED CATCHMENTS,**
University of New England, Armidale (Australia). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W75-10647

**AN AUTOMATIC DATA ACQUISITION AND REDUCTION SYSTEM,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 7A.
W75-10652

**ANALYSIS OF A LARGE WATER DISTRIBUTION SYSTEM USING ADVANCED COMPUTER SOFTWARE,**
Orlando Utilities Commission, Fla.
For primary bibliographic entry see Field 4A.
W75-10720

**COMPUTER SIMULATION OF WATER DISTRIBUTION NETWORKS,**
Boeing Computer Services, Inc., Seattle, Wash. Mathematicals and Modeling Unit.
For primary bibliographic entry see Field 4A.
W75-10823

**PIPELINE STRESS ANALYSIS,**
Tulsa Univ., Okla.
For primary bibliographic entry see Field 8B.
W75-10824

## 8. ENGINEERING WORKS

### 8A. Structures

**HARRY S. TRUMAN DAM AND RESERVOIR, OSAGE RIVER, MISSOURI, APENDIX A (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Kansas City, Mo.
Available from the National Technical Information Service, Springfield, Va. 22161, as USDC, EIS-MO-73-1931-F, $10.50 in paper copy, $2.25 in microfiche. December 12, 1973. 403 p, 86 tab.

Descriptors: *Environmental effects, *Missouri, *Concrete dams, *Reservoir construction, Dam construction, Dams, Damsites, Flood control, Recreation, Electric power, Hydroelectric power, Wildlife habitats, Reservoirs, Detention reservoirs, Multiple-purpose reservoirs, Rivers, Water management(Applied), Wildlife.
Identifiers: *Environemtnal Impact Statements, Dam effects, Osage River(MO).

This material consists of Appendix A, as ordered by the Court, to supplement the final environmental statement regarding the Harry S. Truman Dam and Reservoir Project located on the Osage River in Missouri. Pursuant to the order of the United States District Court, Western District of Missouri, Western Division, the following items are included in this appendix: the memoradum opinion, findings of fact, conclusions of law, and final judgment and decree of the court. Also included are plaintiffs' exhibits one through ten, inclusive, and portions of the other exhibits to which plaintiffs made reference in the proposed findings of fact as admitted in evidence, as well as the statement of findigns by the district engineer. (Fernandez-Florida)
W75-10363

**FLUID-DYNAMIC EXCITATION INVOLVING FLOW INSTABILITY,**
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W75-10544

**A NUMERICAL MODEL FOR PREDICTING THE EFFECTS OF LANDSLIDE-GENERATED WATER WAVES,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. C. Raney, and H. L. Butler.
Available from the National Technical Information Service, Springfield, Va 22161. Research Report H-75-1, February 1975. 42 p, 8 fig, 1 tab, 5 photo, 5 pl, 3 append, 12 ref.

Descriptors: *Landslides, *Mathematical mode
*Reservoirs, Forecasting, *Model studies.
Identifiers: *Water wave generation.

A numerical model for the generation a propagation of landslide-generated water waves reservoirs is developed. Only two-dimensio hydrodynamic quantities are obtained from t program; however, a pseudo three-dimensional- fect is present since the three-dimensio geometry of an actual reservoir can represented. The model provides an approach the evaluation of the first wave crest that r result from potential landslide regions located reservoirs. Arbitrary landslide volumes, reserv depths, slide propagation velocity, slide sha and initial and final location of the slide can considered. The numerical results have been co pared with experimental results obtained o 1:120 undistorted scale model of Libby Dam Lake Koocanusa in Montana. The numeri results for the height of the first wave crest and time of arrival at various points in the reservoir in good agreement with the experimentally m sured values from the hydraulic model. Appen A gives data requirements for the numeri model; Appendix B is an analysis of viscous d and pressure drag coefficients; and Appendix lists and defines symbols used in this rep (WES)
W75-10661

**STOCKHOLM PUTS SEWAGE PLANTS U DERGROUND,**
Stockholm Municipal Services Dept. (Swed Div. of Treatment Plant Design.
For primary bibliographic entry see Field 5D.
W75-10718

**THE PERIMETER CANAL - A NEW WA PROACH TO DISCHARGE URBAN WA INTO A COASTAL MANGROVE AREA,**
Greiner (J.E.) Co., Inc., Tampa, Fla.
For primary bibliographic entry see Field 4A.
W75-10773

**SOME FACTORS AFFECTING CONTROL FLOW IN A LARGE CANAL SYSTEM,**
California Univ., Davis. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W75-10786

**EFFECTS OF SURFACE DRAINAGE STREAM FLOW,**
Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 4A.
W75-10794

**PRINCIPLES OF ESTABLISHING SE SYSTEMS IN THE RURAL SETTLEMENTS MAGDEBURG COUNTY (GRUNDLAGEN F DIE ABWASSER-TECHNISCHE ERSCHL SUNG VON LANDGEMEINDEN IM BEZ MAGDEBURG),**
For primary bibliographic entry see Field 5D.
W75-10833

### 8B. Hydraulics

**NONLINEAR CHANNEL ROUTING BY C PUTER,**
British Columbia Univ., Vancouver. Dept. of Engineering.
For primary bibliographic entry see Field 4A.
W75-10543

**FLUID-DYNAMIC EXCITATION INVOL FLOW INSTABILITY,**
Toronto Univ. (Ontario). Dept. of Mechanic gineering.

artin, E. Naudascher, and M.
bhan.
of the Hydraulics Division, American
of Civil Engineers, Vol 101, No HY6,
ngs Paper 11361, p 681-698, June 1975. 13
, append.

rs: *Vibrations, *Stability, *Fluid
s, Hydraulics, Gates, Pressure, Flow
Shear stress, Flow separation, Boundary
ydraulic structures, Shear, Flow, Stress.
s: Feedback, Excitation.

w-induced structural vibrations can be
o shear-layer instability. They are
by feedback mechanisms through which
ces to the free shear layer are self-
and amplified with an inherent dominant
. Pressure fluctuations are produced
portion of the body surface near the free
er. The range of flow conditions within
ich vibrations may occur for given
al and geometrical properties of the
was predicted by means of a kinematic
ased on some results of stability theory
iments. Verification of the validity of the
vas provided by a comparison with tests
cal hydraulic structure: a high-head gate
nstream lip. The results gave support to
al applicability of this method for the
tion of flow conditions under which
vibrations can be excited. (Lee-ISWS)
4

LICS AND MECHANICS OF RIVER
S,
iv., Iowa City. Inst. of Hydraulic

ner, and J. F. Kennedy.
ort 161, May 1974. 158 p, 39 fig, 3 tab, 33
end. Army Contract DAC25-73-C-0032,
t GK-35918X1.

rs: *Mathematical models, *Ice jams,
*Fluid mechanics, *Mechanical proper-
aulics, Laboratory tests, Equations, Ice,
Velocity, Depth, Froude number,
Failure(Mechanics), Ice cover.

ical model was developed for evolution
s in rivers. The analysis was limited to
of uniform, rectangular channels. It
edictions for the streamwise distribution
kness of the ice cover and the depth of
ath it, the flow depth at the upstream end
, and the velocity of propagation of the
Estimates were obtained for the rate of
a jam during early stages of its evolu-
formulation of the force equilibrium for
included relations for the compressive
strengths of floating fragmented ice,
failure analysis of the material. Experi-
e conducted to determine the compres-
gth, and Merino's experimental results
to determine the shear strength. A com-
ram for solution of the governing equa-
presented, and a specific example was
llustrate application of the mathematical
e mode of thickening of jams was deter-
analyzing the incipient motion of ice
ting beneath a jam. It was concluded
thicken primarily by internal collapse
by transport of floes beneath the float-
(Adams-ISWS)
5

ALONG THE TRANS-ALASKA
ROUTE,
Survey, Anchorage, Alaska.
y bibliographic entry see Field 2C.
2

EROSION SURVEYS ALONG
N SEGMENT OF THE TAPS ROUTE,
1972 AND 1973,
Survey, Anchorage, Alaska.

J. M. Childers.
Open-file report (basic data), 1975. 57 p, 34 fig, 1 tab, 9 ref.

Descriptors: *Surveys, *Channel erosion, *Pipelines, *Oil, *Alaska, Baseline studies, Construction, Bank erosion, Sediment control, Streambeds, Scour, Ice, Floods, Planning, Evaluation.
Identifiers: *Trans-Alaska Pipeline System, *Taps route(Alaska), Flood Creek, Valdez(Alaska).

Preconstruction conditions are described at selected stream-channel sites along the southern segment of the Trans-Alaska Pipeline System from Flood Creek to Valdez. The information can be used in studies of severe channel erosion, streambed scour, bank erosion, or rechannelization. A plan is presented for detecting and measuring significant erosion and the important factors causing the erosion, such as flood discharge, icing development, and construction activities. (Woodard-USGS)
W75-10594

**NORTON POINT DIKE STUDY, CONEY ISLAND, NEW YORK; HYDRAULIC MODEL INVESTIGATION,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. F. Athow, Jr., R. A. Sager, and W. H. Bobb.
Available from the National Technical Information Service, Springfield, Va 22161. Miscellaneous Paper H-75-2, April 1975. 267 p, 6 fig, 26 tab, 26 photo, 176 pl, 3 ref.

Descriptors: *Hydraulic models, *Salinity, *Dye dispersion, *Dikes, *New York, Model studies, Tidal waters.
Identifiers: *Deflection dikes, Coney Island Beach(NY), *Current velocity, *Norton Point Dike(NY), *Tidal currents.

An existing comprehensive physical model that correctly reproduced tides, tidal currents, and density currents throughout the entire New York Harbor was used to determine the effects of constructing a current deflection dike at Norton Point, Coney Island, New York. The study included tests in the model to define the effects of the dike on tidal heights, current velocities, surface current patterns, salinities, and the distribution of dye from four sources throughout the New York Harbor complex. Based on results of the model tests, it was shown that the Norton Point dike would have the following effects in the study area: (a) local current patterns would be changed and a continuous east-west current would be set up along the Coney Island beaches, (b) tidal heights and tidal phasing as well as the salinity regime would not be affected significantly, (c) sediment buildup behind the dike would be encouraged. (d) very little flushing of the waters behind the dike would occur in the period while the area is being filled by the littoral drift, and (e) concentration of pollution from the Passaic Valley Outfall showed a slight net decrease at low-water slack along Coney Island, but a significant net increase at high-water slack. (WES)
W75-10662

**WAIMANO STREAM FLOOD CONTROL PROJECT, PEARL CITY, HAWAII; HYDRAULIC MODEL INVESTIGATION,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
P. E. Saunders.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-006 020, $4.25 in paper copy, $2.25 in microfiche. Technical Report H-75-3, January 1975. 52 p, 3 fig, 9 photo, 14 pl, 2 append.

Descriptors: *Flood control, *Hydraulic models, *Open channel flow, Model studies, *Hawaii.
Identifiers: *High velocity flow, Pearl City(HI), *Waimano Stream (HI).

Tests were conducted on an undistorted, 1:20-scale physical model of the high-velocity channel for Waimano Stream to determine the adequacy of the sinuous channel to pass discharges as large as 6300 cfs. Since right-of-way limitations prevented major realignment of the proposed channel, superelevated curves were more severe than those recommended by current design guidance. The entering transition section was modified to improve flow conditions. Also, the superelevation was increased and the curve modified in several locations to improve flow distribution. The Moanalua Road drains were modified to improve flow conditions at their confluence with the main channel and the entrances to the relief drain and the diversion channel were modified to facilitate passage of the required flows. (WES)
W75-10663

**LOS ANGELES AND LONG BEACH HARBORS MODEL STUDY; REPORT 2, OBSERVATIONS OF SHIP MOORING AND MOVEMENT,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
L. G. Crosby, and D. L. Durham.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-005 149, $5.75 in paper copy, $2.25 in microfiche. Technical Report H-75-4, January 1975 (Report 2 of a series). 189 p, 5 fig, 12 tab.

Descriptors: *Mathematical models, *Model studies, *California, Ships, Harbors.
Identifiers: *Long Beach Harbor(Cal), *Los Angeles Harbor(Cal), *Mooring, Ship motion.

From March 1971 to July 1972, records of reported ship movements for four locations in Los Angeles and Long Beach Harbors were collected and maintained by the U.S. Army Engineer District, Los Angeles, and numerically coded onto computer cards. These cards were transmitted to the U.S. Army Engineer Waterways Experiment Station where they were computer analyzed and arranged into tables reporting mooring configurations and ship motion activity, which are presented in this report. The mooring information is to be used in analyzing and correlating ship motion with prototype wave data collected during the same study period as discussed in Report 1 of this series. Results of wave data analyses and correlations with ship motion will be presented in future reports of this series. (WES)
W75-10664

**SPILLWAY FOR BURNSVILLE DAM, LITTLE KANAWHA RIVER, WEST VIRGINIA; HYDRAULIC MODEL INVESTIGATION,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
B. P. Fletcher.
Available from National Technical Information Service, Springfield, Va 22161 as AD/A-008 372, $4.25 in paper copy, $2.25 in microfiche. Technical Report H-75-5, March 1975. 58 p, 10 fig, 2 tab, 9 photo, 19 pl.

Descriptors: *Open channel flow, *Outlet works, *Spillways, *Stilling basins, Hydraulic models, Model studies, *West Virginia, Concretes, Spillway gates.
Identifiers: *Burnsville Lake(WV), Little Kanawha River(WV).

The concrete gravity ogee spillway for the Burnsville Dam will contain three 42-ft-wide gate bays separated by 8-ft-wide piers. Outlet works consisting of five low-level and three water-quality sluices will discharge on the downstream slope of the spillway. A hydraulic-jump type stilling basin will provide satisfactory dissipation of the energy of the spillway and sluice flows. A 1:40-scale model of the spillway, sluices, stilling basin, approach area, and exit channel was used to study the overall hydraulic performance of the structure. Tests indicated that flow conditions in the ap-

proach to the spillway with both uncontrolled and controlled flows were satisfactory for the full range of anticipated discharges. The stilling basin performed satisfactorily for spillway flows, and the only structural modification recommended was the elimination of the wing walls at the end of the basin. Operation of the right water-quality sluice simultaneously with the five low-level sluices resulted in satisfactory stilling basin performance. The size and extent of the stone protection required on the dam embankment, side slopes of the exit channel, Fisherman's Bridge, and Fisherman's Weir were determined by model investigations. (WES)
W75-10665

**TURBULENT FLOW IN RECTANGULAR OUTLET CONDUIT, REND LAKE DAM, BIG MUDDY RIVER, ILLINOIS,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. A. Pugh.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-005 150, $3.75 in paper copy, $2.25 in microfiche. Technical Report H-75-2, January 1975. 33 p, 9 fig, 1 tab, 9 pl, 7 ref.

Descriptors: *Conduits, *Outlet works, *Turbulent flow, *Illinois.
Identifiers: *Rend Lake Dam(Ill), Big Muddy River(Ill).

Tests were conducted in a 4- by 6-ft concrete conduit at Rend Lake Dam, Big Muddy River, Illinois, in September 1973 to investigate turbulent flow characteristics in a rectangular conduit on a full scale and to provide data for future design work. Two cantilevered velocity probes were used to measure horizontal velocity profiles at 6 points along the inlet region. Piezometric head was measured with embedded piezometers at 12 points along the entire length of the conduit. Average velocity of flow in the conduit was 27 ft/sec, and the average Reynolds number was 1.25 x 10 to the 7th power. Velocity distributions in the boundary layer were in good agreement with a log-linear velocity profile equation. The coefficients in the velocity profile equations and the shear stress become constant at X/D approximately equal to 20. Equivalent sand grain roughness values were about the same as those determined by other investigators for circular conduits of comparable size and construction. (WES)
W75-10666

**NAVIGATION CONDITIONS AT CANNELTON LOCKS AND DAM, OHIO RIVER; HYDRAULIC MODEL INVESTIGATION,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. J. Franco, and C. D. McKellar.
Available from National Technical Information Service, Springfield, Va 22161 as AD/A009 489, $5.25 in paper copy, $2.25 in microfiche. Technical Report H-75-6, April 1975. 114 p, 3 fig, 9 tab, 6 photo, 55 pl.

Descriptors: *Ohio River, *Locks, *Dams, Powerplants, Flow, Channels, Ice, Discharge(Water), Overflow, Spillways, Gates, *Hydraulic models, Model studies, *Indiana, *Navigation.
Identifiers: *Cannelton Locks and Dam(Ind).

Cannelton Locks and Dam, proposed for construction on the Ohio River, will replace existing Locks and Dams 43-45. The project comprises two locks with clear chamber dimensions of 110 by 600 ft and 110 by 1200 ft and a 1365-ft-long, gated, non-navigable dam, with provisions for powerhouse facilities at the left end of the dam. An undistorted, 1:120-scale model reproducing 8 miles of the Ohio River, the locks and dam structures, the hydropower plant, and other structures that affect flow conditions was used for the investigation. The principal results of this investigation indicate the following: (a) Velocities along the lock side of the channel will tend to be high. (b) Ice and debris will tend to move along the lock side of the river, with the concentration on that side increasing as the river discharge increases. (c) Orientation of the powerhouse and tailrace can affect navigation conditions in the lower lock approach. (d) Satisfactory navigation conditions can be developed over the overflow section between the spillway and powerhouse with some excavation along the left overbank upstream of the powerhouse intake channel. (e) The head on the lower lock gate at the end of lock emptying can be as much as 0.6 ft, depending on velocities along the lock side of the channel. Proposed solutions to these problems are presented. (WES)
W75-10667

**FLOOD CONTROL PROJECT ON LYTLE AND WARM CREEKS AND SANTA ANA RIVER, CALIFORNIA; HYDRAULIC MODEL INVESTIGATION,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. H. Ables, Jr., and G. A. Pickering.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-009 493, $4.25 in paper copy, $2.25 in microfiche. Technical Report H-75-7, April 1975. 72 p, 13 fig, 3 tab, 17 photo, 21 pl.

Descriptors: *Flood control, *Flood flow, Levees, Streambeds, Energy dissipation, Bridges, *Hydraulic models, Flow, Riprap, Sediment transport, Design flow, *California, Model studies.
Identifiers: Lytle Creek(Cal), Warm Creek(Cal), *Santa Ana River(Cal), San Bernando(Cal), Grade control structures, Concrete channel, Confluences.

The Lytle and Warm Creeks and Santa Ana River project will provide another important unit under the general comprehensive plan for flood control in San Bernardino County, California. The proposed plan for containing the flood flows will consist of raising levees, excavating streambeds, and constructing grade control structures, energy dissipators, bridges, and several thousand feet of high-velocity concrete channel. The investigation was conducted on a 1:60-scale model with the existing and proposed bridges, concrete channels, and natural streambed channels with revetted slopes reproduced in the model. Tests were concerned with flow conditions, water-surface elevations, rip-rap stability, and sediment transport at the grade control structures, bridges, confluences, and energy dissipators. Tests revealed the flow conditions produced by the original design exposed rock energy dissipators in Santa Ana River and Warm Creek were unsatisfactory. Baffle block energy dissipators that were then developed for these areas resulted in satisfactory flow conditions with the design flow. (WES)
W75-10668

**EVALUATION OF DISPOSAL AREAS IN JAMES RIVER; HYDRAULIC MODEL INVESTIGATION,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. A. Boland, Jr., and W. H. Bobb.
Available from the National Technical Information Service, Springfield, Va 22161. Miscellaneous Paper H-75-1, January 1975. 39 p, 3 fig, 3 tab, 11 photo.

Descriptors: *Hydraulic models, *Sediment control, *Waste disposal, *Virginia, Model studies, Evaluation, Dredging, Sediments, Water pollution sources.
Identifiers: Dredged material, *James River(VA), Waste disposal sites.

The existing comprehensive fixed-bed model of James River (VA) was used to study the major disposal areas used during maintenance dredging operations for the existing 25-ft-deep navigat channel to determine if the disposal areas are p forming satisfactorily in terms of retain dredged material placed therein. The tests c sisted of the release of lightweight sediment surface depth in the disposal areas, tracing p terns of movement of material from the areas, defining areas where these sediments wo probably deposit. The results indicated that general, the disposal areas and operat procedures presently employed are satisfact with respect to areas of material deposition material retention characteristics. (WES)
W75-10669

**LAKE ERIE INTERNATIONAL JETPO MODEL FEASIBILITY INVESTIGATI( PHYSICAL MODEL FEASIBILITY STUDY,**
Army Engineer Waterways Experiment Stat Vicksburg, Miss.
D. G. Outlaw, D. L. Durham, D. D. Davidson, a R. W. Whalin.
Available from the National Technical Infor tion Service, Springfield, Va 22161 as AD/A 729, $5.25 in paper copy, $2.25 in microfi Technical Report H-74-6, April 1975. 114 p, 21 8 tab, 20 pl, 3 append, 24 ref.

Descriptors: *Hydraulic models, *Feasibility dies, *Lake Erie, *Airports, Breakwat *Waves(Water), Littoral drift, Seiches, Stan waves, *Lakes, *Model studies, *Ohio.
Identifiers: Mass circulation, Wave action, R ing circulation, Cleveland(Ohio).

This report presents the conclusions and rec mendations of the U.S. Army Engineer W ways Experiment Station's study of the feasib of using physical hydraulic models to estimat effects of the proposed Lake Erie Internati Jetport on lake hydrodynamics. The phy models considered in the study are mass cir tion, wave action, breakwater stability, longshore littoral transport models. Spe models are recommended for investigation o modification of wave conditions along the s due to the jetport and for evaluation of breakw stability. However, a specific physical mode investigation for mass circulation is not re mended prior to the completion of a numerica culation study, another task in the model feas ty study. A non-rotating standing wave mod the lake is recommended, again dependent o results of the numerical circulation model, f vestigation of seiche currents near the jetpo small-scale pilot model is recommended t timize construction and operating technique both rotating circulation and standing models. (WES)
W75-10670

**WATER WORKS IMPROVEMENTS--SPR FIELD, VERMONT,**
Dvfresne-Henry Engineering Corp., North Sp field, Vt.
For primary bibliographic entry see Field 3D.
W75-10713

**AGRICULTURAL AND URBAN CONSID TIONS IN IRRIGATION AND DRAINAGE.**
American Society of Civil Engineers, New Y
For primary bibliographic entry see Field 4A.
W75-10769

**A CRITERION FOR VEGETATION STIFF**
Waterloo Univ. (Ontario). Dept. of (Engineering.
For primary bibliographic entry see Field 4A.
W75-10782

**SOME FACTORS AFFECTING CONTRO FLOW IN A LARGE CANAL SYSTEM,**
California Univ., Davis. Hydraulics Lab.
J. J. DeVries, and J. Amorocho.

icultural and Urban Considerations in Ir- and Drainage; Selected Papers from the on and Drainage Division Speciality Con-, Fort Collins, Colorado, April 22-24, 1973. an Society of Civil Engineers, New York, 52, 1974. 15 fig, 5 ref, 2 append.

tors: *Hydraulic stuctures, *Canals, ucts, *California, Unsteady flow, Water), Ckeck structures, Winds, Wind eiches, Surges, Canal design, Automatic Hydraulic transients, Water delivery.
ers: *California Water Project.

alifornia Aqueduct is the main water facility of the California Water Project. In g and designing the system, an un- nted job was done in considering the vari- uirements and possible problems. But the the project and unusual meteorological ns have given rise to unforeseen opera- roblems, including wind problems, hydrau- sients, and instabilities in automatic con- perations. Studies made on the North San Division of the aqueduct point to possible s. Results of this work were discussed. o W75-10769) (Jess-ISWS)
786

NT WATER SYSTEMS AUTOMATION RCH AND DEVELOPMENT IN THE BU- OF RECLAMATION,
of Reclamation, Denver, Colo.
nary bibliographic entry see Field 8C.
787

AGRICULTURAL DRAINAGE DESIGN OSTS,
Water Engineers, Inc., Denver, Colo.
nary bibliographic entry see Field 4A.
797

NE STRESS ANALYSIS,
niv., Okla.
r, J. G. Bomba, and V. G. Randolph.
rtation Engineering Journal, American of Civil Engineers, Vol 101, No TE1, ings paper No 11122, p 163-170, February ig, 1 tab, 10 ref.

tors: *Pipelines, *Transportation, ter programs, *Stress analysis, ter models, Structural analysis, Oceans, Simulation analysis, Equations, Evalua- fects, Systems analysis, Behavior, Finite analysis, Model studies.
ers: Underwater pipelines, Matrix s(Structural), Displacement, Nonlinear ming, Offshore structures, Loadings, St- ometry.

s are economical and practical means for ting oil and gas in marine environments. there exist reliable solution techniques to the structural integrity during installation, r, the cost of structural failure could be h. The finite element displacement method unction with the 'incremental piece-wise rocedure' is used to predict marine pipeline and their geometrically nonlinear dis- nts. A computer model, the Offshore Static Stress model, provides an ad- tool to simulate and analyze stresses in- n pipelines during laying operations as well pelines in place. The program is designed ute the reactions and stresses due to con- d loadings. It allows easy evaluation of the of the various externally applied loadings ed with the various stinger geometry con- ns on the pipe structural behavior. The is multipurpose and is applicable and ac- or a wide range of offshore/onshore struc- oblems. Its flexibilities include two and mensional modes, and linear and nonlinear The ocean depth, pipeline dimensions, and the stinger geometry place no restrictions on the applicability of the developed model. (Bell-Cor-nell)
W75-10824

## 8C. Hydraulic Machinery

**CIVIL ENGINEERING LABORATORY DEVELOPS UNIVERSAL CONNECTOR FOR ALL BOOMS.**
For primary bibliographic entry see Field 5G.
W75-10468

**AVALANCHE PROTECTION IN SWITZERLAND.**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
Translated from Buendnerwald, Supplement No 9, Journal of the Braubuenden Foresters Association and of SELVA, Assoc. of Graubuenden Wood Producers, Dec 1972. General Technical Report RM-9, March, 1975, 168 p.

Descriptors: *Avalanches, *Reviews, Europe, Structural members, Structural stability, *Structures, Snow management.
Identifiers: *Avalanche control, Avalanche zoning, *Avalanche damage, *Switzerland.

This translation of a collection of 16 articles by Swiss avalanche experts summarizes the current state-of-the-art of structural control of avalanches in Europe. It includes chapters on avalanche formation and damage, supporting structures, deflecting, and retarding structures, and political aspects of controls. (Forest Service)
W75-10656

**SNOW AVALANCHE SITES: THEIR IDENTIFICATION AND EVALUATION,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W75-10659

**NEW ENGINEERING CRITERIA FOR SNOW FENCE SYSTEMS,**
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W75-10692

**NEW SNOW FENCE DESIGN CONTROLS DRIFTS, IMPROVES VISIBILITY, REDUCES ROAD ICE,**
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W75-10693

**ROTARY DESALINATION ENGINE AND SYSTEM,**
Frontier Engineering Corp., Houston, Tex.; and Zachry (H. B.) Co., San Antonio, Tex. (assignees)
For primary bibliographic entry see Field 3A.
W75-10733

**CURRENT WATER SYSTEMS AUTOMATION RESEARCH AND DEVELOPMENT IN THE BUREAU OF RECLAMATION,**
Bureau of Reclamation, Denver, Colo.
C. A. Calhoun.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 353-367, 1974. 2 fig, 6 ref.

Descriptors: *Research and development, *Automatic control, *Hydraulic structures, *Mathematical models, *Hydraulic models, Model studies, Hydraulic similitude, Canals, Channels, Automation, Control structures, Check structures, Floods, Gates, Gate control, Control systems, Mechanical control, Hydraulics.

Research and development of equipment and methods for automating water systems are underway in the Bureau of Reclamation. Mathematical models and laboratory models are valuable tools in this effort. Mathematical models are used to simulate hydraulic and control systems. Laboratory models are used to test hardware by allowing 'hands-on' techniques. Emphasis on open channel applications has resulted in new control equipment. The EL-FLO + Reset Controller is an example of such equipment. This controller uses the proportional plus reset mode of control and appears to have wide application to existing and planned water projects. The program described is focused on a typical canal operation. It is recognized that a canal reach or an entire canal may be only a microsystem of a much larger macrosystem which will include the river basin and ultimately the universe. Cooperation with planners and operators to provide the interface between the microsystems which make up water systems is required. Computer operated controllers appear to have advantages for these interfaces. By placing attention on more than one method of developing controls it is felt that rapid progress can be made in reaching the stated goal of improved service to water users with less waste and at a cheaper cost of operation. (See also W75-10769) (Sims-ISWS)
W75-10787

**AUTOMATION OF AN EXISTING IRRIGATION SYSTEM - PART I,**
Modesto Irrigation District, Calif.
For primary bibliographic entry see Field 8C.
W75-10788

**AUTOMATION OF AN EXISTING IRRIGATION SYSTEM - PART I,**
Modesto Irrigation District, Calif.
R. G. Ericsen.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York p 369-383, 1974. 19 fig.

Descriptors: *Irrigation systems, *Water control, *Automatic control, *Rehabilitation, *California, Irrigation canals, Construction, Automation, Regulated flow, Control systems, Canals, Irrigation ditches, Irrigation operation and maintenance, Water distribution(Applied), Irrigation engineering, Gate control, Computers.
Identifiers: *Modesto Irrigation District(Cal).

The Modesto Irrigation District lies in California's fertile San Joaquin Valley between the Sierra Nevada Mountains and the San Joaquin River, 75 miles east of San Francisco. Formed in 1887, water was first delivered in 1904. The Tuolumne River passes through San Francisco's Hetch Hetchy reservoirs and power houses before reaching storage in the reservoir behind Don Pedro Dam, owned and operated by the Modesto Irrigation District and her sister, the Turlock Irrigation District. Complicated main canal operations were anticipated in November 1970 with the changeover to the new Don Pedro Dam. The new 2 million acre-feet reservoir inundated the 40 year old, quarter-million acre-feet reservoir. A program of canal gate modifications was undertaken to accomodate the considerable fluctuations of flow in the transmission portion of the main canal to the Modesto Irrigation District's foothill regulating reservoir. These flows were anticipated due to the increased powerhouse discharge capacity used for generation of peaking power. Described and illus-

trated in this report were the several changes made in control gates, automated gate controls, Level sensors, the gate operating machinery. (See also W75-10769) (Sims-ISWS)
W75-10788

**FLOAT VALVE PROVIDES VARIABLE FLOW RATES AT LOW PRESSURES,**
California Polytechnic State Univ., San Luis Obispo. Dept. of Agricultural Engineering.
J. L. Merriam.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 385-402, 1974. 1 fig, 1 append.

Descriptors: *Irrigation, *Irrigation systems, *Irrigation engineering, *Valves, Flow control, Farm equipment, Hydraulic valves, Regulation, Irrigation practices, Furrow irrigation, Furrow systems, Irrigation design, Operating costs, Equipment, Hydraulics, Engineering, Agricultural engineering, Agriculture.

Semi-closed and closed pipeline systems can provide water delivery that is flexible in rate and duration with 'finger-tip' control at the ultimate point of application. Such delivery is essential for efficient and economical use of water and labor. The water source must be capable of supplying water at variable rates and duration; therefore, an on-farm reservoir is frequently necessary. The extra capital investment to construct such a system is economically justified by reduced annual costs of labor and increased irrigation efficiency. Large capacity systems further increase labor efficiency. Semi-closed systems utilizing a float valve actuated by downstream water levels permit deliveries at low, relatively uniform pressure. Closed systems may develop high pressure on steep or long slopes and have appreciable variation in pressure with changes in flow rates. (See also W75-10769)
W75-10789

**GEOTHERMAL POWER PLANT WITH HIGH EFFICIENCY,**
P. Baciu.
U. S. Patent No 3,875,749, 10 p, 13 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 933, No 2, p 576, April 8, 1975.

Descriptors: *Patents, *Geothermal studies, *Temperature, Heat exchangers, Powerplants, Electric powerplants, Pressure, Carbon dioxide.
Identifiers: Geothermal powerplant.

Provided is a closed-system geothermal power plant operative and maintained at super-critical pressure in the utilization of carbon dioxide as the power fluid used in the cycle for the driving of a super-critical pressure-type gas turbine and associated generator to electricity. The exhaust effluent is still in a gaseous state but as reduced pressure nevertheless still at super-critical pressure and temperature and is passed through heat exchangers and then passed to a super-critical type condenser in which the gaseous carbon dioxide effluent is condensed to a liquid state. The super-critical pressurized carbon dioxide fluid is fed to a heat exchanger in relationship with, but isolated from, carbon dioxide gas effluent from the gas turbine. Thereafter the superheated carbon dioxide super-critical pressurized superheated gas is fed downwardly through layers of rock to subterranean lithosphere and preferably to within basalt volcanic rock plug covern space either naturally or artificially-excavation occurring. The basalt rock covern space is subdivided into upper chamber(s) and lower space-apart chamber(s) segregated from one another by two intermediate preheater chambers which are in communication with upper chamber and the wells extending from the lower portion of preheated chambers to a lower portion of preheated chambers. (Sinha-OEIS)
W75-10845

## 8D. Soil Mechanics

**NEW CONCEPTS IN SUBURBAN DRAINAGE IN FLORIDA,**
Diaz, Seckinger and Associates, Inc., Tampa, Fla.
For primary bibliographic entry see Field 4A.
W75-10793

## 8E. Rock Mechanics and Geology

**PROJECT LOST CREEK: FIELD TESTS OF MOUNDING AND CONTROLLED BLASTING,**
Army Engineer Waterways Experiment Station, Livermore, Calif. Explosive Excavation Research Lab.
For primary bibliographic entry see Field 8H.
W75-10553

## 8F. Concrete

**HARRY S. TRUMAN DAM AND RESERVOIR, OSAGE RIVER, MISSOURI, APENDIX A (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 8A.
W75-10363

**SPILLWAY FOR BURNSVILLE DAM, LITTLE KANAWHA RIVER, WEST VIRGINIA; HYDRAULIC MODEL INVESTIGATION,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10665

## 8G. Materials

**CORROSION AND ITS COST IN SEWAGE TREATMENT,**
V. H. Lewin.
Water Pollution Control, Vol 73, No 5, p 548-550, 1974.

Descriptors: *Sewage treatment, *Design criteria, *Construction materials, *Corrosion, Corrosion control, Coating, Paints, Maintenance, *Waste water treatment.
Identifiers: Metal corrosion.

A study was conducted by the Institute of Water Pollution Control (Great Britain) of metal corrosion control in the sewage treatment industry. Goals were to identify major problem areas, to find how local authorities had overcome or attempted to overcome corrosion problems, and to determine the cost of corrosion. Costs were to be broken down into prevention and scheduled maintenance, unscheduled maintenance and repair, and applicable research and development services including consulting. Forty-three sewage works responded to questionnaires. Corrosion is regarded as inevitable and protective measures in the form of paints and coatings vary greatly. Often corrosion is tolerated until it is necessary to replace part or all of the structure; then alternative construction materials may be chosen. Surface treatments should be applied at the time of construction rather than as a later remedial measure for optimal results. However effective the coating, whether it is epoxy resin, paint, chlorinated rubber, or compounds incorporating finely-ground stainless steel, its protection is largely dependent on the thoroughness of surface preparation to clean the bare metal. Costs varied by size, age, and design of the individual sewage treatment plants and no cost generalities could be made from the range of the data. (Prague-FIRL)
W75-10364

**LARGE SCALE LABORATORY DIRECT SHEAR TESTS ON ICE,**
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2C.
W75-10502

**SNOW CREEP: ITS ENGINEERING PROBLEMS AND SOME TECHNIQUES AND RESULTS OF ITS INVESTIGATION,**
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2C.
W75-10503

**THE INFLUENCE SURFACE METHOD FOR FLOATING ICE PLATES,**
Ballistic Missile Defense Systems Command Field Office, Madison, N.J.
For primary bibliographic entry see Field 2C.
W75-10504

**A WEIBULL PREDICTION OF THE TENSILE STRENGTH-VOLUME RELATIONSHIP OF SNOW,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W75-10651

**PIPELINE STRESS ANALYSIS,**
Tulsa Univ., Okla.
For primary bibliographic entry see Field 8B.
W75-10824

## 8H. Rapid Excavation

**PROJECT LOST CREEK: FIELD TESTS O MOUNDING AND CONTROLLED BLASTING,**
Army Engineer Waterways Experiment Statio Livermore, Calif. Explosive Excavation Researc Lab.
C. C. McAneny.
Technical Report E-75-1, January 1975. 122 p, fig, 7 tab, 18 ref, 8 append.

Descriptors: *Excavation, *Rock excavatio *Dam construction, *Spillways, Explosives, E plosions, Hydraulic structures, Engineering, Ci engineering, Dams, Diversion structures, Ro mechanics, Construction, On-site investigations.
Identifiers: *Blasting, Mounding.

A concept of blasting termed 'mounding' involv using relatively compact explosive charges a breaking to the horizontal ground surface. Proje Lost Creek comprised a group of single-char and row-charge blasting experiments designed investigate the concept of mounding. Moundi row design criteria, fragmentation produced mounding charges, and performance of moundi explosives with differing properties were studie as were suitability of mounding for producing ro fill and use of controlled blasting in conjuncti with mounding charges to diminish shock and improve excavation slope control. The Lost Cre experiments were performed in a basaltic andes rock, which showed columnar jointing a netwo of closely spaced irregular fractures. Moundi blasts in this rock produced good fragmentatio such that the material was quite acceptable rock fill. The natural fracture pattern exerted main control on fragment sizes. Of three bulk plosives tested as mounding charges, AN proved to be the most effective, based on to volume of rock broken. A two-lift prototype sp way cut was excavated following blasting w

ing charges. This achievement demon-
that mounding offers a feasible method of
lesign for structural excavations. (Sims-

0553

LTS OF AIRBLAST OVERPRESSURE
UREMENT PROGRAM AT PROJECT
AILEY,
Engineer Waterways Experiment Station,
lore, Calif. Explosive Excavations
ch Lab.
oeft.
aneous Paper E-75-4, February 1975. 47 p,
3 tab, 7 ref, 3 append.

tors: *Explosions, *Excavation,
ds, *Pressure, Explosives, High pressure,
e measuring instruments, Measurement,
Spillways, Construction.
ers: *Airblast overpressure.

ls of predicting gas-vent and ground-shock-
l airblast overpressure levels from un-
nd explosions have been under investiga-
r many years. In order to obtain an accu-
thod for predicting peak overpressures and
es from large-array-type detonations with
nt delay periods, more data from this type
t must become available. The airblast over-
e measurement program at R.D. BAILEY
l in a large amount of data to be used, first,
nating the airblast expected from future
ions in the R.D. BAILEY spillway area
cond, to provide further input to prediction
studies. A discussion of the instrumenta-
d procedures used to obtain these data fol-
presentation of the results and an analysis
e results. Since peak overpressures from
detonations were caused by several dif-
irblast-producing mechanisms, no definite
ions could be drawn concerning prediction
s. (Sims-ISWS)
555

## isheries Engineering

TIALITY OF VITAMIN C IN FEEDS FOR
SIVELY FED CAGED CHANNEL CAT-
Univ., Ala. Dept. of Fisheries and Allied
ltures.
ovell.
Vol 103, No 1, p 134-138, 1973. Illus.

tors: *Channel catfish.
ers: Aeromonas-liquefaciens, *Caged cat-
Feeds, Lordosis, Mortality, Pathology,
is, *Vitamin C, Weight.

l catfish fingerlings (1600) were stocked in
ating cages, 400/cage, and fed production-
ets intensively for 180 days. Half the fish
d a diet that was nutritionally sufficient ex-
being low in vitamin C, and the reamining
re fed the same formulation with supple-
vitamin C. At the end of the feeding period,
h was examined for gross signs of vitamin
iency, and fish were sampled for examina-
internal symptoms by X-ray, tissues analy-
histological techniques. Weight gains (g),
nversions (g gain/g feed), survival (%) and
ce of physical deformation (%) for fish fed
th and without supplemental ascorbic acid,
ively, were 531 vs. 331; 1.29 vs. 1.88; 98.0
8; and 3.9 vs. 45.0. Deformities were
ly scoliosis and lordosis with depigmented
n backs. Vitamin C deficiency resulted in
mortality from pathogenic bacteria
onas liquefaciens) infestation. Differences
nse to the 2 diets did not become apparent
ter the fish had grown satisfactorily for at
wk or weighed 100-180 g. Dietary supple-
on of vitamin C was reflected in blood,
d anterior kidney contents of ascorbic acid
but not in condition of gill filaments or opercula.--
Copyright 1973, Biological Abstracts, Inc.
W75-10362

GROWTH FACTORS IN THE FISH MEAL COMPONENTS OF CATFISH DIETS,
Georgia Univ., Savannah. Agricultural Experiment Station.
For primary bibliographic entry see Field 2I.
W75-10658

# 10. SCIENTIFIC AND TECHNICAL INFORMATION

## 10A. Acquisition And Processing

INDEX TO WATER RESOURCES DATA FOR LOUISIANA: SURFACE WATER RECORDS; WATER-QUALITY RECORDS.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 5A.
W75-10590

## 10C. Secondary Publication And Distribution

ACTIVATED SLUDGE,
California Univ., Davis.
For primary bibliographic entry see Field 5D.
W75-10371

WASTE WATER TREATMENT: WATER RECLAMATION AND REUSE,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-10372

WASTE WATER TREATMENT: LAND DISPOSAL OF WASTE WATER,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5E.
W75-10373

WASTE WATER TREATMENT: LAGOONS AND OXIDATION PONDS,
Kansas Univ., Lawrence.
For primary bibliographic entry see Field 5D.
W75-10374

WASTE WATER TREATMENT: SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-10395

INDUSTRIAL WASTES: PAPER AND ALLIED PRODUCTS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W75-10397

TOXICITY OF PULPING WASTES TO FISH,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 5C.
W75-10403

THE LOWER COLORADO RIVER: A BIBLIOGRAPHY,
Arizona Western Coll., Yuma.
R. Yates, and M. Marshall.
Arizona Western College Press, Yuma, 1974. 153 p.

Descriptors: *Bibliographies, *Colorado River, *Mexican Water Treaty, *History, *Political aspects, Saline water, Indian reservations.

Over fourteen hundred entries dealing primarily or in part with the lower Colorado River are identified. While there is some emphasis on historical records, including early exploration and settlement, the military, and stream navigation, the main attention is on the Colorado Delta, Mexico and the Colorado River, the politics of water, reclamation, mining, and urbanization. The physiography of the Colorado is of increasing importance, and these bibliographical references to its dams, reclamation and irrigation projects, and salinity problems are a useful backup for technical and lay persons. Author and subject indexes are provided. (Paylore-Arizona)
W75-10453

## 10F. Preparation Of Reviews

ACTIVATED SLUDGE,
California Univ., Davis.
For primary bibliographic entry see Field 5D.
W75-10371

WASTE WATER TREATMENT: WATER RECLAMATION AND REUSE,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-10372

WASTE WATER TREATMENT: LAND DISPOSAL OF WASTE WATER,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 05E.
W75-10373

WASTE WATER TREATMENT: LAGOONS AND OXIDATION PONDS,
Kansas Univ., Lawrence.
For primary bibliographic entry see Field 05D.
W75-10374

WASTE WATER TREATMENT: SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W75-10395

INDUSTRIAL WASTES: PAPER AND ALLIED PRODUCTS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 05D.
W75-10397

PROCESS DESIGN MANUAL FOR SLUDGE TREATMENT AND DISPOSAL.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 05D.
W75-10475

# SUBJECT INDEX


**ABAMA RIVER**
ood Plain Information: Catoma Creek, cinity of Montgomery, Alabama.
75-10574 4A

**ORPTION**
udies on the Metabolism of Chlorophenols in sh-I Absorption and Excretion of PCP by ldfish,
75-10417 5C

fect of Water Hardness on the Toxicity of a nionic Detergent to Fish,
75-10444 5C

e Effect of Temperature and Salinity on dmium Uptake by the Blue Crab, Callinectes idus,
75-10448 5C

sorption of Cadmium, Copper and Zinc by g Whelks in the Bristol Channel,
75-10481 5B

senate Uptake and Reduction by Pocillopora rucosa,
5-10491 5C

sidue Analyses on 2-Amino-4 Phen-niazole, a Piscine Anesthetic, in Fishes-I a del Radio-Tracer Experiment with Medaka,
5-10614 5A

sorption, Metabolism, and Excretion by ldfish of the Anionic Detergent Sodium Lau- Sulphate,
5-10626 5C

**DENTS**
e Snowy Torrents: Avalanche Accidents in United States 1967-71,
5-10657 2C

**MINE WATER**
ne Observations on Spawning of Brook ut (Salvelinus Fontinalis Mitchill) in Lime utralized Iron Hydroxide Suspensions,
5-10445 5C

**OLEIN.**
dicting the Concentration of Aquatic Herbi- e Residues in Waterways,
5-10648 5B

**NOMYCETES**
duction of Microbial Protein From Waste lulose by Thermomonospora Fusca, A Ther- philic Actinomycete,
5-10538 5C

**VATED CARBON**
atment of Service Water with Ozone,
5-10840 5D

**VATED SLUDGE**
ivated Sludge,
5-10371 5D

ect of Temperature and Sludge Loading on ay BOD Removal and Sludge Settleability ctivated Sludge Systems Treating Bleached ft Effluents,
5-10379 5D

dies on Possibilities of Biochemical Purifi- on of Evaporator Condensate Occurring ing Sulfite Pulp Manufacture tersuchungen ueber die Moeglichkeit der hemischen Reinigung des bei der Sulfitzell- fherstellung anfallenden Eindampfkonden- s),
5-10382 5D

Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

Multiple Cycle Process for Wastewater Purification,
W75-10738 5D

**ADDITIVE INDEX**
Toxicity of Paired Mixtures of Candidate Forest Insecticides to Rainbow Trout,
W75-10439 5C

**ADRIATIC SEA**
The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

**ADSORPTION**
Adsorption and Degradation of Chlorbromuron in Soil,
W75-10414 5B

Studies on the Metabolism of Chlorophenols in Fish-II Turnover in Absorbed PCP in Goldfish,
W75-10418 5C

Characterization of Cadmium Uptake by Plant Tissue,
W75-10479 5B

**AERATED LAGOONS**
Waste Water Treatment: Lagoons and Oxidation Ponds,
W75-10374 5D

Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

**AERATION**
Plant Performance Using Dissolved Oxygen Control,
W75-10452 5D

**AEROBIC TREATMENT**
Treatment of Milk Truck Washing Wastes by Anerobic Digestion,
W75-10673 5D

**AFRICA**
Tar Pollution of Sierra Leone Beaches,
W75-10472 5B

**AGRICULTURAL CHEMICALS**
Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

**AGRICULTURAL ENGINEERING**
Hydrology of the Albemarle-Pamlico Region, North Carolina--A Preliminary Report on the Impact of Agricultural Developments,
W75-10602 4C

**AGRICULTURAL RUNOFF**
Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

Effects of Farming - Urban Drainage on Fresh Water,
W75-10802 5G

Five Year Study of Des Moines River Water Quality,
W75-10803 5B

**AGRICULTURAL WATERSHEDS**
ACTMO, An Agricultural Chemical Transport Model,
W75-10846 5B

**AIR POLLUTION**
Average Trace Element Composition of Low Level Marine Atmospheric Particulates,
W75-10477 5B

Toxic Trace Elements: Preferential Concentration in Respirable Particles,
W75-10482 5A

Water Pollution Problems Associated with Control of Stack Gas Emission,
W75-10691 5B

Air and Water Pollution Control,
W75-10732 5D

**AIR POLLUTION EFFECTS**
Health Implications of Exposure to Trace Metals from Combustion of Waste Oil,
W75-10765 5C

**AIR PURIFICATION**
Importance of Plants in Oxygen Production, Carbon Dioxide Consumption and Air Purification,
W75-10715 2I

**AIR TEMPERATURE**
Analog Temperature Records from a Linearized Thermistor Network,
W75-10650 7B

Canopy Weight Distribution Affects Windspeed and Temperature in a Lodgepole Pine Forest,
W75-10654 4A

**AIRBLAST OVERPRESSURE**
Results of Airblast Overpressure Measurement Program at Project R.D. Bailey,
W75-10555 8H

**AIRPORTS**
Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

Environmental Action at Port Authority Airports,
W75-10748 5G

**ALABAMA**
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

Flood Plain Information: Catoma Creek, Vicinity of Montgomery, Alabama.
W75-10574 4A

**ALASKA**
Icings Along the Trans-Alaska Pipeline Route,
W75-10592 2C

Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973,
W75-10594 8B

800 Miles to Go,
W75-10638 5C

ALASKA PIPELINE
800 Miles to Go,
W75-10638 5C

ALGAE
Effect of the Insecticide Zectran (Mexacarbate) on Several Algae,
W75-10425 5C

The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

Thallium: Occurrence in the Environment and Toxicity to Fish,
W75-10449 5C

Enrichment of Surface Freshwater Microlayers with Algae,
W75-10583 5A

Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

The Effect of Some Heavy Metal Ions on Photosynthesis in a Freshwater Alga,
W75-10627 5C

Effects of Chlorinated Hydrocarbon Pollutants on Growth of Marine Phytoplankton in Culture,
W75-10636 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

ALGAL CONTROL
Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

ALGEBRA OF SIGNS
Qualitative Sign Matrix Manipulation,
W75-10815 6A

ALPINE
Water-Yield Improvement from Alpine Areas: The Status of Our Knowledge,
W75-10660 3B

ALTERNATIVE PLANNING
Nuclear Power Plant Cooling System Selection,
W75-10822 6C

AMMONIA
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420 5C

Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

ANAEROBIC DIGESTION
The Toxicity of Heavy Metal Ions to Anaerobic Digestion,
W75-10843 5D

ANALYTICAL TECHNIQUES
Determination of the Transition Metals Manganese, Iron, Cobalt, Copper and Zinc in River Fishes With Help of X-Ray Fluorescence Analysis and Flameless Atomic Absorption Spectroscopy, (Bestimmung der Ubergangsmetalle Mangan, Eisen, Kobalt, Kupfer und zink in Flussfischen mit Hilfe der Rontgenfluores-zenzanalyse und der flammenlosen Atomabsorption),
W75-10408 5A

X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

The Determination of Mercury in Soils and Related Materials by Cold-Vapour Atomic Absorption Spectrometry,
W75-10485 5A

Atomic-Absorption Spectrometric Determination of Copper, Lead, Cadmium and Manganese in Pulp and Paper by the Direct-Atomization Technique,
W75-10489 5A

Determination of Nickel in Rocks After Epithermal Neutron Activation,
W75-10493 2K

Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W75-10494 2K

Spectroscopic Determination of Atomization Efficiency (CuCl-Cu+Cl) in an Air-Hydrogen Flame,
W75-10498 2K

Rapid Extractive Spectrophotometric Determination of Gold (III) With 4-(2-Pyridylazo)-Resorcinol,
W75-10499 2K

Laboratory Measurement of Surface Temperature Fluctuations Induced by Small Amplitude Surface Waves,
W75-10505 2L

Automated Sequential Composite Sampling. A New Technique for Water Pollution Study and Control,
W75-10690 5A

Water Analysis of River Waters in Kagawa (IX), Chemical Composition of the Aya Water Basin, (In Japanese),
W75-10841 2K

ANCHOVY
The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

ANEROBIC DIGESTION
Treatment of Milk Truck Washing Wastes by Anerobic Digestion,
W75-10673 5D

ANESTHETIC (PISCINE)
Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

ANIMAL BEHAVIOR
Effects of Methylmercury on Approach and Avoidance Behavior of Mallard Ducklings,
W75-10424 5C

ANIMAL METABOLISM
Effect of Dietary Selenium on Glutathi
Peroxidase in the Chick,
W75-10495

ANIMAL PATHOLOGY
Effect of Dietary Selenium on Glutathi
Peroxidase in the Chick,
W75-10495

ANION EXCHANGE
Determination of Cadmium, Copper, and L
in Natural Waters After Anion-Excha
Separation,
W75-10385

ANODIC STRIPPING VOLTAMMETRY
The Effect of Certain Organic Pollutants
Copper Toxicity to Fish (Lebistes Reticulat
W75-10637

ANTARCTIC
Soils of the High Arctic Landscapes,
W75-10458

ANTELOPE VALLEY AREA (CALIF)
Map of the Antelope Valley-East Kern W
Agency Area, California, Showing Grou
Water Subunits and Areas, Location of We
and Water-Level Contours for Spring 1974,
W75-10595

ANTIBIOTICS
Acute Toxicity of Kanamycin to Steelh
Trout (Salmo Gairdneri),
W75-10423

ANTIBIOTICS (PESTICIDES)
Effects of pH on Toxicity of Antimycin
Fish,
W75-10450

ANTIMYCIN
Effects of pH on Toxicity of Antimycin
Fish,
W75-10450

APPLICATION METHODS
Land Treatment of Municipal Sewage,
W75-10719

AQUATIC ALGAE
An Investigation of the Ecology and W
Quality of a Lake Outlet,
W75-10724

AQUATIC ANIMALS
Population Dynamics of Protozoa in Wa
water, and Impact of Environmental Change
W75-10689

AQUATIC HERBICIDE PROPERTIES
Herbicides in Aquatic Systems,
W75-10625

AQUATIC INSECTS
Uptake, Elimination and Biotransformation
the Lampricide 3-Trifluromethyl-4-Nitroph
(TFM) by Larvae of the Aquatic M
Chironomus Tentans,
W75-10629

An Investigation of the Ecology and W
Quality of a Lake Outlet,
W75-10724

AQUATIC PLANTS
Herbicides in Aquatic Systems,
W75-10625

TIC WEED CONTROL
icting the Concentration of Aquatic Herbi-
Residues in Waterways,
-10648 5B

DUCTS
e Factors Affecting Control of Flow in a
e Canal System,
-10786 8B

OUS SOLUTIONS
matic Device for the Operational Control
the Filtration Rate of Suspen-
s(Automatische Vorrichtung zur
nischen Kontrolle der Filtrationsgeschwin-
eit von Suspensionen),
-10830 5D

CULTURE
Effect of Prolonged Exposure to Elevated
peratures on the Biochemical Constituents,
adal Development and Shell Deposition of
American Oyster, Crassostrea Virginica,
-10849 5C

ER CHARACTERISTICS
raulic Behaviour of the Chalk Aquifer in
Yorkshire Wolds,
-10506 4B

rogeology of the Triassic Rocks of Mary-
-10584 2F

redictive Computer Model of the Lower
aceous Aquifer, Franklin Area, Southeast-
Virginia,
-10599 2F

ER TESTING
raulic Behaviour of the Chalk Aquifer in
Yorkshire Wolds,
-10506 4B

IC
e Aspects of Climatology in Polar Barrens,
-10454 2C

Climatological Analysis of North Polar
rt Areas,
-10455 2C

of the High Arctic Landscapes,
-10458 2C

ew of Development of Arctic Resources,
-10462 2C

urce Development in Canada's High Arc-
-10463 2C

reaking Drillship for Offshore Exploratory
ing in the Arctic,
-10639 5G

IC OCEAN
ard an Ice-Free Arctic Ocean,
-10532 2C

ting Glacial Ice Caps in the Arctic Ocean,
-10533 2C

CLIMATES
e Aspects of Climatology in Polar Barrens,
-10454 2C

NA
hastic Models of Spatial and Temporal Dis-
tion of Thunderstorm Rainfall,
-10519 2B

Change in Quality of Pumped Drainage Effluent,
W75-10779 5B

Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

ARKANSAS
Flood Plain Information: Ouachita River, Hot Springs Creek, Stokes Creek, Molly Creek, Gulpha Creek, City of Hot Springs, Arkansas.
W75-10559 4A

AROCLORS
Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

ARSENIC COMPOUNDS
Arsenate Uptake and Reduction by Pocillopora verrucosa,
W75-10491 5C

ARTESIAN AQUIFERS
Drainage Analysis of a Confining Formation,
W75-10780 4A

ARTIFICAL SUBSTRATES
Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

ARTIFICIAL PRECIPITATION
Users' View of Weather Modification,
W75-10776 3B

ASSESSMENT
Necessary Adaptations for Significant Utilization of the Information System,
W75-10816 6A

ASULAM
Herbicides in Aquatic Systems,
W75-10625 5C

ATLANTIC OCEAN
Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552 2L

ATLANTIC SALMON
Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

ATOMIC ABSORPTION SPECTROMETRY
The Determination of Mercury in Soils and Related Materials by Cold-Vapour Atomic Absorption Spectrometry,
W75-10485 5A

ATOMIC ABSORPTION SPECTROSCOPY
Atomic-Absorption Spectrometric Determination of Copper, Lead, Cadmium and Manganese in Pulp and Paper by the Direct-Atomization Technique,
W75-10489 5A

Atomic Absorption Spectrometric Determination of Cadmium, Lead, Silver, Thallium and Zinc in Silicate Rocks by Direct Atomization From the Solid State,
W75-10492 2K

ATPASES
Inhibition of ATPases Acitivity in Channel Catfish Brain by Kepone(Trade Name) and its Reduction Product,
W75-10612 5C

ATTITUDES
The Effect of Landowner Attitude on the Financial and the Economic Costs of Acquiring Land for a Large Public Works Project,
W75-10827 6B

AUSTRALIA
Valley Design in Urban Growth Centres,
W75-10643 6B

The Mutual Destruction of Polluting Factors in Waste Liquors,
W75-10645 5D

Progress in Australian Hydrology 1965-1974.
W75-10646 2A

Flood Waves and Suspended Sediment Pulses in Urbanized Catchments,
W75-10647 4C

Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

AUTOMATIC CONTROL
Current Water Systems Automation Research and Development in the Bureau of Reclamation,
W75-10787 8C

Automation of an Existing Irrigation System - Part I,
W75-10788 8C

AUTOMATION
Plant Performance Using Dissolved Oxygen Control,
W75-10452 5D

Automatic Device for the Operational Control of the Filtration Rate of Suspensions(Automatische Vorrichtung zur Technischen Kontrolle der Filtrationsgeschwindigkeit von Suspensionen),
W75-10830 5D

AUTOREGRESSIVE RUNOFF MODELS
Use of Autoregressive Runoff Models in Reservoir Studies,
W75-10523 2E

AVALANCHE
Avalanche Warnings: Content and Dissemination,
W75-10653 2C

AVALANCHE CONTROL
Avalanche Protection in Switzerland.
W75-10656 8C

AVALANCHE DAMAGE
Avalanche Protection in Switzerland.
W75-10656 8C

AVALANCHE SAFETY
The Snowy Torrents: Avalanche Accidents in the United States 1967-71,
W75-10657 2C

AVALANCHE SITES
Snow Avalanche Sites: Their Identification and Evaluation,
W75-10659 2C

**AVALANCHES**
Avalanche Protection in Switzerland.
W75-10656 8C

The Snowy Torrents: Avalanche Accidents in the United States 1967-71,
W75-10657 2C

Snow Avalanche Sites: Their Identification and Evaluation,
W75-10659 2C

**AYA WATER BASIN (JAPAN)**
Water Analysis of River Waters in Kagawa (IX), Chemical Composition of the Aya Water Basin, (In Japanese),
W75-10841 2K

**BACTERIA**
Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

**BALTIC FLOUNDER**
The Effect of Different Salinities and Manganese Ion on the Survival Respiration of the Baltic Flounder (Pleuronectes Flesus Trachurus (Dunker)) of the Gulf of Riga,
W75-10411 5C

**BALTIMORE HARBOR (MD)**
A Program for Handling Emergency Oil Spillages in the Port of Baltimore,
W75-10755 5G

**BARLEY**
Effect of a Phytoplankton Culture on the Germination and Seedling Development of Barley, Sugar Beets and Lettuce,
W75-10496 3F

**BASIC DATA COLLECTIONS**
Ground-Water Levels in New Mexico, 1972,
W75-10582 4B

Hydrogeologic Data for the Farmington River Basin, Connecticut,
W75-10591 7C

Hydrological Data From Wells in Southwest Hillsborough County, Florida, 1950-74,
W75-10593 7C

Temperatures of Wyoming Streams,
W75-10604 7C

Ground-Water Conditions in Utah, Spring of 1975,
W75-10606 2F

**BEARSS LEMON**
Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

**BED LOAD**
Research in Stochastic Models for Bedload Transport,
W75-10522 2J

Dispersion of Contaminated Bedload Particles,
W75-10526 5B

**BED-MATERIAL TRANSPORT**
Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

**BEDFORD (IA)**
Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

**BENEFITS**
Derivation of Reservoir Operating Rules by Economic Analysis,
W75-10825 4A

Analysis of Reservoir Recreation Benefits,
W75-10826 6B

**BENTHIC FAUNA**
Utilization of a Kraft Effluent Channel by Fish and Aquatic Organisms,
W75-10377 5C

**BENTHOS**
Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

**BERING SEA**
Review of Development of Arctic Resources,
W75-10462 2C

**BIBLIOGRAPHIES**
Activated Sludge,
W75-10371 5D

Waste Water Treatment: Water Reclamation and Reuse,
W75-10372 5D

Waste Water Treatment: Land Disposal of Waste Water,
W75-10373 5E

Waste Water Treatment: Lagoons and Oxidation Ponds,
W75-10374 5D

Waste Water Treatment: Sludge Treatment, Utilization, and Disposal,
W75-10395 5D

Industrial Wastes: Paper and Allied Products,
W75-10397 5D

Toxicity of Pulping Wastes to Fish,
W75-10403 5C

The Lower Colorado River: A Bibliography,
W75-10453 10C

**BILGE WATER**
Oily Bilge from Commercial Vessels,
W75-10752 5B

**BIOACCUMULATION**
Determination of the Transition Metals Manganese, Iron, Cobalt, Copper and Zinc in River Fishes With Help of X-Ray Fluorescence Analysis and Flameless Atomic Absorption Spectroscopy, (Bestimmung der Ubergangsmetalle Mangan, Eisen, Kobalt, Kupfer und zink in Flussfischen mit Hilfe der Rontgenfluores-zenzanalyse und der flammenlosen Atomabsorption),
W75-10408 5A

Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

Corticosteroid Concentrations in Sockeye S
mon (Oncorhynchus Nerka) Exposed to L
Concentrations of Copper,
W75-10415

**BIOASSAY**
The Effect of Different Salinities and M
ganese Ion on the Survival Respiration of
Baltic Flounder (Pleuronectes Flesus Trachu
(Dunker)) of the Gulf of Riga,
W75-10411

Toxic Effects of Aliphatic Chlorinated
Products from Vinyl Chloride Production
Marine Animals,
W75-10412

Studies on the Metabolism of Chlorophenol
Fish-I Absorption and Excretion of PCP
Goldfish,
W75-10417

Studies on the Metabolism of Chlorophenol
Fish-II Turnover in Absorbed PCP in Goldfi
W75-10418

Marine Pollution Bioassay by Sea Urchin Eg
An Attempt to Enhance Accuracy,
W75-10419

Uptake of Three Polychlorinated Biphen
DDT and DDE by the Green Sunfish, Lepo
Cyanellus Raf.,
W75-10422

Effects of Heavy Metals and Pesticides on
Mass Mortalities of Cultured Shellfishes Al
the Southwest Coast of Taiwan, (In Chinese
W75-10427

DDT : Short Term Effects on Osmoregulat
in Black Surfperch (Embiotoca Jacksoni),
W75-10429

Bioassay Data for Marine Pollution Using
Urchin Eggs, 1972 and 1973,
W75-10432

Effects of the Insecticide Sevin and Its H
Hydrolytic Product, 1-Napthol, on Some Ea
Developmental Stages of the Bay Mus
Mytilus edulis,
W75-10435

The Effects of a No. 2 Fuel Oil and Two Cr
Oils on the Growth and Photosynthesis
Microalgae,
W75-10436

Toxicity of Two Synthetic Pyrethrins to Bro
Trout,
W75-10438

Toxicity of Paired Mixtures of Candid
Forest Insecticides to Rainbow Trout,
W75-10439

Multichannel Toxicant Injection System
Flow-Through Bioassays,
W75-10443

Effect of Water Hardness on the Toxicity
Nonionic Detergent to Fish,
W75-10444

Thallium: Occurrence in the Environment
Toxicity to Fish,
W75-10449

Inhibition of ATPases Acitivity in Channel
fish Brain by Kepone(Trade Name) and
Reduction Product,
W75-10612

: Accumulation of Organochlorine Pesti-
PCB and Certain Heavy Metals in Fish
hellfish from Thai Coastal and Inland
,
0616 5B

Concentration of Mercury, Copper,
, Silver, Cadmium and Lead in the
rn Adriatic Anchovy, Engraulis En-
olus, and Sardine, Sardina Pilchardus,
0620 5B

in the Spotted Sharks, Mustelus
o, From Tokyo Bay, (In Japanese),
0622 5A

Effect of Sublethal Concentrations of
r and Zinc on Ventilatory Activity,
Oxygen, and pH in Rainbow Trout
Gairdneri),
0624 5C

otion, Metabolism, and Excretion by
sh of the Anionic Detergent Sodium Lau-
phate,
0626 5C

e, Elimination and Biotransformation of
mpricide 3-Trifluromethyl-4-Nitrophenol
by Larvae of the Aquatic Midge
omus Tentans,
0629 5C

logical Changes in the Serum and
pancreas of Yellow Tail Injected with
Tetrachloride, (In Japanese),
0630 5C

ty of the Lampricide 3-Trifluoromethyl-
phenol (TFM) to the Nontarget Fish in
Tests,
0701 5C

ty of the Lampricide 3-Trifluoromethyl-
phenol (TFM) to Selected Aquatic In-
rates and Frog Larvae,
0703 5C

ned Effects of Cadmium and Salinity on
pment and Survival of Herring Eggs,
0704 5C

vity-Flow Column to Provide Pesticide-
Water for Aquatic Bioassays,
0844 5A

ffect of the Quantity of Silt to the At-
Microorganisms of the Kuzuryu-Gawa
n the Hokuriku District, (In Japanese),
0696 5C

AYS
s of Mirex on the Larval Development of
rab,
0410 5C

Toxicity of Ammonia to Several
pmental, Stages of Rainbow Trout,
Gairdneri,
0619 5C

MICAL OXYGEN DEMAND
of Temperature and Sludge Loading on
BOD Removal and Sludge Settleability
ivated Sludge Systems Treating Bleached
Effluents,
0379 5D

ic Characterization of Sewer Loading by
Liquors of the Pulp Industry
tische Kennzeichung der Belastung der
Vorfluter durch Ablaugen der Zellstoffindus-
trie),
W75-10381 5D

**BIOCHEMISTRY**
Persistence of Cadmium-Induced Metabolic Changes in Liver and Kidney,
W75-10478 5A

Studies on the Metabolism of Chlorophenols in Fish-III Isolation and Identification of a Conjugated PCP Excreted by Goldfish,
W75-10611 5A

**BIODEGRADATION**
Cellulose Degradation in Waste Water Treatment,
W75-10376 5D

Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

**BIOINDICATORS**
Marine Pollution Bioassay by Sea Urchin Eggs, An Attempt to Enhance Accuracy,
W75-10419 5A

Bioassay Data for Marine Pollution Using Sea Urchin Eggs, 1972 and 1973,
W75-10432 5A

The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

**BIOLOGICAL COMMUNITIES**
Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

**BIOLOGICAL HALF LIFE**
The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437 5C

**BIOLOGICAL TREATMENT**
Studies on Possibilities of Biochemical Purification of Evaporator Condensate Occurring During Sulfite Pulp Manufacture (Untersuchungen ueber die Moeglichkeit der biochemischen Reinigung des bei der Sulfitzellstoffherstellung anfallenden Eindampfkondensates),
W75-10382 5D

Rotating Biological Disk Treatment of Kraft Mill Effluents,
W75-10390 5D

The Mutual Destruction of Polluting Factors in Waste Liquors,
W75-10645 5D

An Effluent Study of a Fresh Water Fish Processing Plant,
W75-10684 5D

Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

Multiple Cycle Process for Wastewater Purification,
W75-10738 5D

**BIOMASS**
Canopy Weight Distribution Affects Windspeed and Temperature in a Lodgepole Pine Forest,
W75-10654 4A

An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

**BIORHYTHMS**
Aspects of the Winter Ecology of Juvenile Coho Salmon (Oncorhynchus Kisutch) and Steelhead Trout (Salmo Gairdneri),
W75-10615 5C

**BIRDS**
Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

**BLACK SURFPERCH**
DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

**BLASTING**
Project Lost Creek: Field Tests of Mounding and Controlled Blasting,
W75-10553 8H

**BLEACHING WASTES**
Effect of Temperature and Sludge Loading on 5-Day BOD Removal and Sludge Settleability in Activated Sludge Systems Treating Bleached Kraft Effluents,
W75-10379 5D

Swimming Performance of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Bleached Kraft Pulp Mill Effluent,
W75-10387 5C

How to Purify Effluents, Recover Byproducts With Reverse Osmosis,
W75-10391 5F

Spent Liquor From Peroxide Bleaching of Groundwood Pulp From Spruce,
W75-10392 5A

Color of Pulp Industry Waste Liquors. (6). Behavior of Color During Waste Treatments (In Japanese),
W75-10393 5D

**BLIZZARDS**
New Engineering Criteria for Snow Fence Systems,
W75-10692 2C

New Snow Fence Design Controls Drifts, Improves Visibility, Reduces Road Ice,
W75-10693 2C

Estimating the Transport and Evaporation of Blowing Snow,
W75-10695 2C

**BLOWING SNOW**
Estimating the Transport and Evaporation of Blowing Snow,
W75-10695 2C

**BLUE CRAB**
Effects of Mirex on the Larval Development of Blue Crab,
W75-10410 5C

BLUE CRABS
The Effect of Temperature and Salinity on Cadmium Uptake by the Blue Crab, Callinectes sapidus,
W75-10448 5C

BOATING
Analysis of Pollution from Marine Engines - Status Report,
W75-10688 5A

BOND ISSUES
Financing Water Works,
W75-10712 3D

BOUNDARY PROCESSES
A Theory of the Mass Transport of Previously Distributed Chemicals in a Water-Saturated Sorbing Porous Medium: 4. Distributions,
W75-10632 5B

BRANDYWINE CREEK (PA)
Flood Plain Information: Brandywine Creek, Chester County, Pennsylvania.
W75-10562 4A

BRAZOS RIVER (TEX)
The Drift of Mayflies (Ephemeroptera) in the Brazos River, Texas,
W75-10558 5B

BROOK TROUT
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

BROWN BULLHEAD
Influence of a Thermal Effluent on Movement of Brown Bullhead (Ictalurus Nebulosus) as Determined by Ultrasonic Tracking,
W75-10628 5C

BROWN TROUT
Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

BUCKEYE (ARIZ)
Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

BULLHEADS
Influence of a Thermal Effluent on Movement of Brown Bullhead (Ictalurus Nebulosus) as Determined by Ultrasonic Tracking,
W75-10628 5C

BURNSVILLE LAKE (WV)
Spillway for Burnsville Dam, Little Kanawha River, West Virginia; Hydraulic Model Investigation,
W75-10665 8B

BUSHKILL CREEK (PA)
Flood Plain Information: Bushkill Creek, Vicinity of Easton, Pennsylvania.
W75-10560 4A

BYPRODUCTS
How to Purify Effluents, Recover Byproducts With Reverse Osmosis,
W75-10391 5F

CADMIUM
Determination of Cadmium, Copper, and Lead in Natural Waters After Anion-Exchange Separation,
W75-10385 5A

Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

The Effect of Temperature and Salinity on Cadmium Uptake by the Blue Crab, Callinectes sapidus,
W75-10448 5C

Persistence of Cadmium-Induced Metabolic Changes in Liver and Kidney,
W75-10478 5A

Characterization of Cadmium Uptake by Plant Tissue,
W75-10479 5B

Absorption of Cadmium, Copper and Zinc by Dog Whelks in the Bristol Channel,
W75-10481 5B

The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

CAGED CATFISH
Essentiality of Vitamin C in Feeds for Intensively Fed Caged Channel Catfish,
W75-10362 8I

CALIFORNIA
Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

Map of the Antelope Valley-East Kern Water Agency Area, California, Showing Ground-Water Subunits and Areas, Location of Wells, and Water-Level Contours for Spring 1974,
W75-10595 7C

Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

Los Angeles and Long Beach Harbors Model Study; Report 2, Observations of Ship Mooring and Movement,
W75-10664 8B

Flood Control Project on Lytle and Warm Creeks and Santa Ana River, California; Hydraulic Model Investigation,
W75-10668 8B

Development of Large Scale Drip Irrigation Systems,
W75-10784 3F

Some Factors Affecting Control of Flow in a Large Canal System,
W75-10786 8B

Automation of an Existing Irrigation System - Part I,
W75-10788 8C

Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

CALIFORNIA WATER PROJECT
Some Factors Affecting Control of Flow in a Large Canal System,
W75-10786 8B

CANADA
Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar)
W75-10431

Resource Development in Canada's High Arctic,
W75-10463

Snow Creep: Its Engineering Problems - Some Techniques and Results of Its Investigation,
W75-10503

Measurement of Hydraulic Conductivity of Peats,
W75-10536

Glacier-Flow Patterns and the Origin of Late Wisconsinan Till in the Southern Rocky Mountain Trench, British Columbia,
W75-10539

Nonlinear Channel Routing by Computer,
W75-10543

International Field Year for the Great Lakes
W75-10547

International Field Year for the Great Lakes
W75-10548

International Field Year for the Great Lakes
W75-10549

International Field Year for the Great Lakes
W75-10550

An Effluent Study of a Fresh Water Fish Processing Plant,
W75-10684

The Master Plan for Water-Supply in the Regional Municipality of Ottawa-Carleton,
W75-10710

Disposal of Used Crankcase and Other Oils in Canada,
W75-10743

CANALS
Additional Studies of the Fishes, Macroinvertebrates and Hydrological Conditions in Upland Canals in Tampa Bay, Florida,
W75-10617

Rivers in the City,
W75-10723

The Perimeter Canal - A New Approach to Discharge Urban Water into a Coastal Mangrove Area,
W75-10773

Some Factors Affecting Control of Flow in a Large Canal System,
W75-10786

CANNELTON LOCKS AND DAM (IND)
Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667

CANOPY
Canopy Weight Distribution Affects Wind speed and Temperature in a Lodgepole Pine Forest,
W75-10654

:ORAL (FLA)
Perimeter Canal - A New Approach to
arge Urban Water into a Coastal Man-
Area,
10773 4A

AL COSTS
ess Design Manual for Sludge Treatment
Disposal.
10475 5D

SIUS AURATUS
t of Water Hardness on the Toxicity of a
onic Detergent to Fish,
10444 5C

HYDRATES
ts of Acute Exposure to Bleached Kraft
Mill Effluent on Carbohydrate Metabol-
f Juvenile Coho Salmon (Oncorhynchus
ch) During Rest and Exercise,
10388 5C

N CYCLE
ease of Net Carbon Flux in Two Species
ussels Caused by Extracts of Crude Oil,
10433 5C

N DIOXIDE
rtance of Plants in Oxygen Production,
on Dioxide Consumption and Air Purifica-
10715 2I

N FLUX
ease of Net Carbon Flux in Two Species
ussels Caused by Extracts of Crude Oil,
10433 5C

N TETRACHLORIDE
ological Changes in the Serum and
topancreas of Yellow Tail Injected with
on Tetrachloride, (In Japanese),
10630 5C

ts of pH on Toxicity of Antimycin to
10450 5C

DE RANGE
rshed Behavior After Forest Fire in
ington,
10790 4C

II
ition of ATPases Acitivity in Channel Cat-
Brain by Kepone(Trade Name) and its
ction Product,
10612 5C

NS
Separation of Tin (IV) From Tin (II) and
Numerous Metal Ions on Ion-Exchange
s,
10497 2K

IA CREEK (ALABAMA)
Plain Information: Catoma Creek,
ity of Montgomery, Alabama.
10574 4A

LAKE CREEK (TEX)
ts of Surface Drainage on Stream Flow,
10794 4A

LOSE
lose Degradation in Waste Water Treat-
10376 5D

Production of Microbial Protein From Waste Cellulose by Thermomonospora Fusca, A Thermophilic Actinomycete,
W75-10538 5C

CENTRIFUGATION
Closed Recycling System for Water Purification and Waste Reduction,
W75-10735 5D

CHALK AQUIFER
Hydraulic Behaviour of the Chalk Aquifer in the Yorkshire Wolds,
W75-10506 4B

CHANNEL CATFISH
Essentiality of Vitamin C in Feeds for Intensively Fed Caged Channel Catfish,
W75-10362 8I

Inhibition of ATPases Acitivity in Channel Catfish Brain by Kepone(Trade Name) and its Reduction Product,
W75-10612 5C

Growth Factors in the Fish Meal Components of Catfish Diets,
W75-10658 2I

CHANNEL EROSION
Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973,
W75-10594 8B

CHANNEL FLOW
Nonlinear Channel Routing by Computer,
W75-10543 4A

CHANNEL IMPROVEMENT
Environmental Issues, Effects, and Solutions,
W75-10795 6G

CHANNELS
Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

CHELATION
Suppression of Nitrogen Fixation by Blue-Green Alage in a Eutrophic Lake with Trace Additions of Copper,
W75-10480 5C

CHELON ENGELI
Critical Thermal Maxima of Three Species of Hawaiian Estuarine Fish: A Comparative Study,
W75-10426 5C

CHEMICAL ANALYSIS
A River-Quality Assessment of the Upper White River, Indiana,
W75-10600 5B

Water Analysis of River Waters in Kagawa (IX), Chemical Composition of the Aya Water Basin, (In Japanese),
W75-10841 2K

CHEMICAL OXYGEN DEMAND
Analytic Characterization of Sewer Loading by Spent Liquors of the Pulp Industry (Analytische Kennzeichung der Belastung der Vorfluter durch Ablaugen der Zellstoffindustrie),
W75-10381 5D

CHEMICAL PROPERTIES
Organic Matter in Natural Water and Water Treatment,
W75-10351 5B

CHEMICALS
A Theory of the Mass Transport of Previously Distributed Chemicals in a Water-Saturated Sorbing Porous Medium: 4. Distributions,
W75-10632 5B

ACTMO, An Agricultural Chemical Transport Model,
W75-10846 5B

CHICKASAWHAY RIVER (MS)
Special Flood Hazard Information Report: Chickasawhay River, Waynesboro, Wayne County, Mississippi.
W75-10569 4A

CHIRONOMUS TENTANS
Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

CHLAMYDOMONAS REINHARDII
The Effect of Some Heavy Metal Ions on Photosynthesis in a Freshwater Alga,
W75-10627 5C

CHLORAMINES
Water Quality Criteria for European Freshwater Fish.
W75-10609 5C

CHLORBROMURON
Adsorption and Degradation of Chlorbromuron in Soil,
W75-10414 5B

CHLORIDE CELLS
X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

CHLORINATED HYDROCARBON PESTICIDES
Effects of Mirex on the Larval Development of Blue Crab,
W75-10410 5C

Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

Effects of Chlorinated Hydrocarbon Pollutants on Growth of Marine Phytoplankton in Culture,
W75-10636 5C

CHLORINATED HYDROCARBONS
Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

CHLORINATION
Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

Toxicity of Chlorinated Municipal Wastes to Fish: An Evaluation Based on Michigan Field Data,
W75-10680 5C

CHLORINE
Water Quality Criteria for European Freshwater Fish.
W75-10609 5C

CHLOROPHYTA
Effect of a Phytoplankton Culture on the Germination and Seedling Development of Barley, Sugar Beets and Lettuce,
W75-10496 3F

The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

CHRISTINA RIVER (DE)
Flood Plain Information: White Clay Creek, New Castle County, Delaware.
W75-10571 4A

CHROMATOGRAPHY
Fast Separation of Tin (IV) From Tin (II) and From Numerous Metal Ions on Ion-Exchange Papers,
W75-10497 2K

CIRCULATION
Physical Model Study of Circulation Patterns in Lake Ontario,
W75-10537 2H

CITIES
Rivers in the City,
W75-10723 6B

CITY PLANNING
Valley Design in Urban Growth Centres,
W75-10643 6B

CLEANING
Serpaflo: Original Solution to Cleaning Paper Mill Effluents (Serpaflo; La solution originale d'epuration des eaux papeteries),
W75-10389 5D

Water Pollution Problems Associated with Control of Stack Gas Emission,
W75-10691 5B

CLIMATES
Protein Content of Winter Wheat Grain as Related to Soil and Climatic Factors in the Semi-Arid Central Great Plains,
W75-10792 3F

CLOUD SEEDING
Weather Modification for Use in the High Plains,
W75-10775 3B

Users' View of Weather Modification,
W75-10776 3B

Role of the Public in Weather Modification,
W75-10777 3B

CLOUDS
Priority Problems for Modifying Cumulus Precipitation,
W75-10774 3B

CLUPEA HARENGUS
Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

COAST GUARD REGULATIONS
Characteristics of Oil Pollution in and Around U.S. Waters,
W75-10754 5B

COASTAL PLAINS
Relationships Between Drouth and Corn Yields on Selected South Atlantic Coastal Plain Soils,
W75-10721 3F

COHO SALMON
Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

COLOR
Color of Pulp Industry Waste Liquors. (6). Behavior of Color During Waste Treatments (In Japanese),
W75-10393 5D

Color of Pulp Industry Waste Liquors. (7). Color Reduction by Ultraviolet Treatment (In Japanese),
W75-10394 5D

Color Removal From Bleached Kraft Effluents,
W75-10399 5D

COLORADO
Flood Plain Information: Goldsmith Gulch, Dutch Creek, Lilley Gulch, and Coon Creek, Volume VI, Denver Metropolitan Region, Colorado.
W75-10563 4A

Hydrologic Reconnaissance of the Southern Uinta Basin, Utah and Colorado,
W75-10585 3B

Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

COLORADO RIVER
The Lower Colorado River: A Bibliography,
W75-10453 10C

Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation,
W75-10805 5G

COMBINED SEWERS
Coping With Urban Runoff in the United States,
W75-10541 5D

COMMERCIAL FISHING
The Economic Impact of Mercury Pollution on Fisheries and Other Related Businesses Around Pickwick Lake,
W75-10356 5G

COMMERCIAL SHELLFISH
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

The Effects of Crude Oil on the Palatability of Marine Crustaceans,
W75-10428 5C

The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437 5C

COMPREHENSIVE PLANNING
The Master Plan for Water-Supply in the Regional Municipality of Ottawa-Carleton,
W75-10710 3D

COMPUTER MODELS
Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404 3B

Simulating Timber Yields and Hydrologic Impacts Resulting From Timber Harvest on Subalpine Watersheds,
W75-10406

A Predictive Computer Model of the Lower Cretaceous Aquifer, Franklin Area, Southeastern Virginia,
W75-10599

Analysis of a Large Water Distribution System Using Advanced Computer Software,
W75-10720

Optimal Sizing of Urban Flood-Control Systems,
W75-10821

Computer Simulation of Water Distribution Networks,
W75-10823

Pipeline Stress Analysis,
W75-10824

COMPUTER PROGRAMS
The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437

Pipeline Stress Analysis,
W75-10824

CONCRETE DAMS
Harry S. Truman Dam and Reservoir, Osage River, Missouri, Apendix A (Final Environmental Impact Statement).
W75-10363

CONDUITS
Turbulent Flow in Rectangular Outlet Conduit, Rend Lake Dam, Big Muddy River, Illinois,
W75-10666

CONFERENCES
Proceedings Symposium on Statistical Hydrology.
W75-10507

Agricultural and Urban Considerations in Irrigation and Drainage.
W75-10769

CONIFEROUS FORESTS
Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404

CONJUNCTIVE USE
Groundwater Control by Pumping,
W75-10778

CONNECTICUT
Hydrogeologic Data for the Farmington River Basin, Connecticut,
W75-10591

CONSTRUCTION
Groundwater Protection in Highway Construction in the Catchment Area of the City of Bern at Kiesen (Grundwasserschutz beim Autob im Fassungsgebiet Stadt Bern in Kiesen),
W75-10837

CONSTRUCTION MATERIALS
Corrosion and Its Cost in Sewage Treatment
W75-10364

CONTINENTAL SHELF
Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552

LING PONDS
clear Power Plant Cooling System Selection,
5-10822 6C

LING SYSTEMS
clear Power Plant Cooling System Selection,
5-10822 6C

LING TOWER PLUMES
ironmental Problems Associated with the
of Cooling Towers,
5-10671 5D

LING TOWERS
ironmental Problems Associated with the
of Cooling Towers,
5-10671 5D

LING WATER
lear Power Plant Cooling System Selection,
5-10822 6C

PODS
Effect of Crude Oil Fractions on the Sur-
l of a Tidepool Copepod, Tigriopus Califor-
s,
5-10641 5C

ER
ermination of Cadmium, Copper, and Lead
Natural Waters After Anion-Exchange
aration,
-10385 5A

vy Metal Contents of Fishes Caught in
hsiung Harbor, (In Chinese),
-10430 5A

ponse of Freshwater Protozoan Artificial
munities to Metals,
-10440 5C

pression of Nitrogen Fixation by Blue-
en Alage in a Eutrophic Lake with Trace
itions of Copper,
-10480 5C

orption of Cadmium, Copper and Zinc by
Whelks in the Bristol Channel,
-10481 5B

troscopic Determination of Atomization
ciency (CuCl-Cu+Cl) in an Air-Hydrogen
ne,
-10498 2K

per, Zinc and Total Protein Levels in the
ma of Sockeye Salmon (Oncorhynchus
ka) During Their Spawning Migration,
-10613 5C

Concentration of Mercury, Copper,
el, Silver, Cadmium and Lead in the
hern Adriatic Anchovy, Engraulis En-
cholus, and Sardine, Sardina Pilchardus,
-10620 5B

Effect of Sublethal Concentrations of
per and Zinc on Ventilatory Activity,
d Oxygen, and pH in Rainbow Trout
no Gairdneri),
-10624 5C

Effect of Certain Organic Pollutants on
per Toxicity to Fish (Lebistes Reticulatus),
-10637 5C

ER SULFATE
icides in Aquatic Systems,
-10625 5C

CORAL
Arsenate Uptake and Reduction by Pocillopora verrucosa,
W75-10491 5C

CORN (FIELD)
Phosphorus in Percolates from Manured Lysimeters,
W75-10573 5B

Relationships Between Drouth and Corn Yields on Selected South Atlantic Coastal Plain Soils,
W75-10721 3F

CORRELATION ANALYSIS
General Aspects of Multivariate Analysis with Applications to Some Problems in Hydrology,
W75-10510 2A

CORROSION
Corrosion and Its Cost in Sewage Treatment,
W75-10364 8G

Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

CORTICOSTEROIDS
Corticosteroid Concentrations in Sockeye Salmon (Oncorhynchus Nerka) Exposed to Low Concentrations of Copper,
W75-10415 5C

COST ANALYSIS
Analysis of Reservoir Recreation Benefits,
W75-10826 6B

COST-BENEFIT RATIO
Review of the Economic Benefits and Costs Resulting from Dewey Reservoir,
W75-10828 6B

COST-EFFECTIVENESS
Nuclear Power Plant Cooling System Selection,
W75-10822 6C

COST REPAYMENT
Analyzing Reimbursement Mechanisms for Resource Development Projects,
W75-10353 6C

COSTS
Process Design Manual for Upgrading Existing Waste Water Treatment Plants.
W75-10396 5D

An Economic Model of Waste Oil Recovery, Reprocessing and Distribution Systems,
W75-10768 5D

COTTON
Some Effects of Field Weathering of Seed Cotton in a Desert Environment,
W75-10557 3F

COTTON (FIELD)
Effects of Soil Moisture on Stress on 2 Varieties of Upland Cotton in Israel: IV. Effects of Periods of Stress Occurrence, Correlations and Regressions,
W75-10791 3F

CRABS
Effects of Mirex on the Larval Development of Blue Crab,
W75-10410 5C

The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437 5C

The Effect of Temperature and Salinity on Cadmium Uptake by the Blue Crab, Callinectes sapidus,
W75-10448 5C

CRAYFISH
Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

CROP PRODUCTION
Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

CROPS
Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

Trickle Irrigation Design Requirements for Row Crops,
W75-10801 3F

CROSS-SPECTRAL ANALYSIS
Cross Spectra of Short-Duration Rainfall,
W75-10514 2B

CRUDE OIL
The Effects of Crude Oil on the Palatability of Marine Crustaceans,
W75-10428 5C

CRUSTACEANS
The Effects of Crude Oil on the Palatability of Marine Crustaceans,
W75-10428 5C

CUMULUS PRECIPITATION
Priority Problems for Modifying Cumulus Precipitation,
W75-10774 3B

CURRENT VELOCITY
Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

CURVE FITTING
A Note on Mixed Distributions in Hydrology,
W75-10527 2E

A Two-Distribution Method for Fitting Mixed Distributions in Hydrology,
W75-10531 2E

CYANOPHYTA
Suppression of Nitrogen Fixation by Blue-Green Alage in a Eutrophic Lake with Trace Additions of Copper,
W75-10480 5C

The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

CYLOLOGICAL STUDIES
Electron Microscope Autoradiography of Kidney After Administration of PB-210 in Mice,
W75-10476 5A

CYTOLOGICAL STUDIES
An Analysis of the Mechanics of Guard Cell Motion,
W75-10488 2I

DAIRY INDUSTRY
Treatment of Milk Truck Washing Wastes by Anerobic Digestion,
W75-10673 5D

DALAPON
Herbicides in Aquatic Systems,
W75-10625 5C

DAM CONSTRUCTION
Project Lost Creek: Field Tests of Mounding and Controlled Blasting,
W75-10553 8H

DAMS
Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667 8B

DAPHNIA
Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

DATA COLLECTIONS
Index to Water Resources Data for Louisiana: Surface Water Records; Water-Quality Records.
W75-10590 5A

DATA EXTENSION
Developing Regional Stochastic Data Bases,
W75-10528 2E

DDE
Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

DDT
Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

Effects of Chlorinated Hydrocarbon Pollutants on Growth of Marine Phytoplankton in Culture,
W75-10636 5C

DECISION MAKING
Derived Decision Rules for Pollution Control in a General Equilibrium Space Economy,
W75-10360 6C

Weather Modification for Use in the High Plains.
W75-10775 3B

Comments on the Straw Man,
W75-10808 6B

Report to the Technical Committee of the Water Resources Centers of the Thirteen Western States,
W75-10809 6B

Nuclear Power Plant Cooling System Selection,
W75-10822 6C

DEER CREEK (SD)
Flood Plain Information: Brookings, Brookings County, South Dakota, Volume I - Deer Creek.
W75-10570 4A

DEFLECTION DIKES
Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

DELAWARE
Flood Plain Information: White Clay Creek, New Castle County, Delaware.
W75-10571 4A

DELAWARE RIVER
Report on the River Master of the Delaware River for the Period December 1, 1973-November 30, 1974,
W75-10589 4A

DELAWARE RIVER BASIN COMMISSION
Report on the River Master of the Delaware River for the Period December 1, 1973-November 30, 1974,
W75-10589 4A

DEMINERALIZATION
Treatment Processes for Coping with Variation in Raw-Water Quality,
W75-10705 5F

DEODORISATION
Treatment of Service Water with Ozone,
W75-10840 5D

DEPENDABLE SUPPLY
Water Supply from Renovated Wastewater--A Resource Manual for Massachusetts Planners, Public Officials and Citizen Groups.
W75-10722 5D

DES MOINES RIVER (IA)
Five Year Study of Des Moines River Water Quality,
W75-10803 5B

DESALINATION
Liquefying Refrigerant for Water Desalination with Liquefied Natural Gas and an Intermediate Energy Cycle,
W75-10725 3A

Rotary Desalination Engine and System,
W75-10733 3A

DESALINATION APPARATUS
Rotary Desalination Engine and System,
W75-10733 3A

DESALINATION PROCESSES
Liquefying Refrigerant for Water Desalination with Liquefied Natural Gas and an Intermediate Energy Cycle,
W75-10725 3A

DESERTS
Geological and Limnological Factors of Cold Deserts,
W75-10457 2C

DESIGN
Multichannel Toxicant Injection System for Flow-Through Bioassays,
W75-10443 5A

Analysis of Wastewater Treatment Systems for a Meat Processing Plant,
W75-10687 5D

A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

DESIGN CRITERIA
Corrosion and Its Cost in Sewage Treatme
W75-10364

Process Design Manual for Sludge Treat and Disposal.
W75-10475

New Engineering Criteria for Snow F Systems,
W75-10692

Water Quality Factors in Designing a Se Plant Based on Public Drainage Stati Data, (In Japanese),
W75-10838

DETERGENTS
Toxic Effects of an Anionic Detergent o Gills of Rainbow Trout,
W75-10434

Effect of Water Hardness on the Toxicit Nonionic Detergent to Fish,
W75-10444

Absorption, Metabolism, and Excretio Goldfish of the Anionic Detergent Sodium ryl Sulphate,
W75-10626

DETERIORATION
Deterioration of Water Quality in Distril Systems,
W75-10711

DETOXIFICATION
Effects of pH on Toxicity of Antimy Fish,
W75-10450

DEWATERING
Gravity Dewatering of Metal Hyd Sludges,
W75-10500

DIATOMS
The Effect of Heavy Metals on Photosyn and Loss of Cell Potassium in Two Spec Marine Algae, Dunaliella tertiolecta Phaeodactylum tricornutum,
W75-10447

The Effect of the Quantity of Silt to t tached Microorganisms of the Kuzuryu River in the Hokuriku District, (In Japane
W75010696

DIELDRIN
Residues of Polychlorinated Biphenyls and Chlorinated Pesticides in Fish and B the Po Delta, (Residus de Polychlorobip (PCB) et de Pesticides Chlores Dans Le sons et Les Oiseaux du Delta du Po),
W75-10446

DIFFUSION
Prediction of Trifluralin Diffusion Coeffi
W75-10542

DIKES
Norton Point Dike Study, Coney Island York; Hydraulic Model Investigation,
W75-10662

DISAGGREGATION
A Method of Disaggregation,
W75-10817

DISCHARGE (WATER)
Organic Compounds in Pulp Mill D Discharge,
W75-10402

ERSION
persion of Contaminated Bedload Particles,
5-10526 5B

OLVED OXYGEN
nt Performance Using Dissolved Oxygen
trol,
5-10452 5D

litional Studies of the Fishes, Macroinver-
rates and Hydrological Conditions of
and Canals in Tampa Bay, Florida,
5-10617 5C

RIBUTION
istribution and Concentration of Mercury in
Environment,
5-10483 5B

the Joint Distribution of the Periods and
olitudes of Sea Waves,
5-10534 2L

heory of the Mass Transport of Previously
ributed Chemicals in a Water-Saturated
ing Porous Medium: 4. Distributions,
-10632 5B

IBUTION FUNCTIONS
e Problems in Pure and Applied Stochastic
rology,
-10508 2A

IBUTION PATTERNS
ments on the Statistical Distribution of
fall per Period Under Various Transforma-
,
-10517 2B

IBUTION SYSTEMS
Master Plan for Water-Supply in the Re-
al Municipality of Ottawa-Carleton,
-10710 3D

rioration of Water Quality in Distribution
ems,
-10711 5F

r Works Improvements--Springfield, Ver-
,
-10713 3D

ysis of a Large Water Distribution System
g Advanced Computer Software,
-10720 4A

ICT OF COLUMBIA
lation Dynamics of Protozoa in Waste-
r, and Impact of Environmental Changes,
10689 5D

SION
rd an Ice-Free Arctic Ocean,
10532 2C

N SPECTROPHOTOMETER
Analysis of Dobson Spectrophotometer
urements of the Total Atmospheric Ozone
ent,
10545 7B

HELKS
rption of Cadmium, Copper and Zinc by
Whelks in the Bristol Channel,
10481 5B

STIC WASTES
stic Waste Water Reuse--Aspects of the
ment System,
10708 5D

DRAINAGE
Agricultural and Urban Considerations in Irrigation and Drainage.
W75-10769 4A

Drainage Analysis of a Confining Formation,
W75-10780 4A

Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation,
W75-10805 5G

DRAINAGE ENGINEERING
Art of Agricultural Drainage Design and Costs,
W75-10797 4A

DRAINAGE PRACTICES
Hydrology of the Albemarle-Pamlico Region, North Carolina--A Preliminary Report on the Impact of Agricultural Developments,
W75-10602 4C

Effects of Farming - Urban Drainage on Fresh Water,
W75-10802 5G

DRAINAGE SYSTEMS
Art of Agricultural Drainage Design and Costs,
W75-10797 4A

DRAINAGE WELLS
Change in Quality of Pumped Drainage Effluent,
W75-10779 5B

DRILLING
Icebreaking Drillship for Offshore Exploratory Drilling in the Arctic,
W75-10639 5G

DRIP IRRIGATION
Development of Large Scale Drip Irrigation Systems,
W75-10784 3F

DROUGHT RESISTANCE
Relationships Between Drouth and Corn Yields on Selected South Atlantic Coastal Plain Soils,
W75-10721 3F

DROUGHT TOLERANCE
Relationships Between Drouth and Corn Yields on Selected South Atlantic Coastal Plain Soils,
W75-10721 3F

DROUGHTS
Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

DUAL WATER SUPPLY SYSTEMS
Water Supply from Renovated Wastewater--A Resource Manual for Massachusetts Planners, Public Officials and Citizen Groups.
W75-10722 5D

DUNALIELLA TERTIOLECTA
The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

DUNGENESS CRAB
The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437 5C

DYE DISPERSION
Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

EAST FORK ONE HUNDRED AND TWO RIVER (IA)
Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

ECOLOGICAL DISTRIBUTION
Fishes of the Hiwassee River System: Ecological and Taxonomic Considerations,
W75-10694 5C

An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

ECONOMETRICS
The Effect of Landowner Attitude on the Financial and the Economic Costs of Acquiring Land for a Large Public Works Project,
W75-10827 6B

ECONOMIC EFFICIENCY
Water Rates: An Assessment of Current Issues,
W75-10707 6C

ECONOMIC IMPACT
Analyzing Reimbursement Mechanisms for Resource Development Projects,
W75-10353 6C

The Economic Impact of Mercury Pollution on Fisheries and Other Related Businesses Around Pickwick Lake,
W75-10356 5G

International Production Aspects of Water and Environmental Quality Control,
W75-10357 5G

Industrial Interdependencies and External Diseconomies of Water Resources,
W75-10358 6B

ECOSYSTEMS
Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

Herbicides in Aquatic Systems,
W75-10625 5C

Problems of Water Quality Management in Western River Basin Systems,
W75-10804 5G

EFFICIENCIES
Increasing the Efficiency of Flotation Savealls (Povyshenie effektivnosti raboty flotatsionnykh lovushek),
W75-10369 5D

EFFLUENT GUIDELINES
EPA's Effluent Guidelines Have Their Day in Court.
W75-10470 5G

EFFLUENTS
Effluent Treatment Equipment.
W75-10832 5D

EGALITARIANISM
Egalitarianism,
W75-10818 6A

ELASTICITY OF DEMAND
On the Peak-Load Pricing of Urban Water Supply,
W75-10706 6C

ELECTROLYSIS
Method of Purification of Waste Water Produced From the Packing of Meat and Aquatic Animals,
W75-10737 5D

EMBRYONIC GROWTH STAGE
Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

Effects of Temperature on Development and Survival of Rainbow Trout, Salmo Gairdneri, in Acid Waters,
W75-10623 5C

ENGINEERING STRUCTURES
Effects of Surface Drainage on Stream Flow,
W75-10794 4A

Environmental Issues, Effects, and Solutions,
W75-10795 6G

ENTEROVIRUSES
Sensitivity of Human Diploid Embryonic Lung Cells from Isolation of Echo Viruses from Sewage,
W75-10836 5C

ENTIAT EXPERIMENTAL FOREST (WASH)
Watershed Behavior After Forest Fire in Washington,
W75-10790 4C

ENVIRONEMTNAL IMPACT STATEMENTS
Harry S. Truman Dam and Reservoir, Osage River, Missouri, Apendix A (Final Environmental Impact Statement).
W75-10363 8A

ENVIRONMENT
Principles and standards for Water Planning,
W75-10355 6B

ENVIRONMENTAL CONTROL
Rivers in the City,
W75-10723 6B

ENVIRONMENTAL EFFECTS
Harry S. Truman Dam and Reservoir, Osage River, Missouri, Apendix A (Final Environmental Impact Statement).
W75-10363 8A

Effects of Methylmercury on Approach and Avoidance Behavior of Mallard Ducklings,
W75-10424 5C

Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

Manual for Preparation of Environmental Impact Statements for Wastewater Treatment Works, Facilities Plans, and 208 Areawide Waste Treatment Management Plans,
W75-10473 5D

Additional Studies of the Fishes, Macroinvertebrates and Hydrological Conditions of Upland Canals in Tampa Bay, Florida,
W75-10617 5C

800 Miles to Go,
W75-10638 5C

Effects of an Offshore Crude Oil Unloading Terminal on the Marine Environment,
W75-10642 5C

Environmental Problems Associated with the Use of Cooling Towers,
W75-10671 5D

Population Dynamics of Protozoa in Wastewater, and Impact of Environmental Changes,
W75-10689 5D

Environmental Issues, Effects, and Solutions,
W75-10795 6G

ENVIRONMENTAL ENGINEERING
Plant Performance Using Dissolved Oxygen Control,
W75-10452 5D

ENVIRONMENTAL IMPACT STATEMENTS
Manual for Preparation of Environmental Impact Statements for Wastewater Treatment Works, Facilities Plans, and 208 Areawide Waste Treatment Management Plans,
W75-10473 5D

Nuclear Power Plant Cooling System Selection,
W75-10822 6C

ENZYMES
Inhibition of ATPases Acitivity in Channel Catfish Brain by Kepone(Trade Name) and its Reduction Product,
W75-10612 5C

Physiological Changes in the Serum and Hepatopancreas of Yellow Tail Injected with Carbon Tetrachloride, (In Japanese),
W75-10630 5C

EPHEMERAL STREAMS
A Stochastic Model of Sediment Yield for Ephemeral Streams,
W75-10524 2J

EPIDEMIOLOGY
Sensitivity of Human Diploid Embryonic Lung Cells from Isolation of Echo Viruses from Sewage,
W75-10836 5C

EQUIPMENT
Effluent Treatment Equipment.
W75-10832 5D

ESTIMATING FLOOD PEAKS
A Comparison of Methods for Estimating Flood Peaks on Streams in Massachusetts,
W75-10587 4A

ESTUARIES
Critical Thermal Maxima of Three Species of Hawaiian Estuarine Fish: A Comparative Study,
W75-10426 5C

ETHOXYLATE DETERGENTS
Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

EUROPE
New Legislative Tendencies for Control of Water Pollution (Nuevas tendencias legislativas en el control de la contaminacion de las aguas),
W75-10384 5G

EUTROPHICATION
Suppression of Nitrogen Fixation by Blue-Green Alage in a Eutrophic Lake with Trace Additions of Copper,
W75-10480 5C

Will Wastewater Treatment Stop Eutrophi
tion of Impoundments,
W75-10686

An Investigation of the Ecology and W
Quality of a Lake Outlet,
W75-10724

EVALUATION
Theoretical and Applied Concepts of W
Resources for Social Welfare.
W75-10354

Development of Large Scale Drip Irriga
Systems,
W75-10784

Panel Review of the Taxonomic Structur
the Straw Man.
W75-10806

Panel Evaluation of the Logical Structure,
sistency, and Underlying Assumptions of
'Strawman' Methodology.
W75-10807

Comments on the Straw Man,
W75-10808

Report to the Technical Committee of
Water Resources Centers of the Thi
Western States,
W75-10809

Proceedings of the Graduate Student Sym
um of the Technical Committee of the W
Resources Centers of the Thirteen We
States.
W75-10810

Qualitative Sign Matrix Manipulation,
W75-10815

A Method of Disaggregation,
W75-10817

EVAPORATION
A Climatological Analysis of North
Desert Areas,
W75-10455

Estimating the Transport and Evaporati
Blowing Snow,
W75-10695

EVAPORATOR CONDENSATES
Studies on Possibilities of Biochemical
cation of Evaporator Condensate Occ
During Sulfite Pulp Manufa
(Untersuchungen ueber die Moeglichkei
biochemischen Reinigung des bei der Sulf
stoffherstellung anfallenden Eindampfko
sates),
W75-10382

EVAPOTRANSPIRATION
Effectiveness of Precipitation in a Mo
Meadow,
W75-10799

EXCAVATION
Project Lost Creek: Field Tests of Mo
and Controlled Blasting,
W75-10553

Results of Airblast Overpressure Measur
Program at Project R.D. Bailey,
W75-10555

EXCHANGE RATES
Theoretical and Applied Concepts of
Resources for Social Welfare.
W75-10354

national Production Aspects of Water and ronmental Quality Control,
-10357 5G

SIONS
lts of Airblast Overpressure Measurement ram at Project R.D. Bailey,
10555 8H

NALITIES
retical and Applied Concepts of Water urces for Social Welfare.
10354 6B

national Production Aspects of Water and onmental Quality Control,
10357 5G

trial Interdependencies and External Dis-mies of Water Resources,
10358 6B

G CREEK (VA)
Plain Information: Falling Creek, erfield County, Virginia.
0577 4A

VASTES
horus in Percolates from Manured eters,
0573 5B

NGTON RIVER BASIN (CONN)
geologic Data for the Farmington River Connecticut,
0591 7C

LITY STUDIES
Erie International Jetport Model Feasi-Investigation, Physical Model Feasibility
0670 8B

L JURISDICTION
l for Preparation of Environmental Im-Statements for Wastewater Treatment , Facilities Plans, and 208 Areawide Treatment Management Plans,
0473 5D

m for Control of Discharges of Pollu-Navigable Waters.
0608 5G

L WATER POLLUTION CONTROL
92-500 (Two Years Later) is Not the r,
0471 5G

aws and Their Enforcement; Progress Problems,
0607 5G

THION
y of Phosphamidon to American Lob-Homarus Americanus) Held at 4 and
413 5C

ZERS
ses of 'Bearss' Lemon to Nitrogen, um and Irrigation Applications,
714 3F

tic Device for the Operational Control e Filtration Rate of Suspen-utomatische Vorrichtung zur chen Kontrolle der Filtrationsgeschwin-von Suspensionen),
830 5D

FILTRATION
Vacuum Filtration Cost Optimization,
W75-10681 5D

Automatic Device for the Operational Control of the Filtration Rate of Suspensions(Automatische Vorrichtung zur Technischen Kontrolle der Filtrationsgeschwindigkeit von Suspensionen),
W75-10830 5D

FINANCING
Financing Water Works,
W75-10712 3D

FINGERLINGS
Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

FISH
Toxicity of Pulping Wastes to Fish,
W75-10403 5C

Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

Critical Thermal Maxima of Three Species of Hawaiian Estuarine Fish: A Comparative Study,
W75-10426 5C

Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

Water Quality Criteria for European Fresh-Water Fish.
W75-10609 5C

Inhibition of ATPases Acitivity in Channel Catfish Brain by Kepone(Trade Name) and its Reduction Product,
W75-10612 5C

Herbicides in Aquatic Systems,
W75-10625 5C

Fishes of the Hiwassee River System: Ecological and Taxonomic Considerations,
W75-10694 5C

FISH BEHAVIOR
Water Quality Criteria for European Fresh-water Fish.
W75-10610 5C

FISH CONTROL AGENTS
Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

FISH DIETS
Growth Factors in the Fish Meal Components of Catfish Diets,
W75-10658 2I

FISH DISEASES
Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

FISH DIVERSITY
Fishes of the Hiwassee River System: Ecological and Taxonomic Considerations,
W75-10694 5C

FISH EGGS
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

FISH MIGRATION
Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

FISH PHYSIOLOGY
Studies on the Metabolism of Chlorophenols in Fish-I Absorption and Excretion of PCP by Goldfish,
W75-10417 5C

Studies on the Metabolism of Chlorophenols in Fish-II Turnover in Absorbed PCP in Goldfish,
W75-10418 5C

DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

Toxic Effects of an Anionic Detergent on the Gills of Rainbow Trout,
W75-10434 5C

The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

Influence of a Thermal Effluent on Movement of Brown Bullhead (Ictalurus Nebulosus) as Determined by Ultrasonic Tracking,
W75-10628 5C

Physiological Changes in the Serum and Hepatopancreas of Yellow Tail Injected with Carbon Tetrachloride, (In Japanese),
W75-10630 5C

FISH POPULATIONS
Utilization of a Kraft Effluent Channel by Fish and Aquatic Organisms,
W75-10377 5C

FISHKILL
Toxicity of Chlorinated Municipal Wastes to Fish: An Evaluation Based on Michigan Field Data,
W75-10680 5C

FIXED-EFFECTIVENESS APPROACH
Nuclear Power Plant Cooling System Selection,
W75-10822 6C

FLAME PHOTOMETRY
Spectroscopic Determination of Atomization Efficiency (CuCl-Cu+Cl) in an Air-Hydrogen Flame,
W75-10498 2K

FLOATING
The Influence Surface Method for Floating Ice Plates,
W75-10504 2C

FLOATING ICE PLATES
The Influence Surface Method for Floating Ice Plates,
W75-10504 2C

FLOCCULATION
Use of Organic Flocculants for Textile Plant Water Treatment (Pouziti organickych flokulantu k cireni vody pro technologii textilni vyroby),
W75-10383 5F

FLOOD
Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

FLOOD CONTROL
Flood Plain Information: Macon County, Illinois.
W75-10565 4A

Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

Flood Plain Information: Brookings, Brookings County, South Dakota, Volume I - Deer Creek.
W75-10570 4A

Flood Plain Information: Catoma Creek, Vicinity of Montgomery, Alabama.
W75-10574 4A

Flood Plain Information: Falling Creek, Chesterfield County, Virginia.
W75-10577 4A

Flood Plain Information: James River, Eagle Rock to Lick Run, Botetourt County, Virginia.
W75-10578 4A

Flood Plain Information: Johnson Creek and Tributary, Chesterfield County, Virginia.
W75-10579 4A

Flood Hazards in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W75-10580 7C

Waimano Stream Flood Control Project, Pearl City, Hawaii; Hydraulic Model Investigation,
W75-10663 8B

Flood Control Project on Lytle and Warm Creeks and Santa Ana River, California; Hydraulic Model Investigation,
W75-10668 8B

Environmental Issues, Effects, and Solutions,
W75-10795 6G

Optimal Sizing of Urban Flood-Control Systems,
W75-10821 4A

Derivation of Reservoir Operating Rules by Economic Analysis,
W75-10825 4A

FLOOD DAMAGE
Flood Plain Information: Bushkill Creek, Vicinity of Easton, Pennsylvania.
W75-10560 4A

Flood Plain Information: Brandywine Creek, Chester County, Pennsylvania.
W75-10562 4A

Flood Plain Information: White Clay Creek, New Castle County, Delaware.
W75-10571 4A

Flood Plain Information: Catoma Creek, Vicinity of Montgomery, Alabama.
W75-10574 4A

Flood Plain Information: Upper River Rouge, Minnow Pond Drain, Bell Branch and Tarabusi Creek, Wayne and Oakland Counties, Michigan.
W75-10575 4A

Flood Hazards in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W75-10580 7C

FLOOD DATA
Flood Plain Information: Bloomsburg, Columbia County, Pennsylvania-Susquehanna River.
W75-10561 4A

Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

Flood Plain Information: Mill Run, Blair County, Pennsylvania.
W75-10568 4A

Flood Plain Information: West Branch Susquehanna River, Lycoming County, Pennsylvania.
W75-10576 4A

FLOOD DISCHARGE
Flood Waves and Suspended Sediment Pulses in Urbanized Catchments,
W75-10647 4C

FLOOD FLOW
Flood Plain Information: Goldsmith Gulch, Dutch Creek, Lilley Gulch, and Coon Creek, Volume VI, Denver Metropolitan Region, Colorado.
W75-10563 4A

Flood Control Project on Lytle and Warm Creeks and Santa Ana River, California; Hydraulic Model Investigation,
W75-10668 8B

FLOOD FORECASTING
Flood Plain Information: Ouachita River, Hot Springs Creek, Stokes Creek, Molly Creek, Gulpha Creek, City of Hot Springs, Arkansas.
W75-10559 4A

Flood Plain Information: Bushkill Creek, Vicinity of Easton, Pennsylvania.
W75-10560 4A

Flood Plain Information: Brandywine Creek, Chester County, Pennsylvania.
W75-10562 4A

Flood Plain Information: Goldsmith Gulch, Dutch Creek, Lilley Gulch, and Coon Creek, Volume VI, Denver Metropolitan Region, Colorado.
W75-10563 4A

Flood Plain Information: Macon Count
linois
W75-10565

Special Flood Hazard Information R
Chickasawhay River, Waynesboro. V
County, Mississippi.
W75-10569

Flood Plain Information: Shabakunk
West Branch Shabakunk and Little Shab
Creeks, Mercer County, New Jersey.
W75-10572

Flood Plain Information: Upper River
Minnow Pond Drain, Bell Branch and Ta
Creek, Wayne and Oakland Co
Michigan.
W75-10575

Flood Plain Information: Johnson Cre
Tributary, Chesterfield County, Virginia.
W75-10579

FLOOD FREQUENCY
Statistical Tolerance Limits for a Pearso
III Distribution,
W75-10511

Flood Plain Information: Macon Cou
linois.
W75-10565

FLOOD HAZARDS
Flood Hazards in the Seattle-Tacoma
Complex and Adjacent Areas, Washingt
W75-10580

FLOOD PEAK
Flood Plain Information: Goldsmith
Dutch Creek, Lilley Gulch, and Coon
Volume VI, Denver Metropolitan
Colorado.
W75-10563

A Comparison of Methods for Es
Flood Peaks on Streams in Massachuse
W75-10587

FLOOD PLAIN ZONING
Flood Plain Information Report: Senec
Montgomery County, Maryland.
W75-10567

Flood Plain Information: Mill Run, Bla
ty, Pennsylvania.
W75-10568

FLOOD PLAINS
Flood Plain Information: Ouachita Ri
Springs Creek, Stokes Creek, Molly
Gulpha Creek, City of Hot Springs, Ar
W75-10559

Flood Plain Information: Bushkill
Vicinity of Easton, Pennsylvania.
W75-10560

Flood Plain Information: Bloomsburg
bia County, Pennsylvania-Susquehann
W75-10561

Flood Plain Information: Brandywin
Chester County, Pennsylvania.
W75-10562

Flood Plain Information: Meadow C
bemarle County and Charlottesville, V
W75-10564

Flood Plain Information: Macon C
linois.
W75-10565

Plain Information: East Fork One Hun-
nd Two River, Bedford, Iowa.
0566 4A

l Flood Hazard Information Report:
asawhay River, Waynesboro, Wayne
y, Mississippi.
0569 4A

Plain Information: Brookings, Brookings
y, South Dakota, Volume I - Deer Creek.
0570 4A

Plain Information: White Clay Creek,
astle County, Delaware.
0571 4A

Plain Information: Shabakunk Creek,
Branch Shabakunk and Little Shabakunk
, Mercer County, New Jersey.
0572 4A

Plain Information: Catoma Creek,
y of Montgomery, Alabama.
0574 4A

Plain Information: Upper River Rouge,
v Pond Drain, Bell Branch and Tarabusi
Wayne and Oakland Counties,
n.
575 4A

Plain Information: West Branch
anna River, Lycoming County,
vania.
576 4A

Plain Information: Falling Creek,
field County, Virginia.
577 4A

Plain Information: James River, Eagle
Lick Run, Botetourt County, Virginia.
578 4A

Plain Information: Johnson Creek and
y, Chesterfield County, Virginia.
579 4A

esign in Urban Growth Centres,
43 6B

ROFILE
Plain Information: Shabakunk Creek,
anch Shabakunk and Little Shabakunk
Mercer County, New Jersey.
72 4A

ROFILES
ain Information: Ouachita River, Hot
Creek, Stokes Creek, Molly Creek,
reek, City of Hot Springs, Arkansas.
59 4A

ain Information: Bloomsburg, Colum-
ty, Pennsylvania-Susquehanna River.
61 4A

ain Information: Meadow Creek, Al-
County and Charlottesville, Virginia.
64 4A

ain Information: Macon County, Il-
5 4A

in Information: Mill Run, Blair Coun-
ylvania.
8 4A

lain Information: Catoma Creek,
f Montgomery, Alabama.
4 4A

Flood Plain Information: West Branch Susquehanna River, Lycoming County, Pennsylvania.
W75-10576 4A

Flood Plain Information: Falling Creek, Chesterfield County, Virginia.
W75-10577 4A

Flood Plain Information: James River, Eagle Rock to Lick Run, Botetourt County, Virginia.
W75-10578 4A

**FLOOD PROTECTION**

Flood Plain Information: Macon County, Illinois.
W75-10565 4A

Flood Plain Information Report: Seneca Creek, Montgomery County, Maryland.
W75-10567 4A

Valley Design in Urban Growth Centres,
W75-10643 6B

**FLOOD RECURRENCE INTERVAL**

Statistical Tolerance Limits for a Pearson Type III Distribution,
W75-10511 2E

The Effects of Urbanization on Floods of Different Recurrence Interval,
W75-10709 4C

**FLOOD VELOCITY**

Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

**FLOODING**

Phosphorus Availability of Some Philippine Rice Soils as Affected by Soil and Water Management Practices,
W75-10421 3F

Flood Plain Information: Ouachita River, Hot Springs Creek, Stokes Creek, Molly Creek, Gulpha Creek, City of Hot Springs, Arkansas.
W75-10559 4A

Flood Plain Information: Goldsmith Gulch, Dutch Creek, Lilley Gulch, and Coon Creek, Volume VI, Denver Metropolitan Region, Colorado.
W75-10563 4A

Flood Plain Information: Meadow Creek, Albemarle County and Charlottesville, Virginia.
W75-10564 4A

Flood Plain Information: Macon County, Illinois.
W75-10565 4A

Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

Flood Plain Information: Mill Run, Blair County, Pennsylvania.
W75-10568 4A

Special Flood Hazard Information Report: Chickasawhay River, Waynesboro, Wayne County, Mississippi.
W75-10569 4A

Flood Plain Information: Brookings, Brookings County, South Dakota, Volume I - Deer Creek.
W75-10570 4A

Flood Plain Information: Shabakunk Creek, West Branch Shabakunk and Little Shabakunk Creeks, Mercer County, New Jersey.
W75-10572 4A

Flood Plain Information: West Branch Susquehanna River, Lycoming County, Pennsylvania.
W75-10576 4A

Flood Plain Information: Falling Creek, Chesterfield County, Virginia.
W75-10577 4A

Flood Plain Information: James River, Eagle Rock to Lick Run, Botetourt County, Virginia.
W75-10578 4A

Flood Plain Information: Johnson Creek and Tributary, Chesterfield County, Virginia.
W75-10579 4A

Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

**FLOODPLAIN MANAGEMENT**

Flood Plain Information Report: Seneca Creek, Montgomery County, Maryland.
W75-10567 4A

**FLOODS**

Flood Plain Information: Ouachita River, Hot Springs Creek, Stokes Creek, Molly Creek, Gulpha Creek, City of Hot Springs, Arkansas.
W75-10559 4A

Flood Plain Information: Bloomsburg, Columbia County, Pennsylvania-Susquehanna River.
W75-10561 4A

Flood Plain Information: Goldsmith Gulch, Dutch Creek, Lilley Gulch, and Coon Creek, Volume VI, Denver Metropolitan Region, Colorado.
W75-10563 4A

Flood Plain Information: Meadow Creek, Albemarle County and Charlottesville, Virginia.
W75-10564 4A

Flood Plain Information: Macon County, Illinois.
W75-10565 4A

Flood Plain Information Report: Seneca Creek, Montgomery County, Maryland.
W75-10567 4A

Special Flood Hazard Information Report: Chickasawhay River, Waynesboro, Wayne County, Mississippi.
W75-10569 4A

Flood Plain Information: Brookings, Brookings County, South Dakota, Volume I - Deer Creek.
W75-10570 4A

Flood Plain Information: West Branch Susquehanna River, Lycoming County, Pennsylvania.
W75-10576 4A

Flood Plain Information: Falling Creek, Chesterfield County, Virginia.
W75-10577 4A

Flood Plain Information: James River, Eagle Rock to Lick Run, Botetourt County, Virginia.
W75-10578 4A

Flood Plain Information: Johnson Creek and Tributary, Chesterfield County, Virginia.
W75-10579 4A

FLOODS

Flood Hazards in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington, W75-10580 7C

A Comparison of Methods for Estimating Flood Peaks on Streams in Massachusetts, W75-10587 4A

Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1973, W75-10596 7C

The Effects of Urbanization on Floods of Different Recurrence Interval, W75-10709 4C

FLORIDA

Utilization of a Kraft Effluent Channel by Fish and Aquatic Organisms, W75-10377 5C

The Loxahatchee - A River in Distress, Southeast Florida, W75-10588 4C

Hydrological Data From Wells in Southwest Hillsborough County, Florida, 1950-74, W75-10593 7C

Additional Studies of the Fishes, Macroinvertebrates and Hydrological Conditions of Upland Canals in Tampa Bay, Florida, W75-10617 5C

Analysis of Pollution from Marine Engines - Status Report, W75-10688 5A

Water and Wastewater Facilities for Florida Housing Developments, W75-10717 5D

The Perimeter Canal - A New Approach to Discharge Urban Water into a Coastal Mangrove Area, W75-10773 4A

New Concepts in Suburban Drainage in Florida, W75-10793 4A

Effects of Farming - Urban Drainage on Fresh Water, W75-10802 5G

FLOTATION

Increasing the Efficiency of Flotation Savealls (Povyshenie effektivnosti raboty flotatsionnykh lovushek), W75-10369 5D

Serpaflo: Original Solution to Cleaning Paper Mill Effluents (Serpaflo; La solution originale d'epuration des eaux papeteries), W75-10389 5D

FLOW

Devices for Toxicological Long-Term Studies on Aquatic Organisms (Gerate zur Durchfuhrung Toxikologischer Langzeitstudien an Wasserorganismen), W75-10618 5A

FLOW SLOPE

Competence of Rivers to Transport Coarse Bedload Material, W75-10540 2J

FLOW-THROUGH BIOASSAYS

Multichannel Toxicant Injection System for Flow-Through Bioassays, W75-10443 5A

FLUCTUATIONS

On the Joint Distribution of the Periods and Amplitudes of Sea Waves, W75-10534 2L

FLUID MECHANICS

Fluid-Dynamic Excitation Involving Flow Instability, W75-10544 8B

Hydraulics and Mechanics of River Ice Jams, W75-10556 8B

FLUOROMETRY

A Remote Sensing Laser Fluorometer, W75-10831 5A

FLUVIAL SEDIMENTS

Competence of Rivers to Transport Coarse Bedload Material, W75-10540 2J

FOOD CHAINS

Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese), W75-10441 5C

Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat, W75-10451 5C

Herbicides in Aquatic Systems, W75-10625 5C

Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.), W75-10699 5C

FOOD PROCESSING INDUSTRY

Lagoons Plus Spray Irrigation for Effective Bean Cannery Waste Treatment, W75-10678 5D

An Effluent Study of a Fresh Water Fish Processing Plant, W75-10684 5D

Analysis of Wastewater Treatment Systems for a Meat Processing Plant, W75-10687 5D

FOOD WEBS

Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese), W75-10441 5C

Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat, W75-10451 5C

FOREIGN COUNTRIES

Pedologic Cover of the Watershed of the Porecka River, W75-10551 2A

FOREIGN TRADE

International Production Aspects of Water and Environmental Quality Control, W75-10357 5G

FOREST FIRES

Watershed Behavior After Forest Fire in Washington, W75-10790 4C

FOREST MANAGEMENT

Land Use Simulation Model of the Subal Coniferous Forest Zone, W75-10404

Watershed Management in the Rocky Mou Subalpine Zone: The Status of Our Knowle W75-10405

Simulating Timber Yields and Hydrologic pacts Resulting From Timber Harvest on alpine Watersheds, W75-10406

FORT WORTH (TEX)

Hydrologic Data for Urban Studies in the Worth, Texas Metropolitan Area, 1973, W75-10596

FOSSIL FUELS

Toxic Trace Elements: Preferential Conc tion in Respirable Particles, W75-10482

FRANKLIN AREA (VA)

A Predictive Computer Model of the L Cretaceous Aquifer, Franklin Area, Sout ern Virginia, W75-10599

FRASER RIVER (BRITISH COLUMBIA)

Nonlinear Channel Routing by Computer, W75-10543

FREEZING

Processes and Costs Imposed by Enviro tal Stress, W75-10461

Closed Recycling System for Water Pu tion and Waste Reduction, W75-10735

FREQUENCY

On the Joint Distribution of the Perio Amplitudes of Sea Waves, W75-10534

FREQUENCY ANALYSIS

Comments on the Statistical Distribut Rainfall per Period Under Various Trans tions, W75-10517

FREQUENCY CURVES

Comments on the Statistical Distribu Rainfall per Period Under Various Tran tions, W75-10517

A Note on Mixed Distributions in Hydr W75-10527

A Two-Distribution Method for Fittin Distributions in Hydrology, W75-10531

FRESHWATER FISH

Water Quality Criteria for European water Fish. W75-10610

Studies on the Metabolism of Chloroph Fish-III Isolation and Identification of gated PCP Excreted by Goldfish, W75-10611

Absorption, Metabolism, and Excr Goldfish of the Anionic Detergent Sod ryl Sulphate, W75-10626

ffluent Study of a Fresh Water Fish
ssing Plant,
0684 5D

OLICH EQUATION
ption and Degradation of Chlorbromuron
,
0414 5B

a in Aquatic Animals,
0375 2I

ty of the Lampricide 3-Trifluoromethyl-
phenol (TFM) to Selected Aquatic In-
rates and Frog Larvae,
0703 5C

GROUND
rphic Processes in Polar Deserts,
0456 2C

LADDER
on the Metabolism of Chlorophenols in
Turnover in Absorbed PCP in Goldfish,
0418 5C

DISTRIBUTIONS
nts on the Statistical Distribution of
per Period Under Various Transforma-
0517 2B

COMATOGRAPHY
s of Tri-Aryl Phosphate Esters and the
ination of Imol S-140 in Fish Tissue and
Samples by Gas Chromatography,
0442 5A

Pollution Problems Associated with Con-
Stack Gas Emission,
0591 5B

Water Pollution Control,
0732 5D

IC INVESTIGATIONS
eology of the Triassic Rocks of Mary-
0784 2F

PHOLOGY
Flow Patterns and the Origin of Late
inan Till in the Southern Rocky Moun-
ch, British Columbia,
0039 2C

nce of Rivers to Transport Coarse
Material,
0040 2J

Metals Removal from Wood Preserving
ter,
0075 5D

MAL STUDIES
hic Processes in Polar Deserts,
0056 2C

al Channel and Harbor Ice Control
0044 4A

al Power Plant with High Efficiency,
0005 8C

TION
a Phytoplankton Culture on the Ger-
and Seedling Development of Barley,
ets and Lettuce,
0006 3F

GILA PROJECT (ARIZ)
Change in Quality of Pumped Drainage Effluent,
W75-10779 5B

GLACIERS
Geological and Limnological Factors of Cold Deserts,
W75-10457 2C

Floating Glacial Ice Caps in the Arctic Ocean,
W75-10533 2C

Glacier-Flow Patterns and the Origin of Late Wisconsinan Till in the Southern Rocky Mountain Trench, British Columbia,
W75-10539 2C

GLACIOLOGY
Some Aspects of Climatology in Polar Barrens,
W75-10454 2C

GOLD
Rapid Extractive Spectrophotometric Determination of Gold (III) With 4-(2-Pyridylazo)-Resorcinol,
W75-10499 2K

GOLDEN IDE
Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

GOLDFISH
Studies on the Metabolism of Chlorophenols in Fish-I Absorption and Excretion of PCP by Goldfish,
W75-10417 5C

Studies on the Metabolism of Chlorophenols in Fish-II Turnover in Absorbed PCP in Goldfish,
W75-10418 5C

Studies on the Metabolism of Chlorophenols in Fish-III Isolation and Identification of a Conjugated PCP Excreted by Goldfish,
W75-10611 5A

Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

GONADAL DEVELOPMENT
The Effect of Prolonged Exposure to Elevated Temperatures on the Biochemical Constituents, Gonadal Development and Shell Deposition of the American Oyster, Crassostrea Virginica,
W75-10849 5C

GOVERNMENT SUPPORTS
Indigenous Peoples of Polar Deserts,
W75-10460 6D

GRASSES
Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

GRAVITY-FLOW COLUMN
A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

GREAT LAKES
International Field Year for the Great Lakes.
W75-10547 2H

International Field Year for the Great Lakes.
W75-10548 2H

International Field Year for the Great Lakes.
W75-10549 2H

International Field Year for the Great Lakes.
W75-10550 2H

GREAT PLAINS
Weather Modification for Use in the High Plains,
W75-10775 3B

Protein Content of Winter Wheat Grain as Related to Soil and Climatic Factors in the Semi-Arid Central Great Plains,
W75-10792 3F

GROUNDWATER
Hydraulic Behaviour of the Chalk Aquifer in the Yorkshire Wolds,
W75-10506 4B

Map of the Antelope Valley-East Kern Water Agency Area, California, Showing Groundwater Subunits and Areas, Location of Wells, and Water-Level Contours for Spring 1974,
W75-10595 7C

Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

Groundwater Protection in Highway Construction in the Catchment Area of the City of Berne at Kiesen (Grundwasserschutz beim Autobahn im Fassungsgebiet Stadt Bern in Kiesen),
W75-10837 5C

Water Analysis of River Waters in Kagawa (IX), Chemical Composition of the Aya Water Basin, (In Japanese),
W75-10841 2K

GROUNDWATER DEVELOPMENT
Ground-Water Conditions in Utah, Spring of 1975,
W75-10606 2F

GROUNDWATER RECHARGE
Seepage from Recharge and Landfill Ditches,
W75-10770 5B

GROUNDWATER RESOURCES
Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

Ground-Water Levels in New Mexico, 1972,
W75-10582 4B

Hydrogeology of the Triassic Rocks of Maryland,
W75-10584 2F

Hydrologic Reconnaissance of the Southern Uinta Basin, Utah and Colorado,
W75-10585 3B

Hydrogeologic Data for the Farmington River Basin, Connecticut,
W75-10591 7C

Summary Appraisals of the Nation's Ground-Water Resources--Rio Grande Region,
W75-10597 4B

Summary Appraisals of the Nation's Ground-Water Resources--Ohio Region,
W75-10598 4B

Ground-Water Conditions in Utah, Spring of 1975,
W75-10606 2F

GROUNDWOOD PULP
Spent Liquor From Peroxide Bleaching of Groundwood Pulp From Spruce,
W75-10392 5A

GROWTH RATE
Bioassay Data for Marine Pollution Using Sea Urchin Eggs, 1972 and 1973,
W75-10432 5A

The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

GROWTH RATES
Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

Growth Factors in the Fish Meal Components of Catfish Diets,
W75-10658 2I

Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

GROWTH STAGES
Effects of Mirex on the Larval Development of Blue Crab,
W75-10410 5C

Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

Effects of the Insecticide Sevin and Its First Hydrolytic Product, 1-Napthol, on Some Early Developmental Stages of the Bay Mussel, Mytilus edulis,
W75-10435 5C

Aspects of the Winter Ecology of Juvenile Coho Salmon (Oncorhynchus Kisutch) and Steelhead Trout (Salmo Gairdneri),
W75-10615 5C

Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5A

Effects of Temperature on Development and Survival of Rainbow Trout, Salmo Gairdneri, in Acid Waters,
W75-10623 5C

GUARD CELL MOTION
An Analysis of the Mechanics of Guard Cell Motion,
W75-10488 2I

GULF OF MEXICO
On the Joint Distribution of the Periods and Amplitudes of Sea Waves,
W75-10534 2L

GUNNISON (COL)
Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

HABITATS
Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

HAIL SUPPRESSION
Weather Modification for Use in the High Plains,
W75-10775 3B

HALOGENATEED PESTICIDES
Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

HARBORS
Rivers in the City,
W75-10723 6B

HARDNESS (WATER)
Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

Water Analysis of River Waters in Kagawa (IX), Chemical Composition of the Aya Water Basin, (In Japanese),
W75-10841 2K

HAWAII
Critical Thermal Maxima of Three Species of Hawaiian Estuarine Fish: A Comparative Study,
W75-10426 5C

Program for Control of Discharges of Pollutants to Navigable Waters.
W75-10608 5G

Waimano Stream Flood Control Project, Pearl City, Hawaii; Hydraulic Model Investigation,
W75-10663 8B

HAZARDS
Results of Airblast Overpressure Measurement Program at Project R.D. Bailey,
W75-10555 8H

HEAT TREATMENT
Heat Treatment of Sewage Sludges,
W75-10644 5D

HEATED WATER
The Effect of Prolonged Exposure to Elevated Temperatures on the Biochemical Constituents, Gonadal Development and Shell Deposition of the American Oyster, Crassostrea Virginica,
W75-10849 5C

HEAVY METALS
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

Heavy Metal Contents of Fishes Caught
Kaohsiung Harbor, (In Chinese),
W75-10430

The Effect of Heavy Metals on Photosynthe
and Loss of Cell Potassium in Two Species
Marine Algae, Dunaliella tertiolecta a
Phaeodactylum tricornutum,
W75-10447

Thallium: Occurrence in the Environment a
Toxicity to Fish,
W75-10449

Absorption of Cadmium, Copper and Zinc
Dog Whelks in the Bristol Channel,
W75-10481

Atomic-Absorption Spectrometric Determi
tion of Copper, Lead, Cadmium and M
ganese in Pulp and Paper by the Dir
Atomization Technique,
W75-10489

Atomic Absorption Spectrometric Determ
tion of Cadmium, Lead, Silver, Thallium
Zinc in Silicate Rocks by Direct Atomiza
From the Solid State,
W75-10492

Uranium, Thorium, and Lead Concentrat
in Three Silicate Standards and a Metho
Lead Isotopic Analysis,
W75-10494

Removal of Trace Metals During Conventi
Water Treatment,
W75-10501

On the Accumulation of Organochlorine P
cides, PCB and Certain Heavy Metals in
and Shellfish from Thai Coastal and In
Waters,
W75-10616

The Concentration of Mercury, Co
Nickel, Silver, Cadmium and Lead in
Northern Adriatic Anchovy, Engraulis
crasicholus, and Sardine, Sardina Pilchardu
W75-10620

The Effect of Sublethal Concentration
Copper and Zinc on Ventilatory Act
Blood Oxygen, and pH in Rainbow
(Salmo Gairdneri),
W75-10624

The Effect of Some Heavy Metal Ion
Photosynthesis in a Freshwater Alga,
W75-10627

Trace Elements in Melbourne Rivers - A
terlaboratory Analysis,
W75-10649

Heavy Metals Removal from Wood Prese
Wastewater,
W75-10675

Process for Removing Heavy Metal Io
Water,
W75-10731

The Toxicity of Heavy Metal Ions to Ana
Digestion,
W75-10843

HEPATOPANCREAS
Physiological Changes in the Serum
Hepatopancreas of Yellow Tail Injected
Carbon Tetrachloride, (In Japanese),
W75-10630

CIDES
ction of Trifluralin Diffusion Coefficients,
0542 5B

cides in Aquatic Systems,
0625 5C

Effect of Some Heavy Metal Ions on
ynthesis in a Freshwater Alga,
0627 5C

ting the Concentration of Aquatic Herbi-
esidues in Waterways,
0648 5B

GS
ned Effects of Cadmium and Salinity on
pment and Survival of Herring Eggs,
0704 5C

ILOROBENZENE
Pollutants Pose Potential Danger to
0464 5B

NIA SP.
Toxicity of the Lampricide 3-
romethyl-4-Nitro-Phenol (TFM) to
s of Mayflies (Hexagenia Sp.),
699 5C

AINS
r Modification for Use in the High
775 3B

LOCITY FLOW
o Stream Flood Control Project, Pearl
awaii; Hydraulic Model Investigation,
563 8B

Y EFFECTS
n the City,
723 6B

water Protection in Highway Construc-
ne Catchment Area of the City of Berne
n (Grundwasserschutz beim Autobahn
ngsgebiet Stadt Bern in Kiesen),
37 5C

Y ICING
ow Fence Design Controls Drifts, Im-
isibility, Reduces Road Ice,
93 2C

CTION
ect of Some Heavy Metal Ions on
thesis in a Freshwater Alga,
27 5C

FLOODS
ain Information: Upper River Rouge,
Pond Drain, Bell Branch and Tarabusi
Wayne and Oakland Counties,
75 4A

er Colorado River: A Bibliography,
3 10C

RIVER (TENN)
the Hiwassee River System: Ecologi-
axonomic Considerations,
4 5C

ainfall Generation for a Network,
5 2B

HUMAN PATHOLOGY
Redistribution and Concentration of Mercury in the Environment,
W75-10483 5B

HUMAN POPULATION
Lead Metabolism in the Normal Human: Stable Isotope Studies,
W75-10484 5A

HYDRAULIC CONDUCTIVITY
Measurement of Hydraulic Conductivity of Peats,
W75-10536 7B

HYDRAULIC DESIGN
Nonlinear Channel Routing by Computer,
W75-10543 4A

New Concepts in Suburban Drainage in Florida,
W75-10793 4A

HYDRAULIC MODELS
Physical Model Study of Circulation Patterns in Lake Ontario,
W75-10537 2H

Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

Waimano Stream Flood Control Project, Pearl City, Hawaii; Hydraulic Model Investigation,
W75-10663 8B

Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667 8B

Flood Control Project on Lytle and Warm Creeks and Santa Ana River, California; Hydraulic Model Investigation,
W75-10668 8B

Evaluation of Disposal Areas in James River; Hydraulic Model Investigation,
W75-10669 8B

Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

Current Water Systems Automation Research and Development in the Bureau of Reclamation,
W75-10787 8C

HYDRAULIC STRUCTURES
Current Water Systems Automation Research and Development in the Bureau of Reclamation,
W75-10787 8C

HYDRAULIC STUCTURES
Some Factors Affecting Control of Flow in a Large Canal System,
W75-10786 8B

HYDRAULIC SYSTEMS
Water Works Improvements--Springfield, Vermont,
W75-10713 3D

HYDROGEN ION CONCENTRATION
Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

HYDROGEOLOGY
Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

Hydrogeology of the Triassic Rocks of Maryland,
W75-10584 2F

A Predictive Computer Model of the Lower Cretaceous Aquifer, Franklin Area, Southeastern Virginia,
W75-10599 2F

HYDROGRAPHS
Effects of Surface Drainage on Stream Flow,
W75-10794 4A

HYDROLOGIC BUDGET
Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

HYDROLOGIC DATA
Developing Regional Stochastic Data Bases,
W75-10528 2E

A Two-Distribution Method for Fitting Mixed Distributions in Hydrology,
W75-10531 2E

Hydrogeologic Data for the Farmington River Basin, Connecticut,
W75-10591 7C

Hydrological Data From Wells in Southwest Hillsborough County, Florida, 1950-74,
W75-10593 7C

Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1973,
W75-10596 7C

Water Resources of the Toppenish Creek Basin, Yakima Indian Reservation, Washington.
W75-10603 3F

Low-Flow Characteristics of Mississippi Streams,
W75-10605 2E

HYDROLOGICAL SEQUENCES
Removal of Periodicities by Differencing and Monthyl Mean Subtraction,
W75-10352 2A

HYDROLOGY
Proceedings Symposium on Statistical Hydrology.
W75-10507 2A

Some Problems in Pure and Applied Stochastic Hydrology,
W75-10508 2A

General Aspects of Multivariate Analysis with Applications to Some Problems in Hydrology,
W75-10510 2A

A Note on Mixed Distributions in Hydrology,
W75-10527 2E

A Two-Distribution Method for Fitting Mixed Distributions in Hydrology,
W75-10531 2E

Progress in Australian Hydrology 1965-1974.
W75-10646 2A

HYDROXIDES
Gravity Dewatering of Metal Hydroxide Sludges,
W75-10500 5D

HYPOCHLOROUS ACID
Water Quality Criteria for European Fresh-Water Fish.
W75-10609 5C

ICE
Processes and Costs Imposed by Environmental Stress,
W75-10461 2C

Large Scale Laboratory Direct Shear Tests on Ice,
W75-10502 2C

The Influence Surface Method for Floating Ice Plates,
W75-10504 2C

Icings Along the Trans-Alaska Pipeline Route,
W75-10592 2C

ICE COVER
Geological and Limnological Factors of Cold Deserts,
W75-10457 2C

Geothermal Channel and Harbor Ice Control System,
W75-10734 4A

ICE FOG
Processes and Costs Imposed by Environmental Stress,
W75-10461 2C

ICE JAMS
Hydraulics and Mechanics of River Ice Jams,
W75-10556 8B

ICE THICKNESS
Floating Glacial Ice Caps in the Arctic Ocean,
W75-10533 2C

ILLINOIS
Flood Plain Information: Macon County, Illinois.
W75-10565 4A

Turbulent Flow in Rectangular Outlet Conduit, Rend Lake Dam, Big Muddy River, Illinois,
W75-10666 8B

IMMATURE GROWTH STAGE
Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

IMOL
Analysis of Tri-Aryl Phosphate Esters and the Determination of Imol S-140 in Fish Tissue and Water Samples by Gas Chromatography,
W75-10442 5A

IMPERIAL VALLEY (CAL)
Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation,
W75-10805 5G

INCOME ANALYSIS
Review of the Economic Benefits and Costs Resulting from Dewey Reservoir,
W75-10828 6B

INCOME DISTRIBUTION
Review of the Economic Benefits and Costs Resulting from Dewey Reservoir,
W75-10828 6B

INDIAN RESERVATIONS
Water Resources of the Toppenish Creek Basin, Yakima Indian Reservation, Washington.
W75-10603 3F

INDIANA
A River-Quality Assessment of the Upper White River, Indiana,
W75-10600 5B

Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667 8B

Disposal of Liquid Effluent by Land Irrigation at Lagro Celotex Plant,
W75-10679 5D

INDUSTRIAL INTERDEPENDENCIES
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

Industrial Interdependencies and External Diseconomies of Water Resources,
W75-10358 6B

INDUSTRIAL PRODUCTION
Industrial Interdependencies and External Diseconomies of Water Resources,
W75-10358 6B

INDUSTRIAL WASTES
Serpaflo: Original Solution to Cleaning Paper Mill Effluents (Serpaflo; La solution originale d'epuration des eaux papeteries),
W75-10389 5D

Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

Toxic Trace Elements: Preferential Concentration in Respirable Particles,
W75-10482 5A

Guidelines for Landfill of Toxic Industrial Sludges,
W75-10487 5G

The Mutual Destruction of Polluting Factors in Waste Liquors,
W75-10645 5D

Heavy Metals Removal from Wood Preserving Wastewater,
W75-10675 5D

Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

Disposal of Liquid Effluent by Land Irrigation at Lagro Celotex Plant,
W75-10679 5D

Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

Automated Sequential Composite Sampling. A New Technique for Water Pollution Study and Control,
W75-10690 5A

Method of Treating Aluminum-Containing Waste Water,
W75-10730 5D

Process for Removing Heavy Metal Ions in Water,
W75-10731 5D

Air and Water Pollution Control,
W75-10732 5D

Proceedings of the International Conferen
Waste Oil Recovery and Reuse.
W75-10739

The Consequences of Accepting Indu
Wastes into Sewers; Water Pollution Res
at Stevenage,
W75-10842

An Evaluation of Persistency for Water
Organics,
W75-10850

INDUSTRIAL WATER
Industrial Interdependencies and Externa
economies of Water Resources,
W75-10358

Water for Industrial Development in A
Itawamba, Prentiss, and Tishomingo Co
Mississippi,
W75-10581

Economic Impact of the Conversion of
from Irrigation to Municipal and Industri
in the Rio Grande Basin of New Mexico,
W75-10771

INFORMATION SYSTEMS
Necessary Adaptations for Significant
tion of the Information System,
W75-10816

INFRARED RADIOMETER
Laboratory Measurement of Surface Te
ture Fluctuations Induced by Small Am
Surface Waves,
W75-10505

INHIBITION
Bioassay Data for Marine Pollution Us
Urchin Eggs, 1972 and 1973,
W75-10432

INLAND WATERWAYS
The Perimeter Canal - A New Appr
Discharge Urban Water into a Coast
grove Area,
W75-10773

INSECT CONTROL
Biological Activity of Organophosphor
pounds and Synthetic Pyrethroids Aga
mature Mosquitoes,
W75-10631

INSECTICIDES
Effect of the Insecticide Zectran (Mexa
on Several Algae,
W75-10425

Toxicity of Two Synthetic Pyrethrins t
Trout,
W75-10438

Toxicity of Paired Mixtures of C
Forest Insecticides to Rainbow Trout,
W75-10439

INTEREST RATES
Financing Water Works,
W75-10712

INTERNATIONAL FIELD YEAR FOR T
GREAT LAKES
International Field Year for the Great
W75-10547

International Field Year for the Great
W75-10548

International Field Year for the Great
W75-10549

rnational Field Year for the Great Lakes.
5-10550 2H

RNATIONAL HYDROLOGICAL DECADE
rnational Field Year for the Great Lakes.
-10547 2H

rnational Field Year for the Great Lakes.
-10548 2H

rnational Field Year for the Great Lakes.
-10549 2H

national Field Year for the Great Lakes.
-10550 2H

NATIONAL WATERS
national Field Year for the Great Lakes.
10547 2H

national Field Year for the Great Lakes.
10548 2H

national Field Year for the Great Lakes.
10549 2H

national Field Year for the Great Lakes.
10550 2H

TEBRATES
Quality Criteria for European Fresh-
Fish.
0609 5C

ity and Residue Dynamics of the Lampri-
3-Trifluoro-Methyl-4-Nitrophenol (TFM)
uatic Invertebrates,
0700 5C

ity of the Lampricide 3-Trifluoromethyl-
ophenol (TFM) to Selected Aquatic In-
rates and Frog Larvae,
0703 5C

CHANGE
Removal From Bleached Kraft Ef-
,
0399 5D

ntration of Dilute Waste Streams by Ion
nge Techniques,
0672 5D

CHANGE RESINS
ms of Space Biology. Volume 24. The
Supply of Spacecraft Crews,
0365 5D

ffect of Some Heavy Metal Ions on
ynthesis in a Freshwater Alga,
0627 5C

Plain Information: East Fork One Hun-
d Two River, Bedford, Iowa.
0566 4A

ear Study of Des Moines River Water
,
803 5B

Microanalysis of Zinc and Iron in the
de Cells of Mayfly Larvae of the River
Rontgenmikroanalyse von Zink und
n Chloridzellen von Eintagsfligenlarven
Sulz),
416 5A

Observations on Spawning of Brook
Salvelinus Fontinalis Mitchill) in Lime
ized Iron Hydroxide Suspensions,
445 5C

IRON OXIDES
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

IRRIGATION
Waste Water Treatment: Land Disposal of Waste Water,
W75-10373 5E

Agricultural and Urban Considerations in Irrigation and Drainage.
W75-10769 4A

Groundwater Control by Pumping,
W75-10778 4B

Change in Quality of Pumped Drainage Effluent,
W75-10779 5B

Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

Water Use and Production of Trickle Irrigated Onions,
W75-10785 3F

Float Valve Provides Variable Flow Rates at Low Pressures,
W75-10789 8C

Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

Irrigation Management for Salt Control,
W75-10800 3C

Trickle Irrigation Design Requirements for Row Crops,
W75-10801 3F

Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation,
W75-10805 5G

IRRIGATION CANALS
Predicting the Concentration of Aquatic Herbicide Residues in Waterways,
W75-10648 5B

IRRIGATION EFFICIENCY
Water Use and Production of Trickle Irrigated Onions,
W75-10785 3F

Trickle Irrigation Design Requirements for Row Crops,
W75-10801 3F

IRRIGATION ENGINEERING
Development of Large Scale Drip Irrigation Systems,
W75-10784 3F

Float Valve Provides Variable Flow Rates at Low Pressures,
W75-10789 8C

IRRIGATION PRACTICES
Water Use and Production of Trickle Irrigated Onions,
W75-10785 3F

IRRIGATION SYSTEMS
Disposal of Liquid Effluent by Land Irrigation at Lagro Celotex Plant,
W75-10679 5D

Development of Large Scale Drip Irrigation Systems,
W75-10784 3F

Automation of an Existing Irrigation System - Part I,
W75-10788 8C

Float Valve Provides Variable Flow Rates at Low Pressures,
W75-10789 8C

Trickle Irrigation Design Requirements for Row Crops,
W75-10801 3F

IRRIGATION WATER
Economic Impact of the Conversion of Water from Irrigation to Municipal and Industrial Use in the Rio Grande Basin of New Mexico,
W75-10771 6D

ISRAEL
Effects of Soil Moisture on Stress on 2 Varieties of Upland Cotton in Israel: IV. Effects of Periods of Stress Occurrence, Correlations and Regressions,
W75-10791 3F

JACK MACKEREL
Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese),
W75-10441 5C

JAMES RIVER (VA)
Flood Plain Information: James River, Eagle Rock to Lick Run, Botetourt County, Virginia.
W75-10578 4A

Evaluation of Disposal Areas in James River; Hydraulic Model Investigation,
W75-10669 8B

JAPAN
Taio Paper (Company, Iyomishima, Japan) Expands to 1,000,000 Tons/Year,
W75-10380 5D

PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5A

Treatment of Service Water with Ozone,
W75-10840 5D

JOHNSON CREEK (VA)
Flood Plain Information: Johnson Creek and Tributary, Chesterfield County, Virginia.
W75-10579 4A

JUVENILE GROWTH STAGE
Aspects of the Winter Ecology of Juvenile Coho Salmon (Oncorhynchus Kisutch) and Steelhead Trout (Salmo Gairdneri),
W75-10615 5C

KANAMYCIN
Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

KANSAS
Users' View of Weather Modification,
W75-10776 3B

KAOHSIUNG HARBOR (TAIWAN)
Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

KENTUCKY
Derivation of Reservoir Operating Rules by Economic Analysis,
W75-10825 4A

Analysis of Reservoir Recreation Benefits,
W75-10826 6B

The Effect of Landowner Attitude on the Financial and the Economic Costs of Acquiring Land for a Large Public Works Project,
W75-10827 6B

Review of the Economic Benefits and Costs Resulting from Dewey Reservoir,
W75-10828 6B

KEPONE (TRADE NAME)
Inhibition of ATPases Acitivity in Channel Catfish Brain by Kepone(Trade Name) and its Reduction Product,
W75-10612 5C

KILLIFISHES
Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

KUHLIA SANDVICENSIS
Critical Thermal Maxima of Three Species of Hawaiian Estuarine Fish: A Comparative Study,
W75-10426 5C

LABORATORY TESTS
Laboratory Measurement of Surface Temperature Fluctuations Induced by Small Amplitude Surface Waves,
W75-10505 2L

Devices for Toxicological Long-Term Studies on Aquatic Organisms (Gerate zur Durchfuhrung Toxikologischer Langzeitstudien an Wasserorganismen),
W75-10618 5A

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

LAKE APOPKA (FLA)
Effects of Farming - Urban Drainage on Fresh Water,
W75-10802 5G

LAKE ERIE
Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

LAKE ICE
Large Scale Laboratory Direct Shear Tests on Ice,
W75-10502 2C

LAKE KINNERET (SEA OF GALILEE)
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420 5C

LAKE ONTARIO
Physical Model Study of Circulation Patterns in Lake Ontario,
W75-10537 2H

International Field Year for the Great Lakes.
W75-10549 2H

LAKES
Indigenous Peoples of Polar Deserts,
W75-10460 6D

Suppression of Nitrogen Fixation by Blue-Green Alage in a Eutrophic Lake with Trace Additions of Copper,
W75-10480 5C

Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

LAMPRICIDES
Uptake, Elimination and Biotransformation of the Lampricide 3-Trifluromethyl-4-Nitrophenol (TFM) by Larvae of the Aquatic Midge Chironomus Tentans,
W75-10629 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to Selected Aquatic Invertebrates and Frog Larvae,
W75-10703 5C

LAND CLEARING
Hydrology of the Albemarle-Pamlico Region, North Carolina--A Preliminary Report on the Impact of Agricultural Developments,
W75-10602 4C

LAND IRRIGATION
Disposal of Liquid Effluent by Land Irrigation at Lagro Celotex Plant,
W75-10679 5D

LAND USE
Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404 3B

Flood Plain Information: White Clay Creek, New Castle County, Delaware.
W75-10571 4A

Rivers in the City,
W75-10723 6B

LANDFILLS
Guidelines for Landfill of Toxic Industria Sludges,
W75-10487 5

Disposal of Digested Sewage Sludge by Land fill,
W75-10682 5

Treatability of Leachate from Sanitary Land fills,
W75-10683 5

Seepage from Recharge and Landfill Ditches,
W75-10770 5

LANDSLIDES
A Numerical Model for Predicting the Effec of Landslide-Generated Water Waves,
W75-10661 8

LARVAE
Effects of Mirex on the Larval Development Blue Crab,
W75-10410

X-ray Microanalysis of Zinc and Iron in t Cheloride Cells of Mayfly Larvae of the Riv Sulz, (Rontgenmikroanalyse von Zink u Eisen in Chloridzellen von Eintagsfligenlarv aus der Sulz),
W75-10416

LARVAL GROWTH STAGE
Effects of the Insecticide Sevin and Its Fi Hydrolytic Product, 1-Napthol, on Some Ea Developmental Stages of the Bay Muss Mytilus edulis,
W75-10435

LARVICIDES
Biological Activity of Organophosphorus Co pounds and Synthetic Pyrethroids Against l mature Mosquitoes,
W75-10631

LASERS
A Remote Sensing Laser Fluorometer,
W75-10831

LC50
Temperature-Induced Changes in Acute Tox ty of Zinc to Atlantic Salmon (Salmo salar),
W75-10431

Toxicity of the Lampricide 3-Trifluorometh 4-Nitrophenol (TFM) to Selected Aquatic vertebrates and Frog Larvae,
W75-10703

LEACHATE
Treatability of Leachate from Sanitary La fills,
W75-10683

LEACHATE TREATMENT
Treatability of Leachate from Sanitary La fills,
W75-10683

LEACHING
Irrigation Management for Salt Control,
W75-10800

LEAD
Determination of Cadmium, Copper, and L in Natural Waters After Anion-Exch Separation,
W75-10385

Heavy Metal Contents of Fishes Caugh Kaohsiung Harbor, (In Chinese),
W75-10430

tron Microscope Autoradiography of Kid-After Administration of PB-210 in Mice,
-10476 5A

Metabolism in the Normal Human: Stable pe Studies,
10484 5A

ium, Thorium, and Lead Concentrations ree Silicate Standards and a Method of Isotopic Analysis,
10494 2K

Concentration of Mercury, Copper, el, Silver, Cadmium and Lead in the ern Adriatic Anchovy, Engraulis En-holus, and Sardine, Sardina Pilchardus,
10620 5B

**OLLUTION**
n Implications of Exposure to Trace s from Combustion of Waste Oil,
0765 5C

**ATION**
Legislative Tendencies for Control of Pollution (Nuevas tendencias legislativas ontrol de la contaminacion de las aguas),
0384 5G

Drinking Water Has Become a Federal
0469 5G

Effluent Guidelines Have Their Day in
0470 5G

chusetts Waste Oil Management Activi-
0763 5D

Consequences of Accepting Industrial into Sewers; Water Pollution Research enage,
0842 5D

ses of 'Bearss' Lemon to Nitrogen, um and Irrigation Applications,
714 3F

**LIMIT**
of Mirex on the Larval Development of ab,
410 5C

Effects of Aliphatic Chlorinated by-s from Vinyl Chloride Production on Animals,
412 5C

of Phosphamidon to American Lob-Homarus Americanus) Held at 4 and
313 5C

on the Metabolism of Chlorophenols in Absorption and Excretion of PCP by
17 5C

ture-Induced Changes in Acute Toxici-c to Atlantic Salmon (Salmo salar),
31 5C

of Two Synthetic Pyrethrins to Brown
38 5C

Toxicity of Ammonia to Several nental, Stages of Rainbow Trout, airdneri,
19 5C

The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

Biological Bases for Water Quality Standards,
W75-10677 5G

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

**LETTUCE**
Effect of a Phytoplankton Culture on the Germination and Seedling Development of Barley, Sugar Beets and Lettuce,
W75-10496 3F

**LEUCISCUS IDUS MELANOTUS**
Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

**LIME**
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

**LIMITING NUTRIENTS**
Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

**LIMNOLOGY**
Geological and Limnological Factors of Cold Deserts,
W75-10457 2C

**LIPIDS**
Effect of Dietary Selenium on Glutathione Peroxidase in the Chick,
W75-10495 5A

PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5A

**LIQUIFIED NATURAL GAS (LNG)**
Jettisoning of LNG at Sea--An Unresolved Pollution Hazard.
W75-10633 5G

**LISTERIA-MONOCYTOGENES**
Listeria in Aquatic Animals,
W75-10375 2I

**LOADS (FORCES)**
The Influence Surface Method for Floating Ice Plates,
W75-10504 2C

**LOBSTERS**
Toxicity of Phosphamidon to American Lobsters (Homarus Americanus) Held at 4 and 12C,
W75-10413 5C

**LOCAL PRECIPITATION**
Environmental Problems Associated with the Use of Cooling Towers,
W75-10671 5D

**LOCKS**
Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667 8B

**LODGEPOLE PINE TREES**
Canopy Weight Distribution Affects Windspeed and Temperature in a Lodgepole Pine Forest,
W75-10654 4A

**LOGGING (RECORDING)**
Instruction for Record Keeping of Water Consumption at the Enterprises of the Paper Industry (Instruktsiya ucheta raskhoda vody na predpriyatiyakh otrasli),
W75-10370 3E

**LONG BEACH HARBOR (CAL)**
Los Angeles and Long Beach Harbors Model Study; Report 2, Observations of Ship Mooring and Movement,
W75-10664 8B

**LOPEZ RESERVOIR (CALIF)**
Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

**LOS ANGELES HARBOR (CAL)**
Los Angeles and Long Beach Harbors Model Study; Report 2, Observations of Ship Mooring and Movement,
W75-10664 8B

**LOUISIANA**
Index to Water Resources Data for Louisiana: Surface Water Records; Water-Quality Records.
W75-10590 5A

**LOW FLOW**
Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

Low-Flow Characteristics of Mississippi Streams,
W75-10605 2E

**LOW FLOW FREQUENCY**
Low-Flow Characteristics of Mississippi Streams,
W75-10605 2E

**LOXAHATCHEE RIVER (FLA)**
The Loxahatchee - A River in Distress, Southeast Florida,
W75-10588 4C

**LUBBOCK (TEX)**
Statistical Model of Short-Duration Precipitation Events,
W75-10529 2B

**LUBE OIL**
Re-Refined Diesel Locomotive Lubricating Oil,
W75-10761 5D

**LUBE OILS**
The Source and Supply of Virgin Lubes,
W75-10741 5B

**LUBRICANTS**
Experience with the IFP Propane Clarification Process in Re-Refining Spent Crankcase Oils,
W75-10759 5D

LUMBERING
Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404 3B

LYSIMETERS
Phosphorus in Percolates from Manured Lysimeters,
W75-10573 5B

MAGDEBURG COUNTY (EAST GERMANY)
Principles of Establishing Sewer Systems in the Rural Settlements of Magdeburg County (Grundlagen fuer die Abwasser-Technische Erschliessung von Landgemeinden im Bezirk Magdeburg),
W75-10833 5D

MAINTENANCE COSTS
Process Design Manual for Sludge Treatment and Disposal.
W75-10475 5D

MALLARD DUCK
Effects of Methylmercury on Approach and Avoidance Behavior of Mallard Ducklings,
W75-10424 5C

MANAGEMENT
Study of Solid Waste Management Practices in the Pulp and Paper Industry.
W75-10366 5D

Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

MANGANESE
Determination of Manganese in Natural Waters by Atomic Absortion Spectrometry with a Carbon Tube Atomizer,
W75-10386 5A

The Effect of Different Salinities and Manganese Ion on the Survival Respiration of the Baltic Flounder (Pleuronectes Flesus Trachurus (Dunker)) of the Gulf of Riga,
W75-10411 5C

MAPS
Map of the Antelope Valley-East Kern Water Agency Area, California, Showing Ground-Water Subunits and Areas, Location of Wells, and Water-Level Contours for Spring 1974,
W75-10595 7C

MARINE ALGAE
The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

MARINE FISH
Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese),
W75-10441 5C

MARKING TECHNIQUES
Influence of a Thermal Effluent on Movement of Brown Bullhead (Ictalurus Nebulosus) as Determined by Ultrasonic Tracking,
W75-10628 5C

MARKOV CHAIN MODEL
A Stochastic Model for Daily Rainfall Data Synthesis,
W75-10518 2B

Stochastic Model of Daily Rainfall,
W75-10520 2B

MARKOV PROCESSES
Statistical Inference on Streamflow Processes with Markovian Characteristics,
W75-10525 2E

MARYLAND
Daily Temperature and Salinity of Surface Water of Patuxent River at Solomons, Maryland, Based on 30 Years of Records (1938-1967),
W75-10535 2E

Flood Plain Information Report: Seneca Creek, Montgomery County, Maryland.
W75-10567 4A

Hydrogeology of the Triassic Rocks of Maryland,
W75-10584 2F

Waste Oil--Solution to Maryland's Energy Crisis,
W75-10762 5D

An Economic Model of Waste Oil Recovery, Reprocessing and Distribution Systems,
W75-10768 5D

MASS TRANSFER
A Theory of the Mass Transport of Previously Distributed Chemicals in a Water-Saturated Sorbing Porous Medium: 4. Distributions,
W75-10632 5B

MASSACHUSETTS
A Comparison of Methods for Estimating Flood Peaks on Streams in Massachusetts,
W75-10587 4A

Water Supply from Renovated Wastewater--A Resource Manual for Massachusetts Planners, Public Officials and Citizen Groups.
W75-10722 5D

Massachusetts Waste Oil Management Activities,
W75-10763 5D

MATERIALS TESTING
NBS Adds Foreign Wrinkle to Standards Work,
W75-10490 5A

MATHEMATICAL MODELS
Political Participation and Water Rates. A Closer Look,
W75-10361 6C

A Note on Mixed Distributions in Hydrology,
W75-10527 2E

Developing Regional Stochastic Data Bases,
W75-10528 2E

Statistical Model of Short-Duration Precipitation Events,
W75-10529 2B

Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

A Two-Distribution Method for Fitting Mixed Distributions in Hydrology,
W75-10531 2E

Hydraulics and Mechanics of River Ice Jams,
W75-10556 8B

A Numerical Model for Predicting the Effec of Landslide-Generated Water Waves,
W75-10661 8

Los Angeles and Long Beach Harbors Mod Study; Report 2, Observations of Ship Moori and Movement,
W75-10664 8

An Economic Model of Waste Oil Recover Reprocessing and Distribution Systems,
W75-10768

Current Water Systems Automation Resear and Development in the Bureau of Reclam tion,
W75-10787

ACTMO, An Agricultural Chemical Transp Model,
W75-10846

MAYFLIES
X-ray Microanalysis of Zinc and Iron in Cheloride Cells of Mayfly Larvae of the Ri Sulz, (Rontgenmikroanalyse von Zink Eisen in Chloridzellen von Eintagsfliegenlar aus der Sulz),
W75-10416

The Drift of Mayflies (Ephemeroptera) in Brazos River, Texas,
W75-10558

Acute Toxicity of the Lampricide Trifluoromethyl-4-Nitro-Phenol (TFM) Nymphs of Mayflies (Hexagenia Sp.),
W75-10699

Toxicity and Residue Dynamics of the Lam cide 3-Trifluoro-Methyl-4-Nitrophenol (T in Aquatic Invertebrates,
W75-10700

MEADOW CREEK (VA)
Flood Plain Information: Meadow Creek, bemarle County and Charlottesville, Virgini
W75-10564

MEADOW GRASSES
Effectiveness of Precipitation in a Mou Meadow,
W75-10799

MEASUREMENT
Multichannel Toxicant Injection System Flow-Through Bioassays,
W75-10443

Error Analysis of Dobson Spectrophoton Measurements of the Total Atmospheric O Content,
W75-10545

MEAT PROCESSING WASTES
Analysis of Wastewater Treatment Syste a Meat Processing Plant,
W75-10687

MECHANICAL PROPERTIES
Hydraulics and Mechanics of River Ice Ja
W75-10556

MEDAKA
Residue Analyses on 2-Amino-4 ylthiazole, a Piscine Anesthetic, in Fish Model Radio-Tracer Experiment with Me
W75-10614

MERCURY
Effects of Methylmercury on Approach Avoidance Behavior of Mallard Ducklings
W75-10424

Metal Contents of Fishes Caught in
ıng Harbor, (In Chinese),
430 5A

ological Half-Life of Inorganic Mercury
ungeness Crab (Cancer magister),
437 5C

ıental Investigation on the Biological
tration of Mercury-I. On the Rate of
Transfer Through the Food Chain
ack Mackerel to Young Yellowtail (In
e),
441 5C

bution and Concentration of Mercury in
ronment,
83 5B

ermination of Mercury in Soils and Re-
aterials by Cold-Vapour Atomic Ab-
Spectrometry,
85 5A

ncentration of Mercury, Copper,
Silver, Cadmium and Lead in the
Adriatic Anchovy, Engraulis En-
us, and Sardine, Sardina Pilchardus,
20 5B

LISM
of Acute Exposure to Bleached Kraft
l Effluent on Carbohydrate Metabol-
uvenile Coho Salmon (Oncorhynchus
During Rest and Exercise,
88 5C

n the Metabolism of Chlorophenols in
bsorption and Excretion of PCP by
17 5C

of Three Polychlorinated Biphenyls,
DDE by the Green Sunfish, Lepomis
s Raf.,
22 5C

of Net Carbon Flux in Two Species
ls Caused by Extracts of Crude Oil,
3 5C

ce of Cadmium-Induced Metabolic
n Liver and Kidney,
8 5A

ization of Cadmium Uptake by Plant
9 5B

abolism in the Normal Human: Stable
tudies,
4 5A

Zinc and Total Protein Levels in the
f Sockeye Salmon (Oncorhynchus
uring Their Spawning Migration,
3 5C

n, Metabolism, and Excretion by
f the Anionic Detergent Sodium Lau-
te,
5 5C

tion of the Transition Metals Man-
on, Cobalt, Copper and Zinc in River
th Help of X-Ray Fluorescence Anal-
Flameless Atomic Absorption Spec-
(Bestimmung der Ubergangsmetalle
Eisen, Kobalt, Kupfer und zink in
en mit Hilfe der Rontgenfluores-zen-
zanalyse und der flammenlosen Atomabsorp-
tion),
W75-10408 5A

The Effect of Different Salinities and Man-
ganese Ion on the Survival Respiration of the
Baltic Flounder (Pleuronectes Flesus Trachurus
(Dunker)) of the Gulf of Riga,
W75-10411 5C

Average Trace Element Composition of Low
Level Marine Atmospheric Particulates,
W75-10477 5B

NBS Adds Foreign Wrinkle to Standards
Work,
W75-10490 5A

Gravity Dewatering of Metal Hydroxide
Sludges,
W75-10500 5D

Water Quality Criteria for European Fresh-
water Fish.
W75-10610 5C

METHODOLOGY
Determination of the Transition Metals Man-
ganese, Iron, Cobalt, Copper and Zinc in River
Fishes With Help of X-Ray Fluorescence Anal-
ysis and Flameless Atomic Absorption Spec-
troscopy, (Bestimmung der Ubergangsmetalle
Mangan, Eisen, Kobalt, Kupfer und zink in
Flussfischen mit Hilfe der Rontgenfluores-zen-
zanalyse und der flammenlosen Atomabsorp-
tion),
W75-10408 5A

Panel Review of the Taxonomic Structure of
the Straw Man.
W75-10806 6B

Panel Evaluation of the Logical Structure, Con-
sistency, and Underlying Assumptions of the
'Strawman' Methodology.
W75-10807 6B

Comments on the Straw Man,
W75-10808 6B

Report to the Technical Committee of the
Water Resources Centers of the Thirteen
Western States,
W75-10809 6B

Proceedings of the Graduate Student Sympos-
ium of the Technical Committee of the Water
Resources Centers of the Thirteen Western
States.
W75-10810 6A

Social Indicators and Connectives,
W75-10812 6A

Towards a Sharper Concept of an Action Vari-
able,
W75-10813 6A

Methodological Problems in Applying the
Straw Man to Real Life Problems,
W75-10814 6A

Necessary Adaptations for Significant Utiliza-
tion of the Information System,
W75-10816 6A

A Method of Disaggregation,
W75-10817 6A

Algorithmic Modeling and the Straw Man,
W75-10820 6A

METHYL MERCURY
Experimental Investigation on the Biological
Concentration of Mercury-I. On the Rate of
Mercury Transfer Through the Food Chain
From Jack Mackerel to Young Yellowtail (In
Japanese),
W75-10441 5C

MEXICALI VALLEY
Wellton-Mohawk Drainage and the Mexican
Salt Problem,
W75-10783 4A

MEXICAN WATER TREATY
The Lower Colorado River: A Bibliography,
W75-10453 10C

MEXICO
Wellton-Mohawk Drainage and the Mexican
Salt Problem,
W75-10783 4A

MICHIGAN
Flood Plain Information: Upper River Rouge,
Minnow Pond Drain, Bell Branch and Tarabusi
Creek, Wayne and Oakland Counties,
Michigan.
W75-10575 4A

Toxicity of Chlorinated Municipal Wastes to
Fish: An Evaluation Based on Michigan Field
Data,
W75-10680 5C

MICROBIAL DEGRADATION
Environmental Limitations on the Microbial
Degradation of Hydrocarbons in Temperate
Lakes,
W75-10407 5C

Adsorption and Degradation of Chlorbromuron
in Soil,
W75-10414 5B

MICROORGANISMS
Deterioration of Water Quality in Distribution
Systems,
W75-10711 5F

The Effect of the Quantity of Silt to the At-
tached Microorganisms of the Kuzuryu-Gawa
River in the Hokuriku District, (In Japanese),
W75010696 5C

MIDGES
Uptake, Elimination and Biotransformation of
the Lampricide 3-Trifluromethyl-4-Nitrophenol
(TFM) by Larvae of the Aquatic Midge
Chironomus Tentans,
W75-10629 5C

Acute Toxicities of 3-Trifluoromethyl-4-
Nitrophenol (TFM) and 2',5-Dichloro-4'-
Nitrosalicylanilide (Bayer 73) to Larvae of the
Midge (Chironomus Tentans),
W75-10698 5C

MILK TRUCK WASHINGS
Treatment of Milk Truck Washing Wastes by
Anerobic Digestion,
W75-10673 5D

MILL RUN (PA)
Flood Plain Information: Mill Run, Blair Coun-
ty, Pennsylvania.
W75-10568 4A

MINE WASTES
Thallium: Occurrence in the Environment and
Toxicity to Fish,
W75-10449 5C

MINERALS LOCATION
International Exploration Locates Minerals and Oils,
W75-10467 5B

MIRAMICHI RIVER (NEW BRUNSWICK)
Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

MIREX
Effects of Mirex on the Larval Development of Blue Crab,
W75-10410 5C

A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

MISSISSIPPI
Special Flood Hazard Information Report: Chickasawhay River, Waynesboro, Wayne County, Mississippi.
W75-10569 4A

Water for Industrial Development in Alcorn, Itawamba, Prentiss, and Tishomingo Counties, Mississippi,
W75-10581 3E

Low-Flow Characteristics of Mississippi Streams,
W75-10605 2E

MISSISSIPPI RIVER
Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

MISSOURI
Harry S. Truman Dam and Reservoir, Osage River, Missouri, Apendix A (Final Environmental Impact Statement).
W75-10363 8A

Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

MIXED DISTRIBUTIONS
A Note on Mixed Distributions in Hydrology,
W75-10527 2E

A Two-Distribution Method for Fitting Mixed Distributions in Hydrology,
W75-10531 2E

MODEL STUDIES
Proceedings Symposium on Statistical Hydrology.
W75-10507 2A

Multisite Streamflow Simulation of Truckee River, Nevada,
W75-10509 2E

A Precipitation Data Simulator Using a Second Order Autoregressive Scheme,
W75-10513 2B

Hourly Rainfall Generation for a Network,
W75-10515 2B

Stochastic Generation of the Occurrence, Pattern, and Location of Maximum Amount of Daily Rainfall,
W75-10516 2B

A Stochastic Model for Daily Rainfall Data Synthesis,
W75-10518 2B

Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

Stochastic Model of Daily Rainfall,
W75-10520 2B

An Event-Based Stochastic Model of Areal Rainfall and Runoff,
W75-10521 2B

Research in Stochastic Models for Bedload Transport,
W75-10522 2J

Use of Autoregressive Runoff Models in Reservoir Studies,
W75-10523 2E

A Stochastic Model of Sediment Yield for Ephemeral Streams,
W75-10524 2J

Statistical Inference on Streamflow Processes with Markovian Characteristics,
W75-10525 2E

Dispersion of Contaminated Bedload Particles,
W75-10526 5B

Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

Physical Model Study of Circulation Patterns in Lake Ontario,
W75-10537 2H

Nonlinear Channel Routing by Computer,
W75-10543 4A

Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552 2L

A Numerical Model for Predicting the Effects of Landslide-Generated Water Waves,
W75-10661 8A

Los Angeles and Long Beach Harbors Model Study; Report 2, Observations of Ship Mooring and Movement,
W75-10664 8B

Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

An Economic Model of Waste Oil Recovery, Reprocessing and Distribution Systems,
W75-10768 5D

Seepage from Recharge and Landfill Ditches,
W75-10770 5B

Change in Quality of Pumped Drainage Effluent,
W75-10779 5B

Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

MODESTO IRRIGATION DISTRICT (CAL)
Automation of an Existing Irrigation System - Part I,
W75-10788 8C

MOISTURE STRESS
Effects of Soil Moisture on Stress on 2 Va
ties of Upland Cotton in Israel: IV. Effects
Periods of Stress Occurrence, Correlations
Regressions,
W75-10791

MOORING
Los Angeles and Long Beach Harbors Mo
Study; Report 2, Observations of Ship Moo
and Movement,
W75-10664

MORTALITY
Acute Toxicity of Kanamycin to Steelh
Trout (Salmo Gairdneri),
W75-10423

Effects of Heavy Metals and Pesticides on
Mass Mortalities of Cultured Shellfishes Al
the Southwest Coast of Taiwan, (In Chinese
W75-10427

Effects of Temperature on Development
Survival of Rainbow Trout, Salmo Gairdneri
Acid Waters,
W75-10623

MOSQUITO CONTROL
Biological Activity of Organophosphorus C
pounds and Synthetic Pyrethroids Against
mature Mosquitoes,
W75-10631

MOTOR BOATS
Analysis of Pollution from Marine Engine
Status Report,
W75-10688

MUGIL CEPHALUS
Critical Thermal Maxima of Three Species
Hawaiian Estuarine Fish: A Comparat
Study,
W75-10426

MULTIVARIATE ANALYSIS
General Aspects of Multivariate Analysis
Applications to Some Problems in Hydrolog
W75-10510

MUNICIPAL WASTES
Process Design Manual for Upgrading Exis
Waste Water Treatment Plants.
W75-10396

Toxicity of Chlorinated Municipal Waste
Fish: An Evaluation Based on Michigan F
Data,
W75-10680

Waste Automotive Lubricating Oil as a
nicipal Incinerator Fuel,
W75-10764

MUNICIPAL WATER
Economic Impact of the Conversion of W
from Irrigation to Municipal and Industrial
in the Rio Grande Basin of New Mexico,
W75-10771

Impacts of Rural to Urban Water Use,
W75-10772

MUSKEGON (MI)
Land Treatment of Municipal Sewage,
W75-10719

MUSSELS
Decrease of Net Carbon Flux in Two Spe
of Mussels Caused by Extracts of Crude Oi
W75-10433

US EDULIS
ts of the Insecticide Sevin and Its First olytic Product, 1-Napthol, on Some Early opmental Stages of the Bay Mussel, us edulis,
0435 5C

ATION
ation Conditions at Cannelton Locks and Ohio River; Hydraulic Model Investiga-
0667 8B

SKA
dwater Control by Pumping,
0778 4B

dwater Model as a Tool in Planning and gement,
0781 4B

RK DESIGN
ater Simulation of Water Distribution rks,
0823 4A

RKS
Rainfall Generation for a Network,
0515 2B

LIZATION
Observations on Spawning of Brook (Salvelinus Fontinalis Mitchill) in Lime lized Iron Hydroxide Suspensions,
0445 5C

ON ACTIVATION ANALYSIS
ination of Nickel in Rocks After rmal Neutron Activation,
0493 2K

te Streamflow Simulation of Truckee Nevada,
0509 2E

RSEY
Plain Information: Shabakunk Creek, ranch Shabakunk and Little Shabakunk , Mercer County, New Jersey.
572 4A

XICO
-Water Levels in New Mexico, 1972,
582 4B

nic Impact of the Conversion of Water rigation to Municipal and Industrial Use io Grande Basin of New Mexico,
771 6D

Use and Production of Trickle Irrigated
785 3F

RK
Point Dike Study, Coney Island, New Hydraulic Model Investigation,
562 8B

ent of Winery Wastes by Aerated , Activated Sludge, and Rotating al Contractor,
585 5D

RK (NY)
Oil: The Recapture of an Energy e (The Generation, Disposal and y of Waste Oil in the New York olitan Area),
745 5D

NICKEL
Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

Determination of Nickel in Rocks After Epithermal Neutron Activation,
W75-10493 2K

The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

NITROGEN
Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

NITROGEN COMPOUNDS
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420 5C

NITROGEN CYCLE
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420

NORTH AMERICA
Some Features of Tsunamis on the Pacific Coast of South and North America,
W75-10554 2L

NORTH CAROLINA
A Precipitation Data Simulator Using a Second Order Autoregressive Scheme,
W75-10513 2B

Sediment Characteristics of Streams in the Eastern Piedmont and Western Coastal Plain Regions of North Carolina,
W75-10586 2J

Hydrology of the Albemarle-Pamlico Region, North Carolina--A Preliminary Report on the Impact of Agricultural Developments,
W75-10602 4C

Relationships Between Drouth and Corn Yields on Selected South Atlantic Coastal Plain Soils,
W75-10721 3F

NORTH DAKOTA
Drainage Analysis of a Confining Formation,
W75-10780 4A

NORTON POINT DIKE (NY)
Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

NUCLEAR POWERPLANTS
Nuclear Power Plant Cooling System Selection,
W75-10822 6C

NUTRIENT SOURCES
Will Wastewater Treatment Stop Eutrophication of Impoundments,
W75-10686 5D

NUTRIENTS
An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

OCEAN WAVES
Laboratory Measurement of Surface Temperature Fluctuations Induced by Small Amplitude Surface Waves,
W75-10505 2L

On the Joint Distribution of the Periods and Amplitudes of Sea Waves,
W75-10534 2L

Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552 2L

OCEANS
Average Trace Element Composition of Low Level Marine Atmospheric Particulates,
W75-10477 5B

Oil in the Sea.
W75-10640 5B

OFFSHORE DRILLING
Icebreaking Drillship for Offshore Exploratory Drilling in the Arctic,
W75-10639 5G

OHIO
Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

OHIO RIVER
Summary Appraisals of the Nation's Ground-Water Resources--Ohio Region,
W75-10598 4B

Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667 8B

OHIO RIVER REGION
Summary Appraisals of the Nation's Ground-Water Resources--Ohio Region,
W75-10598 4B

OIL
Decrease of Net Carbon Flux in Two Species of Mussels Caused by Extracts of Crude Oil,
W75-10433 5C

The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

International Exploration Locates Minerals and Oils,
W75-10467 5B

Icings Along the Trans-Alaska Pipeline Route,
W75-10592 2C

Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973,
W75-10594 8B

Icebreaking Drillship for Offshore Exploratory Drilling in the Arctic,
W75-10639 5G

Oil in the Sea.
W75-10640 5B

OIL

The Source and Supply of Virgin Lubes,
W75-10741 5B

Disposal of Used Crankcase and Other Oils in Canada,
W75-10743 5D

Waste Oil in Maryland: A Pollutant or a Resource,
W75-10744 5B

Waste Oil: The Recapture of an Energy Resource (The Generation, Disposal and Recovery of Waste Oil in the New York Metropolitan Area),
W75-10745 5D

Waste Lubricating Oil Characteristics--Do They Vary Geographically, Seasonally, and With Origin,
W75-10746 5B

Quality Products from Used Petroleum Oils,
W75-10756 5D

Waste Oil--Solution to Maryland's Energy Crisis,
W75-10762 5D

Waste Automotive Lubricating Oil as a Municipal Incinerator Fuel,
W75-10764 5D

Runoff of Oils from Rural Roads Treated to Suppress Dust,
W75-10766 5B

OIL BOOMS

Civil Engineering Laboratory Develops Universal Connector for All Booms.
W75-10468 5G

OIL INDUSTRY

Oil Reuse--A National Need,
W75-10740 5D

The Source and Supply of Virgin Lubes,
W75-10741 5B

Waste Oil Management--The Environmental Protection Agency's Role,
W75-10742 5G

Waste Oil in Maryland: A Pollutant or a Resource,
W75-10744 5B

Waste Lubricating Oil Characteristics--Do They Vary Geographically, Seasonally, and With Origin,
W75-10746 5B

Quality Products from Used Petroleum Oils,
W75-10756 5D

The Waste Oil Industry: A Discussion of Some Issues to Consider in Performing an Economic Analysis,
W75-10767 5G

OIL POLLUTION

Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

USCG Sets Broader Use of Pollution Control Systems,
W75-10466 5G

Marine Floating Screen.
W75-10634 5G

Recovering Oil Spills from Water.
W75-10635 5G

Oil in the Sea.
W75-10640 5B

The Effect of Crude Oil Fractions on the Survival of a Tidepool Copepod, Tigriopus Californicus,
W75-10641 5C

Oil and Debris Removal Unit,
W75-10726 5G

Oil Separation and Recovery Device,
W75-10728 5G

Proceedings of the International Conference on Waste Oil Recovery and Reuse.
W75-10739 5D

Oil Reuse--A National Need,
W75-10740 5D

Disposal and/or Recycle of Air Force Waste Petroleum Oils and Lubricants,
W75-10749 5D

Oily Bilge from Commercial Vessels,
W75-10752 5B

Characteristics of Oil Pollution in and Around U.S. Waters,
W75-10754 5B

A Program for Handling Emergency Oil Spillages in the Port of Baltimore,
W75-10755 5G

Runoff of Oils from Rural Roads Treated to Suppress Dust,
W75-10766 5B

OIL SPILLS

USCG Sets Broader Use of Pollution Control Systems,
W75-10466 5G

Civil Engineering Laboratory Develops Universal Connector for All Booms.
W75-10468 5G

Jettisoning of LNG at Sea--An Unresolved Pollution Hazard.
W75-10633 5G

Marine Floating Screen.
W75-10634 5G

Recovering Oil Spills from Water.
W75-10635 5G

Effects of an Offshore Crude Oil Unloading Terminal on the Marine Environment,
W75-10642 5C

Oil and Debris Removal Unit,
W75-10726 5G

Oil Separation and Recovery Device,
W75-10728 5G

Containment, Collection and Recycling of Oily Wastes,
W75-10747 5G

A Program for Handling Emergency Oil Spillages in the Port of Baltimore,
W75-10755 5G

A Remote Sensing Laser Fluorometer,
W75-10831 5A

OIL WASTES

The Effect of Crude Oil Fractions on the Su
vival of a Tidepool Copepod, Tigriopus Calif
nicus,
W75-10641

Proceedings of the International Conference
Waste Oil Recovery and Reuse.
W75-10739

Oil Reuse--A National Need,
W75-10740

The Source and Supply of Virgin Lubes,
W75-10741

Waste Oil Management--The Environmen
Protection Agency's Role,
W75-10742

Disposal of Used Crankcase and Other Oil
Canada,
W75-10743

Waste Oil in Maryland: A Pollutant o
Resource,
W75-10744

Waste Oil: The Recapture of an Ene
Resource (The Generation, Disposal
Recovery of Waste Oil in the New Y
Metropolitan Area),
W75-10745

Waste Lubricating Oil Characteristics-
They Vary Geographically, Seasonally,
With Origin,
W75-10746

Containment, Collection and Recycling of
Wastes,
W75-10747

Environmental Action at Port Authority
ports,
W75-10748

Disposal and/or Recycle of Air Force W
Petroleum Oils and Lubricants,
W75-10749

The Navy's Oily Wastes Handling and Disp
Program,
W75-10750

Port Reception and Treatment Facilities
Oily Waste from Vessels,
W75-10751

Shipyard Problems with Oily Wastes,
W75-10753

Characteristics of Oil Pollution in and Ar
U.S. Waters,
W75-10754

Quality Products from Used Petroleum Oils
W75-10756

The Economics of Re-Refining,
W75-10757

Pollution Control with a Comprehensive W
Oil Processing Plant,
W75-10758

Experience with the IFP Propane Clarifica
Process in Re-Refining Spent Crankcase Oi
W75-10759

Re-Refined Diesel Locomotive Lubricating
W75-10761

Oil--Solution to Maryland's Energy Cri-
0762 5D

chusetts Waste Oil Management Activi-
0763 5D

aste Oil Industry: A Discussion of Some to Consider in Performing an Economic is,
0767 5G

TER INTERFACES
lity Test Program of Application of cing Phase Oil/Water Separators to Self nsating Fuel Tanks in Surface Ships,
474 5G

TER SEPARATORS
lity Test Program of Application of cing Phase Oil/Water Separators to Self nsating Fuel Tanks in Surface Ships,
474 5G

TER
ity Test Program of Application of ing Phase Oil/Water Separators to Self nsating Fuel Tanks in Surface Ships,
474 5G

ment, Collection and Recycling of Oily
747 5G

mental Action at Port Authority Air-
748 5G

vy's Oily Wastes Handling and Disposal
750 5D

ception and Treatment Facilities for ste from Vessels,
751 5G

ge from Commercial Vessels,
752 5B

l Problems with Oily Wastes,
753 5B

eristics of Oil Pollution in and Around ters,
754 5B

am for Handling Emergency Oil Spil-he Port of Baltimore,
755 5G

aminated Water Recycling System,
760 5D

MA
euse in a Paper Reprocessing Plant,
01 5D

Aspects of Multivariate Analysis with ons to Some Problems in Hydrology,
10 2A

c Generation of the Occurrence, Pat-l Location of Maximum Amount of nfall,
16 2B

ULFONATE
f a Mixture of Succinic Acid Mono-ster and Olefin Sulfonate on Fish e Wirkung einer Mischung von Sul-insaure-halbester und Olefinsulfonat e),
09 5C

ONIONS
Water Use and Production of Trickle Irrigated Onions,
W75-10785 3F

OPEN CHANNEL FLOW
Waimano Stream Flood Control Project, Pearl City, Hawaii; Hydraulic Model Investigation,
W75-10663 8B

Spillway for Burnsville Dam, Little Kanawha River, West Virginia; Hydraulic Model Investigation,
W75-10665 8B

OPERATING COSTS
Process Design Manual for Sludge Treatment and Disposal.
W75-10475 5D

Derivation of Reservoir Operating Rules by Economic Analysis,
W75-10825 4A

OPERATIONS
Operational Value of Weather Information in Relation to Soil Management Characteristics,
W75-10367 2G

Process Design Manual for Upgrading Existing Waste Water Treatment Plants.
W75-10396 5D

OPPORTUNITY COST
Principles and standards for Water Planning,
W75-10355 6B

The Economic Impact of Mercury Pollution on Fisheries and Other Related Businesses Around Pickwick Lake,
W75-10356 5G

OPTIMIZATION
Vacuum Filtration Cost Optimization,
W75-10681 5D

Optimal Sizing of Urban Flood-Control Systems,
W75-10821 4A

ORGANIC COMPOUNDS
Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

Studies on the Metabolism of Chlorophenols in Fish-I Absorption and Excretion of PCP by Goldfish,
W75-10417 5C

Studies on the Metabolism of Chlorophenols in Fish-II Turnover in Absorbed PCP in Goldfish,
W75-10418 5C

Analysis of Tri-Aryl Phosphate Esters and the Determination of Imol S-140 in Fish Tissue and Water Samples by Gas Chromatography,
W75-10442 5A

Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

Studies on the Metabolism of Chlorophenols in Fish-III Isolation and Identification of a Conjugated PCP Excreted by Goldfish,
W75-10611 5A

Uptake, Elimination and Biotransformation of the Lampricide 3-Trifluromethyl-4-Nitrophenol (TFM) by Larvae of the Aquatic Midge Chironomus Tentans,
W75-10629 5C

An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

ORGANIC LOADING
An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

ORGANIC MATTER
Organic Matter in Natural Water and Water Treatment,
W75-10351 5B

ORGANIC NITROGEN
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420 5C

ORGANIC PESTICIDES
On the Accumulation of Organochlorine Pesticides, PCB and Certain Heavy Metals in Fish and Shellfish from Thai Coastal and Inland Waters,
W75-10616 5B

ORGANIC WASTES
The Effect of Certain Organic Pollutants on Copper Toxicity to Fish (Lebistes Reticulatus),
W75-10637 5C

ORGANOLEPTIC PROPERTIES
The Effects of Crude Oil on the Palatability of Marine Crustaceans,
W75-10428 5C

ORGANOPHOSPHORUS COMPOUNDS
Toxic Effects of an Anionic Detergent on the Gills of Rainbow Trout,
W75-10434 5C

Toxicity of Paired Mixtures of Candidate Forest Insecticides to Rainbow Trout,
W75-10439 5C

Analysis of Tri-Aryl Phosphate Esters and the Determination of Imol S-140 in Fish Tissue and Water Samples by Gas Chromatography,
W75-10442 5A

Biological Activity of Organophosphorus Compounds and Synthetic Pyrethroids Against Immature Mosquitoes,
W75-10631 5G

ORGANOPHOSPHORUS PESTICIDES
Toxicity of Phosphamidon to American Lobsters (Homarus Americanus) Held at 4 and 12C,
W75-10413 5C

ORLANDO (FL)
Analysis of a Large Water Distribution System Using Advanced Computer Software,
W75-10720 4A

OSMOREGULATION
DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

OUACHITA RIVER (ARK)
Flood Plain Information: Ouachita River, Hot Springs Creek, Stokes Creek, Molly Creek, Gulpha Creek, City of Hot Springs, Arkansas.
W75-10559 4A

OUTLET WORKS
Spillway for Burnsville Dam, Little Kanawha River, West Virginia; Hydraulic Model Investigation,
W75-10665 8B

Turbulent Flow in Rectangular Outlet Conduit, Rend Lake Dam, Big Muddy River, Illinois,
W75-10666 8B

OVERFLOW
Coping With Urban Runoff in the United States,
W75-10541 5D

OXIDATION LAGOONS
Waste Water Treatment: Lagoons and Oxidation Ponds,
W75-10374 5D

OXYGEN
Effect of the Insecticide Zectran (Mexacarbate) on Several Algae,
W75-10425 5C

Importance of Plants in Oxygen Production, Carbon Dioxide Consumption and Air Purification,
W75-10715 2I

OXYGEN DEMAND
An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

OYSTERS
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

The Effect of Prolonged Exposure to Elevated Temperatures on the Biochemical Constituents, Gonadal Development and Shell Deposition of the American Oyster, Crassostrea Virginica,
W75-10849 5C

OZONE
Error Analysis of Dobson Spectrophotometer Measurements of the Total Atmospheric Ozone Content,
W75-10545 7B

Treatment of Service Water with Ozone,
W75-10840 5D

P. L. 92-500
P. L. 92-500 (Two Years Later) is Not the Answer,
W75-10471 5G

PACIFIC OCEAN
Some Features of Tsunamis on the Pacific Coast of South and North America,
W75-10554 2L

PATENTS
Liquefying Refrigerant for Water Desalination with Liquefied Natural Gas and an Intermediate Energy Cycle,
W75-10725 3A

Oil and Debris Removal Unit,
W75-10726 5G

Water Collection and Storage Dispersion Apparatus,
W75-10727 4A

Oil Separation and Recovery Device,
W75-10728 5G

Integral Circular Wastewater Treatment Plant,
W75-10729 5D

Method of Treating Aluminum-Containing Waste Water,
W75-10730 5D

Process for Removing Heavy Metal Ions in Water,
W75-10731 5D

Air and Water Pollution Control,
W75-10732 5D

Rotary Desalination Engine and System,
W75-10733 3A

Geothermal Channel and Harbor Ice Control System,
W75-10734 4A

Closed Recycling System for Water Purification and Waste Reduction,
W75-10735 5D

Removal of Pollutants from Water,
W75-10736 5D

Method of Purification of Waste Water Produced From the Packing of Meat and Aquatic Animals,
W75-10737 5D

Multiple Cycle Process for Wastewater Purification,
W75-10738 5D

Geothermal Power Plant with High Efficiency,
W75-10845 8C

PATH OF POLLUTANTS
Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese),
W75-10441 5C

Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

Ocean Pollutants Pose Potential Danger to Man,
W75-10464 5B

Average Trace Element Composition of Low Level Marine Atmospheric Particulates,
W75-10477 5B

Redistribution and Concentration of Mercury in the Environment,
W75-10483 5B

Dispersion of Contaminated Bedload Particles,
W75-10526 5B

Prediction of Trifluralin Diffusion Coefficients,
W75-10542 5B

Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

Water Pollution Problems Associated with Control of Stack Gas Emission,
W75-10691 5B

Runoff of Oils from Rural Roads Treated to Suppress Dust,
W75-10766 5B

Seepage from Recharge and Landfill Ditches,
W75-10770 5B

ACTMO, An Agricultural Chemical Transport Model,
W75-10846 5B

PATUXENT RIVER (MD)
Daily Temperature and Salinity of Surface Water of Patuxent River at Solomons, Maryland, Based on 30 Years of Records (1938-1967),
W75-10535 2E

PCP
Studies on the Metabolism of Chlorophenols in Fish-III Isolation and Identification of a Conjugated PCP Excreted by Goldfish,
W75-10611 5A

PEAK-LOAD PRICING
On the Peak-Load Pricing of Urban Water Supply,
W75-10706 6C

PEAK LOADS
On the Peak-Load Pricing of Urban Water Supply,
W75-10706 6C

PEARSON TYPE III DISTRIBUTION
Statistical Tolerance Limits for a Pearson Type III Distribution,
W75-10511 2E

PEAT
Measurement of Hydraulic Conductivity of Peats,
W75-10536 7B

PEDOCALS
Pedologic Cover of the Watershed of the Porecka River,
W75-10551 2A

PENNSYLVANIA
Flood Plain Information: Bushkill Creek Vicinity of Easton, Pennsylvania.
W75-10560 4A

Flood Plain Information: Bloomsburg, Columbia County, Pennsylvania-Susquehanna River.
W75-10561 4A

Flood Plain Information: Brandywine Creek Chester County, Pennsylvania.
W75-10562 4A

Flood Plain Information: Mill Run, Blair County, Pennsylvania.
W75-10568 4A

Flood Plain Information: West Branch Susquehanna River, Lycoming County Pennsylvania.
W75-10576 4A

PENTA-CHLOROPHENOL (PCP)
Studies on the Metabolism of Chlorophenols Fish-I Absorption and Excretion of PCP Goldfish,
W75-10417

PENTACHLOROPHENOL
Studies on the Metabolism of Chlorophenols Fish-II Turnover in Absorbed PCP in Goldfis
W75-10418

PERCHES
DDT : Short Term Effects on Osmoregulati in Black Surfperch (Embiotoca Jacksoni),
W75-10429

COLATION
Climatological Analysis of North Polar sert Areas,
75-10455 2C

FORMANCE
creasing the Efficiency of Flotation Savealls vyshenie effektivnosti raboty flotatsionnykh ushek),
75-10369 5D

imming Performance of Juvenile Coho Salon (Oncorhynchus Kisutch) Exposed to ached Kraft Pulp Mill Effluent,
5-10387 5C

nt Performance Using Dissolved Oxygen ntrol,
5-10452 5D

ODICITY
noval of Periodicities by Differencing and nthyl Mean Subtraction,
5-10352 2A

MAFROST
morphic Processes in Polar Deserts,
5-10456 2C

MEABILITY
T : Short Term Effects on Osmoregulation Black Surfperch (Embiotoca Jacksoni),
5-10429 5C

Effect of Heavy Metals on Photosynthesis Loss of Cell Potassium in Two Species of rine Algae, Dunaliella tertiolecta and eodactylum tricornutum,
5-10447 5C

OXIDE BLEACHING
nt Liquor From Peroxide Bleaching of undwood Pulp From Spruce,
5-10392 5A

ISTANCE
Evaluation of Persistency for Water Borne anics,
5-10850 5B

CIDE RESIDUES
idue Analyses on 2-Amino-4 Phenazole, a Piscine Anesthetic, in Fishes-I a del Radio-Tracer Experiment with Medaka,
5-10614 5A

CIDE RESIDUES
idues of Polychlorinated Biphenyls (PCB) Chlorinated Pesticides in Fish and Birds of Po Delta, (Residus de Polychlorobiphenyls B) et de Pesticides Chlores Dans Les Poiss et Les Oiseaux du Delta du Po),
5-10446 5B

CIDES
icity of Phosphamidon to American Lobs (Homarus Americanus) Held at 4 and
5-10413 5C

cts of Heavy Metals and Pesticides on the s Mortalities of Cultured Shellfishes Along Southwest Coast of Taiwan, (In Chinese),
5-10427 5C

cts of the Insecticide Sevin and Its First rolytic Product, 1-Napthol, on Some Early elopmental Stages of the Bay Mussel, ilus edulis,
5-10435 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to Selected Aquatic Invertebrates and Frog Larvae,
W75-10703 5C

A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

PETROLEUM INDUSTRY
Water-Quality Requirements for the Petroleum Industry,
W75-10465 5D

PHAEODACTYLUM TRICORNUTUM
The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

PHENOLS
Analysis of Tri-Aryl Phosphate Esters and the Determination of Imol S-140 in Fish Tissue and Water Samples by Gas Chromatography,
W75-10442 5A

Studies on the Metabolism of Chlorophenols in Fish-III Isolation and Identification of a Conjugated PCP Excreted by Goldfish,
W75-10611 5A

PHILIPPINE ISLANDS
Phosphorus Availability of Some Philippine Rice Soils as Affected by Soil and Water Management Practices,
W75-10421 3F

PHOENIX (ARIZ)
Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

PHOSPHAMIDON
Toxicity of Phosphamidon to American Lobsters (Homarus Americanus) Held at 4 and 12C,
W75-10413 5C

PHOSPHORUS
Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

Phosphorus Availability of Some Philippine Rice Soils as Affected by Soil and Water Management Practices,
W75-10421 3F

Phosphorus in Percolates from Manured Lysimeters,
W75-10573 5B

PHOSPHORUS COMPOUNDS
Biological Activity of Organophosphorus Compounds and Synthetic Pyrethroids Against Immature Mosquitoes,
W75-10631 5G

PHOSPHORUS REMOVAL
Rate of Phosphorus Uptake by Activated Sludge,
W75-10839 5D

PHOSPHORUS UPTAKE RATE
Rate of Phosphorus Uptake by Activated Sludge,
W75-10839 5D

PHOTOPLANKTON
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420 5C

PHOTOSYNTHESIS
Effect of the Insecticide Zectran (Mexacarbate) on Several Algae,
W75-10425 5C

The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

The Effect of Some Heavy Metal Ions on Photosynthesis in a Freshwater Alga,
W75-10627 5C

PHYTOPLANKTON
Effects of Chlorinated Hydrocarbon Pollutants on Growth of Marine Phytoplankton in Culture,
W75-10636 5C

PICKWICK LAKE (ALA)
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

PIEDMONT REGION (NC)
Sediment Characteristics of Streams in the Eastern Piedmont and Western Coastal Plain Regions of North Carolina,
W75-10586 2J

PIGMENTS
Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

PIPELINES
Icings Along the Trans-Alaska Pipeline Route,
W75-10592 2C

**PIPELINES**

Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973,
W75-10594 8B

800 Miles to Go,
W75-10638 5C

Computer Simulation of Water Distribution Networks,
W75-10823 4A

Pipeline Stress Analysis,
W75-10824 8B

**PISCICIDES**

Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

**PLANKTON**

Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

**PLANNING**

Principles and standards for Water Planning,
W75-10355 6B

Flood Plain Information: White Clay Creek, New Castle County, Delaware.
W75-10571 4A

Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

Panel Review of the Taxonomic Structure of the Straw Man.
W75-10806 6B

Panel Evaluation of the Logical Structure, Consistency, and Underlying Assumptions of the 'Strawman' Methodology.
W75-10807 6B

Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States.
W75-10810 6A

Social Indicators and Connectives,
W75-10812 6A

Towards a Sharper Concept of an Action Variable,
W75-10813 6A

Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

Qualitative Sign Matrix Manipulation,
W75-10815 6A

Necessary Adaptations for Significant Utilization of the Information System,
W75-10816 6A

A Method of Disaggregation,
W75-10817 6A

Algorithmic Modeling and the Straw Man,
W75-10820 6A

**PLANT MORPHOLOGY**

An Analysis of the Mechanics of Guard Cell Motion,
W75-10488 2I

**PLANT PHYSIOLOGY**

The Effect of Some Heavy Metal Ions on Photosynthesis in a Freshwater Alga,
W75-10627 5C

Importance of Plants in Oxygen Production, Carbon Dioxide Consumption and Air Purification,
W75-10715 2I

**PLANTING MANAGEMENT**

Effect of a Phytoplankton Culture on the Germination and Seedling Development of Barley, Sugar Beets and Lettuce,
W75-10496 3F

**PLASTICS**

Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

Tar Pollution of Sierra Leone Beaches,
W75-10472 5B

**PLATTE RIVER (NEB)**

Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

**PO RIVER (ITALY)**

Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

**POLAR DESERTS**

A Climatological Analysis of North Polar Desert Areas,
W75-10455 2C

**POLAR REGIONS**

Geomorphic Processes in Polar Deserts,
W75-10456 2C

Soils of the High Arctic Landscapes,
W75-10458 2C

Application of Low-Latitude Microbial Ecology to High-Latitude Deserts,
W75-10459 2C

Indigenous Peoples of Polar Deserts,
W75-10460 6D

Processes and Costs Imposed by Environmental Stress,
W75-10461 2C

**POLITICAL ASPECTS**

Political Participation and Water Rates. A Closer Look,
W75-10361 6C

The Lower Colorado River: A Bibliography,
W75-10453 10C

**POLLUTANT IDENTIFICATION**

Analytic Characterization of Sewer Loading by Spent Liquors of the Pulp Industry (Analytische Kennzeichung der Belastung der Vorfluter durch Ablaugen der Zellstoffindustrie),
W75-10381 5D

Determination of Cadmium, Copper, and Lead in Natural Waters After Anion-Exchange Separation,
W75-10385 5A

Determination of Manganese in Natural Waters by Atomic Absortion Spectrometry with a Carbon Tube Atomizer,
W75-10386 5A

X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

Marine Pollution Bioassay by Sea Urchin Eggs, An Attempt to Enhance Accuracy,
W75-10419 5A

Analysis of Tri-Aryl Phosphate Esters and the Determination of Imol S-140 in Fish Tissue and Water Samples by Gas Chromatography,
W75-10442 5A

USCG Sets Broader Use of Pollution Control Systems,
W75-10466 5G

Electron Microscope Autoradiography of Kidney After Administration of PB-210 in Mice,
W75-10476 5A

Average Trace Element Composition of Low Level Marine Atmospheric Particulates,
W75-10477 5B

Persistence of Cadmium-Induced Metabolic Changes in Liver and Kidney,
W75-10478 5A

Absorption of Cadmium, Copper and Zinc by Dog Whelks in the Bristol Channel,
W75-10481 5B

The Determination of Mercury in Soils and Related Materials by Cold-Vapour Atomic Absorption Spectrometry,
W75-10485 5A

Atomic-Absorption Spectrometric Determination of Copper, Lead, Cadmium and Manganese in Pulp and Paper by the Direct Atomization Technique,
W75-10489 5A

NBS Adds Foreign Wrinkle to Standards Work,
W75-10490 5A

Effect of Dietary Selenium on Glutathione Peroxidase in the Chick,
W75-10495 5A

Enrichment of Surface Freshwater Microlayers with Algae,
W75-10583 5A

Studies on the Metabolism of Chlorophenols in Fish-III Isolation and Identification of a Conjugated PCP Excreted by Goldfish,
W75-10611 5A

Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I: Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

Influence of a Thermal Effluent on Movement of Brown Bullhead (Ictalurus Nebulosus) as Determined by Ultrasonic Tracking,
W75-10628 5C

Analysis of Pollution from Marine Engines Status Report,
W75-10688 5A

tomated Sequential Composite Sampling. A w Technique for Water Pollution Study and ntrol,
75-10690 5A

ve Year Study of Des Moines River Water ality,
75-10803 5B

Remote Sensing Laser Fluorometer,
75-10831 5A

nsitivity of Human Diploid Embryonic Lung ls from Isolation of Echo Viruses from vage,
75-10836 5C

ter Analysis of River Waters in Kagawa ), Chemical Composition of the Aya Water sin, (In Japanese),
75-10841 2K

e Toxicity of Heavy Metal Ions to Anaerobic estion,
75-10843 5D

LUTANTS
source Development in Canada's High Arc-
75-10463 2C

LUTION ABATEMENT
ernational Production Aspects of Water and vironmental Quality Control,
75-10357 5G

rived Decision Rules for Pollution Control in eneral Equilibrium Space Economy,
75-10360 6C

il Engineering Laboratory Develops Univer- Connector for All Booms.
75-10468 5G

pression of Nitrogen Fixation by Bluc- en Alage in a Eutrophic Lake with Trace ditions of Copper,
75-10480 5C

vironmental Problems Associated with the e of Cooling Towers,
75-10671 5D

l Wastewater Treatment Stop Eutrophica- n of Impoundments,
75-10686 5D

ceedings of the International Conference on ste Oil Recovery and Reuse.
75-10739 5D

vironmental Action at Port Authority Air- ts,
75-10748 5G

t Reception and Treatment Facilities for y Waste from Vessels,
75-10751 5G

LUTION CONTROL
lution Control with a Comprehensive Waste Processing Plant,
75-10758 5D

LUTION SENSORS
CG Sets Broader Use of Pollution Control tems,
75-10466 5G

LUTION TAXES (CHARGES)
lution Control and Optimal Taxation: A ic Analysis,
75-10359 6E

Derived Decision Rules for Pollution Control in a General Equilibrium Space Economy,
W75-10360 6C

POLYCHLORINATED BIPHENYLS
Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5A

POLYCHLORINATED BIPHYENLS
On the Accumulation of Organochlorine Pesticides, PCB and Certain Heavy Metals in Fish and Shellfish from Thai Coastal and Inland Waters,
W75-10616 5B

PONDEROSA PINE ZONE
Watershed Management Problems and Opportunities for the Colorado Front Range Ponderosa Pine Zone: The Status of Our Knowledge,
W75-10655 4D

POROUS MEDIA
A Theory of the Mass Transport of Previously Distributed Chemicals in a Water-Saturated Sorbing Porous Medium: 4. Distributions,
W75-10632 5B

PORT AUTHORITY OF NEW YORK
Environmental Action at Port Authority Airports,
W75-10748 5G

POTABLE WATER
Safe Drinking Water Has Become a Federal Case.
W75-10469 5G

POTASSIUM
The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

PRE-TREATMENT (WATER)
Use of Organic Flocculants for Textile Plant Water Treatment (Pouziti organickych flokulantu k cireni vody pro technologii textilni vyroby),
W75-10383 5F

PRECIPITATION
A Climatological Analysis of North Polar Desert Areas,
W75-10455 2C

PRECIPITATION (ATMOSPHERIC)
A Precipitation Data Simulator Using a Second Order Autoregressive Scheme,
W75-10513 2B

Statistical Model of Short-Duration Precipitation Events,
W75-10529 2B

Priority Problems for Modifying Cumulus Precipitation,
W75-10774 3B

Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

PRESSURE
Snow Creep: Its Engineering Problems and Some Techniques and Results of Its Investigation,
W75-10503 2C

Results of Airblast Overpressure Measurement Program at Project R.D. Bailey,
W75-10555 8H

PRICES
On the Peak-Load Pricing of Urban Water Supply,
W75-10706 6C

PRICING
Water Rates: An Assessment of Current Issues,
W75-10707 6C

PRIMARY PRODUCTIVITY
Herbicides in Aquatic Systems,
W75-10625 5C

The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

PROBABILITY
On the Joint Distribution of the Periods and Amplitudes of Sea Waves,
W75-10534 2L

PROJECTS
Towards a Sharper Concept of an Action Variable,
W75-10813 6A

PROPERTY VALUES
The Effect of Landowner Attitude on the Financial and the Economic Costs of Acquiring Land for a Large Public Works Project,
W75-10827 6B

PROTEIN
Production of Microbial Protein From Waste Cellulose by Thermomonospora Fusca, A Thermophilic Actinomycete,
W75-10538 5C

Protein Content of Winter Wheat Grain as Related to Soil and Climatic Factors in the Semi-Arid Central Great Plains,
W75-10792 3F

PROTEINS
Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

PROTOZOA
Response of Freshwater Protozoan Artificial Communities to Metals,
W75-10440 5C

Population Dynamics of Protozoa in Wastewater, and Impact of Environmental Changes,
W75-10689 5D

PUBLIC HEALTH
Safe Drinking Water Has Become a Federal Case.
W75-10469 5G

**PUBLIC HEALTH**

Health Implications of Exposure to Trace Metals from Combustion of Waste Oil,
W75-10765 5C

Sensitivity of Human Diploid Embryonic Lung Cells from Isolation of Echo Viruses from Sewage,
W75-10836 5C

**PUBLIC INVOLVEMENT**

Role of the Public in Weather Modification,
W75-10777 3B

**PUBLICATIONS**

Process Design Manual for Upgrading Existing Waste Water Treatment Plants.
W75-10396 5D

**PULP AND PAPER INDUSTRY**

Study of Solid Waste Management Practices in the Pulp and Paper Industry.
W75-10366 5D

Reduction of Effluent Pollution at the Arkhangel'sk Mills (Snizhenie zagryaznennosti stochnykh vod na Arkhangel'-skom Kombinate),
W75-10368 5D

Instruction for Record Keeping of Water Consumption at the Enterprises of the Paper Industry (Instruktsiya ucheta raskhoda vody na predpriyatiyakh otrasli),
W75-10370 3E

Wisconsin Tissue Mills One Year After Startup of the Effluent Plant,
W75-10378 5D

Industrial Wastes: Paper and Allied Products,
W75-10397 5D

Problems Encountered in Sludge Treatment and Some Advanced Solutions,
W75-10398 5E

Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

**PULP WASTES**

Study of Solid Waste Management Practices in the Pulp and Paper Industry.
W75-10366 5D

Utilization of a Kraft Effluent Channel by Fish and Aquatic Organisms,
W75-10377 5C

Wisconsin Tissue Mills One Year After Startup of the Effluent Plant,
W75-10378 5D

Effect of Temperature and Sludge Loading on 5-Day BOD Removal and Sludge Settleability in Activated Sludge Systems Treating Bleached Kraft Effluents,
W75-10379 5D

Taio Paper (Company, Iyomishima, Japan) Expands to 1,000,000 Tons/Year,
W75-10380 5D

Analytic Characterization of Sewer Loading by Spent Liquors of the Pulp Industry (Analytische Kennzeichung der Belastung der Vorfluter durch Ablaugen der Zellstoffindustrie),
W75-10381 5D

Studies on Possibilities of Biochemical Purification of Evaporator Condensate Occurring During Sulfite Pulp Manufacture (Untersuchungen ueber die Moeglichkeit der biochemischen Reinigung des bei der Sulfitzellstoffherstellung anfallenden Eindampfkondensates),
W75-10382 5D

Swimming Performance of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Bleached Kraft Pulp Mill Effluent,
W75-10387 5C

Serpaflo: Original Solution to Cleaning Paper Mill Effluents (Serpaflo; La solution originale d'epuration des eaux papeteries),
W75-10389 5D

Rotating Biological Disk Treatment of Kraft Mill Effluents,
W75-10390 5D

Color of Pulp Industry Waste Liquors. (6). Behavior of Color During Waste Treatments (In Japanese),
W75-10393 5D

Color of Pulp Industry Waste Liquors. (7). Color Reduction by Ultraviolet Treatment (In Japanese),
W75-10394 5D

Industrial Wastes: Paper and Allied Products,
W75-10397 5D

Color Removal From Bleached Kraft Effluents,
W75-10399 5D

Analysis of Alternatives for Removal of Suspended Solids in Pulp and Paper Mill Effluents,
W75-10400 5D

Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

Toxicity of Pulping Wastes to Fish,
W75-10403 5C

**PYRETHRINS**

Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

**PYRETHROIDS (SYNTHETIC)**

Biological Activity of Organophosphorus Compounds and Synthetic Pyrethroids Against Immature Mosquitoes,
W75-10631 5G

**RADIATION**

Laboratory Measurement of Surface Temperature Fluctuations Induced by Small Amplitude Surface Waves,
W75-10505 2L

Error Analysis of Dobson Spectrophotometer Measurements of the Total Atmospheric Ozone Content,
W75-10545 7B

**RADIOISOTOPES**

Electron Microscope Autoradiography of Kidney After Administration of PB-210 in Mice,
W75-10476 5A

**RAILROADS**

Re-Refined Diesel Locomotive Lubricating Oil,
W75-10761 5D

**RAINBOW TROUT**

Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

Toxic Effects of an Anionic Detergent on the Gills of Rainbow Trout,
W75-10434 5C

Toxicity of Paired Mixtures of Candidate Forest Insecticides to Rainbow Trout,
W75-10439 5C

Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

Effects of Temperature on Development and Survival of Rainbow Trout, Salmo Gairdneri, in Acid Waters,
W75-10623 5C

The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

**RAINFALL**

Cross Spectra of Short-Duration Rainfall,
W75-10514 2B

Hourly Rainfall Generation for a Network,
W75-10515 2B

Stochastic Generation of the Occurrence, Pattern, and Location of Maximum Amount of Daily Rainfall,
W75-10516 2B

Comments on the Statistical Distribution of Rainfall per Period Under Various Transformations,
W75-10517 2B

A Stochastic Model for Daily Rainfall Data Synthesis,
W75-10518 2B

Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

Stochastic Model of Daily Rainfall,
W75-10520 2B

An Event-Based Stochastic Model of Areal Rainfall and Runoff,
W75-10521 2B

Statistical Model of Short-Duration Precipitation Events,
W75-10529 2B

Water Collection and Storage Dispersion Apparatus,
W75-10727 4A

Sediment-Yield Characteristics from Unit Source Watersheds,
W75-10848 2J

**RAINFALL DISPOSITION**

A Precipitation Data Simulator Using a Second Order Autoregressive Scheme,
W75-10513 2B

FALL-RUNOFF RELATIONSHIPS
ermine Urban Runoff the Simple Way,
5-10716 2E

E MANAGEMENT
ershed Management Problems and Opportunities for the Colorado Front Range Ponosa Pine Zone: The Status of Our owledge,
5-10655 4D

ONAL FORMULA
ermine Urban Runoff the Simple Way,
-10716 2E

FINING
lity Products from Used Petroleum Oils,
-10756 5D

Economics of Re-Refining,
-10757 5G

erience with the IFP Propane Clarification ess in Re-Refining Spent Crankcase Oils,
-10759 5D

Refined Diesel Locomotive Lubricating Oil,
-10761 5D

sachusetts Waste Oil Management Activi-
-10763 5D

AIMED WATER
te Water Treatment: Water Reclamation Reuse,
-10372 5D

er Supply from Renovated Wastewater--A ource Manual for Massachusetts Planners, ic Officials and Citizen Groups.
-10722 5D

EATION
onnectives Model Relating Water Policy on Variables to Recreational Opportunity al Indicators,
-10819 6A

vation of Reservoir Operating Rules by nomic Analysis,
-10825 4A

EATION DEMAND
ysis of Reservoir Recreation Benefits,
-10826 6B

EATION FACILITIES
ey Design in Urban Growth Centres,
-10643 6B

CLING
lems of Space Biology. Volume 24. The er Supply of Spacecraft Crews,
-10365 5D

amation of Textile Printing Wastewaters Direct Recycle,
-10676 5D

ed Recycling System for Water Purification and Waste Reduction,
-10735 5D

iple Cycle Process for Wastewater Purifin,
-10738 5D

eedings of the International Conference on e Oil Recovery and Reuse.
-10739 5D

Containment, Collection and Recycling of Oily Wastes,
W75-10747 5G

Disposal and/or Recycle of Air Force Waste Petroleum Oils and Lubricants,
W75-10749 5D

Quality Products from Used Petroleum Oils,
W75-10756 5D

The Economics of Re-Refining,
W75-10757 5G

Experience with the IFP Propane Clarification Process in Re-Refining Spent Crankcase Oils,
W75-10759 5D

Oil Contaminated Water Recycling System,
W75-10760 5D

Re-Refined Diesel Locomotive Lubricating Oil,
W75-10761 5D

Rate of Phosphorus Uptake by Activated Sludge,
W75-10839 5D

**REDUCTION (CHEMICAL)**
Arsenate Uptake and Reduction by Pocillopora verrucosa,
W75-10491 5C

**REFACTORY INDEX**
An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

**REGIONAL ANALYSIS**
Summary Appraisals of the Nation's Ground-Water Resources--Rio Grande Region,
W75-10597 4B

Summary Appraisals of the Nation's Ground-Water Resources--Ohio Region,
W75-10598 4B

The Master Plan for Water-Supply in the Regional Municipality of Ottawa-Carleton,
W75-10710 3D

**REGIONAL DEVELOPMENT**
Principles and standards for Water Planning,
W75-10355 6B

Rivers in the City,
W75-10723 6B

**REGRESSION ANALYSIS**
General Aspects of Multivariate Analysis with Applications to Some Problems in Hydrology,
W75-10510 2A

Use of Autoregressive Runoff Models in Reservoir Studies,
W75-10523 2E

Analysis of Reservoir Recreation Benefits,
W75-10826 6B

**REHABILITATION**
Automation of an Existing Irrigation System - Part I,
W75-10788 8C

**REMOTE SENSING**
A Remote Sensing Laser Fluorometer,
W75-10831 5A

**REND LAKE DAM (ILL)**
Turbulent Flow in Rectangular Outlet Conduit, Rend Lake Dam, Big Muddy River, Illinois,
W75-10666 8B

**REPRODUCTION**
Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

**REPUBLICAN RIVER (NEB)**
Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

**RESEARCH AND DEVELOPMENT**
Progress in Australian Hydrology 1965-1974.
W75-10646 2A

Current Water Systems Automation Research and Development in the Bureau of Reclamation,
W75-10787 8C

**RESERVOIR CONSTRUCTION**
Harry S. Truman Dam and Reservoir, Osage River, Missouri, Apendix A (Final Environmental Impact Statement).
W75-10363 8A

**RESERVOIR OPERATION**
Derivation of Reservoir Operating Rules by Economic Analysis,
W75-10825 4A

**RESERVOIR STORAGE**
Some Problems in Pure and Applied Stochastic Hydrology,
W75-10508 2A

**RESERVOIRS**
Use of Autoregressive Runoff Models in Reservoir Studies,
W75-10523 2E

Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

A Numerical Model for Predicting the Effects of Landslide-Generated Water Waves,
W75-10661 8A

**RESINS**
Problems of Space Biology. Volume 24. The Water Supply of Spacecraft Crews,
W75-10365 5D

**RESOURCES**
Review of Development of Arctic Resources,
W75-10462 2C

**RESOURCES ALLOCATION**
Review of Development of Arctic Resources,
W75-10462 2C

**RESOURCES DEVELOPMENT**
Review of Development of Arctic Resources,
W75-10462 2C

Resource Development in Canada's High Arctic,
W75-10463 2C

RESPIRATION
The Effect of Different Salinities and Manganese Ion on the Survival Respiration of the Baltic Flounder (Pleuronectes Flesus Trachurus (Dunker)) of the Gulf of Riga,
W75-10411 5C

Effect of the Insecticide Zectran (Mexacarbate) on Several Algae,
W75-10425 5C

The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

RETURN PERIODS
Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

REVERSE OSMOSIS
How to Purify Effluents, Recover Byproducts With Reverse Osmosis,
W75-10391 5F

REVIEWS
Activated Sludge,
W75-10371 5D

Waste Water Treatment: Water Reclamation and Reuse,
W75-10372 5D

Waste Water Treatment: Land Disposal of Waste Water,
W75-10373 5E

Waste Water Treatment: Lagoons and Oxidation Ponds,
W75-10374 5D

Waste Water Treatment: Sludge Treatment, Utilization, and Disposal,
W75-10395 5D

Industrial Wastes: Paper and Allied Products,
W75-10397 5D

Watershed Management in the Rocky Mountain Subalpine Zone: The Status of Our Knowledge,
W75-10405 3B

Progress in Australian Hydrology 1965-1974.
W75-10646 2A

Avalanche Protection in Switzerland.
W75-10656 8C

RICE
Phosphorus Availability of Some Philippine Rice Soils as Affected by Soil and Water Management Practices,
W75-10421 3F

RIO GRANDE REGION
Summary Appraisals of the Nation's Ground-Water Resources--Rio Grande Region,
W75-10597 4B

RIO GRANDE RIVER
Summary Appraisals of the Nation's Ground-Water Resources--Rio Grande Region,
W75-10597 4B

Economic Impact of the Conversion of Water from Irrigation to Municipal and Industrial Use in the Rio Grande Basin of New Mexico,
W75-10771 6D

Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation,
W75-10805 5G

RIVER BASINS
A River-Quality Assessment of the Upper White River, Indiana,
W75-10600 5B

RIVER REGULATION
Toward an Ice-Free Arctic Ocean,
W75-10532 2C

RIVERS
Multisite Streamflow Simulation of Truckee River, Nevada,
W75-10509 2E

Competence of Rivers to Transport Coarse Bedload Material,
W75-10540 2J

Hydraulics and Mechanics of River Ice Jams,
W75-10556 8B

Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

Rivers in the City,
W75-10723 6B

Problems of Water Quality Management in Western River Basin Systems,
W75-10804 5G

Water Analysis of River Waters in Kagawa (IX), Chemical Composition of the Aya Water Basin, (In Japanese),
W75-10841 2K

ROCK EXCAVATION
Project Lost Creek: Field Tests of Mounding and Controlled Blasting,
W75-10553 8H

ROCKS
Atomic Absorption Spectrometric Determination of Cadmium, Lead, Silver, Thallium and Zinc in Silicate Rocks by Direct Atomization From the Solid State,
W75-10492 2K

Determination of Nickel in Rocks After Epithermal Neutron Activation,
W75-10493 2K

Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W75-10494 2K

ROCKY MOUNTAIN REGION
Watershed Management in the Rocky Mountain Subalpine Zone: The Status of Our Knowledge,
W75-10405 3B

ROCKY MOUNTAIN TRENCH (BRITISH COLUMBIA)
Glacier-Flow Patterns and the Origin of Late Wisconsinan Till in the Southern Rocky Mountain Trench, British Columbia,
W75-10539 2C

RODENTS
Electron Microscope Autoradiography of Kidney After Administration of PB-210 in Mice,
W75-10476 5A

Persistence of Cadmium-Induced Metabolic Changes in Liver and Kidney,
W75-10478 5A

ROOT SYSTEMS
Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

ROTATING BIOLOGICAL CONTACTOR
Treatment of Winery Wastes by Aer
Lagoon, Activated Sludge, and Rot
Biological Contractor,
W75-10685

ROTATING BIOLOGICAL DISK
Rotating Biological Disk Treatment of
Mill Effluents,
W75-10390

ROUTING
Nonlinear Channel Routing by Computer,
W75-10543

RUNOFF
A Climatological Analysis of North
Desert Areas,
W75-10455

Some Problems in Pure and Applied Stoch
Hydrology,
W75-10508

An Event-Based Stochastic Model of
Rainfall and Runoff,
W75-10521

Use of Autoregressive Runoff Models in R
voir Studies,
W75-10523

The Effects of Urbanization on Floods of
ferent Recurrence Interval,
W75-10709

Sediment-Yield Characteristics from
Source Watersheds,
W75-10848

RUNOFF FORECASTING
Determine Urban Runoff the Simple Way,
W75-10716

RURAL AREAS
Runoff of Oils from Rural Roads Treat
Suppress Dust,
W75-10766

Principles of Establishing Sewer Systems
Rural Settlements of Magdeburg C
(Grundlagen fuer die Abwasser-Techn
Erschliessung von Landgemeinden im
Magdeburg),
W75-10833

SABIN RIVER (TEX)
Developing Regional Stochastic Data Base
W75-10528

SACRAMENTO COUNTY
Evaluation of Ground Water Resources:
mento County,
W75-10546

SAFE DRINKING WATER ACT
Safe Drinking Water Has Become a F
Case.
W75-10469

SAFETY FACTORS
Snow Avalanche Sites: Their Identificatio
Evaluation,
W75-10659

SALINE SOILS
Drainage Analysis of a Confining Formati
W75-10780

SALINE WATER FISH
PCBS in the Spotted Sharks, Mu
Manazo, From Tokyo Bay, (In Japanese),
W75-10622

E WATER INTRUSION
Loxahatchee - A River in Distress, heast Florida,
-10588 4C

ITY
Effect of Different Salinities and Manse Ion on the Survival Respiration of the c Flounder (Pleuronectes Flesus Trachurus ker)) of the Gulf of Riga,
10411 5C

ease of Net Carbon Flux in Two Species ussels Caused by Extracts of Crude Oil,
10433 5C

Effect of Temperature and Salinity on ium Uptake by the Blue Crab, Callinectes us,
10448 5C

Temperature and Salinity of Surface r of Patuxent River at Solomons, Mary- Based on 30 Years of Records (1938-
10535 2E

on Point Dike Study, Coney Island, New Hydraulic Model Investigation,
10662 8B

bined Effects of Cadmium and Salinity on opment and Survival of Herring Eggs,
10704 5C

ems of Water Quality Management in ern River Basin Systems,
10804 5G

t of Agricultural Use on Water Quality for stream Use for Irrigation,
10805 5G

N
ming Performance of Juvenile Coho Sal- (Oncorhynchus Kisutch) Exposed to hed Kraft Pulp Mill Effluent,
0387 5C

ts of Acute Exposure to Bleached Kraft Mill Effluent on Carbohydrate Metabolf Juvenile Coho Salmon (Oncorhynchus ch) During Rest and Exercise,
0388 5C

ts of the Winter Ecology of Juvenile Salmon (Oncorhynchus Kisutch) and ead Trout (Salmo Gairdneri),
0615 5C

ty of the Lampricide 3-Trifluoromethyl-ophenol (TFM) To Nontarget Fish in Through Tests,
0702 5C

NIDS
of a Mixture of Succinic Acid Mono-o-Ester and Olefin Sulfonate on Fish die Wirkung einer Mischung von Sulsteinsaure-halbester und Olefinsulfonat sche),
0409 5C

osteroid Concentrations in Sockeye Sal- Oncorhynchus Nerka) Exposed to Low ntrations of Copper,
0415 5C

Toxicity of Kanamycin to Steelhead (Salmo Gairdneri),
0423 5C

Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

Toxic Effects of an Anionic Detergent on the Gills of Rainbow Trout,
W75-10434 5C

Water Quality Criteria for European Fresh-Water Fish.
W75-10609 5C

Aspects of the Winter Ecology of Juvenile Coho Salmon (Oncorhynchus Kisutch) and Steelhead Trout (Salmo Gairdneri),
W75-10615 5C

Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

Effects of Temperature on Development and Survival of Rainbow Trout, Salmo Gairdneri, in Acid Waters,
W75-10623 5C

The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

SALT TOLERANCE
Irrigation Management for Salt Control,
W75-10800 3C

SALTS
Irrigation Management for Salt Control,
W75-10800 3C

SAMPLING
Enrichment of Surface Freshwater Microlayers with Algae,
W75-10583 5A

The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

SAN LUIS VALLEY
Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

SANGAMON RIVER (ILL)
Flood Plain Information: Macon County, Illinois.
W75-10565 4A

SANTA ANA RIVER (CAL)
Flood Control Project on Lytle and Warm Creeks and Santa Ana River, California; Hydraulic Model Investigation,
W75-10668 8B

SARDINE
The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

SAVEALLS
Increasing the Efficiency of Flotation Savealls (Povyshenie effektivnosti raboty flotatsionnykh lovushek),
W75-10369 5D

SCREENS
Marine Floating Screen.
W75-10634 5G

SEA ICE
Toward an Ice-Free Arctic Ocean,
W75-10532 2C

Floating Glacial Ice Caps in the Arctic Ocean,
W75-10533 2C

SEA URCHIN EGGS
Marine Pollution Bioassay by Sea Urchin Eggs, An Attempt to Enhance Accuracy,
W75-10419 5A

Bioassay Data for Marine Pollution Using Sea Urchin Eggs, 1972 and 1973,
W75-10432 5A

SEA WATER
Marine Pollution Bioassay by Sea Urchin Eggs, An Attempt to Enhance Accuracy,
W75-10419 5A

Bioassay Data for Marine Pollution Using Sea Urchin Eggs, 1972 and 1973,
W75-10432 5A

The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

Arsenate Uptake and Reduction by Pocillopora verrucosa,
W75-10491 5C

SEABOOMS
Marine Floating Screen.
W75-10634 5G

SEATTLE-TACOMA AREA (WASH)
Flood Hazards in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W75-10580 7C

SECONDARY PRODUCTIVITY
Herbicides in Aquatic Systems,
W75-10625 5C

SECONDARY UNDULATIONS
Some Features of Tsunamis on the Pacific Coast of South and North America,
W75-10554 2L

SEDIMENT CONTROL
Evaluation of Disposal Areas in James River; Hydraulic Model Investigation,
W75-10669 8B

SEDIMENT DISCHARGE
Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

SEDIMENT DISTRIBUTION
Sediment Characteristics of Streams in the Eastern Piedmont and Western Coastal Plain Regions of North Carolina,
W75-10586 2J

SEDIMENT LOAD
Flood Waves and Suspended Sediment Pulses in Urbanized Catchments,
W75-10647 4C

**SEDIMENT LOAD**

Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

**SEDIMENT MEASUREMENT**
Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

**SEDIMENT MODELS**
Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

**SEDIMENT TRANSPORT**
Research in Stochastic Models for Bedload Transport,
W75-10522 2J

Dispersion of Contaminated Bedload Particles,
W75-10526 5B

Competence of Rivers to Transport Coarse Bedload Material,
W75-10540 2J

Sediment Characteristics of Streams in the Eastern Piedmont and Western Coastal Plain Regions of North Carolina,
W75-10586 2J

Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

**SEDIMENT YIELD**
A Stochastic Model of Sediment Yield for Ephemeral Streams,
W75-10524 2J

Sediment Characteristics of Streams in the Eastern Piedmont and Western Coastal Plain Regions of North Carolina,
W75-10586 2J

Sediment-Yield Characteristics from Unit Source Watersheds,
W75-10848 2J

**SEEPAGE**
Seepage from Recharge and Landfill Ditches,
W75-10770 5B

**SELENIUM**
Effect of Dietary Selenium on Glutathione Peroxidase in the Chick,
W75-10495 5A

**SEMIARID CLIMATES**
Some Aspects of Climatology in Polar Barrens,
W75-10454 2C

**SENECA CREEK (MD)**
Flood Plain Information Report: Seneca Creek, Montgomery County, Maryland.
W75-10567 4A

**SEPARATED SEWERS**
Coping With Urban Runoff in the United States,
W75-10541 5D

**SEPARATION TECHNIQUES**
Feasibility Test Program of Application of Coalescing Phase Oil/Water Separators to Self Compensating Fuel Tanks in Surface Ships,
W75-10474 5G

Fast Separation of Tin (IV) From Tin (II) and From Numerous Metal Ions on Ion-Exchange Papers,
W75-10497 2K

Recovering Oil Spills from Water.
W75-10635 5G

Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

Oil and Debris Removal Unit,
W75-10726 5G

Oil Separation and Recovery Device,
W75-10728 5G

Air and Water Pollution Control,
W75-10732 5D

Closed Recycling System for Water Purification and Waste Reduction,
W75-10735 5D

**SERPAFLO**
Serpaflo: Original Solution to Cleaning Paper Mill Effluents (Serpaflo; La solution originale d'epuration des eaux papeteries),
W75-10389 5D

**SERUM**
Physiological Changes in the Serum and Hepatopancreas of Yellow Tail Injected with Carbon Tetrachloride, (In Japanese),
W75-10630 5C

**SERVICE WATER**
Treatment of Service Water with Ozone,
W75-10840 5D

**SESSILE ALGAE**
The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

**SEVIER RIVER (UTAH)**
Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation,
W75-10805 5G

**SEVIN**
Effects of the Insecticide Sevin and Its First Hydrolytic Product, 1-Napthol, on Some Early Developmental Stages of the Bay Mussel, Mytilus edulis,
W75-10435 5C

**SEWAGE**
Sensitivity of Human Diploid Embryonic Lung Cells from Isolation of Echo Viruses from Sewage,
W75-10836 5C

**SEWAGE EFFLUENTS**
Art of Agricultural Drainage Design and Costs,
W75-10797 4A

Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

**SEWAGE SLUDGE**
Heat Treatment of Sewage Sludges,
W75-10644 5D

Investigations on the Production of Hygienic Compost from Air-Dried Sewage Using Different Additives (Versuche zur Herstellung von hygienisch einwandfreiem Kompost aus luftgetrocknetem Faulschlamm unter Verwendung verschiedener Zusaetze),
W75-10834 5D

**SEWAGE TREATMENT**
Corrosion and Its Cost in Sewage Treatment,
W75-10364 8G

Toxicity of Chlorinated Municipal Wastes
Fish: An Evaluation Based on Michigan Fie
Data,
W75-10680 5

Vacuum Filtration Cost Optimization,
W75-10681 5

Population Dynamics of Protozoa in Was
water, and Impact of Environmental Changes,
W75-10689 5

Domestic Waste Water Reuse--Aspects of t
Treatment System,
W75-10708 5

Water and Wastewater Facilities for Flora
Housing Developments,
W75-10717 5

Stockholm Puts Sewage Plants Underground,
W75-10718 5

Integral Circular Wastewater Treatment Plant
W75-10729 5

Multiple Cycle Process for Wastewater Puri
cation,
W75-10738 5

The Toxicity of Heavy Metal Ions to Anaerob
Digestion,
W75-10843 5

**SEWERAGE**
Principles of Establishing Sewer Systems in t
Rural Settlements of Magdeburg Coun
(Grundlagen fuer die Abwasser-Technisch
Erschliessung von Landgemeinden im Bezi
Magdeburg),
W75-10833 5

**SHABAKUNK CREEK (NJ)**
Flood Plain Information: Shabakunk Cree
West Branch Shabakunk and Little Shabakun
Creeks, Mercer County, New Jersey.
W75-10572 4

**SHARKS**
PCBS in the Spotted Sharks, Mustel
Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5

**SHEAR STRENGTH**
Large Scale Laboratory Direct Shear Tests
Ice,
W75-10502 2

**SHIPS**
Oily Bilge from Commercial Vessels,
W75-10752 5

Shipyard Problems with Oily Wastes,
W75-10753 5

**SHIPYARDS**
Shipyard Problems with Oily Wastes,
W75-10753 5

**SHRIMP**
Toxic Effects of Aliphatic Chlorinated H
Products from Vinyl Chloride Production
Marine Animals,
W75-10412 5

**SIERRE LEONE**
Tar Pollution of Sierra Leone Beaches,
W75-10472 5

**SILICATES**
Uranium, Thorium, and Lead Concentratio
in Three Silicate Standards and a Method
Lead Isotopic Analysis,
W75-10494 2

ffect of the Quantity of Silt to the At-
Microorganisms of the Kuzuryu-Gawa
n the Hokuriku District, (In Japanese),
0696 5C

Concentration of Mercury, Copper,
Silver, Cadmium and Lead in the
rn Adriatic Anchovy, Engraulis En-
olus, and Sardine, Sardina Pilchardus,
9620 5B

TION ANALYSIS
Use Simulation Model of the Subalpine
rous Forest Zone,
0404 3B

te Streamflow Simulation of Truckee
Nevada,
0509 2E

ipitation Data Simulator Using a Second
Autoregressive Scheme,
0513 2B

ping Regional Stochastic Data Bases,
0528 2E

mic Modeling and the Straw Man,
0820 6A

Sizing of Urban Flood-Control
s,
0821 4A

ter Simulation of Water Distribution
ks,
0823 4A

ALLS (SD)
ration of Water Quality in Distribution
s,
0711 5F

DISPOSAL
Water Treatment: Sludge Treatment,
ion, and Disposal,
0395 5D

s Encountered in Sludge Treatment
ne Advanced Solutions,
0398 5E

Design Manual for Sludge Treatment
posal.
0475 5D

es for Landfill of Toxic Industrial
,
0487 5G

Disposal on Agricultural Soil,
0574 5D

of Digested Sewage Sludge by Land-
0582 5D

TREATMENT
Water Treatment: Sludge Treatment,
on, and Disposal,
0395 5D

s Encountered in Sludge Treatment
e Advanced Solutions,
0398 5E

Design Manual for Sludge Treatment
posal.
0475 5D

Gravity Dewatering of Metal Hydroxide Sludges,
W75-10500 5D

Heat Treatment of Sewage Sludges,
W75-10644 5D

Vacuum Filtration Cost Optimization,
W75-10681 5D

SLUDGE WASTES
Guidelines for Landfill of Toxic Industrial Sludges,
W75-10487 5G

SLUDGES
Gravity Dewatering of Metal Hydroxide Sludges,
W75-10500 5D

SNAILS
Listeria in Aquatic Animals,
W75-10375 2I

SNOW
Geomorphic Processes in Polar Deserts,
W75-10456 2C

Geological and Limnological Factors of Cold Deserts,
W75-10457 2C

SNOW CREEP
Snow Creep: Its Engineering Problems and Some Techniques and Results of Its Investigation,
W75-10503 2C

SNOW FENCES
New Engineering Criteria for Snow Fence Systems,
W75-10692 2C

New Snow Fence Design Controls Drifts, Improves Visibility, Reduces Road Ice,
W75-10693 2C

SNOW MANAGEMENT
A Weibull Prediction of the Tensile Strength-Volume Relationship of Snow,
W75-10651 2C

Snow Avalanche Sites: Their Identification and Evaluation,
W75-10659 2C

Water-Yield Improvement from Alpine Areas: The Status of Our Knowledge,
W75-10660 3B

New Engineering Criteria for Snow Fence Systems,
W75-10692 2C

New Snow Fence Design Controls Drifts, Improves Visibility, Reduces Road Ice,
W75-10693 2C

Estimating the Transport and Evaporation of Blowing Snow,
W75-10695 2C

SNOWPACKS
Snow Creep: Its Engineering Problems and Some Techniques and Results of Its Investigation,
W75-10503 2C

Water-Yield Improvement from Alpine Areas: The Status of Our Knowledge,
W75-10660 3B

New Engineering Criteria for Snow Fence Systems,
W75-10692 2C

New Snow Fence Design Controls Drifts, Improves Visibility, Reduces Road Ice,
W75-10693 2C

Estimating the Transport and Evaporation of Blowing Snow,
W75-10695 2C

SOCIAL ASPECTS
Panel Review of the Taxonomic Structure of the Straw Man.
W75-10806 6B

Panel Evaluation of the Logical Structure, Consistency, and Underlying Assumptions of the 'Strawman' Methodology.
W75-10807 6B

Report to the Technical Committee of the Water Resources Centers of the Thirteen Western States,
W75-10809 6B

Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States.
W75-10810 6A

Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

Social Indicators and Connectives,
W75-10812 6A

Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

A Method of Disaggregation,
W75-10817 6A

SOCIAL EQUILIBRIUM
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

International Production Aspects of Water and Environmental Quality Control,
W75-10357 5G

SOCIAL GOALS
Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

SOCIAL IMPACT
Analyzing Reimbursement Mechanisms for Resource Development Projects,
W75-10353 6C

SOCIAL INDICATORS
Panel Review of the Taxonomic Structure of the Straw Man.
W75-10806 6B

Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

SOCIAL PARTICIPATION
Role of the Public in Weather Modification,
W75-10777 3B

SOCKEYE SALMON
Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

SODIUM SULFATE
Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

SOIL ANALYSIS
The Determination of Mercury in Soils and Related Materials by Cold-Vapour Atomic Absorption Spectrometry,
W75-10485 5A

SOIL CLASSIFICATION
Soils of the High Arctic Landscapes,
W75-10458 2C

SOIL DISPOSAL FIELDS
Sludge Disposal on Agricultural Soil,
W75-10674 5D

Land Treatment of Municipal Sewage,
W75-10719 5D

SOIL INVESTIGATIONS
Pedologic Cover of the Watershed of the Porecka River,
W75-10551 2A

SOIL MANAGEMENT
Operational Value of Weather Information in Relation to Soil Management Characteristics,
W75-10367 2G

Phosphorus Availability of Some Philippine Rice Soils as Affected by Soil and Water Management Practices,
W75-10421 3F

SOIL MICROBIOLOGY
Application of Low-Latitude Microbial Ecology to High-Latitude Deserts,
W75-10459 2C

SOIL MOISTURE
Prediction of Trifluralin Diffusion Coefficients,
W75-10542 5B

Effects of Soil Moisture on Stress on 2 Varieties of Upland Cotton in Israel: IV. Effects of Periods of Stress Occurrence, Correlations and Regressions,
W75-10791 3F

SOIL PHYSICAL PROPERTIES
Soils of the High Arctic Landscapes,
W75-10458 2C

SOIL TEMPERATURE
Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

SOIL TREATMENT
Land Treatment of Municipal Sewage,
W75-10719 5D

SOIL WATER
Protein Content of Winter Wheat Grain as Related to Soil and Climatic Factors in the Semi-Arid Central Great Plains,
W75-10792 3F

SOIL-WATER-PLANT RELATIONSHIPS
Water-Soil-Plant Interactions with Terbacil,
W75-10486 5C

SOILS
Soils of the High Arctic Landscapes,
W75-10458 2C

Pedologic Cover of the Watershed of the Porecka River,
W75-10551 2A

SOLID WASTES
Study of Solid Waste Management Practices in the Pulp and Paper Industry.
W75-10366 5D

Guidelines for Landfill of Toxic Industrial Sludges,
W75-10487 5G

SORGHUM
Water-Soil-Plant Interactions with Terbacil,
W75-10486 5C

SOUTH AMERICA
Some Features of Tsunamis on the Pacific Coast of South and North America,
W75-10554 2L

SOUTH DAKOTA
Flood Plain Information: Brookings, Brookings County, South Dakota, Volume I - Deer Creek.
W75-10570 4A

Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

Weather Modification for Use in the High Plains,
W75-10775 3B

SOUTHERN UINTA BASIN (UTAH AND COLO)
Hydrologic Reconnaissance of the Southern Uinta Basin, Utah and Colorado,
W75-10585 3B

SOUTHWEST HILLSBOROUGH COUNTY (FLA)
Hydrological Data From Wells in Southwest Hillsborough County, Florida, 1950-74,
W75-10593 7C

SOUTHWEST U.S.
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

SOUTHWEST US
Some Effects of Field Weathering of Seed Cotton in a Desert Environment,
W75-10557 3F

SPACECRAFT
Problems of Space Biology. Volume 24. The Water Supply of Spacecraft Crews,
W75-10365 5D

SPATIAL DISTRIBUTION
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

SPAWNING
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

Copper, Zinc and Total Protein Levels
Plasma of Sockeye Salmon (Oncorhy
Nerka) During Their Spawning Migration
W75-10613

SPECTROMETERS
Error Analysis of Dobson Spectrophot
Measurements of the Total Atmospheric
Content,
W75-10545

SPECTROPHOTOMETRY
Determination of Manganese in Natural
by Atomic Absortion Spectrometry with
bon Tube Atomizer,
W75-10386

The Determination of Mercury in Soils a
lated Materials by Cold-Vapour Atom
sorption Spectrometry,
W75-10485

Rapid Extractive Spectrophotometric
mination of Gold (III) With 4-(2-Pyrid
Resorcinol,
W75-10499

SPECTROSCOPY
Determination of the Transition Metal
ganese, Iron, Cobalt, Copper and Zinc i
Fishes With Help of X-Ray Fluorescenc
ysis and Flameless Atomic Absorption
troscopy, (Bestimmung der Ubergangs
Mangan, Eisen, Kobalt, Kupfer und
Flussfischen mit Hilfe der Rontgenfluor
zanalyse und der flammenlosen Atom
tion),
W75-10408

Atomic Absorption Spectrometric Det
tion of Cadmium, Lead, Silver, Thalli
Zinc in Silicate Rocks by Direct Atom
From the Solid State,
W75-10492

SPILLWAYS
Project Lost Creek: Field Tests of M
and Controlled Blasting,
W75-10553

Spillway for Burnsville Dam, Little K
River, West Virginia; Hydraulic Mo
vestigation,
W75-10665

SPOTTED SHARKS
PCBS in the Spotted Sharks, M
Manazo, From Tokyo Bay, (In Japanese
W75-10622

SPRAYING
Herbicides in Aquatic Systems,
W75-10625

SPRINGFIELD (VT)
Water Works Improvements--Springfie
mont,
W75-10713

SPRUCE TREES (PICEA)
Spent Liquor From Peroxide Bleach
Groundwood Pulp From Spruce,
W75-10392

STABILITY
Fluid-Dynamic Excitation Involving F
stability,
W75-10544

STABLE ISOTOPES
Lead Metabolism in the Normal Human
Isotope Studies,
W75-10484

CK GAS EMISSIONS
ter Pollution Problems Associated with Control of Stack Gas Emission,
5-10691 5B

GE-DISCHARGE RELATIONS
Model of Statistical Errors in Estimating eamflow from Continuous-Stage Records,
5-10512 2E

nlinear Channel Routing by Computer,
5-10543 4A

DARD REFERENCE MATERIALS
S Adds Foreign Wrinkle to Standards rk,
5-10490 5A

DARDS
oretical and Applied Concepts of Water ources for Social Welfare.
5-10354 6B

nciples and standards for Water Planning,
5-10355 6B

e Drinking Water Has Become a Federal e.
5-10469 5G

E JURISDICTION
gram for Control of Discharges of Pollu- s to Navigable Waters.
5-10608 5G

IC TESTS
icity of the Lampricide 3-Trifluoromethyl-itrophenol (TFM) to the Nontarget Fish in ic Tests,
5-10701 5C

IONS
ex to Water Resources Data for Louisiana: face Water Records; Water-Quality ords.
5-10590 5A

ISTICAL ERRORS
Model of Statistical Errors in Estimating eamflow from Continuous-Stage Records,
5-10512 2E

ISTICAL MODELS
ceedings Symposium on Statistical Hydrolo-
5-10507 2A

ne Problems in Pure and Applied Stochastic drology,
5-10508 2A

istical Inference on Streamflow Processes n Markovian Characteristics,
5-10525 2E

ISTICAL TOLERANCE LIMITS
istical Tolerance Limits for a Pearson Type Distribution,
5-10511 2E

ISTICS
istical Tolerance Limits for a Pearson Type Distribution,
5-10511 2E

Model of Statistical Errors in Estimating amflow from Continuous-Stage Records,
5-10512 2E

LHEAD TROUT
te Toxicity of Kanamycin to Steelhead ut (Salmo Gairdneri),
5-10423 5C

STEROIDS
Corticosteroid Concentrations in Sockeye Salmon (Oncorhynchus Nerka) Exposed to Low Concentrations of Copper,
W75-10415 5C

STILLING BASINS
Spillway for Burnsville Dam, Little Kanawha River, West Virginia; Hydraulic Model Investigation,
W75-10665 8B

STOCHASTIC PROCESSES
Proceedings Symposium on Statistical Hydrology.
W75-10507 2A

Stochastic Generation of the Occurrence, Pattern, and Location of Maximum Amount of Daily Rainfall,
W75-10516 2B

A Stochastic Model for Daily Rainfall Data Synthesis,
W75-10518 2B

Stochastic Model of Daily Rainfall,
W75-10520 2B

An Event-Based Stochastic Model of Areal Rainfall and Runoff,
W75-10521 2B

Research in Stochastic Models for Bedload Transport,
W75-10522 2J

A Stochastic Model of Sediment Yield for Ephemeral Streams,
W75-10524 2J

STOMATA
An Analysis of the Mechanics of Guard Cell Motion,
W75-10488 2I

STORM RUNOFF
Flood Waves and Suspended Sediment Pulses in Urbanized Catchments,
W75-10647 4C

STORM WATER
Coping With Urban Runoff in the United States,
W75-10541 5D

STRAW MAN
Panel Review of the Taxonomic Structure of the Straw Man.
W75-10806 6B

Panel Evaluation of the Logical Structure, Consistency, and Underlying Assumptions of the 'Strawman' Methodology.
W75-10807 6B

Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

Social Indicators and Connectives,
W75-10812 6A

Towards a Sharper Concept of an Action Variable,
W75-10813 6A

Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

Qualitative Sign Matrix Manipulation,
W75-10815 6A

Necessary Adaptations for Significant Utilization of the Information System,
W75-10816 6A

A Method of Disaggregation,
W75-10817 6A

Algorithmic Modeling and the Straw Man,
W75-10820 6A

STRAW MAN MODEL
Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States.
W75-10810 6A

STREAM ENRICHMENT
An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

STREAM GAGES
A Criterion for Vegetation Stiffness,
W75-10782 4A

STREAMFLOW
Multisite Streamflow Simulation of Truckee River, Nevada,
W75-10509 2E

A Model of Statistical Errors in Estimating Streamflow from Continuous-Stage Records,
W75-10512 2E

Statistical Inference on Streamflow Processes with Markovian Characteristics,
W75-10525 2E

Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

A Comparison of Methods for Estimating Flood Peaks on Streams in Massachusetts,
W75-10587 4A

Report on the River Master of the Delaware River for the Period December 1, 1973-November 30, 1974,
W75-10589 4A

Index to Water Resources Data for Louisiana: Surface Water Records; Water-Quality Records.
W75-10590 5A

Low-Flow Characteristics of Mississippi Streams,
W75-10605 2E

A Criterion for Vegetation Stiffness,
W75-10782 4A

Effects of Surface Drainage on Stream Flow,
W75-10794 4A

STREAMS
The Loxahatchee - A River in Distress, Southeast Florida,
W75-10588 4C

Temperatures of Wyoming Streams,
W75-10604 7C

STRESS
Decrease of Net Carbon Flux in Two Species of Mussels Caused by Extracts of Crude Oil,
W75-10433 5C

STRESS ANALYSIS
Pipeline Stress Analysis,
W75-10824 8B

STRUCTURES
Avalanche Protection in Switzerland.
W75-10656 8C

SUBLETHAL CONCENTRATIONS
Uptake, Elimination and Biotransformation of the Lampricide 3-Trifluromethyl-4-Nitrophenol (TFM) by Larvae of the Aquatic Midge Chironomus Tentans,
W75-10629 5C

SUBLETHAL EFFECTS
Corticosteroid Concentrations in Sockeye Salmon (Oncorhynchus Nerka) Exposed to Low Concentrations of Copper,
W75-10415 5C

The Effects of Crude Oil on the Palatability of Marine Crustaceans,
W75-10428 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

SUBLIMATION
Estimating the Transport and Evaporation of Blowing Snow,
W75-10695 2C

SUCCINIC ACID MONO-SULPHO-ESTER
Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

SUGAR BEETS
Effect of a Phytoplankton Culture on the Germination and Seedling Development of Barley, Sugar Beets and Lettuce,
W75-10496 3F

SULFATES
Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

The Mutual Destruction of Polluting Factors in Waste Liquors,
W75-10645 5D

SULFITE LIQUORS
Studies on Possibilities of Biochemical Purification of Evaporator Condensate Occurring During Sulfite Pulp Manufacture (Untersuchungen ueber die Moeglichkeit der biochemischen Reinigung des bei der Sulfitzellstoffherstellung anfallenden Eindampfkondensates),
W75-10382 5D

How to Purify Effluents, Recover Byproducts With Reverse Osmosis,
W75-10391 5F

SULFUR BACTERIA
The Mutual Destruction of Polluting Factors in Waste Liquors,
W75-10645 5D

SULFUR COMPOUNDS
Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

SUNFISHES
Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

SUPPLY
A Connectives Model Relating Water Policy Action Variables to Recreational Opportunity Social Indicators,
W75-10819 6A

SURFACE WATER AVAILABILITY
Hydrologic Reconnaissance of the Southern Uinta Basin, Utah and Colorado,
W75-10585 3B

SURVEYS
Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973,
W75-10594 8B

SUSPENDED SEDIMENTS
Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

SUSPENDED SOLIDS
Analysis of Alternatives for Removal of Suspended Solids in Pulp and Paper Mill Effluents,
W75-10400 5D

SUSQUEHANNA RIVER (PA)
Flood Plain Information: Bloomsburg, Columbia County, Pennsylvania-Susquehanna River.
W75-10561 4A

Flood Plain Information: West Branch Susquehanna River, Lycoming County, Pennsylvania.
W75-10576 4A

SWAMPS
Hydrology of the Albemarle-Pamlico Region, North Carolina--A Preliminary Report on the Impact of Agricultural Developments,
W75-10602 4C

SWANNANOA RIVER
A Precipitation Data Simulator Using a Second Order Autoregressive Scheme,
W75-10513 2B

SWEDEN
Stockholm Puts Sewage Plants Underground,
W75-10718 5D

SWIMMING
Swimming Performance of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Bleached Kraft Pulp Mill Effluent,
W75-10387 5C

SWITZERLAND
Avalanche Protection in Switzerland.
W75-10656 8C

SYNERGISTIC EFFECTS
Toxicity of Paired Mixtures of Candidate Forest Insecticides to Rainbow Trout,
W75-10439 5C

Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

SYNTHESIS
A Stochastic Model for Daily Rainfall Data Synthesis,
W75-10518 2B

SYSTEMATICS
Fishes of the Hiwassee River System: Ecological and Taxonomic Considerations,
W75-10694 5C

SYSTEMS ANALYSIS
Analysis of a Large Water Distribution System Using Advanced Computer Software,
W75-10720 4A

TAIWAN
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

TAMPA BAY AREA (FLA)
New Concepts in Suburban Drainage in Florida,
W75-10793 4A

TAMPA BAY (FLA)
Additional Studies of the Fishes, Macroinvertebrates and Hydrological Conditions of Upland Canals in Tampa Bay, Florida,
W75-10617 5C

TAPS ROUTE (ALASKA)
Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973,
W75-10594 8B

TAR POLLUTION
Tar Pollution of Sierra Leone Beaches,
W75-10472 5B

TELEOSTS
DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

TEMPERATURE
Critical Thermal Maxima of Three Species of Hawaiian Estuarine Fish: A Comparative Study,
W75-10426 5A

Bioassay Data for Marine Pollution Using Sea Urchin Eggs, 1972 and 1973,
W75-10432 5A

The Effect of Temperature and Salinity on Cadmium Uptake by the Blue Crab, Callinectes sapidus,
W75-10448 5B

A Climatological Analysis of North Polar Desert Areas,
W75-10455 2C

Daily Temperature and Salinity of Surface Water of Patuxent River at Solomons, Maryland, Based on 30 Years of Records (1937-1967),
W75-10535 2L

Analog Temperature Records from Linearized Thermistor Network,
W75-10650 7B

eothermal Channel and Harbor Ice Control ystem,
'75-10734 4A

eothermal Power Plant with High Efficiency,
'75-10845 8C

MPERATURES
rocesses and Costs Imposed by Environmen- l Stress,
'75-10461 2C

MPORAL DISTRIBUTION
ochastic Models of Spatial and Temporal Dis- ibution of Thunderstorm Rainfall,
'75-10519 2B

NNESSEE
shes of the Hiwassee River System: Ecologi- l and Taxonomic Considerations,
'75-10694 5C

NSILE STRENGTH
Weibull Prediction of the Tensile Strength- olume Relationship of Snow,
'75-10651 2C

BACIL
ater-Soil-Plant Interactions with Terbacil,
'75-10486 5C

T WELLS
ydrogeologic Data for the Farmington River asin, Connecticut,
'75-10591 7C

AS
eveloping Regional Stochastic Data Bases,
'75-10528 2E

atistical Model of Short-Duration Precipita- on Events,
'75-10529 2B

ne Drift of Mayflies (Ephemeroptera) in the razos River, Texas,
'75-10558 5B

ydrologic Data for Urban Studies in the Fort orth, Texas Metropolitan Area, 1973,
'75-10596 7C

ffects of Surface Drainage on Stream Flow,
'75-10794 4A

TILE PRINTING EFFLUENTS
eclamation of Textile Printing Wastewaters r Direct Recycle,
'75-10676 5D

I
ptake, Elimination and Biotransformation of e Lampricide 3-Trifluromethyl-4-Nitrophenol FM) by Larvae of the Aquatic Midge hironomus Tentans,
'75-10629 5C

oxicity of the Lampricide 3-Trifluoromethyl- nitrophenol (TFM) to 10 Species of Algae,
'75-10697 5C

cute Toxicities of 3-Trifluoromethyl-4- itrophenol (TFM) and 2',5-Dichloro-4'- itrosalicylanilide (Bayer 73) to Larvae of the idge (Chironomus Tentans),
'75-10698 5C

cute Toxicity of the Lampricide 3- rifluoromethyl-4-Nitro-Phenol (TFM) to ymphs of Mayflies (Hexagenia Sp.),
'75-10699 5C

Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to Selected Aquatic Invertebrates and Frog Larvae,
W75-10703 5C

THAILAND (GULF OF SIAM)
On the Accumulation of Organochlorine Pesticides, PCB and Certain Heavy Metals in Fish and Shellfish from Thai Coastal and Inland Waters,
W75-10616 5B

THALASSIOSIRA PSEUDONANA
The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

THALLIUM
Thallium: Occurrence in the Environment and Toxicity to Fish,
W75-10449 5C

THAWING
Geothermal Channel and Harbor Ice Control System,
W75-10734 4A

THEORETICAL ANALYSIS
Derived Decision Rules for Pollution Control in a General Equilibrium Space Economy,
W75-10360 6C

THERMAL POLLUTION
Influence of a Thermal Effluent on Movement of Brown Bullhead (Ictalurus Nebulosus) as Determined by Ultrasonic Tracking,
W75-10628 5C

The Effect of Prolonged Exposure to Elevated Temperatures on the Biochemical Constituents, Gonadal Development and Shell Deposition of the American Oyster, Crassostrea Virginica,
W75-10849 5C

THERMOMETER
Analog Temperature Records from a Linearized Thermistor Network,
W75-10650 7B

THERMOPHILIC BACTERIA
Production of Microbial Protein From Waste Cellulose by Thermomonospora Fusca, A Thermophilic Actinomycete,
W75-10538 5C

THUNDERSTORMS
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

TIDAL CURRENTS
Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

TIGRIOPUS CALIFORNICUS
The Effect of Crude Oil Fractions on the Survival of a Tidepool Copepod, Tigriopus Californicus,
W75-10641 5C

TILE DRAINAGE
Art of Agricultural Drainage Design and Costs,
W75-10797 4A

TILL
Glacier-Flow Patterns and the Origin of Late Wisconsinan Till in the Southern Rocky Mountain Trench, British Columbia,
W75-10539 2C

TIMBER YIELD
Simulating Timber Yields and Hydrologic Impacts Resulting From Timber Harvest on Subalpine Watersheds,
W75-10406 3B

TIME SERIES ANALYSIS
Removal of Periodicities by Differencing and Monthyl Mean Subtraction,
W75-10352 2A

TIN
Fast Separation of Tin (IV) From Tin (II) and From Numerous Metal Ions on Ion-Exchange Papers,
W75-10497 2K

TOKYO BAY
PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5A

TOXAPHENE
Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

TOXICITY
Toxicity of Pulping Wastes to Fish,
W75-10403 5C

Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

Toxicity of Phosphamidon to American Lobsters (Homarus Americanus) Held at 4 and 12C,
W75-10413 5C

Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

Toxic Effects of an Anionic Detergent on the Gills of Rainbow Trout,
W75-10434 5C

**TOXICITY**

The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

Toxicity of Paired Mixtures of Candidate Forest Insecticides to Rainbow Trout,
W75-10439 5C

Analysis of Tri-Aryl Phosphate Esters and the Determination of Imol S-140 in Fish Tissue and Water Samples by Gas Chromatography,
W75-10442 5A

Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

Thallium: Occurrence in the Environment and Toxicity to Fish,
W75-10449 5C

Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

Toxic Trace Elements: Preferential Concentration in Respirable Particles,
W75-10482 5A

Water-Soil-Plant Interactions with Terbacil,
W75-10486 5C

Water Quality Criteria for European Fresh-Water Fish.
W75-10609 5C

Water Quality Criteria for European Freshwater Fish.
W75-10610 5C

Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

Effects of Temperature on Development and Survival of Rainbow Trout, Salmo Gairdneri, in Acid Waters,
W75-10623 5C

Uptake, Elimination and Biotransformation of the Lampricide 3-Trifluromethyl-4-Nitrophenol (TFM) by Larvae of the Aquatic Midge Chironomus Tentans,
W75-10629 5C

Effects of Chlorinated Hydrocarbon Pollutants on Growth of Marine Phytoplankton in Culture,
W75-10636 5C

The Effect of Certain Organic Pollutants on Copper Toxicity to Fish (Lebistes Reticulatus),
W75-10637 5C

The Effect of Crude Oil Fractions on the Survival of a Tidepool Copepod, Tigriopus Californicus,
W75-10641 5C

Toxicity of Chlorinated Municipal Wastes to Fish: An Evaluation Based on Michigan Field Data,
W75-10680 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to Selected Aquatic Invertebrates and Frog Larvae,
W75-10703 5C

Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

Amendments to the Water Act,
W75-10835 5G

The Toxicity of Heavy Metal Ions to Anaerobic Digestion,
W75-10843 5D

**TOXINS**

Toxicity of Pulping Wastes to Fish,
W75-10403 5C

Effect of Dietary Selenium on Glutathione Peroxidase in the Chick,
W75-10495 5A

**TRACE ELEMENTS**

Average Trace Element Composition of Low Level Marine Atmospheric Particulates,
W75-10477 5B

Toxic Trace Elements: Preferential Concentration in Respirable Particles,
W75-10482 5A

Removal of Trace Metals During Conventional Water Treatment,
W75-10501 5F

Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

**TRACERS**

Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

**TRANS-ALASKA PIPELINE ROUTE**

Icings Along the Trans-Alaska Pipeline Route,
W75-10592 2C

**TRANS-ALASKA PIPELINE SYSTEM**

Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973,
W75-10594 8B

**TRANSFORMATIONS**

Comments on the Statistical Distribution Rainfall per Period Under Various Transfor tions,
W75-10517

**TRANSPORTATION**

Computer Simulation of Water Distribu Networks,
W75-10823

Pipeline Stress Analysis,
W75-10824

**TREATMENT**

Treatability of Leachate from Sanitary L fills,
W75-10683

**TREATMENT FACILITIES**

Wisconsin Tissue Mills One Year After St of the Effluent Plant,
W75-10378

Process Design Manual for Upgrading Ex Waste Water Treatment Plants.
W75-10396

Manual for Preparation of Environmenta pact Statements for Wastewater Treat Works, Facilities Plans, and 208 Area Waste Treatment Management Plans,
W75-10473

Water and Wastewater Facilities for F Housing Developments,
W75-10717

Stockholm Puts Sewage Plants Undergrou
W75-10718

Integral Circular Wastewater Treatment P
W75-10729

Port Reception and Treatment Facilitie Oily Waste from Vessels,
W75-10751

Water Quality Factors in Designing a S Plant Based on Public Drainage Stat Data, (In Japanese),
W75-10838

**TRIASSIC ROCKS (MD)**

Hydrogeology of the Triassic Rocks of land,
W75-10584

**TRICKLE IRRIGATION**

Water Use and Production of Trickle Ir Onions,
W75-10785

Trickle Irrigation Design Requiremen Row Crops,
W75-10801

**TRIFLURALIN DIFFUSION COEFFICIEN**

Prediction of Trifluralin Diffusion Coeffi
W75-10542

**TROUT**

Aspects of the Winter Ecology of J Coho Salmon (Oncorhynchus Kisutch Steelhead Trout (Salmo Gairdneri),
W75-10615

Toxaphene Effects on Growth and D ment of Brook Trout (Salvelinus Fontina
W75-10621

oxicity of the Lampricide 3-Trifluoromethyl-
-Nitrophenol (TFM) To Nontarget Fish in
low- Through Tests,
75-10702 5C

NAMIS
ome Features of Tsunamis on the Pacific
oast of South and North America,
75-10554 2L

NNEL CONSTRUCTION
tockholm Puts Sewage Plants Underground,
75-10718 5D

NNELS
ivers in the City,
75-10723 6B

RBULENT FLOW
rbulent Flow in Rectangular Outlet Conduit,
end Lake Dam, Big Muddy River, Illinois,
75-10666 8B

RTLES
steria in Aquatic Animals,
75-10375 2I

RASONICS
fluence of a Thermal Effluent on Movement
Brown Bullhead (Ictalurus Nebulosus) as
etermined by Ultrasonic Tracking,
75-10628 5C

RAVIOLET RADIATION
olor of Pulp Industry Waste Liquors. (7).
olor Reduction by Ultraviolet Treatment (In
panese),
75-10394 5D

ERGROUND STRUCTURES
ockholm Puts Sewage Plants Underground,
75-10718 5D

T SOURCE WATERSHEDS
diment-Yield Characteristics from Unit
urce Watersheds,
75-10848 2J

TED STATES
ernational Field Year for the Great Lakes.
75-10547 2H

ernational Field Year for the Great Lakes.
75-10548 2H

ernational Field Year for the Great Lakes.
75-10549 2H

ernational Field Year for the Great Lakes.
75-10550 2H

t of Agricultural Drainage Design and Costs,
75-10797 4A

oblems of Water Quality Management in
estern River Basin Systems,
75-10804 5G

VERSAL CONNECTORS
vil Engineering Laboratory Develops Univer-
Connector for All Booms.
75-10468 5G

AND CANALS
ditional Studies of the Fishes, Macroinver-
rates and Hydrological Conditions of
land Canals in Tampa Bay, Florida,
75-10617 5C

ER RIVER ROUGE (MI)
od Plain Information: Upper River Rouge,
nnow Pond Drain, Bell Branch and Tarabusi
Creek, Wayne and Oakland Counties,
Michigan.
W75-10575 4A

UPPER WHITE RIVER (IND)
A River-Quality Assessment of the Upper
White River, Indiana,
W75-10600 5B

URBAN DRAINAGE
Valley Design in Urban Growth Centres,
W75-10643 6B

Determine Urban Runoff the Simple Way,
W75-10716 2E

Effects of Farming - Urban Drainage on Fresh
Water,
W75-10802 5G

URBAN HYDROLOGY
Hydrologic Data for Urban Studies in the Fort
Worth, Texas Metropolitan Area, 1973,
W75-10596 7C

URBAN RUNOFF
Coping With Urban Runoff in the United
States,
W75-10541 5D

Flood Waves and Suspended Sediment Pulses
in Urbanized Catchments,
W75-10647 4C

The Effects of Urbanization on Floods of Dif-
ferent Recurrence Interval,
W75-10709 4C

The Perimeter Canal - A New Approach to
Discharge Urban Water into a Coastal Man-
grove Area,
W75-10773 4A

URBAN WATER SUPPLY
On the Peak-Load Pricing of Urban Water
Supply,
W75-10706 6C

URBANIZATION
Hydrologic Data for Urban Studies in the Fort
Worth, Texas Metropolitan Area, 1973,
W75-10596 7C

Flood Waves and Suspended Sediment Pulses
in Urbanized Catchments,
W75-10647 4C

The Effects of Urbanization on Floods of Dif-
ferent Recurrence Interval,
W75-10709 4C

Rivers in the City,
W75-10723 6B

Impacts of Rural to Urban Water Use,
W75-10772 6D

Optimal Sizing of Urban Flood-Control
Systems,
W75-10821 4A

UREAS
Urea in the Waters of Lake Kinneret (Sea of
Galilee),
W75-10420 5C

UTAH
Hydrologic Reconnaissance of the Southern
Uinta Basin, Utah and Colorado,
W75-10585 3B

Ground-Water Conditions in Utah, Spring of
1975,
W75-10606 2F

VACUUM FILTRATION
Vacuum Filtration Cost Optimization,
W75-10681 5D

VALUE ENGINEERING
Theoretical and Applied Concepts of Water
Resources for Social Welfare.
W75-10354 6B

VALVES
Float Valve Provides Variable Flow Rates at
Low Pressures,
W75-10789 8C

VARIABILITY
Cross Spectra of Short-Duration Rainfall,
W75-10514 2B

VEGETATION EFFECTS
A Criterion for Vegetation Stiffness,
W75-10782 4A

VEGETATION STIFFNESS
A Criterion for Vegetation Stiffness,
W75-10782 4A

VERMONT
Water Works Improvements--Springfield, Ver-
mont,
W75-10713 3D

VIBRATIONS
Fluid-Dynamic Excitation Involving Flow In-
stability,
W75-10544 8B

VIRGINIA
Flood Plain Information: Meadow Creek, Al-
bemarle County and Charlottesville, Virginia.
W75-10564 4A

Flood Plain Information: Falling Creek,
Chesterfield County, Virginia.
W75-10577 4A

Flood Plain Information: James River, Eagle
Rock to Lick Run, Botetourt County, Virginia.
W75-10578 4A

Flood Plain Information: Johnson Creek and
Tributary, Chesterfield County, Virginia.
W75-10579 4A

A Predictive Computer Model of the Lower
Cretaceous Aquifer, Franklin Area, Southeast-
ern Virginia,
W75-10599 2F

Evaluation of Disposal Areas in James River;
Hydraulic Model Investigation,
W75-10669 8B

Will Wastewater Treatment Stop Eutrophica-
tion of Impoundments,
W75-10686 5D

VIRGINIAN SEA
Wave Climate Model of the Mid-Atlantic Shelf
and Shoreline (Virginian Sea), Model Develop-
ment, Shelf Geomorphology, and Preliminary
Results,
W75-10552 2L

VIRUSES
Sensitivity of Human Diploid Embryonic Lung
Cells from Isolation of Echo Viruses from
Sewage,
W75-10836 5C

VITAMIN C
Essentiality of Vitamin C in Feeds for Inten-
sively Fed Caged Channel Catfish,
W75-10362 8I

WAIMANO STREAM (HI)
Waimano Stream Flood Control Project, Pearl City, Hawaii; Hydraulic Model Investigation, W75-10663 8B

WALNUT GULCH WATERSHED (ARIZ)
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall, W75-10519 2B

WASHINGTON
Organic Compounds in Pulp Mill Lagoon Discharge, W75-10402 5D

Flood Hazards in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington, W75-10580 7C

Water Resources of the Toppenish Creek Basin, Yakima Indian Reservation, Washington. W75-10603 3F

Disposal of Digested Sewage Sludge by Landfill, W75-10682 5D

Watershed Behavior After Forest Fire in Washington, W75-10790 4C

WASTE DISCHARGE
Program for Control of Discharges of Pollutants to Navigable Waters. W75-10608 5G

WASTE DISPOSAL
Ocean Pollutants Pose Potential Danger to Man, W75-10464 5B

Evaluation of Disposal Areas in James River; Hydraulic Model Investigation, W75-10669 8B

Sludge Disposal on Agricultural Soil, W75-10674 5D

Disposal of Liquid Effluent by Land Irrigation at Lagro Celotex Plant, W75-10679 5D

Disposal of Digested Sewage Sludge by Landfill, W75-10682 5D

Proceedings of the International Conference on Waste Oil Recovery and Reuse. W75-10739 5D

Disposal of Used Crankcase and Other Oils in Canada, W75-10743 5D

Waste Oil in Maryland: A Pollutant or a Resource, W75-10744 5B

Waste Oil: The Recapture of an Energy Resource (The Generation, Disposal and Recovery of Waste Oil in the New York Metropolitan Area), W75-10745 5D

Waste Lubricating Oil Characteristics--Do They Vary Geographically, Seasonally, and With Origin, W75-10746 5B

Disposal and/or Recycle of Air Force Waste Petroleum Oils and Lubricants, W75-10749 5D

Port Reception and Treatment Facilities for Oily Waste from Vessels, W75-10751 5G

Shipyard Problems with Oily Wastes, W75-10753 5B

The Economics of Re-Refining, W75-10757 5G

Massachusetts Waste Oil Management Activities, W75-10763 5D

The Waste Oil Industry: A Discussion of Some Issues to Consider in Performing an Economic Analysis, W75-10767 5G

The Consequences of Accepting Industrial Wastes into Sewers; Water Pollution Research at Stevenage, W75-10842 5D

WASTE IDENTIFICATION
Automated Sequential Composite Sampling. A New Technique for Water Pollution Study and Control, W75-10690 5A

WASTE MANAGEMENT
Massachusetts Waste Oil Management Activities, W75-10763 5D

WASTE OIL RECOVERY
Proceedings of the International Conference on Waste Oil Recovery and Reuse. W75-10739 5D

Oil Reuse--A National Need, W75-10740 5D

An Economic Model of Waste Oil Recovery, Reprocessing and Distribution Systems, W75-10768 5D

WASTE OIL RECOVERY/DISPOSAL PLANT
Pollution Control with a Comprehensive Waste Oil Processing Plant, W75-10758 5D

WASTE OIL REUSE
Proceedings of the International Conference on Waste Oil Recovery and Reuse. W75-10739 5D

Oil Reuse--A National Need, W75-10740 5D

Health Implications of Exposure to Trace Metals from Combustion of Waste Oil, W75-10765 5C

WASTE POLLUTION SOURCES
Water Pollution Problems Associated with Control of Stack Gas Emission, W75-10691 5B

WASTE TREATMENT
Study of Solid Waste Management Practices in the Pulp and Paper Industry. W75-10366 5D

Problems Encountered in Sludge Treatment and Some Advanced Solutions, W75-10398 5E

Sludge Disposal on Agricultural Soil, W75-10674 5D

Lagoons Plus Spray Irrigation for Effective Bean Cannery Waste Treatment, W75-10678 5D

Disposal of Digested Sewage Sludge by Lan fill, W75-10682

Proceedings of the International Conference Waste Oil Recovery and Reuse. W75-10739

Disposal and/or Recycle of Air Force Wa Petroleum Oils and Lubricants, W75-10749

The Navy's Oily Wastes Handling and Disp Program, W75-10750

Pollution Control with a Comprehensive W Oil Processing Plant, W75-10758

Experience with the IFP Propane Clarifica Process in Re-Refining Spent Crankcase Oi W75-10759

Re-Refined Diesel Locomotive Lubricating W75-10761

Waste Automotive Lubricating Oil as a nicipal Incinerator Fuel, W75-10764

Investigations on the Production of Hyg Compost from Air-Dried Sewage Using ferent Additives (Versuche zur Herstellun hygienisch einwandfreiem Kompost aus getrocknetem Faulschlamm unter Verwen verschiedener Zusaetze), W75-10834

WASTE WATER DISPOSAL
Waste Water Treatment: Land Dispos Waste Water, W75-10373

WASTE WATER (POLLUTION)
Will Wastewater Treatment Stop Eutro tion of Impoundments, W75-10686

WASTE WATER TREATMENT
Corrosion and Its Cost in Sewage Treatm W75-10364

Problems of Space Biology. Volume 2 Water Supply of Spacecraft Crews, W75-10365

Study of Solid Waste Management Pract the Pulp and Paper Industry. W75-10366

Reduction of Effluent Pollution at the A gel'sk Mills (Snizhenie zagryazn stochnykh vod na Arkhangel'-skom binate), W75-10368

Increasing the Efficiency of Flotation S (Povyshenie effektivnosti raboty flotats lovushek), W75-10369

Activated Sludge, W75-10371

Waste Water Treatment: Lagoons and tion Ponds, W75-10374

Cellulose Degradation in Waste Wate ment, W75-10376

nsin Tissue Mills One Year After Startup Effluent Plant,
0378 5D

of Temperature and Sludge Loading on BOD Removal and Sludge Settleability ivated Sludge Systems Treating Bleached Effluents,
0379 5D

aper (Company, Iyomishima, Japan) Ex- to 1,000,000 Tons/Year,
0380 5D

ic Characterization of Sewer Loading by Liquors of the Pulp Industry tische Kennzeichung der Belastung der ter durch Ablaugen der Zellstoffindus-
0381 5D

on Possibilities of Biochemical Purifi- of Evaporator Condensate Occurring Sulfite Pulp Manufacture suchungen ueber die Moeglichkeit der nischen Reinigung des bei der Sulfitzell- rstellung anfallenden Eindampfkonden-
0382 5D

o: Original Solution to Cleaning Paper fluents (Serpaflo; La solution originale tion des eaux papeteries),
389 5D

g Biological Disk Treatment of Kraft luents,
390 5D

Purify Effluents, Recover Byproducts verse Osmosis,
391 5F

f Pulp Industry Waste Liquors. (6). r of Color During Waste Treatments nese),
393 5D

f Pulp Industry Waste Liquors. (7). eduction by Ultraviolet Treatment (In e),
394 5D

Water Treatment: Sludge Treatment, on, and Disposal,
395 5D

Design Manual for Upgrading Existing Vater Treatment Plants.
396 5D

l Wastes: Paper and Allied Products,
97 5D

Removal From Bleached Kraft Ef-
99 5D

of Alternatives for Removal of ed Solids in Pulp and Paper Mill Ef-
00 5D

euse in a Paper Reprocessing Plant,
01 5D

rformance Using Dissolved Oxygen
52 5D

Dewatering of Metal Hydroxide
00 5D

Heat Treatment of Sewage Sludges,
W75-10644 5D

The Mutual Destruction of Polluting Factors in Waste Liquors,
W75-10645 5D

Concentration of Dilute Waste Streams by Ion Exchange Techniques,
W75-10672 5D

Treatment of Milk Truck Washing Wastes by Anerobic Digestion,
W75-10673 5D

Heavy Metals Removal from Wood Preserving Wastewater,
W75-10675 5D

Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

Lagoons Plus Spray Irrigation for Effective Bean Cannery Waste Treatment,
W75-10678 5D

Disposal of Liquid Effluent by Land Irrigation at Lagro Celotex Plant,
W75-10679 5D

Vacuum Filtration Cost Optimization,
W75-10681 5D

Treatability of Leachate from Sanitary Landfills,
W75-10683 5D

An Effluent Study of a Fresh Water Fish Processing Plant,
W75-10684 5D

Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

Will Wastewater Treatment Stop Eutrophication of Impoundments,
W75-10686 5D

Analysis of Wastewater Treatment Systems for a Meat Processing Plant,
W75-10687 5D

Population Dynamics of Protozoa in Wastewater, and Impact of Environmental Changes,
W75-10689 5D

Domestic Waste Water Reuse--Aspects of the Treatment System,
W75-10708 5D

Water and Wastewater Facilities for Florida Housing Developments,
W75-10717 5D

Stockholm Puts Sewage Plants Underground,
W75-10718 5D

Land Treatment of Municipal Sewage,
W75-10719 5D

Liquefying Refrigerant for Water Desalination with Liquefied Natural Gas and an Intermediate Energy Cycle,
W75-10725 3A

Integral Circular Wastewater Treatment Plant,
W75-10729 5D

Method of Treating Aluminum-Containing Waste Water,
W75-10730 5D

Process for Removing Heavy Metal Ions in Water,
W75-10731 5D

Air and Water Pollution Control,
W75-10732 5D

Closed Recycling System for Water Purification and Waste Reduction,
W75-10735 5D

Removal of Pollutants from Water,
W75-10736 5D

Method of Purification of Waste Water Produced From the Packing of Meat and Aquatic Animals,
W75-10737 5D

Multiple Cycle Process for Wastewater Purification,
W75-10738 5D

Oil Contaminated Water Recycling System,
W75-10760 5D

An Economic Model of Waste Oil Recovery, Reprocessing and Distribution Systems,
W75-10768 5D

Automatic Device for the Operational Control of the Filtration Rate of Suspensions(Automatische Vorrichtung zur Technischen Kontrolle der Filtrationsgeschwindigkeit von Suspensionen),
W75-10830 5D

Water Quality Factors in Designing a Sewage Plant Based on Public Drainage Statistical Data, (In Japanese),
W75-10838 5D

Rate of Phosphorus Uptake by Activated Sludge,
W75-10839 5D

Treatment of Service Water with Ozone,
W75-10840 5D

The Consequences of Accepting Industrial Wastes into Sewers; Water Pollution Research at Stevenage,
W75-10842 5D

The Toxicity of Heavy Metal Ions to Anaerobic Digestion,
W75-10843 5D

**WATER ANALYSIS**

Determination of Cadmium, Copper, and Lead in Natural Waters After Anion-Exchange Separation,
W75-10385 5A

Determination of Manganese in Natural Waters by Atomic Absortion Spectrometry with a Carbon Tube Atomizer,
W75-10386 5A

Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

**WATER CONSUMPTION**

Reduction of Effluent Pollution at the Arkhangel'sk Mills (Snizhenie zagryaznennosti stochnykh vod na Arkhangel'-skom Kombinate),
W75-10368 5D

Instruction for Record Keeping of Water Consumption at the Enterprises of the Paper Indus-

**WATER CONSUMPTION**

try (Instruktsiya ucheta raskhoda vody na predpriyatiyakh otrasli),
W75-10370 3E

**WATER CONTROL**
Automation of an Existing Irrigation System - Part I,
W75-10788 8C

**WATER COSTS**
Water Rates: An Assessment of Current Issues,
W75-10707 6C

**WATER DELIVERY**
Water Works Improvements--Springfield, Vermont,
W75-10713 3D

**WATER DEMAND**
On the Peak-Load Pricing of Urban Water Supply,
W75-10706 6C

Water Rates: An Assessment of Current Issues,
W75-10707 6C

The Master Plan for Water-Supply in the Regional Municipality of Ottawa-Carleton,
W75-10710 3D

Impacts of Rural to Urban Water Use,
W75-10772 6D

**WATER DISTRIBUTION (APPLIED)**
The Master Plan for Water-Supply in the Regional Municipality of Ottawa-Carleton,
W75-10710 3D

Analysis of a Large Water Distribution System Using Advanced Computer Software,
W75-10720 4A

Computer Simulation of Water Distribution Networks,
W75-10823 4A

**WATER LAW**
Towards a Sharper Concept of an Action Variable,
W75-10813 6A

**WATER LEVEL FLUCTUATIONS**
Ground-Water Levels in New Mexico, 1972,
W75-10582 4B

A Predictive Computer Model of the Lower Cretaceous Aquifer, Franklin Area, Southeastern Virginia,
W75-10599 2F

**WATER LEVELS**
Map of the Antelope Valley-East Kern Water Agency Area, California, Showing Ground-Water Subunits and Areas, Location of Wells, and Water-Level Contours for Spring 1974,
W75-10595 7C

Ground-Water Conditions in Utah, Spring of 1975,
W75-10606 2F

**WATER MANAGEMENT**
Report on the River Master of the Delaware River for the Period December 1, 1973-November 30, 1974,
W75-10589 4A

**WATER MANAGEMENT (APPLIED)**
Flood Plain Information: Meadow Creek, Albemarle County and Charlottesville, Virginia.
W75-10564 4A

Water Works Improvements--Springfield, Vermont,
W75-10713 3D

**WATER-METERING CELLS**
Multichannel Toxicant Injection System for Flow-Through Bioassays,
W75-10443 5A

**WATER POLICY**
Economic Impact of the Conversion of Water from Irrigation to Municipal and Industrial Use in the Rio Grande Basin of New Mexico,
W75-10771 6D

Impacts of Rural to Urban Water Use,
W75-10772 6D

A Connectives Model Relating Water Policy Action Variables to Recreational Opportunity Social Indicators,
W75-10819 6A

**WATER POLLUTANT EFFECTS**
Effects of Chlorinated Hydrocarbon Pollutants on Growth of Marine Phytoplankton in Culture,
W75-10636 5C

The Effect of Certain Organic Pollutants on Copper Toxicity to Fish (Lebistes Reticulatus),
W75-10637 5C

**WATER POLLUTION**
Predicting the Concentration of Aquatic Herbicide Residues in Waterways,
W75-10648 5B

Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

Amendments to the Water Act,
W75-10835 5G

**WATER POLLUTION CONTROL**
Reduction of Effluent Pollution at the Arkhangel'sk Mills (Snizhenie zagryaznennosti stochnykh vod na Arkhangel'-skom Kombinate),
W75-10368 5D

New Legislative Tendencies for Control of Water Pollution (Nuevas tendencias legislativas en el control de la contaminacion de las aguas),
W75-10384 5G

Plant Performance Using Dissolved Oxygen Control,
W75-10452 5D

USCG Sets Broader Use of Pollution Control Systems,
W75-10466 5G

Civil Engineering Laboratory Develops Universal Connector for All Booms.
W75-10468 5G

EPA's Effluent Guidelines Have Their Day in Court.
W75-10470 5G

Feasibility Test Program of Application of Coalescing Phase Oil/Water Separators to Self Compensating Fuel Tanks in Surface Ships,
W75-10474 5G

Guidelines for Landfill of Toxic Industrial Sludges,
W75-10487 5G

Jettisoning of LNG at Sea--An Unresolved Pollution Hazard.
W75-10633 5G

Marine Floating Screen.
W75-10634

Recovering Oil Spills from Water.
W75-10635

Oil and Debris Removal Unit,
W75-10726

Oil Separation and Recovery Device,
W75-10728

Integral Circular Wastewater Treatment
W75-10729

Method of Treating Aluminum-Co
Waste Water,
W75-10730

Method of Purification of Waste
Produced From the Packing of Me
Aquatic Animals,
W75-10737

Effects of Farming - Urban Drainage o
Water,
W75-10802

Methodological Application of the Str
Decision Structure to a Hypothetical Ca
Dorfman-Jacoby Water Quality Model,
W75-10811

Methodological Problems in Apply
Straw Man to Real Life Problems,
W75-10814

**WATER POLLUTION EFFECTS**
The Economic Impact of Mercury Poll
Fisheries and Other Related Businesses
Pickwick Lake,
W75-10356

Industrial Interdependencies and Exte
economies of Water Resources,
W75-10358

Swimming Performance of Juvenile C
mon (Oncorhynchus Kisutch) Exp
Bleached Kraft Pulp Mill Effluent,
W75-10387

Effects of Acute Exposure to Bleach
Pulp Mill Effluent on Carbohydrate
ism of Juvenile Coho Salmon (Onco
Kisutch) During Rest and Exercise,
W75-10388

Toxicity of Pulping Wastes to Fish,
W75-10403

Effects of Heavy Metals and Pesticid
Mass Mortalities of Cultured Shellfis
the Southwest Coast of Taiwan, (In C
W75-10427

Heavy Metal Contents of Fishes
Kaohsiung Harbor, (In Chinese),
W75-10430

Temperature-Induced Changes in Ac
ty of Zinc to Atlantic Salmon (Salmo
W75-10431

Toxic Effects of an Anionic Deterg
Gills of Rainbow Trout,
W75-10434

Ocean Pollutants Pose Potential
Man,
W75-10464

ıational Exploration Locates Minerals and
10467 5B

Effect of Crude Oil Fractions on the Sur-
of a Tidepool Copepod, Tigriopus Califor-
10641 5C

sis of Pollution from Marine Engines -
Report,
0688 5A

POLLUTION SOURCES
ption and Degradation of Chlorbromuron
,
0414 5B

ational Exploration Locates Minerals and
0467 5B

llution of Sierra Leone Beaches,
0472 5B

ver-Quality Assessment of the Upper
River, Indiana,
0600 5B

ms Related to Water Quality and Algal
l in Lopez Reservoir, San Luis Obispo
, California,
0601 5B

Oil Management--The Environmental
ion Agency's Role,
0742 5G

nment, Collection and Recycling of Oily
,
0747 5G

lge from Commercial Vessels,
0752 5B

ram for Handling Emergency Oil Spil-
the Port of Baltimore,
0755 5G

ear Study of Des Moines River Water
,
803 5B

ity of Human Diploid Embryonic Lung
rom Isolation of Echo Viruses from
,
836 5C

D, An Agricultural Chemical Transport
846 5B

POLLUTION TREATMENT
l of Trace Metals During Conventional
Treatment,
501 5F

for Removing Heavy Metal Ions in
731 5D

l of Pollutants from Water,
736 5D

Cycle Process for Wastewater Purifi-
738 5D

URIFICATION
nt Processes for Coping with Variation
Water Quality,
705 5F

Domestic Waste Water Reuse--Aspects of the Treatment System,
W75-10708 5D

Water and Wastewater Facilities for Florida Housing Developments,
W75-10717 5D

Liquefying Refrigerant for Water Desalination with Liquefied Natural Gas and an Intermediate Energy Cycle,
W75-10725 3A

Rotary Desalination Engine and System,
W75-10733 3A

Removal of Pollutants from Water,
W75-10736 5D

Method of Purification of Waste Water Produced From the Packing of Meat and Aquatic Animals,
W75-10737 5D

Investigations on the Production of Hygienic Compost from Air-Dried Sewage Using Different Additives (Versuche zur Herstellung von hygienisch einwandfreiem Kompost aus luftgetrocknetem Faulschlamm unter Verwendung verschiedener Zusaetze),
W75-10834 5D

WATER QUALITY
Geological and Limnological Factors of Cold Deserts,
W75-10457 2C

Daily Temperature and Salinity of Surface Water of Patuxent River at Solomons, Maryland, Based on 30 Years of Records (1938-1967),
W75-10535 2E

Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

Index to Water Resources Data for Louisiana: Surface Water Records; Water-Quality Records.
W75-10590 5A

A River-Quality Assessment of the Upper White River, Indiana,
W75-10600 5B

Rivers in the City,
W75-10723 6B

An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

Agricultural and Urban Considerations in Irrigation and Drainage.
W75-10769 4A

Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

Five Year Study of Des Moines River Water Quality,
W75-10803 5B

Problems of Water Quality Management in Western River Basin Systems,
W75-10804 5G

Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation,
W75-10805 5G

WATER QUALITY CONTROL
International Production Aspects of Water and Environmental Quality Control,
W75-10357 5G

Marine Pollution Bioassay by Sea Urchin Eggs, An Attempt to Enhance Accuracy,
W75-10419 5A

Bioassay Data for Marine Pollution Using Sea Urchin Eggs, 1972 and 1973,
W75-10432 5A

Treatment Processes for Coping with Variation in Raw-Water Quality,
W75-10705 5F

Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

Oil and Debris Removal Unit,
W75-10726 5G

Air and Water Pollution Control,
W75-10732 5D

Rotary Desalination Engine and System,
W75-10733 3A

Removal of Pollutants from Water,
W75-10736 5D

Method of Purification of Waste Water Produced From the Packing of Meat and Aquatic Animals,
W75-10737 5D

Social Indicators and Connectives,
W75-10812 6A

Water Quality Factors in Designing a Sewage Plant Based on Public Drainage Statistical Data, (In Japanese),
W75-10838 5D

WATER QUALITY STANDARDS
Safe Drinking Water Has Become a Federal Case.
W75-10469 5G

EPA's Effluent Guidelines Have Their Day in Court.
W75-10470 5G

P. L. 92-500 (Two Years Later) is Not the Answer,
W75-10471 5G

The Laws and Their Enforcement; Progress Amidst Problems,
W75-10607 5G

Program for Control of Discharges of Pollutants to Navigable Waters.
W75-10608 5G

Water Quality Criteria for European Fresh-Water Fish.
W75-10609 5C

Biological Bases for Water Quality Standards,
W75-10677 5G

WATER QUALITYSTANDARDS
Water Quality Criteria for European Freshwater Fish.
W75-10610 5C

WATER RATES
Political Participation and Water Rates. A Closer Look,
W75-10361 6C

Water Rates: An Assessment of Current Issues,
W75-10707 6C

WATER RESOURCES
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

Water Resources of the Toppenish Creek Basin, Yakima Indian Reservation, Washington.
W75-10603 3F

Egalitarianism,
W75-10818 6A

A Connectives Model Relating Water Policy Action Variables to Recreational Opportunity Social Indicators,
W75-10819 6A

WATER RESOURCES DEVELOPMENT
Analyzing Reimbursement Mechanisms for Resource Development Projects,
W75-10353 6C

Water for Industrial Development in Alcorn, Itawamba, Prentiss, and Tishomingo Counties, Mississippi,
W75-10581 3E

Hydrologic Reconnaissance of the Southern Uinta Basin, Utah and Colorado,
W75-10585 3B

Rivers in the City,
W75-10723 6B

Panel Review of the Taxonomic Structure of the Straw Man.
W75-10806 6B

Panel Evaluation of the Logical Structure, Consistency, and Underlying Assumptions of the 'Strawman' Methodology.
W75-10807 6B

Comments on the Straw Man,
W75-10808 6B

Report to the Technical Committee of the Water Resources Centers of the Thirteen Western States,
W75-10809 6B

Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States.
W75-10810 6A

Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

Social Indicators and Connectives,
W75-10812 6A

Towards a Sharper Concept of an Action Variable,
W75-10813 6A

Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

Qualitative Sign Matrix Manipulation,
W75-10815 6A

A Method of Disaggregation,
W75-10817 6A

Algorithmic Modeling and the Straw Man,
W75-10820 6A

WATER RESOURCES INDEX (LA)
Index to Water Resources Data for Louisiana: Surface Water Records; Water-Quality Records.
W75-10590 5A

WATER REUSE
Problems of Space Biology. Volume 24. The Water Supply of Spacecraft Crews,
W75-10365 5D

Waste Water Treatment: Water Reclamation and Reuse,
W75-10372 5D

Taio Paper (Company, Iyomishima, Japan) Expands to 1,000,000 Tons/Year,
W75-10380 5D

Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

Water-Quality Requirements for the Petroleum Industry,
W75-10465 5D

Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

Domestic Waste Water Reuse--Aspects of the Treatment System,
W75-10708 5D

Land Treatment of Municipal Sewage,
W75-10719 5D

Water Supply from Renovated Wastewater--A Resource Manual for Massachusetts Planners, Public Officials and Citizen Groups.
W75-10722 5D

Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

WATER STORAGE
Water Collection and Storage Dispersion Apparatus,
W75-10727 4A

WATER SUPPLY
Problems of Space Biology. Volume 24. The Water Supply of Spacecraft Crews,
W75-10365 5D

Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

On the Peak-Load Pricing of Urban Water Supply,
W75-10706 6C

Water Collection and Storage Dispersion Apparatus,
W75-10727 4A

WATER SUPPLY DEVELOPMENT
Domestic Waste Water Reuse--Aspects of the Treatment System,
W75-10708 5D

The Master Plan for Water-Supply in the Regional Municipality of Ottawa-Carleton,
W75-10710 3D

Water Works Improvements--Springfield, mont,
W75-10713

Water and Wastewater Facilities for F Housing Developments,
W75-10717

Water Supply from Renovated Wastewa Resource Manual for Massachusetts Pla Public Officials and Citizen Groups.
W75-10722

WATER TABLE
Drainage Analysis of a Confining Format
W75-10780

WATER TEMPERATURE
Toxicity of Phosphamidon to American sters (Homarus Americanus) Held at 12C,
W75-10413

Temperature-Induced Changes in Acute ty of Zinc to Atlantic Salmon (Salmo sal
W75-10431

Laboratory Measurement of Surface Te ture Fluctuations Induced by Small Am Surface Waves,
W75-10505

Temperatures of Wyoming Streams,
W75-10604

Effects of Temperature on Developm Survival of Rainbow Trout, Salmo Gair Acid Waters,
W75-10623

WATER TREATMENT
Organic Matter in Natural Water an Treatment,
W75-10351

Use of Organic Flocculants for Text Water Treatment (Pouziti organickyc lantu k cireni vody pro technologi vyroby),
W75-10383

Removal of Trace Metals During Con Water Treatment,
W75-10501

Treatment Processes for Coping with in Raw-Water Quality,
W75-10705

Deterioration of Water Quality in Di Systems,
W75-10711

Water Supply from Renovated Wast Resource Manual for Massachusetts Public Officials and Citizen Groups.
W75-10722

WATER UTILIZATION
Agricultural and Urban Considerati rigation and Drainage.
W75-10769

WATER WAVE GENERATION
A Numerical Model for Predicting t of Landslide-Generated Water Wave
W75-10661

WATER WELLS
Hydrological Data From Wells in Hillsborough County, Florida, 1950-
W75-10593

of the Antelope Valley-East Kern Water
ncy Area, California, Showing Ground-
er Subunits and Areas, Location of Wells,
Water-Level Contours for Spring 1974,
-10595 7C

R WORKS
ncing Water Works,
-10712 3D

R YIELD
rshed Management in the Rocky Mountain
lpine Zone: The Status of Our Knowledge,
-10405 3B

lating Timber Yields and Hydrologic Im-
Resulting From Timber Harvest on Sub-
e Watersheds,
-10406 3B

R YIELD IMPROVEMENT
r-Yield Improvement from Alpine Areas:
Status of Our Knowledge,
10660 3B

RFOWL
ts of Methylmercury on Approach and
dance Behavior of Mallard Ducklings,
10424 5C

RSHED (BASINS)
nent-Yield Characteristics from Unit
e Watersheds,
10848 2J

RSHED MANAGEMENT
rshed Management in the Rocky Mountain
pine Zone: The Status of Our Knowledge,
10405 3B

ating Timber Yields and Hydrologic Im-
Resulting From Timber Harvest on Sub-
Watersheds,
10406 3B

rshed Management Problems and Oppor-
es for the Colorado Front Range Pon-
a Pine Zone: The Status of Our
ledge,
10655 4D

SHEDS (BASINS)
Spectra of Short-Duration Rainfall,
0514 2B

ogic Cover of the Watershed of the
ka River,
0551 2A

shed Behavior After Forest Fire in
ngton,
0790 4C

(WATER)
Climate Model of the Mid-Atlantic Shelf
horeline (Virginian Sea), Model Develop-
Shelf Geomorphology, and Preliminary
s,
0552 2L

Erie International Jetport Model Feasi-
Investigation, Physical Model Feasibility
0670 8B

ER INFORMATION
tional Value of Weather Information in
on to Soil Management Characteristics,
0367 2G

WEATHER MODIFICATION
Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404 3B

Priority Problems for Modifying Cumulus Precipitation,
W75-10774 3B

Weather Modification for Use in the High Plains,
W75-10775 3B

Users' View of Weather Modification,
W75-10776 3B

Role of the Public in Weather Modification,
W75-10777 3B

WEATHERING
Some Effects of Field Weathering of Seed Cotton in a Desert Environment,
W75-10557 3F

WEIBULL PREDICTION
A Weibull Prediction of the Tensile Strength-Volume Relationship of Snow,
W75-10651 2C

WELFARE (ECONOMICS)
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

Principles and standards for Water Planning,
W75-10355 6B

WELLTON-MOHAWK DRAINAGE
Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

WEST VIRGINIA
Spillway for Burnsville Dam, Little Kanawha River, West Virginia; Hydraulic Model Investigation,
W75-10665 8B

WESTERN UNITED STATES
Problems of Water Quality Management in Western River Basin Systems,
W75-10804 5G

WET SCRUBBERS
Water Pollution Problems Associated with Control of Stack Gas Emission,
W75-10691 5B

WHEAT
Protein Content of Winter Wheat Grain as Related to Soil and Climatic Factors in the Semi-Arid Central Great Plains,
W75-10792 3F

Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

WHITE CLAY CREEK (DE)
Flood Plain Information: White Clay Creek, New Castle County, Delaware.
W75-10571 4A

WILDLIFE CONSERVATION
Water Collection and Storage Dispersion Apparatus,
W75-10727 4A

WINDBREAKS
New Engineering Criteria for Snow Fence Systems,
W75-10692 2C

New Snow Fence Design Controls Drifts, Improves Visibility, Reduces Road Ice,
W75-10693 2C

WINDSPEED
Canopy Weight Distribution Affects Windspeed and Temperature in a Lodgepole Pine Forest,
W75-10654 4A

WINERY WASTES
Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

WISCONSIN
Wisconsin Tissue Mills One Year After Startup of the Effluent Plant,
W75-10378 5D

Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

Treatability of Leachate from Sanitary Landfills,
W75-10683 5D

WOOD PRESERVATIVES (PESTICIDES)
Heavy Metals Removal from Wood Preserving Wastewater,
W75-10675 5D

WORMS
Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

WYOMING
Temperatures of Wyoming Streams,
W75-10604 7C

Canopy Weight Distribution Affects Windspeed and Temperature in a Lodgepole Pine Forest,
W75-10654 4A

New Engineering Criteria for Snow Fence Systems,
W75-10692 2C

New Snow Fence Design Controls Drifts, Improves Visibility, Reduces Road Ice,
W75-10693 2C

Estimating the Transport and Evaporation of Blowing Snow,
W75-10695 2C

X-RAY ANALYSIS
Determination of the Transition Metals Manganese, Iron, Cobalt, Copper and Zinc in River Fishes With Help of X-Ray Fluorescence Analysis and Flameless Atomic Absorption Spectroscopy, (Bestimmung der Ubergangsmetalle Mangan, Eisen, Kobalt, Kupfer und zink in Flussfischen mit Hilfe der Rontgenfluores-zenzanalyse und der flammenlosen Atomabsorption),
W75-10408 5A

X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

X-RAY FLUORESCENCE
Determination of the Transition Metals Manganese, Iron, Cobalt, Copper and Zinc in River Fishes With Help of X-Ray Fluorescence Analysis and Flameless Atomic Absorption Spectroscopy, (Bestimmung der Ubergangsmetalle Mangan, Eisen, Kobalt, Kupfer und zink in Flussfischen mit Hilfe der Rontgenfluores-zenzanalyse und der flammenlosen Atomabsorption),
W75-10408 5A

YAKIMA INDIAN RESERVATION (WASH)
Water Resources of the Toppenish Creek Basin, Yakima Indian Reservation, Washington.
W75-10603 3F

YELLOW TAIL
Physiological Changes in the Serum and Hepatopancreas of Yellow Tail Injected with Carbon Tetrachloride, (In Japanese),
W75-10630 5C

YELLOWTAIL
Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese),
W75-10441 5C

YUGOSLAVIA (PORECKA RIVER)
Pedologic Cover of the Watershed of the Porecka River,
W75-10551 2A

ZECTRAN
Effect of the Insecticide Zectran (Mexacarbate) on Several Algae,
W75-10425 5C

ZINC
X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

Response of Freshwater Protozoan Artificial Communities to Metals,
W75-10440 5C

Absorption of Cadmium, Copper and Zinc by Dog Whelks in the Bristol Channel,
W75-10481 5B

Water Quality Criteria for European Freshwater Fish.
W75-10610 5C

Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

ZOOPLANKTON
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420 5C

ZURN-ATTISHOLZ PROCESS
Wisconsin Tissue Mills One Year After Startup of the Effluent Plant,
W75-10378 5D

# AUTHOR INDEX


AARD, K.
ward an Ice-Free Arctic Ocean,
5-10532 2C

, P. D.
ic Effects of an Anionic Detergent on the
s of Rainbow Trout,
5-10434 5C

S, J. H. JR.
od Control Project on Lytle and Warm
eks and Santa Ana River, California;
draulic Model Investigation,
5-10668 8B

IS, C. E. JR.
lysis of Alternatives for Removal of
pended Solids in Pulp and Paper Mill Ef-
nts,
5-10400 5D

AKE, H.
ies on the Metabolism of Chlorophenols in
-I Absorption and Excretion of PCP by
dfish,
-10417 5C

ies on the Metabolism of Chlorophenols in
-II Turnover in Absorbed PCP in Goldfish,
-10418 5C

ies on the Metabolism of Chlorophenols in
-III Isolation and Identification of a Conju-
d PCP Excreted by Goldfish,
-10611 5A

ANDER, R. R.
ulating Timber Yields and Hydrologic Im-
s Resulting From Timber Harvest on Sub-
e Watersheds,
-10406 3B

N, G. R.
er Works Improvements--Springfield, Ver-
t,
-10713 3D

N, P. B.
l Sediment Load by the Extrapolated Data
edure,
-10847 2J

OCHO, J.
e Factors Affecting Control of Flow in a
e Canal System,
-10786 8B

RSON, J. R.
ity Dewatering of Metal Hydroxide
ges,
-10500 5D

EWS, J. W.
rience with the IFP Propane Clarification
ess in Re-Refining Spent Crankcase Oils,
10759 5D

th Factors in the Fish Meal Components
tfish Diets,
10658 2I

NELLI, A.
efying Refrigerant for Water Desalination
Liquefied Natural Gas and an Inter-
ate Energy Cycle,
10725 3A

CIO FERRATER, I.
Legislative Tendencies for Control of
r Pollution (Nuevas tendencias legislativas
control de la contaminacion de las aguas),
10384 5G

ARMSTRONG, A. S.
Port Reception and Treatment Facilities for Oily Waste from Vessels,
W75-10751 5G

ARMSTRONG, D. A.
Effects of the Insecticide Sevin and Its First Hydrolytic Product, 1-Napthol, on Some Early Developmental Stages of the Bay Mussel, Mytilus edulis,
W75-10435 5C

ARNAIZ, J. B.
Feasibility Test Program of Application of Coalescing Phase Oil/Water Separators to Self Compensating Fuel Tanks in Surface Ships,
W75-10474 5G

ATHOW, R. F. JR.
Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

ATTAR, A. M.
Environmental Action at Port Authority Airports,
W75-10748 5G

AULENBACH, D. B.
Treatment of Milk Truck Washing Wastes by Anerobic Digestion,
W75-10673 5D

AUSTIN, T. A.
Statistical Model of Short-Duration Precipitation Events,
W75-10529 2B

AVERETT, R. C.
Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

AYERS, F. E.
The Master Plan for Water-Supply in the Regional Municipality of Ottawa-Carleton,
W75-10710 3D

AZAR, J. J.
Pipeline Stress Analysis,
W75-10824 8B

BACIU, P.
Geothermal Power Plant with High Efficiency,
W75-10845 8C

BAERSCH, L.
Principles of Establishing Sewer Systems in the Rural Settlements of Magdeburg County (Grundlagen fuer die Abwasser-Technische Erschliessung von Landgemeinden im Bezirk Magdeburg),
W75-10833 5D

BAKER, M. M.
Industrial Interdependencies and External Diseconomies of Water Resources,
W75-10358 6B

BAKER, V. R.
Competence of Rivers to Transport Coarse Bedload Material,
W75-10540 2J

BANSAL, I. K.
How to Purify Effluents, Recover Byproducts With Reverse Osmosis,
W75-10391 5F

BARNES, B. B.
Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

BARNETT, C. J.
The Effect of Crude Oil Fractions on the Survival of a Tidepool Copepod, Tigriopus Californicus,
W75-10641 5C

BARRY, R. G.
A Climatological Analysis of North Polar Desert Areas,
W75-10455 2C

BASCH, R.
Toxicity of Chlorinated Municipal Wastes to Fish: An Evaluation Based on Michigan Field Data,
W75-10680 5C

BASS, M. L.
The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

BATUTIS, E.
Feasibility Test Program of Application of Coalescing Phase Oil/Water Separators to Self Compensating Fuel Tanks in Surface Ships,
W75-10474 5G

BAUMANN, E. R.
Five Year Study of Des Moines River Water Quality,
W75-10803 5B

BEACH, J. S.
Automated Sequential Composite Sampling. A New Technique for Water Pollution Study and Control,
W75-10690 5A

BEACH, M. I.
Automated Sequential Composite Sampling. A New Technique for Water Pollution Study and Control,
W75-10690 5A

BEARD, L. R.
Developing Regional Stochastic Data Bases,
W75-10528 2E

BECKERMAN, W.
Pollution Control and Optimal Taxation: A Static Analysis,
W75-10359 6E

BEDARD, R. G.
An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

BENDER, M. E.
Analysis of Pollution from Marine Engines - Status Report,
W75-10688 5A

BENNETT, A. C.
Effects of Surface Drainage on Stream Flow,
W75-10794 4A

BENNETT, E. R.
Vacuum Filtration Cost Optimization,
W75-10681 5D

BENNETT, G. H.
Population Dynamics of Protozoa in Wastewater, and Impact of Environmental Changes,
W75-10689 5D

BENZ, L. C.
Drainage Analysis of a Confining Formation,
W75-10780 4A

BERMAN, T.
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420 5C

BERNSTEIN, L.
Irrigation Management for Salt Control,
W75-10800 3C

BIELBY, D. G.
Phosphorus in Percolates from Manured Lysimeters,
W75-10573 5B

BIGLER, E. R.
Effect of a Phytoplankton Culture on the Germination and Seedling Development of Barley, Sugar Beets and Lettuce,
W75-10496 3F

BILLS, T. D.
Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

BISHOP, W. M.
Effects of Farming - Urban Drainage on Fresh Water,
W75-10802 5G

BITTNER, M. A.
Uptake, Elimination and Biotransformation of the Lampricide 3-Trifluromethyl-4-Nitrophenol (TFM) by Larvae of the Aquatic Midge Chironomus Tentans,
W75-10629 5C

BLACK, J. A.
The Effect of Certain Organic Pollutants on Copper Toxicity to Fish (Lebistes Reticulatus),
W75-10637 5C

BLOYD, R. M. JR.
Summary Appraisals of the Nation's Ground-Water Resources--Ohio Region,
W75-10598 4B

BOAR, P. L.
Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

BOBB, W. H.
Evaluation of Disposal Areas in James River; Hydraulic Model Investigation,
W75-10669 8B

Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

BODE, L. E.
Prediction of Trifluralin Diffusion Coefficients,
W75-10542 5B

BOELSCH, G.
Principles of Establishing Sewer Systems in the Rural Settlements of Magdeburg County (Grundlagen fuer die Abwasser-Technische Erschliessung von Landgemeinden im Bezirk Magdeburg),
W75-10833 5D

BOERSMA, L.
A Theory of the Mass Transport of Previously Distributed Chemicals in a Water-Saturated Sorbing Porous Medium: 4. Distributions,
W75-10632 5B

BOLAND, R. A. JR.
Evaluation of Disposal Areas in James River; Hydraulic Model Investigation,
W75-10669 8B

BOMBA, J. G.
Pipeline Stress Analysis,
W75-10824 8B

BONER, F. C.
Temperatures of Wyoming Streams,
W75-10604 7C

BONHAM, A. J.
Valley Design in Urban Growth Centres,
W75-10643 6B

BOOKHOUT, C. G.
Effects of Mirex on the Larval Development of Blue Crab,
W75-10410 5C

BORNE, J.
The Consequences of Accepting Industrial Wastes into Sewers; Water Pollution Research at Stevenage,
W75-10842 5D

BORTHWICK, P. W.
A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

BOTZLER, R. G.
Listeria in Aquatic Animals,
W75-10375 2I

BOVIS, M. J.
A Climatological Analysis of North Polar Desert Areas,
W75-10455 2C

BOYLE, W. C.
Treatability of Leachate from Sanitary Landfills,
W75-10683 5D

BRENCHLEY, D. L.
Environmental Problems Associated with the Use of Cooling Towers,
W75-10671 5D

BRIDBORD, K.
Health Implications of Exposure to Trace Metals from Combustion of Waste Oil,
W75-10765 5C

BRIGGS, R. E.
Some Effects of Field Weathering of Seed Cotton in a Desert Environment,
W75-10557 3F

BRINK, G. E.
Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404 3B

BRIONES, A. M.
Phosphorus Availability of Some Philippine Rice Soils as Affected by Soil and Water Management Practices,
W75-10421 3F

BROADHURST, W. L.
Summary Appraisals of the Nation's Ground-Water Resources--Rio Grande Region,
W75-10597 4B

BROCK, T. D.
Environmental Limitations on the Microbi Degradation of Hydrocarbons in Tempera Lakes,
W75-10407

BROECKER, W. S.
Floating Glacial Ice Caps in the Arctic Ocean
W75-10533

BROOKS, R. B.
Heat Treatment of Sewage Sludges,
W75-10644

BROWN, D. A,
Effects of Acute Exposure to Bleached Kr Pulp Mill Effluent on Carbohydrate Metab ism of Juvenile Coho Salmon (Oncorhynch Kisutch) During Rest and Exercise,
W75-10388

BROWN, L. A.
Environmental Issues, Effects, and Solution
W75-10795

BROWN, S. F.
Color Removal From Bleached Kraft fluents,
W75-10399

BRYANT, K. A. JR.
New Concepts in Suburban Drainage Florida,
W75-10793

BUCKS, D. A.
Trickle Irrigation Design Requirements Row Crops,
W75-10801

BURGES, S. J.
Use of Autoregressive Runoff Models in R voir Studies,
W75-10523

BUSTARD, D. R.
Aspects of the Winter Ecology of Juv Coho Salmon (Oncorhynchus Kisutch) Steelhead Trout (Salmo Gairdneri),
W75-10615

BUTLER, H. L.
A Numerical Model for Predicting the E of Landslide-Generated Water Waves,
W75-10661

BUXTON, D. R.
Some Effects of Field Weathering of See ton in a Desert Environment,
W75-10557

BYRNE, R. J.
Wave Climate Model of the Mid-Atlantic and Shoreline (Virginian Sea), Model De ment, Shelf Geomorphology, and Preli Results,
W75-10552

CAIRNS, J. JR.
Response of Freshwater Protozoan A Communities to Metals,
W75-10440

CALHOUN, C. A.
Current Water Systems Automation Re and Development in the Bureau of Re tion,
W75-10787

CAMERON, R. E.
Application of Low-Latitude Microbial gy to High-Latitude Deserts,
W75-10459

MPBELL, G. S.
The Effect of Prolonged Exposure to Elevated Temperatures on the Biochemical Constituents, Gonadal Development and Shell Deposition of he American Oyster, Crassostrea Virginica, W75-10849 5C

RLSON, E. J.
Change in Quality of Pumped Drainage Effluent, W75-10779 5B

RPENE, E.
esidues of Polychlorinated Biphenyls (PCB) nd Chlorinated Pesticides in Fish and Birds of ie Po Delta, (Residus de Polychlorobiphenyls CB) et de Pesticides Chlores Dans Les Poisons et Les Oiseaux du Delta du Po), /75-10446 5B

RRIERO, G.
xperience with the IFP Propane Clarification rocess in Re-Refining Spent Crankcase Oils, 75-10759 5D

RSON, W. G.
hallium: Occurrence in the Environment and oxicity to Fish, 75-10449 5C

RSON, W. V.
hallium: Occurrence in the Environment and oxicity to Fish, 75-10449 5C

TER, R. C.
aste Lubricating Oil Characteristics--Do ey Vary Geographically, Seasonally, and ith Origin, 75-10746 5B

LFIELD, H. P. JR.
owards a Sharper Concept of an Action Variable, 75-10813 6A

MBERLAIN, A. R.
le of the Public in Weather Modification, 75-10777 3B

MBERLIN, T. A.
lor Removal From Bleached Kraft Effents, 75-10399 5D

NDLER, J. H.
xicity of the Lampricide 3-Trifluoromethyl-Nitrophenol (TFM) To Nontarget Fish in ow- Through Tests, 75-10702 5C

xicity of the Lampricide 3-Trifluoromethyl-Nitrophenol (TFM) to Selected Aquatic Intebrates and Frog Larvae, 75-10703 5C

NG, J. H.
boratory Measurement of Surface Tempera- e Fluctuations Induced by Small Amplitude face Waves, 5-10505 2L

NSKY, S.
ste Automotive Lubricating Oil as a Muipal Incinerator Fuel, 5-10764 5D

PMAN, W. H.
and Water Pollution Control, 5-10732 5D

CHARLEY, R. W.
Groundwater Model as a Tool in Planning and Management, W75-10781 4B

CHAWLA, R.
Some Features of Tsunamis on the Pacific Coast of South and North America, W75-10554 2L

CHEE, L.
Evaluation of Ground Water Resources: Sacramento County, W75-10546 2F

CHEONG, H. F.
Dispersion of Contaminated Bedload Particles, W75-10526 5B

CHESTER, R.
Average Trace Element Composition of Low Level Marine Atmospheric Particulates, W75-10477 5B

CHILDERS, J. M.
Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973, W75-10594 8B

CHILDERS, W. F.
Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf., W75-10422 5C

CHIZHOV, S. V.
Problems of Space Biology. Volume 24. The Water Supply of Spacecraft Crews, W75-10365 5D

CHRISTIANSEN, J. E.
Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation, W75-10805 5G

CHRISTY, D.
Users' View of Weather Modification, W75-10776 3B

CLABORN, B. J.
Statistical Model of Short-Duration Precipitation Events, W75-10529 2B

CLAGUE, J. J.
Glacier-Flow Patterns and the Origin of Late Wisconsinan Till in the Southern Rocky Mountain Trench, British Columbia, W75-10539 2C

CLARK, A. C. K.
Shipyard Problems with Oily Wastes, W75-10753 5B

CLOUD, T. J. JR.
The Drift of Mayflies (Ephemeroptera) in the Brazos River, Texas, W75-10558 5B

COACHMAN, L. K.
Toward an Ice-Free Arctic Ocean, W75-10532 2C

COLEMAN, G. A.
Sediment-Yield Characteristics from Unit Source Watersheds, W75-10848 2J

COLLINS, L. A.
Additional Studies of the Fishes, Macroinvertebrates and Hydrological Conditions of Upland Canals in Tampa Bay, Florida, W75-10617 5C

COLUCCI, A.
Health Implications of Exposure to Trace Metals from Combustion of Waste Oil, W75-10765 5C

COMPTE, A.
Experience with the IFP Propane Clarification Process in Re-Refining Spent Crankcase Oils, W75-10759 5D

CONDIT, P. JR.
Oil and Debris Removal Unit, W75-10726 5G

COOK, P. L.
Manual for Preparation of Environmental Impact Statements for Wastewater Treatment Works, Facilities Plans, and 208 Areawide Waste Treatment Management Plans, W75-10473 5D

COREY, D. L.
Massachusetts Waste Oil Management Activities, W75-10763 5D

CORTESI, P.
Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po), W75-10446 5B

COSNER, O. J.
A Predictive Computer Model of the Lower Cretaceous Aquifer, Franklin Area, Southeastern Virginia, W75-10599 2F

COSTLOW, J. D. JR.
Effects of Mirex on the Larval Development of Blue Crab, W75-10410 5C

COUES, W. P.
Financing Water Works, W75-10712 3D

COWAN, A. B.
Listeria in Aquatic Animals, W75-10375 2I

CRAWFORD, D. L.
Production of Microbial Protein From Waste Cellulose by Thermomonospora Fusca, A Thermophilic Actinomycete, W75-10538 5C

CREASE, R. I.
Hydraulic Behaviour of the Chalk Aquifer in the Yorkshire Wolds, W75-10506 4B

CRISETIG, G.
Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po), W75-10446 5B

CRONIN, N.
Manual for Preparation of Environmental Impact Statements for Wastewater Treatment Works, Facilities Plans, and 208 Areawide Waste Treatment Management Plans, W75-10473 5D

CROSBY, L. G.
Los Angeles and Long Beach Harbors Model Study; Report 2, Observations of Ship Mooring and Movement,
W75-10664 8B

CULLEN, G. V.
Removal of Pollutants from Water,
W75-10736 5D

CULLEY, D. D. JR.
The Effects of Crude Oil on the Palatability of Marine Crustaceans,
W75-10428 5C

CURRY, N. A.
Guidelines for Landfill of Toxic Industrial Sludges,
W75-10487 5G

CUTLER, J. M.
Characterization of Cadmium Uptake by Plant Tissue,
W75-10479 5B

D'ARGE, R. C.
Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

DAI, T. S.
Measurement of Hydraulic Conductivity of Peats,
W75-10536 7B

DALTON, T.
Containment, Collection and Recycling of Oily Wastes,
W75-10747 5G

DARWAZEH, H. A.
Biological Activity of Organophosphorus Compounds and Synthetic Pyrethroids Against Immature Mosquitoes,
W75-10631 5G

DAVENPORT, J. T.
Towards a Sharper Concept of an Action Variable,
W75-10813 6A

DAVIDSON, D. D.
Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

DAVIES, W. E.
Geological and Limnological Factors of Cold Deserts,
W75-10457 2C

DAVIS, A. R.
A Remote Sensing Laser Fluorometer,
W75-10831 5A

DAVIS, C. H.
Effect of a Phytoplankton Culture on the Germination and Seedling Development of Barley, Sugar Beets and Lettuce,
W75-10496 3F

DAVIS, D. W.
Optimal Sizing of Urban Flood-Control Systems,
W75-10821 4A

DAVIS, E. M.
Biological Bases for Water Quality Standards,
W75-10677 5G

DAY, C. L.
Prediction of Trifluralin Diffusion Coefficients,
W75-10542 5B

DEAL, R. B.
General Aspects of Multivariate Analysis with Applications to Some Problems in Hydrology,
W75-10510 2A

DEAN, H. J.
Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

DEBOER, J. G.
Five Year Study of Des Moines River Water Quality,
W75-10803 5B

DECOURSEY, D. G.
General Aspects of Multivariate Analysis with Applications to Some Problems in Hydrology,
W75-10510 2A

DEFOE, D. L.
Multichannel Toxicant Injection System for Flow-Through Bioassays,
W75-10443 5A

DELEVAUX, M. H.
Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W75-10494 2K

DELLEUR, J. W.
Removal of Periodicities by Differencing and Monthyl Mean Subtraction,
W75-10352 2A

DEMICHELE, D. W.
An Analysis of the Mechanics of Guard Cell Motion,
W75-10488 2I

DENNY, J. L.
Statistical Inference on Streamflow Processes with Markovian Characteristics,
W75-10525 2E

DESAIAH, D.
Inhibition of ATPases Acitivity in Channel Catfish Brain by Kepone(Trade Name) and its Reduction Product,
W75-10612 5C

DEVRIES, J. J.
Some Factors Affecting Control of Flow in a Large Canal System,
W75-10786 8B

DICK, R. I.
Waste Water Treatment: Sludge Treatment, Utilization, and Disposal,
W75-10395 5D

DOBBS, T. L.
Analyzing Reimbursement Mechanisms for Resource Development Projects,
W75-10353 6C

DOERING, E. J.
Drainage Analysis of a Confining Formation,
W75-10780 4A

DOLEZAL, J.
Atomic Absorption Spectrometric Determination of Cadmium, Lead, Silver, Thallium and Zinc in Silicate Rocks by Direct Atomization From the Solid State,
W75-10492 2K

DONALDSON, E. M.
Corticosteroid Concentrations in Sockeye S
mon (Oncorhynchus Nerka) Exposed to L
Concentrations of Copper,
W75-10415

DOUGLAS, I.
Flood Waves and Suspended Sediment Pul
in Urbanized Catchments,
W75-10647

DOVE, F. H.
Methodological Problems in Applying
Straw Man to Real Life Problems,
W75-10814

DOWELL, C. O.
Derivation of Reservoir Operating Rules
Economic Analysis,
W75-10825

DRAGOUN, F. J.
Groundwater Control by Pumping,
W75-10778

DREW, W. M.
The Mutual Destruction of Polluting Facto
Waste Liquors,
W75-10645

DUCKSTEIN, L.
An Event-Based Stochastic Model of
Rainfall and Runoff,
W75-10521

DUERR, A. D.
Hydrological Data From Wells in Sout
Hillsborough County, Florida, 1950-74,
W75-10593

DURHAM, D. L.
Lake Erie International Jetport Model
bility Investigation, Physical Model Feas
Study,
W75-10670

Los Angeles and Long Beach Harbors
Study; Report 2, Observations of Ship M
and Movement,
W75-10664

DYE, H. M.
Corticosteroid Concentrations in Sockey
mon (Oncorhynchus Nerka) Exposed t
Concentrations of Copper,
W75-10415

EBINA, S.
Water Quality Factors in Designing a
Plant Based on Public Drainage St
Data, (In Japanese),
W75-10838

EDBERG, N.
Cellulose Degradation in Waste Wate
ment,
W75-10376

EDLUND, S.
Stockholm Puts Sewage Plants Undergr
W75-10718

EDWARDS, A. B.
Deterioration of Water Quality in Dis
Systems,
W75-10711

EICHELMANN, J. F. JR.
Air and Water Pollution Control,
W75-10732

SH, J. N.
e Water Treatment: Water Reclamation Reuse,
-10372 5D

EN, R. G.
mation of an Existing Irrigation System -
I,
10788 8C

AR, M. C.
d Extractive Spectrophotometric Deter-tion of Gold (III) With 4-(2-Pyridylazo)-rcinol,
10499 2K

R, D. A.
s of the Hiwassee River System: Ecologi-d Taxonomic Considerations,
10694 5C

, C. A. JR.
Trace Elements: Preferential Concentra-n Respirable Particles,
10482 5A

, J. C. W.
Paper (Company, Iyomishima, Japan) Ex-to 1,000,000 Tons/Year,
10380 5D

TT, W. L.
odological Problems in Applying the Man to Real Life Problems,
0814 6A

R. H.
-Quality Requirements for the Petroleum try,
0465 5D

, R. E.
tional Value of Weather Information in on to Soil Management Characteristics,
0367 2G

NER, J. H.
d-Water Conditions in Utah, Spring of
0606 2F

W. A. JR.
onal Studies of the Fishes, Macroinver-es and Hydrological Conditions of d Canals in Tampa Bay, Florida,
0617 5C

, G. J.
Elements in Melbourne Rivers - An In-oratory Analysis,
0649 5A

RLUND, U. H. M.
Toxicity of Kanamycin to Steelhead (Salmo Gairdneri),
0423 5C

N, R. A.
Water Treatment: Land Disposal of Water,
0373 5E

AN, S. L.
e Peak-Load Pricing of Urban Water
,
0706 6C

. Y.
ffect of Prolonged Exposure to Elevated ratures on the Biochemical Constituents, al Development and Shell Deposition of nerican Oyster, Crassostrea Virginica,
0849 5C

FIELD, R.
Coping With Urban Runoff in the United States,
W75-10541 5D

FINLEY, H. E.
Population Dynamics of Protozoa in Wastewater, and Impact of Environmental Changes,
W75-10689 5D

FISCHER, R. A.
Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

FISH, R. E.
Report on the River Master of the Delaware River for the Period December 1, 1973-November 30, 1974,
W75-10589 4A

FISHER, N. S.
Effects of Chlorinated Hydrocarbon Pollutants on Growth of Marine Phytoplankton in Culture,
W75-10636 5C

FLETCHER, B. P.
Spillway for Burnsville Dam, Little Kanawha River, West Virginia; Hydraulic Model Investigation,
W75-10665 8B

FLETCHER, G. L.
Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

FLETCHER, R.
A Connectives Model Relating Water Policy Action Variables to Recreational Opportunity Social Indicators,
W75-10819 6A

FOGEL, M. M.
An Event-Based Stochastic Model of Areal Rainfall and Runoff,
W75-10521 2B

FOLLMER, S.
Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

FONTANE, D. G.
Statistical Tolerance Limits for a Pearson Type III Distribution,
W75-10511 2E

FORD, R. S.
Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

FORDHAM, J. W.
Multisite Streamflow Simulation of Truckee River, Nevada,
W75-10509 2E

FORESTER, J.
A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

FOSTER, S. S. D.
Hydraulic Behaviour of the Chalk Aquifer in the Yorkshire Wolds,
W75-10506 4B

FOXWORTHY, B. L.
Flood Hazards in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W75-10580 7C

FRANCO, J. J.
Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667 8B

FRANZ, D. D.
Hourly Rainfall Generation for a Network,
W75-10515 2B

FREESTONE, F. J.
Runoff of Oils from Rural Roads Treated to Suppress Dust,
W75-10766 5B

FREMLING, C. R.
Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

FRERE, M. H.
ACTMO, An Agricultural Chemical Transport Model,
W75-10846 5B

FRIBERG, T. S.
Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

FRISA, C. N.
Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

FRY, R. G.
Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

FUJINO, O.
Determination of Manganese in Natural Waters by Atomic Absortion Spectrometry with a Carbon Tube Atomizer,
W75-10386 5A

FUKUYAMA, Y.
Method of Treating Aluminum-Containing Waste Water,
W75-10730 5D

FULLER, R. H.
Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

FURUTA, M.
Method of Purification of Waste Water Produced From the Packing of Meat and Aquatic Animals,
W75-10737 5D

GAGNON, C. R.
Computer Simulation of Water Distribution Networks,
W75-10823 4A

GAL'PER, G. E.
Instruction for Record Keeping of Water Consumption at the Enterprises of the Paper Industry (Instruktsiya ucheta raskhoda vody na predpriyatiyakh otrasli),
W75-10370 3E

GALICIA, F.
Oil Separation and Recovery Device,
W75-10728 5G

GARY, H. L.
Canopy Weight Distribution Affects Windspeed and Temperature in a Lodgepole Pine Forest,
W75-10654 4A

Watershed Management Problems and Opportunities for the Colorado Front Range Ponderosa Pine Zone: The Status of Our Knowledge,
W75-10655 4D

GAUL, D.
Investigations on the Production of Hygienic Compost from Air-Dried Sewage Using Different Additives (Versuche zur Herstellung von hygienisch einwandfreiem Kompost aus luftgetrocknetem Faulschlamm unter Verwendung verschiedener Zusaetze),
W75-10834 5D

GEBHARDT, M. R.
Prediction of Trifluralin Diffusion Coefficients,
W75-10542 5B

GEISER, H.
Groundwater Protection in Highway Construction in the Catchment Area of the City of Berne at Kiesen (Grundwasserschutz beim Autobahn im Fassungsgebiet Stadt Bern in Kiesen),
W75-10837 5C

GEISSEL, L. D.
Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

GELLMAN, I.
Industrial Wastes: Paper and Allied Products,
W75-10397 5D

GENYS, J. B.
Daily Temperature and Salinity of Surface Water of Patuxent River at Solomons, Maryland, Based on 30 Years of Records (1938-1967),
W75-10535 2E

GERNER, D. L.
Redistribution and Concentration of Mercury in the Environment,
W75-10483 5B

GILFILLAN, E. S.
Decrease of Net Carbon Flux in Two Species of Mussels Caused by Extracts of Crude Oil,
W75-10433 5C

GILMARTIN, M.
The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

GIOVINETTO, M. B.
Some Aspects of Climatology in Polar Barrens,
W75-10454 2C

GODFREY, K. A. JR.
Land Treatment of Municipal Sewage,
W75-10719 5D

GOERING, C. E.
Prediction of Trifluralin Diffusion Coefficients,
W75-10542 5B

GOLDMAN, C. R.
Suppression of Nitrogen Fixation by Blue-Green Alage in a Eutrophic Lake with Trace Additions of Copper,
W75-10480 5C

GOLDSMITH, V.
Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552 2L

GOVE, G. W.
Industrial Wastes: Paper and Allied Products,
W75-10397 5D

GRAHN, O.
Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

GRANADE, J. W.
The Economic Impact of Mercury Pollution on Fisheries and Other Related Businesses Around Pickwick Lake,
W75-10356 5G

GRANT, L. O.
Priority Problems for Modifying Cumulus Precipitation,
W75-10774 3B

GRANT, M. G.
The Navy's Oily Wastes Handling and Disposal Program,
W75-10750 5D

GREB, B. W.
Protein Content of Winter Wheat Grain as Related to Soil and Climatic Factors in the Semi-Arid Central Great Plains,
W75-10792 3F

GRIZZARD, T. J.
Will Wastewater Treatment Stop Eutrophication of Impoundments,
W75-10686 5D

GROSS, H. G.
A Remote Sensing Laser Fluorometer,
W75-10831 5A

GULABI, M.
Fast Separation of Tin (IV) From Tin (II) and From Numerous Metal Ions on Ion-Exchange Papers,
W75-10497 2K

GUMTZ, G. D.
Pollution Control with a Comprehensive Waste Oil Processing Plant,
W75-10758 5D

GUPTA, V. L.
Multisite Streamflow Simulation of Truckee River, Nevada,
W75-10509 2E

HAISE, H. R.
Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

HALLOCK, R. V.
Treatment of Milk Truck Washing Wastes by Anerobic Digestion,
W75-10673 5D

HALPENNY, L. C.
Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

HAM, R. K.
Treatability of Leachate from Sanitary Land fills,
W75-10683 5

HAMAGUCHI, A.
Physiological Changes in the Serum an Hepatopancreas of Yellow Tail Injected wit Carbon Tetrachloride, (In Japanese),
W75-10630 5

HAMDY, M. Y.
Sludge Disposal on Agricultural Soil,
W75-10674 5

HAMILTON, R. S.
Concentration of Dilute Waste Streams by I Exchange Techniques,
W75-10672 5

HAMMER, D. I.
Health Implications of Exposure to Tra Metals from Combustion of Waste Oil,
W75-10765

HAMPTON, B. B.
Hydrologic Data for Urban Studies in the F Worth, Texas Metropolitan Area, 1973,
W75-10596

HAMRICK, R. L.
A Stochastic Model for Daily Rainfall D Synthesis,
W75-10518

HANAMI, Y.
Method of Treating Aluminum-Contain Waste Water,
W75-10730

HANDMAN, E. H.
Hydrogeologic Data for the Farmington Ri Basin, Connecticut,
W75-10591

HANKE, S. H.
Water Rates: An Assessment of Current sues,
W75-10707

HANN, R. W. JR.
Effects of an Offshore Crude Oil Unloa Terminal on the Marine Environment,
W75-10642

HANSEN, C. R. JR.
Acute Toxicities of 3-Trifluorometh Nitrophenol (TFM) and 2',5-Dichlor Nitrosalicylanilide (Bayer 73) to Larvae of Midge (Chironomus Tentans),
W75-10698

HANSSEN, J. E.
Atomic Absorption Spectrometric Deter tion of Cadmium, Lead, Silver, Thallium Zinc in Silicate Rocks by Direct Atomiz From the Solid State,
W75-10492

HARKIN, J. M.
Production of Microbial Protein From W Cellulose by Thermomonospora Fusca, A mophilic Actinomycete,
W75-10538

HARMS, U.
Determination of the Transition Metals ganese, Iron, Cobalt, Copper and Zinc in Fishes With Help of X-Ray Fluorescence ysis and Flameless Atomic Absorption troscopy, (Bestimmung der Ubergangsm Mangan, Eisen, Kobalt, Kupfer und zi

lussfischen mit Hilfe der Rontgenfluores-zenanalyse und der flammenlosen Atomabsorpon),
/75-10408 5A

n the Accumulation of Organochlorine Pestides, PCB and Certain Heavy Metals in Fish nd Shellfish from Thai Coastal and Inland 'aters,
/75-10616 5B

RRAH, D.
omments on the Straw Man,
/75-10808 6B

RRINGTON, A.
Criterion for Vegetation Stiffness,
75-10782 4A

RRIS, J. E.
race Elements in Melbourne Rivers - An Inrlaboratory Analysis,
75-10649 5A

RT, F. L.
n Evaluation of Persistency for Water Borne rganics,
75-10850 5B

H, L.
eterioration of Water Quality in Distribution stems,
75-10711 5F

ANAKA, M.
xperimental Investigation on the Biological oncentration of Mercury-I. On the Rate of ercury Transfer Through the Food Chain om Jack Mackerel to Young Yellowtail (In panese),
75-10441 5C

CHER, R. F.
richment of Surface Freshwater Microlayers th Algae,
75-10583 5A

VKINS, R. H.
Note on Mixed Distributions in Hydrology,
75-10527 2E

TH, A. C.
e Effect of Sublethal Concentrations of pper and Zinc on Ventilatory Activity, ood Oxygen, and pH in Rainbow Trout lmo Gairdneri),
75-10624 5C

TH, R. C.
drology of the Albemarle-Pamlico Region, rth Carolina--A Preliminary Report on the pact of Agricultural Developments,
75-10602 4C

KROTH, C. W.
L. 92-500 (Two Years Later) is Not the swer,
75-10471 5G

IZ, G.
fects of Methylmercury on Approach and oidance Behavior of Mallard Ducklings,
75-10424 5C

FGOTT, T.
Evaluation of Persistency for Water Borne ganics,
75-10850 5B

VEY, J. D.
tershed Behavior After Forest Fire in shington,
75-10790 4C

HENRY, C.
Disposal of Digested Sewage Sludge by Landfill,
W75-10682 5D

HERSHFIELD, D. M.
Cross Spectra of Short-Duration Rainfall,
W75-10514 2B

HEUSS, K.
X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

HIGGINS, J. M. JR.
The Effect of Landowner Attitude on the Financial and the Economic Costs of Acquiring Land for a Large Public Works Project,
W75-10827 6B

HINES, W. G.
Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

HIROSAWA, K.
Electron Microscope Autoradiography of Kidney After Administration of PB-210 in Mice,
W75-10476 5A

HITCH, R. K.
Fishes of the Hiwassee River System: Ecological and Taxonomic Considerations,
W75-10694 5C

HODSON, P. V.
Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

HOEFT, M. J.
Results of Airblast Overpressure Measurement Program at Project R.D. Bailey,
W75-10555 8H

HOFSTEN, B. V.
Cellulose Degradation in Waste Water Treatment,
W75-10376 5D

HOGAN, C.
Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

HOLLAND, A. C.
Error Analysis of Dobson Spectrophotometer Measurements of the Total Atmospheric Ozone Content,
W75-10545 7B

HOLLIS, G. E.
The Effects of Urbanization on Floods of Different Recurrence Interval,
W75-10709 4C

HOLTAN, H. N.
ACTMO, An Agricultural Chemical Transport Model,
W75-10846 5B

HOPKINS, H. T.
Hydrogeologic Data for the Farmington River Basin, Connecticut,
W75-10591 7C

HORNE, A. J.
Suppression of Nitrogen Fixation by Blue-Green Alage in a Eutrophic Lake with Trace Additions of Copper,
W75-10480 5C

HOWARD, T. E.
Swimming Performance of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Bleached Kraft Pulp Mill Effluent,
W75-10387 5C

HOWES, D.
Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

HRUTFIORD, B. F.
Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

HUANG, Y. W.
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

HUDSON, J. D.
Ground-Water Levels in New Mexico, 1972,
W75-10582 4B

HUFF, C. E.
Analyzing Reimbursement Mechanisms for Resource Development Projects,
W75-10353 6C

HUGHES, D. A.
The Toxicity of Heavy Metal Ions to Anaerobic Digestion,
W75-10843 5D

HUNG, C. S.
Research in Stochastic Models for Bedload Transport,
W75-10522 2J

HUSAIN, W.
Fast Separation of Tin (IV) From Tin (II) and From Numerous Metal Ions on Ion-Exchange Papers,
W75-10497 2K

HUSCHENBETH, E.
On the Accumulation of Organochlorine Pesticides, PCB and Certain Heavy Metals in Fish and Shellfish from Thai Coastal and Inland Waters,
W75-10616 5B

HUTCHESON, M. S.
The Effect of Temperature and Salinity on Cadmium Uptake by the Blue Crab, Callinectes sapidus,
W75-10448 5C

ISHIZAKI, T.
Color of Pulp Industry Waste Liquors. (6). Behavior of Color During Waste Treatments (In Japanese),
W75-10393 5D

ITOYAMA, T.
Water Analysis of River Waters in Kagawa (IX), Chemical Composition of the Aya Water Basin, (In Japanese),
W75-10841 2K

JACOBSEN, G.
Resource Development in Canada's High Arctic,
W75-10463 2C

JACOBY, S. L. S.
Computer Simulation of Water Distribution Networks,
W75-10823 4A

JAKOBSON, K.
Waste Oil Management--The Environmental Protection Agency's Role,
W75-10742 5G

JAKSCH, J. A.
The Waste Oil Industry: A Discussion of Some Issues to Consider in Performing an Economic Analysis,
W75-10767 5G

JAMES, W. P.
Effects of an Offshore Crude Oil Unloading Terminal on the Marine Environment,
W75-10642 5C

JENG, S. S.
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

JENKINS, W.
A Method of Disaggregation,
W75-10817 6A

JENNELLE, E. M.
Will Wastewater Treatment Stop Eutrophication of Impoundments,
W75-10686 5D

JENNINGS, F. D.
International Exploration Locates Minerals and Oils,
W75-10467 5B

JEWETT, G.
Egalitarianism,
W75-10818 6A

JOHANSSON, L.
Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

JOHNSON, H. E.
Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

JONES, K. M.
Icebreaking Drillship for Offshore Exploratory Drilling in the Arctic,
W75-10639 5G

JONES, P.
Production of Microbial Protein From Waste Cellulose by Thermomonospora Fusca, A Thermophilic Actinomycete,
W75-10538 5C

JOSEPH, E. S.
Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

JUDGE, R. M.
Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

JUDSON, A.
Avalanche Warnings: Content and Dissemination,
W75-10653 2C

KACEW, S.
Persistence of Cadmium-Induced Metabolic Changes in Liver and Kidney,
W75-10478 5A

KACHEL, W. M.
Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

KAGAN, R. S.
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

KAJIYAMA, Y.
Process for Removing Heavy Metal Ions in Water,
W75-10731 5D

KAMIJO, H.
The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

KARPEVICH, A. F.
The Effect of Different Salinities and Manganese Ion on the Survival Respiration of the Baltic Flounder (Pleuronectes Flesus Trachurus (Dunker)) of the Gulf of Riga,
W75-10411 5C

KAVVAS, M. L.
Removal of Periodicities by Differencing and Monthyl Mean Subtraction,
W75-10352 2A

KAWATSKI, J. A.
Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

Uptake, Elimination and Biotransformation of the Lampricide 3-Trifluromethyl-4-Nitrophenol (TFM) by Larvae of the Aquatic Midge Chironomus Tentans,
W75-10629 5C

KEINATH, T. M.
Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

KELSO, J. R. M.
Influence of a Thermal Effluent on Movement of Brown Bullhead (Ictalurus Nebulosus) as Determined by Ultrasonic Tracking,
W75-10628 5C

KENNEDY, J. F.
Hydraulics and Mechanics of River Ice Jams,
W75-10556 8B

KESTERSON, J. W.
Responses of 'Bearss' Lemon to Nitroge Potassium and Irrigation Applications,
W75-10714 3

KHANAL, N. N.
A Stochastic Model for Daily Rainfall Da Synthesis,
W75-10518 2

KIKUCHI, T.
Residue Analyses on 2-Amino-4 Phe ylthiazole, a Piscine Anesthetic, in Fishes-I Model Radio-Tracer Experiment with Medaka
W75-10614 5

KING, C. H. JR.
The Perimeter Canal - A New Approach Discharge Urban Water into a Coastal Ma grove Area,
W75-10773 4

KING, M. J.
Copper, Zinc and Total Protein Levels in Plasma of Sockeye Salmon (Oncorhynch Nerka) During Their Spawning Migration,
W75-10613

KINNEY, E. T.
The Navy's Oily Wastes Handling and Dispo Program,
W75-10750

KINOSHITA, K.
Determination of Manganese in Natural Wat by Atomic Absortion Spectrometry with a C bon Tube Atomizer,
W75-10386

KIRCHER, J. E.
Temperatures of Wyoming Streams,
W75-10604

KIRK, B. S.
Multiple Cycle Process for Wastewater Pu cation,
W75-10738

KISER, K. M.
Physical Model Study of Circulation Pattern Lake Ontario,
W75-10537

KISIEL, C. C.
Statistical Inference on Streamflow Proce with Markovian Characteristics,
W75-10525

KITAGAWA, K.
Spectroscopic Determination of Atomiza Efficiency (CuCl-Cu+Cl) in an Air-Hydr Flame,
W75-10498

KLEMES, V.
Some Problems in Pure and Applied Stoch Hydrology,
W75-10508

KNAACK, D.
Studies on Possibilities of Biochemical P cation of Evaporator Condensate Occu During Sulfite Pulp Manufa (Untersuchungen ueber die Moeglichkei biochemischen Reinigung des bei der Sulfi stoffherstellung anfallenden Eindampfko sates),
W75-10382

KNAUF, N.
Devices for Toxicological Long-Term St on Aquatic Organisms (Gerate

rchfuhrung Toxikologischer Langzeitstudien (Wasserorganismen),
5-10618 5A

PER, L. H.
e Effects of Crude Oil on the Palatability of rine Crustaceans,
5-10428 5C

HT, R. J.
nium, Thorium, and Lead Concentrations Three Silicate Standards and a Method of d Isotopic Analysis,
5-10494 2K

. C.
clear Power Plant Cooling System Selection,
5-10822 6C

YASHI, K.
dies on the Metabolism of Chlorophenols in n-I Absorption and Excretion of PCP by dfish,
5-10417 5C

dies on the Metabolism of Chlorophenols in n-II Turnover in Absorbed PCP in Goldfish,
5-10418 5C

dies on the Metabolism of Chlorophenols in n-III Isolation and Identification of a Conju- d PCP Excreted by Goldfish,
5-10611 5A

YASHI, N.
ssay Data for Marine Pollution Using Sea hin Eggs, 1972 and 1973,
5-10432 5A

ine Pollution Bioassay by Sea Urchin Eggs, Attempt to Enhance Accuracy,
5-10419 5A

, R. B.
bition of ATPases Acitivity in Channel Cat- Brain by Kepone(Trade Name) and its uction Product,
5-10612 5C

LER, J. H.
of the Antelope Valley-East Kern Water ncy Area, California, Showing Ground- er Subunits and Areas, Location of Wells, Water-Level Contours for Spring 1974,
-10595 7C

, G. C.
r Removal From Bleached Kraft Ef- nts,
-10399 5D

O, T.
r of Pulp Industry Waste Liquors. (6). avior of Color During Waste Treatments apanese),
-10393 5D

r of Pulp Industry Waste Liquors. (7). r Reduction by Ultraviolet Treatment (In nese),
-10394 5D

OGIANNIS, J. E.
Effect of Crude Oil Fractions on the Sur- l of a Tidepool Copepod, Tigriopus Califor- s,
-10641 5C

R. C. J.
onses of 'Bearss' Lemon to Nitrogen, ssium and Irrigation Applications,
-10714 3F

KOPPLE, J. D.
Lead Metabolism in the Normal Human: Stable Isotope Studies,
W75-10484 5A

KOPYLOV, V. A.
Increasing the Efficiency of Flotation Savealls (Povyshenie effektivnosti raboty flotatsionnykh lovushek),
W75-10369 5D

KORKISCH, J.
Determination of Cadmium, Copper, and Lead in Natural Waters After Anion-Exchange Separation,
W75-10385 5A

KOUWEN, N.
A Criterion for Vegetation Stiffness,
W75-10782 4A

KRATKY, B. A.
Water-Soil-Plant Interactions with Terbacil,
W75-10486 5C

KRIDER, J. N.
New Concepts in Suburban Drainage in Florida,
W75-10793 4A

KROOP, R. H.
Disposal and/or Recycle of Air Force Waste Petroleum Oils and Lubricants,
W75-10749 5D

KRUSE, E. G.
Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

KRUUS, J.
A Remote Sensing Laser Fluorometer,
W75-10831 5A

KUGELMAN, I. J.
Waste Water Treatment: Water Reclamation and Reuse,
W75-10372 5D

KUIPER, D.
Domestic Waste Water Reuse--Aspects of the Treatment System,
W75-10708 5D

KWAIN, W-H.
Effects of Temperature on Development and Survival of Rainbow Trout, Salmo Gairdneri, in Acid Waters,
W75-10623 5C

LABELLA, S. A.
Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

LACLAIR, L. M.
Integral Circular Wastewater Treatment Plant,
W75-10729 5D

LACY, A. W.
International Production Aspects of Water and Environmental Quality Control,
W75-10357 5G

LAIN, J. L.
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

LANCE, E. V.
Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

LANDO, R.
Social Indicators and Connectives,
W75-10812 6A

LANE, L. J.
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

LANGMYHR, F. J.
Atomic Absorption Spectrometric Determination of Cadmium, Lead, Silver, Thallium and Zinc in Silicate Rocks by Direct Atomization From the Solid State,
W75-10492 2K

Atomic-Absorption Spectrometric Determination of Copper, Lead, Cadmium and Manganese in Pulp and Paper by the Direct-Atomization Technique,
W75-10489 5A

LARKIN, P. A.
The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437 5C

LAW, P.
Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

LEAF, C. F.
Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404 3B

Simulating Timber Yields and Hydrologic Impacts Resulting From Timber Harvest on Subalpine Watersheds,
W75-10406 3B

Watershed Management in the Rocky Mountain Subalpine Zone: The Status of Our Knowledge,
W75-10405 3B

LEDERMAN, P. B.
Waste Oil Management--The Environmental Protection Agency's Role,
W75-10742 5G

LEDVINA, M. M.
Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

LEE, E. G-H.
Effect of Temperature and Sludge Loading on 5-Day BOD Removal and Sludge Settleability in Activated Sludge Systems Treating Bleached Kraft Effluents,
W75-10379 5D

Rotating Biological Disk Treatment of Kraft Mill Effluents,
W75-10390 5D

LEITHE, W.
Analytic Characterization of Sewer Loading by Spent Liquors of the Pulp Industry (Analytische Kennzeichung der Belastung der

LEITHE, W.

Vorfluter durch Ablaugen der Zellstoffindustrie),
W75-10381 5D

LEVY, B.
Cross Spectra of Short-Duration Rainfall,
W75 10514 2B

LEWIN, V. H.
Corrosion and Its Cost in Sewage Treatment,
W75-10364 8G

LEWIS, C. J.
Water Pollution Problems Associated with Control of Stack Gas Emission,
W75-10691 5B

LEWIS, E. A.
Economic Impact of the Conversion of Water from Irrigation to Municipal and Industrial Use in the Rio Grande Basin of New Mexico,
W75-10771 6D

LI, C.
Physical Model Study of Circulation Patterns in Lake Ontario,
W75-10537 2H

LIEBENOW, W. F.
Re-Refined Diesel Locomotive Lubricating Oil,
W75-10761 5D

LIEBERMAN, M.
Disposal and/or Recycle of Air Force Waste Petroleum Oils and Lubricants,
W75-10749 5D

LINDALL, W. N. JR.
Additional Studies of the Fishes, Macroinvertebrates and Hydrological Conditions of Upland Canals in Tampa Bay, Florida,
W75-10617 5C

LINDSTROM, F. T.
A Theory of the Mass Transport of Previously Distributed Chemicals in a Water-Saturated Sorbing Porous Medium: 4. Distributions,
W75-10632 5B

LINSTEDT, K. D.
Vacuum Filtration Cost Optimization,
W75-10681 5D

LIVELY, L. D.
Analysis of Wastewater Treatment Systems for a Meat Processing Plant,
W75-10687 5D

LONG, J. R.
NBS Adds Foreign Wrinkle to Standards Work,
W75-10490 5A

LONG, M. T.
Waste Oil in Maryland: A Pollutant or a Resource,
W75-10744 5B

LONGUET-HIGGINS, M. S.
On the Joint Distribution of the Periods and Amplitudes of Sea Waves,
W75-10534 2L

LOVELL, R. T.
Essentiality of Vitamin C in Feeds for Intensively Fed Caged Channel Catfish,
W75-10362 8I

LOWHAM, H. W.
Temperatures of Wyoming Streams,
W75-10604 7C

LUTTINGER, L. B.
Gravity Dewatering of Metal Hydroxide Sludges,
W75-10500 5D

LUXMOORE, R. J.
Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

LYONS, T. C.
Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

MACKAY, J. R.
Snow Creep: Its Engineering Problems and Some Techniques and Results of Its Investigation,
W75-10503 2C

MAKI, A. W.
Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

MAKKI, YAHIA
Some Effects of Field Weathering of Seed Cotton in a Desert Environment,
W75-10557 3F

MALTEZOU, S.
Waste Oil: The Recapture of an Energy Resource (The Generation, Disposal and Recovery of Waste Oil in the New York Metropolitan Area),
W75-10745 5D

MANN, H.
Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

MANN, R.
Rivers in the City,
W75-10723 6B

MAR, B. W.
Disposal of Digested Sewage Sludge by Landfill,
W75-10682 5D

MARANI, A.
Effects of Soil Moisture on Stress on 2 Varieties of Upland Cotton in Israel: IV. Effects of Periods of Stress Occurrence, Correlations and Regressions,
W75-10791 3F

MARKANDYA, A.
Pollution Control and Optimal Taxation: A Static Analysis,
W75-10359 6E

MARKING, L. L.
Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

Toxicity of Paired Mixtures of Candidate Forest Insecticides to Rainbow Trout,
W75-10439 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to Selected Aquatic Invertebrates and Frog Larvae,
W75-10703 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Sandpaper Fish in Static Tests,
W75-10701 5C

MARSHALL, M.
The Lower Colorado River: A Bibliography,
W75-10453 6E

MARTIN, E. J.
An Economic Model of Waste Oil Recovery, Reprocessing and Distribution Systems,
W75-10768 5D

MARTIN, W. R. B.
The Mutual Destruction of Pollutng Factors in Waste Liquors,
W75-10645 5D

MARTIN, W. W.
Fluid-Dynamic Excitation Involving Flow stability,
W75-10544 8G

MARTINELLI, M. JR.
Snow Avalanche Sites: Their Identification Evaluation,
W75-10659 2C

Water-Yield Improvement from Alpine Ar The Status of Our Knowledge,
W75-10660 4A

MASON, D. D.
Relationships Between Drouth and Corn Yi on Selected South Atlantic Coastal Plain So
W75-10721 3F

MASSOUMI, A.
Atomic-Absorption Spectrometric Determ tion of Copper, Lead, Cadmium and M ganese in Pulp and Paper by the Di Atomization Technique,
W75-10489 5A

MATHEWS, W. H.
Snow Creep: Its Engineering Problems Some Techniques and Results of Its Inve tion,
W75-10503 2C

MATSUI, M.
Determination of Manganese in Natural W by Atomic Absortion Spectrometry with a bon Tube Atomizer,
W75-10386 5A

MAUCK, W. L.
Toxicity of Paired Mixtures of Can Forest Insecticides to Rainbow Trout,
W75-10439 5C

MAYER, F. L. JR.
Toxaphene Effects on Growth and De ment of Brook Trout (Salvelinus Fontinal
W75-10621 5C

MAYO, L. R.
Icings Along the Trans-Alaska Pipeline R
W75-10592 8D

MCANENY, C. C.
Project Lost Creek: Field Tests of Mo and Controlled Blasting,
W75-10553 8G

**RIDE, J.**
ute Toxicity of Kanamycin to Steelhead out (Salmo Gairdneri),
75-10423 5C

**OY, B.**
ste Automotive Lubricating Oil as a Mu-ipal Incinerator Fuel,
75-10764 5D

**OY, E.**
oduction of Microbial Protein From Waste llulose by Thermomonospora Fusca, A Ther-philic Actinomycete,
75-10538 5C

**RACKEN, R. J.**
lationships Between Drouth and Corn Yields Selected South Atlantic Coastal Plain Soils,
75-10721 3F

**ILL, H. N.**
fects of Surface Drainage on Stream Flow,
75-10794 4A

**EE, M.**
gorithmic Modeling and the Straw Man,
5-10820 6A

**ELLAR, C. D.**
vigation Conditions at Cannelton Locks and n, Ohio River; Hydraulic Model Investiga-n,
5-10667 8B

**EAY, D. J.**
ects of Acute Exposure to Bleached Kraft p Mill Effluent on Carbohydrate Metabol- of Juvenile Coho Salmon (Oncorhynchus utch) During Rest and Exercise,
5-10388 5C

**EESE, D. W.**
xicity of Phosphamidon to American Lob-rs (Homarus Americanus) Held at 4 and ,
5-10413 5C

**ILLAN, L.**
Economic Model of Waste Oil Recovery, processing and Distribution Systems,
5-10768 5D

**HIRTER, J. R.**
egral Circular Wastewater Treatment Plant,
5-10729 5D

**RLE, P. M.**
xaphene Effects on Growth and Develop-nt of Brook Trout (Salvelinus Fontinalis),
5-10621 5C

**R, P. G.**
alysis of Pollution from Marine Engines - tus Report,
5-10688 5A

**ALI, Z.**
sistence of Cadmium-Induced Metabolic anges in Liver and Kidney,
5-10478 5A

**CER, L. J.**
tical Participation and Water Rates. A ser Look,
5-10361 6C

**RETT, R. H.**
Miles to Go,
5-10638 5C

**MERRIAM, J. L.**
Float Valve Provides Variable Flow Rates at Low Pressures,
W75-10789 8C

**METCALF, R. L.**
Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

**MIERSCH, K.**
Investigations on the Production of Hygienic Compost from Air-Dried Sewage Using Different Additives (Versuche zur Herstellung von hygienisch einwandfreiem Kompost aus luftgetrocknetem Faulschlamm unter Verwendung verschiedener Zusaetze),
W75-10834 5D

**MILLEMANN, R. E.**
Effects of the Insecticide Sevin and Its First Hydrolytic Product, 1-Napthol, on Some Early Developmental Stages of the Bay Mussel, Mytilus edulis,
W75-10435 5C

**MILLER, J. R. JR.**
Weather Modification for Use in the High Plains,
W75-10775 3B

**MILLER, L. L.**
Hydrologic Reconnaissance of the Southern Uinta Basin, Utah and Colorado,
W75-10585 3B

**MILLER, W. L.**
Operational Value of Weather Information in Relation to Soil Management Characteristics,
W75-10367 2G

**MITCI, C.**
Determine Urban Runoff the Simple Way,
W75-10716 2E

**MOODY, W. B.**
Effects of Surface Drainage on Stream Flow,
W75-10794 4A

**MORAN, J. B.**
Health Implications of Exposure to Trace Metals from Combustion of Waste Oil,
W75-10765 5C

**MOREAU, J.**
Serpaflo: Original Solution to Cleaning Paper Mill Effluents (Serpaflo; La solution originale d'epuration des eaux papeteries),
W75-10389 5D

**MORGAN, W. D.**
Political Participation and Water Rates. A Closer Look,
W75-10361 6C

**MORI, M.**
Treatment of Service Water with Ozone,
W75-10840 5D

**MORRIS, W. D.**
Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552 2L

**MOSEY, F. E.**
The Toxicity of Heavy Metal Ions to Anaerobic Digestion,
W75-10843 5D

**MUELLER, J. C.**
Effect of Temperature and Sludge Loading on 5-Day BOD Removal and Sludge Settleability in Activated Sludge Systems Treating Bleached Kraft Effluents,
W75-10379 5D

Rotating Biological Disk Treatment of Kraft Mill Effluents,
W75-10390 5D

**MUELLER, W.**
Investigations on the Production of Hygienic Compost from Air-Dried Sewage Using Different Additives (Versuche zur Herstellung von hygienisch einwandfreiem Kompost aus luftgetrocknetem Faulschlamm unter Verwendung verschiedener Zusaetze),
W75-10834 5D

**MULLA, M. S.**
Biological Activity of Organophosphorus Compounds and Synthetic Pyrethroids Against Immature Mosquitoes,
W75-10631 5G

**MUNNECKE, T.**
Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

Qualitative Sign Matrix Manipulation,
W75-10815 6A

**MURAKAMI, M.**
Electron Microscope Autoradiography of Kidney After Administration of PB-210 in Mice,
W75-10476 5A

**MURPHY, L. L.**
An Effluent Study of a Fresh Water Fish Processing Plant,
W75-10684 5D

**MURRAY, D. A. J.**
Analysis of Tri-Aryl Phosphate Esters and the Determination of Imol S-140 in Fish Tissue and Water Samples by Gas Chromatography,
W75-10442 5A

**MURTY, T. S.**
Some Features of Tsunamis on the Pacific Coast of South and North America,
W75-10554 2L

**NAGARKAR, S. G.**
Rapid Extractive Spectrophotometric Determination of Gold (III) With 4-(2-Pyridylazo)-Resorcinol,
W75-10499 2K

**NAGEL, T.**
Report to the Technical Committee of the Water Resources Centers of the Thirteen Western States,
W75-10809 6B

**NARASIMHAN, T. N.**
Seepage from Recharge and Landfill Ditches,
W75-10770 5B

**NARVER, D. W.**
Aspects of the Winter Ecology of Juvenile Coho Salmon (Oncorhynchus Kisutch) and Steelhead Trout (Salmo Gairdneri),
W75-10615 5C

**NASSAR, E. G.**
Flood Hazards in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W75-10580 7C

NATUSCH, D. F. S.
Toxic Trace Elements: Preferential Concentration in Respirable Particles,
W75-10482 5A

NAUDASCHER, E.
Fluid-Dynamic Excitation Involving Flow Instability,
W75-10544 8B

NEMEROW, N. L.
Lagoons Plus Spray Irrigation for Effective Bean Cannery Waste Treatment,
W75-10678 5D

NEWBOLD, C.
Herbicides in Aquatic Systems,
W75-10625 5C

NEWSOME, C.
Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

NEWSOME, C. S.
Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

NICKLESS, G.
Absorption of Cadmium, Copper and Zinc by Dog Whelks in the Bristol Channel,
W75-10481 5B

NICKS, A. D.
Stochastic Generation of the Occurrence, Pattern, and Location of Maximum Amount of Daily Rainfall,
W75-10516 2B

NIKITIN, YA. V.
Instruction for Record Keeping of Water Consumption at the Enterprises of the Paper Industry (Instruktsiya ucheta raskhoda vody na predpriyatiyakh otrasli),
W75-10370 3E

NUTTER, L. J.
Hydrogeology of the Triassic Rocks of Maryland,
W75-10584 2F

O'BRIEN, B.
Amendments to the Water Act,
W75-10835 5G

O'BRIEN, W. J.
Waste Water Treatment: Lagoons and Oxidation Ponds,
W75-10374 5D

O'CONNOR, J. T.
Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

O'LOUGHLIN, E. M.
Predicting the Concentration of Aquatic Herbicide Residues in Waterways,
W75-10648 5B

O'NEIL, R. A.
A Remote Sensing Laser Fluorometer,
W75-10831 5A

OKERA, W.
Tar Pollution of Sierra Leone Beaches,
W75-10472 5B

OLSON, B. R. JR.
Development of Large Scale Drip Irrigation Systems,
W75-10784 3F

OLSON, L. E.
Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

OMAYE, S. T.
Effect of Dietary Selenium on Glutathione Peroxidase in the Chick,
W75-10495 5A

ONSTAD, C. A.
ACTMO, An Agricultural Chemical Transport Model,
W75-10846 5B

OSBORN, H. B.
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

OSWOOD, M. W.
An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

OULMAN, C. S.
Five Year Study of Des Moines River Water Quality,
W75-10803 5B

OUTLAW, D. G.
Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

OVERFIELD, J. L.
Oil Contaminated Water Recycling System,
W75-10760 5D

OVERNELL, J.
The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

The Effect of Some Heavy Metal Ions on Photosynthesis in a Freshwater Alga,
W75-10627 5C

PADMANABHAN, M.
Fluid-Dynamic Excitation Involving Flow Instability,
W75-10544 8B

PAGE, J. W.
Growth Factors in the Fish Meal Components of Catfish Diets,
W75-10658 2I

PALMER, W. T.
The Influence Surface Method for Floating Ice Plates,
W75-10504 2C

PARKER, B. C.
Enrichment of Surface Freshwater Microlayers with Algae,
W75-10583 5A

PATTERSON, T. C.
Water Use and Production of Trickle Irrigated Onions,
W75-10785 3F

PAULSON, W. L.
Analysis of Wastewater Treatment Systems fo
a Meat Processing Plant,
W75-10687 5I

PEARSON, G. M.
Removal of Pollutants from Water,
W75-10736 5I

PETTIS, R. W.
Trace Elements in Melbourne Rivers - An In
terlaboratory Analysis,
W75-10649 5

PETZOLD, S.
Principles of Establishing Sewer Systems in th
Rural Settlements of Magdeburg Count
(Grundlagen fuer die Abwasser-Technisch
Erschliessung von Landgemeinden im Bezir
Magdeburg),
W75-10833 5

PEWE, T. L.
Geomorphic Processes in Polar Deserts,
W75-10456 2

PHILLIP, A. T.
Trace Elements in Melbourne Rivers - An I
terlaboratory Analysis,
W75-10649 5

PHILP, D. H.
Color Removal From Bleached Kraft I
fluents,
W75-10399

PICKERING, G. A.
Flood Control Project on Lytle and Wa
Creeks and Santa Ana River, Californ
Hydraulic Model Investigation,
W75-10668

PILLSBURY, A. F.
Problems of Water Quality Management
Western River Basin Systems,
W75-10804

PILSON, M. E. Q.
Arsenate Uptake and Reduction by Pocillop
verrucosa,
W75-10491

PIPES, A.
Nonlinear Channel Routing by Computer,
W75-10543

PIVOVAROV, V. G.
Increasing the Efficiency of Flotation Save
(Povyshenie effektivnosti raboty flotatsionn
lovushek),
W75-10369

POLLACK, B. L.
Waste Oil--Solution to Maryland's Energy
sis,
W75-10762

POWELL, G. M.
Groundwater Model as a Tool in Planning
Management,
W75-10781

PRICE, R. I.
USCG Sets Broader Use of Pollution Co
Systems,
W75-10466

PRINCE, D.
Hydrologic Reconnaissance of the Sou
Uinta Basin, Utah and Colorado,
W75-10585

JGH, C. A.
Turbulent Flow in Rectangular Outlet Conduit, Rend Lake Dam, Big Muddy River, Illinois,
W75-10666 8B

JLICH, W. M. JR.
The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

UICK, M. C.
Nonlinear Channel Routing by Computer,
W75-10543 4A

ABINOWITZ, M. B.
Lead Metabolism in the Normal Human: Stable Isotope Studies,
W75-10484 5A

AGLAND, D. V.
Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

AINS, D. W.
Characterization of Cadmium Uptake by Plant Tissue,
W75-10479 5B

ANDALL, K. J.
Port Reception and Treatment Facilities for Oily Waste from Vessels,
W75-10751 5G

ANDOLPH, V. G.
Pipeline Stress Analysis,
W75-10824 8B

ANEY, D. C.
A Numerical Model for Predicting the Effects of Landslide-Generated Water Waves,
W75-10661 8A

AWLINS, S. L.
Irrigation Management for Salt Control,
W75-10800 3C

EED, J. C.
Review of Development of Arctic Resources,
W75-10462 2C

EESE, R. L.
Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

EID, G.
Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

EIN, D. A.
Vacuum Filtration Cost Optimization,
W75-10681 5D

EVELANTE, N.
The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

HOADES, E. D.
Sediment-Yield Characteristics from Unit Source Watersheds,
W75-10848 2J

HOADES, J. D.
Irrigation Management for Salt Control,
W75-10800 3C

RICE, S. D.
Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

RICE, W.
Wisconsin Tissue Mills One Year After Startup of the Effluent Plant,
W75-10378 5D

RICHARD, J. W.
Oil Contaminated Water Recycling System,
W75-10760 5D

RIDDLE, M. J.
An Effluent Study of a Fresh Water Fish Processing Plant,
W75-10684 5D

RITCHIE, D. E. JR.
Daily Temperature and Salinity of Surface Water of Patuxent River at Solomons, Maryland, Based on 30 Years of Records (1938-1967),
W75-10535 2E

RITTER, D. F.
Competence of Rivers to Transport Coarse Bedload Material,
W75-10540 2J

ROBECK, G. G.
Treatment Processes for Coping with Variation in Raw-Water Quality,
W75-10705 5F

ROBERTSON, J. A. JR
Groundwater Control by Pumping,
W75-10778 4B

RODIS, H. G.
The Loxahatchee - A River in Distress, Southeast Florida,
W75-10588 4C

ROESLER, J. F.
Plant Performance Using Dissolved Oxygen Control,
W75-10452 5D

ROGGENSACK, W. D.
Large Scale Laboratory Direct Shear Tests on Ice,
W75-10502 2C

ROSENBAUM, D. H.
Review of the Economic Benefits and Costs Resulting from Dewey Reservoir,
W75-10828 6B

ROSENBERG, R.
Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

ROSENTHAL, H.
Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

ROSS, W. L.
Integral Circular Wastewater Treatment Plant,
W75-10729 5D

ROWLEY, G. W.
Indigenous Peoples of Polar Deserts,
W75-10460 6D

RUDAKOVA, A. M.
Reduction of Effluent Pollution at the Arkhangel'sk Mills (Snizhenie zagryaznennosti stochnykh vod na Arkhangel'-skom Kombinate),
W75-10368 5D

RUDDY, G. M.
The Effect of Prolonged Exposure to Elevated Temperatures on the Biochemical Constituents, Gonadal Development and Shell Deposition of the American Oyster, Crassostrea Virginica,
W75-10849 5C

RUMER, R. R.
Physical Model Study of Circulation Patterns in Lake Ontario,
W75-10537 2H

RUPPERSBERGER, J.
Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

RUSSELL, D. P.
Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

RUSSELL, L. V.
Heavy Metals Removal from Wood Preserving Wastewater,
W75-10675 5D

RUTHVEN, J. A.
Response of Freshwater Protozoan Artificial Communities to Metals,
W75-10440 5C

SAGER, R. A.
Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

SAHAGIAN, J.
Waste Automotive Lubricating Oil as a Municipal Incinerator Fuel,
W75-10764 5D

SAKAGUCHI, H.
Physiological Changes in the Serum and Hepatopancreas of Yellow Tail Injected with Carbon Tetrachloride, (In Japanese),
W75-10630 5C

SALL, D. W.
Groundwater Control by Pumping,
W75-10778 4B

SAMESHIMA, K.
Color of Pulp Industry Waste Liquors. (6). Behavior of Color During Waste Treatments (In Japanese),
W75-10393 5D

Color of Pulp Industry Waste Liquors. (7). Color Reduction by Ultraviolet Treatment (In Japanese),
W75-10394 5D

SAMUELSON, O.
Spent Liquor From Peroxide Bleaching of Groundwood Pulp From Spruce,
W75-10392 5A

SANBORN, J. R.
Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

SANCHEZ, P. A.


SANCHEZ, P. A.
Phosphorus Availability of Some Philippine Rice Soils as Affected by Soil and Water Management Practices,
W75-10421 3F

SANDERS, H. O.
Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

SANDERS, J. L.
An Event-Based Stochastic Model of Areal Rainfall and Runoff,
W75-10521 2B

SANDSTROM, G. E.
Stockholm Puts Sewage Plants Underground,
W75-10718 5D

SAUNDERS, P. E.
Waimano Stream Flood Control Project, Pearl City, Hawaii; Hydraulic Model Investigation,
W75-10663 8B

SAVAGE, K. E.
Adsorption and Degradation of Chlorbromuron in Soil,
W75-10414 5B

SAVARESE, R. E.
Analysis of a Large Water Distribution System Using Advanced Computer Software,
W75-10720 4A

SCHAFF, J. C.
Icebreaking Drillship for Offshore Exploratory Drilling in the Arctic,
W75-10639 5G

SCHENK, J. E.
Analysis of Pollution from Marine Engines - Status Report,
W75-10688 5A

SCHIEPPATI, R.
Experience with the IFP Propane Clarification Process in Re-Refining Spent Crankcase Oils,
W75-10759 5D

SCHLEUSENER, R. A.
Weather Modification for Use in the High Plains,
W75-10775 3B

SCHMIDT, R. A.
Analog Temperature Records from a Linearized Thermistor Network,
W75-10650 7B

SCHNITZER, E.
Rotary Desalination Engine and System,
W75-10733 3A

SCHOLL, W.
Investigations on the Production of Hygienic Compost from Air-Dried Sewage Using Different Additives (Versuche zur Herstellung von hygienisch einwandfreiem Kompost aus luftgetrocknetem Faulschlamm unter Verwendung verschiedener Zusaetze),
W75-10834 5D

SCHROEDER, E. D.
Activated Sludge,
W75-10371 5D

SCHWOYER, W. L.
Gravity Dewatering of Metal Hydroxide Sludges,
W75-10500 5D

SCOTT, J. D.
Lagoons Plus Spray Irrigation for Effective Bean Cannery Waste Treatment,
W75-10678 5D

SEKIZAWA, Y.
Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

SELLERS, C. M. JR
The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

SELTZER, R. J.
Ocean Pollutants Pose Potential Danger to Man,
W75-10464 5B

SHABALIN, A. F.
Instruction for Record Keeping of Water Consumption at the Enterprises of the Paper Industry (Instruktsiya ucheta raskhoda vody na predpriyatiyakh otrasli),
W75-10370 3E

SHAMPINE, W. J.
A River-Quality Assessment of the Upper White River, Indiana,
W75-10600 5B

SHAND, C. A.
The Determination of Mercury in Soils and Related Materials by Cold-Vapour Atomic Absorption Spectrometry,
W75-10485 5A

SHAPIRO, M. A.
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

SHARPE, J. H. PETER
An Analysis of the Mechanics of Guard Cell Motion,
W75-10488 2I

SHEFFIELD, C. W.
Effects of Farming - Urban Drainage on Fresh Water,
W75-10802 5G

SHELDON, A. L.
An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

SHEN, H. W.
Dispersion of Contaminated Bedload Particles,
W75-10526 5B

Research in Stochastic Models for Bedload Transport,
W75-10522 2J

SHENTON, L. R.
Comments on the Statistical Distribution of Rainfall per Period Under Various Transformations,
W75-10517 2B

SHERIDAN, R. P.
Effect of the Insecticide Zectran (Mexacarbate) on Several Algae,
W75-10425 5C

SHIGEMATSU, T.
Determination of Manganese in Natural Wat by Atomic Absortion Spectrometry with a C bon Tube Atomizer,
W75-10386

SHIMMA, H.
PCBS in the Spotted Sharks. Must Manazo, From Tokyo Bay, (In Japanese),
W75-10622

SHIMMA, Y.
PCBS in the Spotted Sharks. Must Manazo, From Tokyo Bay, (In Japanese),
W75-10622

SHIMURA, M.
Residue Analyses on 2-Amino-4 P ylthiazole, a Piscine Anesthetic, in Fishe Model Radio-Tracer Experiment with Meda
W75-10614

SHIREMAN, J. V.
Utilization of a Kraft Effluent Channel by and Aquatic Organisms,
W75-10377

SHURIN, A. T.
The Effect of Different Salinities and I ganese Ion on the Survival Respiration o Baltic Flounder (Pleuronectes Flesus Trach (Dunker)) of the Gulf of Riga,
W75-10411

SIMMONS, C. E.
Sediment Characteristics of Streams in Eastern Piedmont and Western Coastal Regions of North Carolina,
W75-10586

SIMMONS, D. G.
Analysis of a Large Water Distribution Sy Using Advanced Computer Software,
W75-10720

SIMMS, M. A.
Effect of the Insecticide Zectran (Mexaca on Several Algae,
W75-10425

SINGH, K. P.
A Two-Distribution Method for Fitting I Distributions in Hydrology,
W75-10531

SINGHAL, R. L.
Persistence of Cadmium-Induced Met Changes in Liver and Kidney,
W75-10478

SINYAK, YU. YE.
Problems of Space Biology. Volume 2 Water Supply of Spacecraft Crews,
W75-10365

SIVIOUR, N. G.
Removal of Pollutants from Water,
W75-10736

SJOBERG, L.-A.
Spent Liquor From Peroxide Bleach Groundwood Pulp From Spruce,
W75-10392

SKEA, J. C.
Toxicity of Two Synthetic Pyrethrins to Trout,
W75-10438

EES, P. M.
Comments on the Statistical Distribution of Rainfall per Period Under Various Transformations,
W75-10517 2B

EDMORE, J. F.
Toxic Effects of an Anionic Detergent on the Gills of Rainbow Trout,
W75-10434 5C

ENNER, D. J.
Disposal of Used Crankcase and Other Oils in Canada,
W75-10743 5D

OAN, C. E.
Icings Along the Trans-Alaska Pipeline Route,
W75-10592 2C

OAN, J. P.
The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437 5C

OWEY, F.
Effects of an Offshore Crude Oil Unloading Terminal on the Marine Environment,
W75-10642 5C

VKA, D. E.
Protein Content of Winter Wheat Grain as Related to Soil and Climatic Factors in the Semi-arid Central Great Plains,
W75-10792 3F

ITH, E. J.
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

ITH, J. E. JR.
Problems Encountered in Sludge Treatment and Some Advanced Solutions,
W75-10398 5E

ITH, O. D.
Analysis of Alternatives for Removal of Suspended Solids in Pulp and Paper Mill Effluents.
W75-10400 5D

LONITSYN, R. A.
Increasing the Efficiency of Flotation Saveralls (Povyshenie effektivnosti raboty flotatsionnykh ovushek),
W75-10369 5D

MMERFELD, R. A.
An Automatic Data Acquisition and Reduction System,
W75-10652 7A

A Weibull Prediction of the Tensile Strength-Volume Relationship of Snow,
W75-10651 2C

PHER, C. D.
Relationships Between Drouth and Corn Yields in Selected South Atlantic Coastal Plain Soils,
W75-10721 3F

RIO, A.
Determination of Cadmium, Copper, and Lead in Natural Waters After Anion-Exchange Separation,
W75-10385 5A

ARLING, J. H.
Measurement of Hydraulic Conductivity of Peats,
W75-10536 7B

SPERLING, K. R.
Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

SPRAGUE, J. B.
Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

STACHE, H.
Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

STANEK, J.
Use of Organic Flocculants for Textile Plant Water Treatment (Pouziti organickych flokulantu k cireni vody pro technologii textilni vyroby),
W75-10383 5F

STAPLETON, H. N.
Some Effects of Field Weathering of Seed Cotton in a Desert Environment,
W75-10557 3F

STEIN, R. M.
Analysis of Alternatives for Removal of Suspended Solids in Pulp and Paper Mill Effluents,
W75-10400 5D

STEINNES, E.
Determination of Nickel in Rocks After Epithermal Neutron Activation,
W75-10493 2K

STENNER, R. D.
Absorption of Cadmium, Copper and Zinc by Dog Whelks in the Bristol Channel,
W75-10481 5B

STEWART, K. W.
The Drift of Mayflies (Ephemeroptera) in the Brazos River, Texas,
W75-10558 5B

STOKES, R. M.
Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

STOLZY, L. H.
Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

STONER, J. H.
Average Trace Element Composition of Low Level Marine Atmospheric Particulates,
W75-10477 5B

STOUT, D. W.
Closed Recycling System for Water Purification and Waste Reduction,
W75-10735 5D

STRASDINE, G.
Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

STRAUCH, D.
Investigations on the Production of Hygienic Compost from Air-Dried Sewage Using Different Additives (Versuche zur Herstellung von hygienisch einwandfreiem Kompost aus luftgetrocknetem Faulschlamm unter Verwendung verschiedener Zusaetze),
W75-10834 5D

STREEBIN, L.
Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

STREET, D. R.
The Economic Impact of Mercury Pollution on Fisheries and Other Related Businesses Around Pickwick Lake,
W75-10356 5G

Industrial Interdependencies and External Diseconomies of Water Resources,
W75-10358 6B

Principles and standards for Water Planning,
W75-10355 6B

STRIGNER, P. L.
Disposal of Used Crankcase and Other Oils in Canada,
W75-10743 5D

STUBERGH, J. R.
Atomic Absorption Spectrometric Determination of Cadmium, Lead, Silver, Thallium and Zinc in Silicate Rocks by Direct Atomization From the Solid State,
W75-10492 2K

SUMIMOTO, M.
Color of Pulp Industry Waste Liquors. (6). Behavior of Color During Waste Treatments (In Japanese),
W75-10393 5D

Color of Pulp Industry Waste Liquors. (7). Color Reduction by Ultraviolet Treatment (In Japanese),
W75-10394 5D

SUN, L. T.
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

SURPRENANT, N.
Waste Automotive Lubricating Oil as a Municipal Incinerator Fuel,
W75-10764 5D

SUTHERLAND, D. J. B.
Persistence of Cadmium-Induced Metabolic Changes in Liver and Kidney,
W75-10478 5A

SUZUKI, A.
Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

SUZUKI, T.
Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese),
W75-10441 5C

SYKORA, J. L.
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

SYLVESTER, J. R.
Critical Thermal Maxima of Three Species of Hawaiian Estuarine Fish: A Comparative Study,
W75-10426 5C

SYMONS, J. M.
Treatment Processes for Coping with Variation in Raw-Water Quality,
W75-10705 5F

SYNAK, M.
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

SYNDER, C. D.
Disposal of Liquid Effluent by Land Irrigation at Lagro Celotex Plant,
W75-10679 5D

TABATA, N.
Treatment of Service Water with Ozone,
W75-10840 5D

TABLER, R. D.
Estimating the Transport and Evaporation of Blowing Snow,
W75-10695 2C

New Engineering Criteria for Snow Fence Systems,
W75-10692 2C

New Snow Fence Design Controls Drifts, Improves Visibility, Reduces Road Ice,
W75-10693 2C

TABOR, C. C.
Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

TAGATZ, M. E.
A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

TAKEUCHI, K.
Necessary Adaptations for Significant Utilization of the Information System,
W75-10816 6A

TAKEUCHI, T.
Spectroscopic Determination of Atomization Efficiency (CuCl-Cu+Cl) in an Air-Hydrogen Flame,
W75-10498 2K

TALBOT, C.
Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

TANASIJEVIC, D. M.
Pedologic Cover of the Watershed of the Porecka River,
W75-10551 2A

TAPPEL, A. L.
Effect of Dietary Selenium on Glutathione Peroxidase in the Chick,
W75-10495 5A

TASKER, G. D.
A Comparison of Methods for Estimating Flood Peaks on Streams in Massachusetts,
W75-10587 4A

TATSUMOTO, M.
Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W75-10494 2K

TEDROW, J. C. F.
Soils of the High Arctic Landscapes,
W75-10458 2C

TEER, E. H.
Heavy Metals Removal from Wood Preserving Wastewater,
W75-10675 5D

TEHAN, J. E.
Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

TEL, D. A.
Phosphorus in Percolates from Manured Lysimeters,
W75-10573 5B

THAKER, I. H.
Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

THARPE, E. J.
Low-Flow Characteristics of Mississippi Streams,
W75-10605 2E

Water for Industrial Development in Alcorn, Itawamba, Prentiss, and Tishomingo Counties, Mississippi,
W75-10581 3E

THOMAS, R. B.
A Model of Statistical Errors in Estimating Streamflow from Continuous-Stage Records,
W75-10512 2E

THOMAS, R. W. L.
Error Analysis of Dobson Spectrophotometer Measurements of the Total Atmospheric Ozone Content,
W75-10545 7B

THOMASSEN, Y.
Atomic Absorption Spectrometric Determination of Cadmium, Lead, Silver, Thallium and Zinc in Silicate Rocks by Direct Atomization From the Solid State,
W75-10492 2K

Atomic-Absorption Spectrometric Determination of Copper, Lead, Cadmium and Manganese in Pulp and Paper by the Direct-Atomization Technique,
W75-10489 5A

THOMPSON, J. A. J.
The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437 5C

TIETENBERG, T. H.
Derived Decision Rules for Pollution Control in a General Equilibrium Space Economy,
W75-10360 6C

TODOROVIC, P.
Stochastic Model of Daily Rainfall,
W75-10520 2B

A Stochastic Model of Sediment Yield for Ephemeral Streams,
W75-10524 2J

TOFFLEMIRE, T. J.
Waste Water Treatment. Land Disposal
Waste Water,
W75-10373

TOREN, R. L.
Art of Agricultural Drainage Design and Cost
W75-10797

TOVELL, P. W. A.
Absorption, Metabolism, and Excretion
Goldfish of the Anionic Detergent Sodium L
ryl Sulphate,
W75-10626

Effect of Water Hardness on the Toxicity c
Nonionic Detergent to Fish,
W75-10444

TUSSEY, R. C. JR.
Analysis of Reservoir Recreation Benefits,
W75-10826

TUSSING, A. R.
Processes and Costs Imposed by Environm
tal Stress,
W75-10461

TWOMEY, D. W.
The Source and Supply of Virgin Lubes,
W75-10741

UHRMACHER, J. C.
Waste Oil--Solution to Maryland's Energy
sis,
W75-10762

UMEMURA, K.
Residue Analyses on 2-Amino-4 P
ylthiazole, a Piscine Anesthetic, in Fishes
Model Radio-Tracer Experiment with Meda
W75-10614

URE, A. M.
The Determination of Mercury in Soils and
lated Materials by Cold-Vapour Atomic
sorption Spectrometry,
W75-10485

UZUNER, M. S.
Hydraulics and Mechanics of River Ice Jam
W75-10556

VALENTINE, B. W.
Water and Wastewater Facilities for Fl
Housing Developments,
W75-10717

VAN BAALEN, C.
The Effects of a No. 2 Fuel Oil and Two C
Oils on the Growth and Photosynthes
Microalgae,
W75-10436

VAN HUISEN, A. T.
Geothermal Channel and Harbor Ice Co
System,
W75-10734

VAN SCHILFGAARDE, J.
Irrigation Management for Salt Control,
W75-10800

VAN SOEST, R.
Wisconsin Tissue Mills One Year After S
of the Effluent Plant,
W75-10378

VAN VOORHIS, P. W.
Characteristics of Oil Pollution in and A
U.S. Waters,
W75-10754

ARMA, M. M.
Population Dynamics of Protozoa in Wastewater, and Impact of Environmental Changes,
W75-10689 5D

TTETOE, G. C.
Effects of Surface Drainage on Stream Flow,
W75-10794 4A

VIANI, R.
Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

QUANG, D.
Experience with the IFP Propane Clarification Process in Re-Refining Spent Crankcase Oils,
W75-10759 5D

ADE, J. C.
Developing Regional Stochastic Data Bases,
W75-10528 2E

AGGONER, J. P.
DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

AGNER, R. N.
Laboratory Measurement of Surface Temperature Fluctuations Induced by Small Amplitude Surface Waves,
W75-10505 2L

ALCOTT, F. R.
Water Collection and Storage Dispersion Apparatus,
W75-10727 4A

ALDEN, C. C.
Effect of Temperature and Sludge Loading on 5-Day BOD Removal and Sludge Settleability in Activated Sludge Systems Treating Bleached Kraft Effluents,
W75-10379 5D

ALLACE, J. R.
Statistical Tolerance Limits for a Pearson Type III Distribution,
W75-10511 2E

Toxic Trace Elements: Preferential Concentration in Respirable Particles,
W75-10482 5A

ALLER, R.
Oily Bilge from Commercial Vessels,
W75-10752 5B

ALSH, D. F.
Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

ALTHER, H.-J.
Studies on Possibilities of Biochemical Purification of Evaporator Condensate Occurring During Sulfite Pulp Manufacture (Untersuchungen ueber die Moeglichkeit der biochemischen Reinigung des bei der Sulfitzellstoffherstellung anfallenden Eindampfkondensates),
W75-10382 5D

ANG, G. S.
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

WARD, C. H.
Biological Bases for Water Quality Standards,
W75-10677 5G

WARD, D. M.
Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

WARD, G. M.
The Perimeter Canal - A New Approach to Discharge Urban Water into a Coastal Mangrove Area,
W75-10773 4A

WARREN, G. F.
Water-Soil-Plant Interactions with Terbacil,
W75-10486 5C

WASSON, B. E.
Water for Industrial Development in Alcorn, Itawamba, Prentiss, and Tishomingo Counties, Mississippi,
W75-10581 3E

WATANABE, T.
The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

WATTS, E. G.
Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

WEBBER, L. R.
Phosphorus in Percolates from Manured Lysimeters,
W75-10573 5B

WEBER, J. H.
Organic Matter in Natural Water and Water Treatment,
W75-10351 5B

WECHSLER, R.
Domestic Waste Water Reuse--Aspects of the Treatment System,
W75-10708 5D

WEIDENSAUL, T. C.
Importance of Plants in Oxygen Production, Carbon Dioxide Consumption and Air Purification,
W75-10715 2I

WEINBERGER, L. W.
Oil Reuse--A National Need,
W75-10740 5D

WEINER, J.
Toxicity of Pulping Wastes to Fish,
W75-10403 5C

WEINSTEIN, N. J.
The Economics of Re-Refining,
W75-10757 5G

WEISS, A. D.
Developing Regional Stochastic Data Bases,
W75-10528 2E

WELCH, N. H.
Sediment-Yield Characteristics from Unit Source Watersheds,
W75-10848 2J

WELLS, J. V. B.
Report on the River Master of the Delaware River for the Period December 1, 1973-November 30, 1974,
W75-10589 4A

WELLS, W. N.
Rate of Phosphorus Uptake by Activated Sludge,
W75-10839 5D

WEST, S. W.
Summary Appraisals of the Nation's Ground-Water Resources--Rio Grande Region,
W75-10597 4B

WESTERHHAGEN, H.
Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

WESTLIN, P. R.
Environmental Problems Associated with the Use of Cooling Towers,
W75-10671 5D

WETHERILL, G. W.
Lead Metabolism in the Normal Human: Stable Isotope Studies,
W75-10484 5A

WETZLER, T. F.
Listeria in Aquatic Animals,
W75-10375 2I

WHALIN, R. W.
Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

WHITE, L. J.
The Laws and Their Enforcement; Progress Amidst Problems,
W75-10607 5G

WHITE, R. K.
Sludge Disposal on Agricultural Soil,
W75-10674 5D

WHITLOCK, C. H.
Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552 2L

WICHARD, W.
X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

WIERSMA, D.
Operational Value of Weather Information in Relation to Soil Management Characteristics,
W75-10367 2G

WIGEN, S. O.
Some Features of Tsunamis on the Pacific Coast of South and North America,
W75-10554 2L

WILCOX, R.
A Program for Handling Emergency Oil Spillages in the Port of Baltimore,
W75-10755 5G

WILLIAMS, B. R.
Quality Products from Used Petroleum Oils,
W75-10756 5D

WILLIAMS, J. O.

WILLIAMS, J. O.
Impacts of Rural to Urban Water Use,
W75-10772 6D

WILLIAMS, K.
The Snowy Torrents: Avalanche Accidents in the United States 1967-71,
W75-10657 2C

WILSON, D. F.
Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

WILSON, J. R.
Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

WINTER, H.
Principles of Establishing Sewer Systems in the Rural Settlements of Magdeburg County (Grundlagen fuer die Abwasser-Technische Erschliessung von Landgemeinden im Bezirk Magdeburg),
W75-10833 5D

WINTERS, K.
The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

WISER, E. H.
A Precipitation Data Simulator Using a Second Order Autoregressive Scheme,
W75-10513 2B

WITHEROW, J. L.
Analysis of Wastewater Treatment Systems for a Meat Processing Plant,
W75-10687 5D

WITHERSPOON, P. A.
Seepage from Recharge and Landfill Ditches,
W75-10770 5B

WOOLHISER, D.
Stochastic Model of Daily Rainfall,
W75-10520 2B

WOOLHISER, D. A.
A Stochastic Model of Sediment Yield for Ephemeral Streams,
W75-10524 2J

YAKOWITZ, S. L.
Statistical Inference on Streamflow Processes with Markovian Characteristics,
W75-10525 2E

YANAGISAWA, M.
Spectroscopic Determination of Atomization Efficiency (CuCl-Cu+Cl) in an Air-Hydrogen Flame,
W75-10498 2K

YARBROUGH, M. M.
Industrial Interdependencies and External Diseconomies of Water Resources,
W75-10358 6B

YATES, R.
The Lower Colorado River: A Bibliography,
W75-10453 10C

YOUNG, T. W.
Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

ZAGRODZKI, S.
Automatic Device for the Operational Control of the Filtration Rate of Suspensions(Automatische Vorrichtung zur Technischen Kontrolle der Filtrationsgeschwindigkeit von Suspensionen),
W75-10830 5D

ZDRAZILEK, J.
Sensitivity of Human Diploid Embryonic Lung Cells from Isolation of Echo Viruses from Sewage,
W75-10836 5C

ZEEMAN, M. G.
DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

ZEMANSKY, G. M.
Removal of Trace Metals During Conventional Water Treatment,
W75-10501 5F

ZENONE, C.
Icings Along the Trans-Alaska Pipeline Route,
W75-10592 2C

ZITKO, V.
Thallium: Occurrence in the Environment and Toxicity to Fish,
W75-10449 5C

# ORGANIZATIONAL INDEX


**ACADEMIA SINICA, TAIPEI (TAIWAN). INST. OF ZOOLOGY.**
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

**AGRICULTURAL RESEARCH AND EDUCATIONAL CENTER, LAKE ALFRED, FLA.**
Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

**AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD. HYDROGRAPH LAB.**
Cross Spectra of Short-Duration Rainfall,
W75-10514 2B

**AGRICULTURAL RESEARCH SERVICE, CHICKASHA, OKLA.**
General Aspects of Multivariate Analysis with Applications to Some Problems in Hydrology,
W75-10510 2A

Stochastic Generation of the Occurrence, Pattern, and Location of Maximum Amount of Daily Rainfall,
W75-10516 2B

ACTMO, An Agricultural Chemical Transport Model,
W75-10846 5B

Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

Sediment-Yield Characteristics from Unit Source Watersheds,
W75-10848 2J

**AGRICULTURAL RESEARCH SERVICE, FORT COLLINS, COLO.**
A Stochastic Model of Sediment Yield for Ephemeral Streams,
W75-10524 2J

Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

**AGRICULTURAL RESEARCH SERVICE, MANDAN, N. DAK. NORTHERN GREAT PLAINS RESEARCH CENTER.**
Drainage Analysis of a Confining Formation,
W75-10780 4A

**AGRICULTURAL RESEARCH SERVICE, PHOENIX, ARIZ. WATER CONSERVATION LAB.**
Trickle Irrigation Design Requirements for Row Crops,
W75-10801 3F

**AGRICULTURAL RESEARCH SERVICE, RIVERSIDE, CALIF. SALINITY LAB.**
Irrigation Management for Salt Control,
W75-10800 3C

**AGRICULTURAL RESEARCH SERVICE, STONEVILLE, MISS. SOUTH WEED SCIENCE LAB.**
Adsorption and Degradation of Chlorbromuron in Soil,
W75-10414 5B

Prediction of Trifluralin Diffusion Coefficients,
W75-10542 5B

**AGRICULTURAL RESEARCH SERVICE, TUCSON, ARIZ. SOUTHWEST WATERSHED RESEARCH CENTER.**
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

**AGRICULTURAL RESEARCH SERVICE, WASHINGTON, D.C.**
Proceedings Symposium on Statistical Hydrology.
W75-10507 2A

**AICHI PREFECTURE FISHERIES EXPERIMENTAL STATION, MIYA (JAPAN).**
Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese),
W75-10441 5C

**AIRCO, INC., MONTVALE, N.J. (ASSIGNEE)**
Multiple Cycle Process for Wastewater Purification,
W75-10738 5D

**ALASKA UNIV., COLLEGE. INST. OF SOCIAL, ECONOMIC, AND GOVERNMENT RESEARCH.**
Processes and Costs Imposed by Environmental Stress,
W75-10461 2C

**ALBERTA UNIV., EDMONTON. DEPT. OF CIVIL ENGINEERING.**
Large Scale Laboratory Direct Shear Tests on Ice,
W75-10502 2C

**ALL-UNION RESEARCH INST. OF SEA FISHERIES AND OCEANOGRAPHY, MOSCOW (USSR).**
The Effect of Different Salinities and Manganese Ion on the Survival Respiration of the Baltic Flounder (Pleuronectes Flesus Trachurus (Dunker)) of the Gulf of Riga,
W75-10411 5C

**ALYESKA PIPELINE SERVICE CO., BELLEVUE, WASH.**
800 Miles to Go,
W75-10638 5C

**AMERICAN BIOCULTURE, INC., PHOENIX, ARIZ. RESEARCH LAB.**
Effect of a Phytoplankton Culture on the Germination and Seedling Development of Barley, Sugar Beets and Lettuce,
W75-10496 3F

**AMERICAN PETROLEUM INST., NEW YORK. TASK FORCE ON UTILIZATION OF WASTE LUBRICATING OILS.**
Waste Lubricating Oil Characteristics--Do They Vary Geographically, Seasonally, and With Origin,
W75-10746 5B

**AMERICAN SOCIETY OF CIVIL ENGINEERS, NEW YORK.**
Agricultural and Urban Considerations in Irrigation and Drainage.
W75-10769 4A

**ARCTIC INST. OF NORTH AMERICA, MONTREAL (QUEBEC).**
Review of Development of Arctic Resources,
W75-10462 2C

**ARIZONA STATE UNIV., TEMPE. DEPT. OF GEOLOGY.**
Geomorphic Processes in Polar Deserts,
W75-10456 2C

**ARIZONA UNIV., TUCSON.**
Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

**ARIZONA UNIV., TUCSON. DEPT. OF AGRONOMY AND PLANT GENETICS.**
Some Effects of Field Weathering of Seed Cotton in a Desert Environment,
W75-10557 3F

**ARIZONA UNIV., TUCSON. DEPT. OF MATHEMATICS.**
Statistical Inference on Streamflow Processes with Markovian Characteristics,
W75-10525 2E

**ARIZONA UNIV., TUCSON. DEPT. OF WATERSHED MANAGEMENT.**
An Event-Based Stochastic Model of Areal Rainfall and Runoff,
W75-10521 2B

**ARIZONA WESTERN COLL., YUMA.**
The Lower Colorado River: A Bibliography,
W75-10453 10C

**ARKHANGELSK KOMBINAT (USSR).**
Reduction of Effluent Pollution at the Arkhangel'sk Mills (Snizhenie zagryaznennosti stochnykh vod na Arkhangel'-skom Kombinate),
W75-10368 5D

**ARMY ENGINEER DISTRICT, BALTIMORE.**
Flood Plain Information: Mill Run, Blair County, Pennsylvania.
W75-10568 4A

**ARMY ENGINEER DISTRICT, BALTIMORE, MD.**
Flood Plain Information: Bloomsburg, Columbia County, Pennsylvania-Susquehanna River.
W75-10561 4A

Flood Plain Information Report: Seneca Creek, Montgomery County, Maryland.
W75-10567 4A

Flood Plain Information: West Branch Susquehanna River, Lycoming County, Pennsylvania.
W75-10576 4A

**ARMY ENGINEER DISTRICT, CHICAGO, ILL.**
Flood Plain Information: Macon County, Illinois.
W75-10565 4A

**ARMY ENGINEER DISTRICT, DETROIT, MICH.**
Flood Plain Information: Upper River Rouge, Minnow Pond Drain, Bell Branch and Tarabusi Creek, Wayne and Oakland Counties, Michigan.
W75-10575 4A

**ARMY ENGINEER DISTRICT, KANSAS CITY, MO.**
Harry S. Truman Dam and Reservoir, Osage River, Missouri, Apendix A (Final Environmental Impact Statement).
W75-10363 8A

Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

ARMY ENGINEER DISTRICT, MOBILE, ALA.

ARMY ENGINEER DISTRICT, MOBILE, ALA.
Special Flood Hazard Information Report: Chickasawhay River, Waynesboro, Wayne County, Mississippi.
W75-10569 4A

Flood Plain Information: Catoma Creek, Vicinity of Montgomery, Alabama.
W75-10574 4A

ARMY ENGINEER DISTRICT, NORFOLK, VA.
Flood Plain Information: Meadow Creek, Albemarle County and Charlottesville, Virginia.
W75-10564 4A

Flood Plain Information: Falling Creek, Chesterfield County, Virginia.
W75-10577 4A

Flood Plain Information: James River, Eagle Rock to Lick Run, Botetourt County, Virginia.
W75-10578 4A

Flood Plain Information: Johnson Creek and Tributary, Chesterfield County, Virginia.
W75-10579 4A

ARMY ENGINEER DISTRICT, OMAHA, NEB.
Flood Plain Information: Brookings, Brookings County, South Dakota, Volume I - Deer Creek.
W75-10570 4A

ARMY ENGINEER DISTRICT, OMAHA, NEBR.
Flood Plain Information: Goldsmith Gulch, Dutch Creek, Lilley Gulch, and Coon Creek, Volume VI, Denver Metropolitan Region, Colorado.
W75-10563 4A

ARMY ENGINEER DISTRICT, PHILADELPHIA, PA.
Flood Plain Information: Bushkill Creek, Vicinity of Easton, Pennsylvania.
W75-10560 4A

Flood Plain Information: Brandywine Creek, Chester County, Pennsylvania.
W75-10562 4A

Flood Plain Information: White Clay Creek, New Castle County, Delaware.
W75-10571 4A

Flood Plain Information: Shabakunk Creek, West Branch Shabakunk and Little Shabakunk Creeks, Mercer County, New Jersey.
W75-10572 4A

ARMY ENGINEER DISTRICT, VICKSBURG, MISS.
Flood Plain Information: Ouachita River, Hot Springs Creek, Stokes Creek, Molly Creek, Gulpha Creek, City of Hot Springs, Arkansas.
W75-10559 4A

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, LIVERMORE, CALIF. EXPLOSIVE EXCAVATION RESEARCH LAB.
Project Lost Creek: Field Tests of Mounding and Controlled Blasting,
W75-10553 8H

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, LIVERMORE, CALIF. EXPLOSIVE EXCAVATIONS RESEARCH LAB.
Results of Airblast Overpressure Measurement Program at Project R.D. Bailey,
W75-10555 8H

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
A Numerical Model for Predicting the Effects of Landslide-Generated Water Waves,
W75-10661 8A

Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

Waimano Stream Flood Control Project, Pearl City, Hawaii; Hydraulic Model Investigation,
W75-10663 8B

Los Angeles and Long Beach Harbors Model Study; Report 2, Observations of Ship Mooring and Movement,
W75-10664 8B

Spillway for Burnsville Dam, Little Kanawha River, West Virginia; Hydraulic Model Investigation,
W75-10665 8B

Turbulent Flow in Rectangular Outlet Conduit, Rend Lake Dam, Big Muddy River, Illinois,
W75-10666 8B

Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667 8B

Flood Control Project on Lytle and Warm Creeks and Santa Ana River, California; Hydraulic Model Investigation,
W75-10668 8B

Evaluation of Disposal Areas in James River; Hydraulic Model Investigation,
W75-10669 8B

Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

ASSOCIATION OF PETROLEUM RE-REFINERS, WASHINGTON, D.C.
Proceedings of the International Conference on Waste Oil Recovery and Reuse.
W75-10739 5D

ASTON UNIV., BIRMINGHAM (ENGLAND). DEPT. OF BIOLOGICAL SCIENCES.
Toxic Effects of an Anionic Detergent on the Gills of Rainbow Trout,
W75-10434 5C

AUBURN UNIV., ALA. DEPT. OF FISHERIES AND ALLIED AQUACULTURES.
Essentiality of Vitamin C in Feeds for Intensively Fed Caged Channel Catfish,
W75-10362 8I

AUBURN UNIV., ALABAMA. DEPT. OF ECONOMICS.
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

Principles and standards for Water Planning,
W75-10355 6B

The Economic Impact of Mercury Pollution on Fisheries and Other Related Businesses Around Pickwick Lake,
W75-10356 5G

International Production Aspects of Water and Environmental Quality Control,
W75-10357 5G

Industrial Interdependencies and External Di economies of Water Resources.
W75-10358 6

AUSTRALIAN INST. OF MARINE SCIENCES, TOWNSVILLE.
The Concentration of Mercury, Coppe Nickel, Silver, Cadmium and Lead in th Northern Adriatic Anchovy, Engraulis E crasicholus, and Sardine, Sardina Pilchardus,
W75-10620

B.C. RESEARCH LTD., VANCOUVER.
Effect of Temperature and Sludge Loading 5-Day BOD Removal and Sludge Settleabili in Activated Sludge Systems Treating Bleach Kraft Effluents,
W75-10379

B.C. RESEARCH LTD., VANCOUVER. DIV. O APPLIED BIOLOGY.
Swimming Performance of Juvenile Coho S mon (Oncorhynchus Kisutch) Exposed Bleached Kraft Pulp Mill Effluent,
W75-10387

Effects of Acute Exposure to Bleached Kr Pulp Mill Effluent on Carbohydrate Metab ism of Juvenile Coho Salmon (Oncorhynch Kisutch) During Rest and Exercise.
W75-10388

Rotating Biological Disk Treatment of Kr Mill Effluents,
W75-10390

BALLISTIC MISSILE DEFENSE SYSTEMS COMMAND FIELD OFFICE, MADISON, N.J.
The Influence Surface Method for Floating Plates,
W75-10504

BIOLOGISCHE ANSTALT HEIGOLAND (WE GERMANY).
Combined Effects of Cadmium and Salinity Development and Survival of Herring Eggs,
W75-10704

BOEING COMPUTER SERVICES, INC., SEATTLE, WASH. MATHEMATICALS AND MODELING UNIT.
Computer Simulation of Water Distribu Networks,
W75-10823

BOLOGNA UNIV. (ITALY). ISTITUTO DI BIOCHIMICA.
Residues of Polychlorinated Biphenyls (P and Chlorinated Pesticides in Fish and Birc the Po Delta, (Residus de Polychlorobiphe (PCB) et de Pesticides Chlores Dans Les I sons et Les Oiseaux du Delta du Po),
W75-10446

BRISTOL UNIV. (ENGLAND). SCHOOL OF CHEMISTRY.
Absorption of Cadmium, Copper and Zin Dog Whelks in the Bristol Channel,
W75-10481

BRITISH COLUMBIA UNIV., VANCOUVER DEPT. OF CIVIL ENGINEERING.
Nonlinear Channel Routing by Computer,
W75-10543

BRITISH COLUMBIA UNIV., VANCOUVER DEPT. OF FORESTRY.
Aspects of the Winter Ecology of Juv Coho Salmon (Oncorhynchus Kisutch) Steelhead Trout (Salmo Gairdneri),
W75-10615

ITISH COLUMBIA UNIV., VANCOUVER.
EPT. OF GEOLOGICAL SCIENCES.
Snow Creep: Its Engineering Problems and Some Techniques and Results of Its Investigation,
W75-10503 2C

Glacier-Flow Patterns and the Origin of Late Wisconsinan Till in the Southern Rocky Mountain Trench, British Columbia,
W75-10539 2C

NDESFORSCHUNGSANSTALT FUER SCHEREI, HAMBURG (WEST GERMANY).
STITUT FUER KUESTEN- UND BINNEN-SCHEREI.
Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

NDESFORSCHUNGSANSTALT FUER SCHEREI, HAMBURG (WEST GERMANY).
OTOPENLABORATORIUM.
Determination of the Transition Metals Manganese, Iron, Cobalt, Copper and Zinc in River Fishes With Help of X-Ray Fluorescence Analysis and Flameless Atomic Absorption Spectroscopy, (Bestimmung der Ubergangsmetalle Mangan, Eisen, Kobalt, Kupfer und zink in Flussfischen mit Hilfe der Rontgenfluores-zenzanalyse und der flammenlosen Atomabsorption),
W75-10408 5A

On the Accumulation of Organochlorine Pesticides, PCB and Certain Heavy Metals in Fish and Shellfish from Thai Coastal and Inland Waters,
W75-10616 5B

UREAU OF RECLAMATION, AURORA, OLO.
Change in Quality of Pumped Drainage Effluent,
W75-10779 5B

UREAU OF RECLAMATION, DENVER, OLO.
Current Water Systems Automation Research and Development in the Bureau of Reclamation,
W75-10787 8C

UREAU OF SPORT FISHERIES AND ILDLIFE, COLUMBIA, MO. FISH-PESTICIDE ESEARCH LAB.
Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

UREAU OF SPORT FISHERIES AND ILDLIFE, LA CROSSE, WIS. FISH CONTROL AB.
Toxicity of Paired Mixtures of Candidate Forest Insecticides to Rainbow Trout,
W75-10439 5C

Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

BUREAU OF SPORT FISHERIES AND WILDLIFE, LACROSSE, WIS. FISH CONTROL LAB.
Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

BUREAU OF SPORT FISHERIES AND WILDLIFE, LAUREL MD. PATUXENT WILDLIFE RESEARCH CENTER.
Effects of Methylmercury on Approach and Avoidance Behavior of Mallard Ducklings,
W75-10424 5C

BUREAU OF SPORT FISHERIES AND WILDLIFE, WARM SPRINGS, GA. SOUTHEASTERN FISH CONTROL LAB.
Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to Selected Aquatic Invertebrates and Frog Larvae,
W75-10703 5C

CALGARY UNIV., ALBERTA. DEPT. OF GEOGRAPHY.
Some Aspects of Climatology in Polar Barrens,
W75-10454 2C

CALIFORNIA POLYTECHNIC STATE UNIV., SAN LUIS OBISPO. DEPT. OF AGRICULTURAL ENGINEERING.
Float Valve Provides Variable Flow Rates at Low Pressures,
W75-10789 8C

CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO.
Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

CALIFORNIA STATE UNIV., HUMBOLDT, ARCATA. SCHOOL OF NATURAL RESOURCES.
Listeria in Aquatic Animals,
W75-10375 2I

CALIFORNIA STATE UNIV., NORTHRIDGE. DEPT. OF BIOLOGY.
The Effect of Crude Oil Fractions on the Survival of a Tidepool Copepod, Tigriopus Californicus,
W75-10641 5C

CALIFORNIA UNIV., BERKELEY.
Water Rates: An Assessment of Current Issues,
W75-10707 6C

CALIFORNIA UNIV., BERKELEY. DEPT. OF GEOLOGICAL ENGINEERING.
Seepage from Recharge and Landfill Ditches,
W75-10770 5B

CALIFORNIA UNIV., BERKELEY. SANITARY ENGINEERING RESEARCH LAB.
Suppression of Nitrogen Fixation by Blue-Green Alage in a Eutrophic Lake with Trace Additions of Copper,
W75-10480 5C

CALIFORNIA UNIV., DAVIS.
Activated Sludge,
W75-10371 5D

CALIFORNIA UNIV., DAVIS. DEPT. OF AGRONOMY AND RANGE SCIENCE.
Characterization of Cadmium Uptake by Plant Tissue,
W75-10479 5B

CALIFORNIA UNIV., DAVIS. DEPT. OF FOOD SCIENCE AND TECHNOLOGY.
Effect of Dietary Selenium on Glutathione Peroxidase in the Chick,
W75-10495 5A

CALIFORNIA UNIV., DAVIS. HYDRAULICS LAB.
Some Factors Affecting Control of Flow in a Large Canal System,
W75-10786 8B

CALIFORNIA UNIV., LOS ANGELES. COLL. OF ENGINEERING.
Problems of Water Quality Management in Western River Basin Systems,
W75-10804 5G

CALIFORNIA UNIV., LOS ANGELES. INST. OF GEOPHYSICS AND PLANETARY PHYSICS.
Lead Metabolism in the Normal Human: Stable Isotope Studies,
W75-10484 5A

CALIFORNIA UNIV., RIVERSIDE.
Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

Social Indicators and Connectives,
W75-10812 6A

Qualitative Sign Matrix Manipulation,
W75-10815 6A

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF ENTOMOLOGY.
Biological Activity of Organophosphorus Compounds and Synthetic Pyrethroids Against Immature Mosquitoes,
W75-10631 5G

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF PHILOSOPHY.
Comments on the Straw Man,
W75-10808 6B

CALIFORNIA UNIV., RIVERSIDE. PROGRAM IN ENVIRONMENTAL ECONOMICS.
Panel Review of the Taxonomic Structure of the Straw Man.
W75-10806 6B

Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States.
W75-10810 6A

CALIFORNIA UNIV., RIVERSIDE. TECHNICAL COMMITTEE OF THE WATER RESOURCES CENTERS OF THE THIRTEEN WESTERN STATES.
Panel Evaluation of the Logical Structure, Consistency, and Underlying Assumptions of the 'Strawman' Methodology.
W75-10807 6B

CALIFORNIA UNIV., SANTA BARBARA.
Political Participation and Water Rates. A Closer Look,
W75-10361 6C

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
Influence of a Thermal Effluent on Movement of Brown Bullhead (Ictalurus Nebulosus) as Determined by Ultrasonic Tracking,
W75-10628 5C

CELOTEX CORP., LAGRO, IND.
Disposal of Liquid Effluent by Land Irrigation at Lagro Celotex Plant,
W75-10679 5D

CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT, WEST PALM BEACH.
A Stochastic Model for Daily Rainfall Data Synthesis,
W75-10518 2B

CENTRAL NEBRASKA PUBLIC POWER AND IRRIGATION DISTRICT, HOLDREGE.
Groundwater Control by Pumping,
W75-10778 4B

CENTROS DE ESTUDIOS, INVESTIGACIONES Y APLICACIONES DEL AGUA, GRANADA (SPAIN).
New Legislative Tendencies for Control of Water Pollution (Nuevas tendencias legislativas en el control de la contaminacion de las aguas),
W75-10384 5G

CH2M/HILL, PORTLAND, OREG.
Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

CHALMERS UNIV. OF TECHNOLOGY, GOTEBORG (SWEDEN). DEPT. OF CHEMICAL ENGINEERING.
Spent Liquor From Peroxide Bleaching of Groundwood Pulp From Spruce,
W75-10392 5A

CLARK UNIV., WORCESTER, MASS.
Water Supply from Renovated Wastewater--A Resource Manual for Massachusetts Planners, Public Officials and Citizen Groups.
W75-10722 5D

CLARK UNIV., WORCESTER, MASS. GRADUATE SCHOOL OF GEOGRAPHY.
On the Peak-Load Pricing of Urban Water Supply,
W75-10706 6C

CLEMSON UNIV., S.C. DEPT. OF ENVIRONMENTAL SYSTEMS ENGINEERING.
Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

COAST GUARD, WASHINGTON, D.C.
Characteristics of Oil Pollution in and Around U.S. Waters,
W75-10754 5B

COAST GUARD, WASHINGTON, D.C. OFFICE OF MARINE ENVIRONMENT AND SYSTEMS.
USCG Sets Broader Use of Pollution Control Systems,
W75-10466 5G

COLORADO STATE UNIV., FORT COLLINS.
Role of the Public in Weather Modification,
W75-10777 3B

Towards a Sharper Concept of an Action Variable,
W75-10813 6A

Necessary Adaptations for Significant Utilization of the Information System,
W75-10816 6A

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF ATMOSPHERIC SCIENCE.
Priority Problems for Modifying Cumulus Precipitation,
W75-10774 3B

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.
Stochastic Model of Daily Rainfall,
W75-10520 2B

Research in Stochastic Models for Bedload Transport,
W75-10522 2J

Dispersion of Contaminated Bedload Particles,
W75-10526 5B

COLORADO UNIV., BOULDER. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Vacuum Filtration Cost Optimization,
W75-10681 5D

COLORADO UNIV., BOULDER. DEPT. OF GEOGRAPHY; AND COLORADO UNIV., BOULDER. INST. OF ARCTIC AND ALPINE RESEARCH.
A Climatological Analysis of North Polar Desert Areas,
W75-10455 2C

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, GRIFFITH (AUSTRALIA). DIV. OF IRRIGATION RESEARCH.
Predicting the Concentration of Aquatic Herbicide Residues in Waterways,
W75-10648 5B

CONNECTICUT UNIV., NOANK. MARINE RESEARCH LAB.
The Effect of Prolonged Exposure to Elevated Temperatures on the Biochemical Constituents, Gonadal Development and Shell Deposition of the American Oyster, Crassostrea Virginica,
W75-10849 5C

CONSERVATION SERVICE, TEMPLE, TEX.
Effects of Surface Drainage on Stream Flow,
W75-10794 4A

COUNCIL ON THE ENVIRONMENT OF NEW YORK CITY.
Waste Oil: The Recapture of an Energy Resource (The Generation, Disposal and Recovery of Waste Oil in the New York Metropolitan Area),
W75-10745 5D

DELAWARE UNIV., NEWARK. DEPT. OF CIVIL ENGINEERING.
Waste Water Treatment: Sludge Treatment, Utilization, and Disposal,
W75-10395 5D

DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT, OTTAWA (ONTARIO).
Indigenous Peoples of Polar Deserts,
W75-10460 6D

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO).
Disposal of Used Crankcase and Other Oils in Canada,
W75-10743 5D

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). INLAND WATERS DIRECTORATE.
A Remote Sensing Laser Fluorometer,
W75-10831 5A

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). MARINE SCIENCES DIRECTORATE.
Some Features of Tsunamis on the Pac Coast of South and North America,
W75-10554

DIAZ, SECKINGER AND ASSOCIATES, INC. TAMPA, FLA.
New Concepts in Suburban Drainage Florida,
W75-10793

DOSHISHA UNIV., KYOTO (JAPAN). BIOLOGICAL LAB.
Marine Pollution Bioassay by Sea Urchin Eg An Attempt to Enhance Accuracy,
W75-10419

Bioassay Data for Marine Pollution Using Urchin Eggs, 1972 and 1973,
W75-10432

DOW CHEMICAL CO., MIDLAND, MICH.
Color Removal From Bleached Kraft fluents,
W75-10399

DUKE UNIV., DURHAM, N.C. DEPT. OF ZOOLOGY.
Effects of Mirex on the Larval Developmer Blue Crab,
W75-10410

DVFRESNE-HENRY ENGINEERING CORP., NORTH SPRINGFIELD, VT.
Water Works Improvements--Springfield, mont,
W75-10713

EDISON WATER QUALITY RESEARCH LA N.J.
Runoff of Oils from Rural Roads Treate Suppress Dust,
W75-10766

EL PASO SOUTHERN CO., TEX. (ASSIGNE
Air and Water Pollution Control,
W75-10732

ENVIRONMENTAL CONTROL TECHNOLO CORP., ANN ARBOR, MICH.
Analysis of Pollution from Marine Engi Status Report,
W75-10688

ENVIRONMENTAL PROTECTION AGENC GULF BREEZE, FLA. GULF BREEZE ENVIRONMENTAL RESEARCH LAB.
A Gravity-Flow Column to Provide Pest Laden Water for Aquatic Bioassays,
W75-10844

ENVIRONMENTAL PROTECTION AGENC WASHINGTON, D.C.
Waste Oil Management--The Environm Protection Agency's Role,
W75-10742

Health Implications of Exposure to Metals from Combustion of Waste Oil,
W75-10765

The Waste Oil Industry: A Discussion of Issues to Consider in Performing an Eco Analysis,
W75-10767

IRONMENTAL PROTECTION AGENCY, HINGTON, D.C. OFFICE OF FEDERAL IVITIES.
nual for Preparation of Environmental Im-ct Statements for Wastewater Treatment rks, Facilities Plans, and 208 Areawide ste Treatment Management Plans,
5-10473 5D

RONMENTAL PROTECTION AGENCY, HINGTON, D.C. TECHNOLOGY NSFER STAFF.
cess Design Manual for Upgrading Existing ste Water Treatment Plants.
5-10396 5D

cess Design Manual for Sludge Treatment Disposal.
5-10475 5D

RONMENTAL PROTECTION SERVICE, WA (ONTARIO). WATER POLLUTION TROL DIRECTORATE.
Effluent Study of a Fresh Water Fish cessing Plant,
5-10684 5D

RONMENTAL QUALITY SYSTEMS, INC., KVILLE, MD.
Reuse--A National Need,
5-10740 5D

Bilge from Commercial Vessels,
5-10752 5B

ution Control with a Comprehensive Waste Processing Plant,
5-10758 5D

Economic Model of Waste Oil Recovery, rocessing and Distribution Systems,
5-10768 5D

WERKE HOECHST, FRANKFURT AM (WEST GERMANY).
ices for Toxicological Long-Term Studies Aquatic Organisms (Gerate zur chfuhrung Toxikologischer Langzeitstudien Wasserorganismen),
5-10618 5A

AND WILDLIFE SERVICE, FORT TH, TEX. DIV. OF RIVER BASIN IES.
Drift of Mayflies (Ephemeroptera) in the zos River, Texas,
5-10558 5B

RIES AND MARINE SERVICE, OUVER (BRITISH COLUMBIA). OUVER LAB.
icosteroid Concentrations in Sockeye Sal- (Oncorhynchus Nerka) Exposed to Low centrations of Copper,
5-10415 5C

te Toxicity of Kanamycin to Steelhead t (Salmo Gairdneri),
-10423 5C

RIES AND MARINE SERVICE, WEST OUVER (BRITISH COLUMBIA). PACIFIC RONMENT INST.
Biological Half-Life of Inorganic Mercury e Dungeness Crab (Cancer magister),
-10437 5C

**FISHERIES RESEARCH BOARD OF CANADA, ST. ANDREWS (NEW BRUNSWICK). BIOLOGICAL STATION.**

Toxicity of Phosphamidon to American Lobsters (Homarus Americanus) Held at 4 and 12C,
W75-10413 5C

Thallium: Occurrence in the Environment and Toxicity to Fish,
W75-10449 5C

**FISHERIES RESEARCH BOARD OF CANADA, WINNIPEG (MANITOBA). FRESHWATER INST.**

Analysis of Tri-Aryl Phosphate Esters and the Determination of Imol S-140 in Fish Tissue and Water Samples by Gas Chromatography,
W75-10442 5A

**FLORIDA UNIV., GAINESVILLE. SCHOOL OF FOREST RESOURCES AND CONSERVATION.**

Utilization of a Kraft Effluent Channel by Fish and Aquatic Organisms,
W75-10377 5C

**FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, ROME (ITALY). EUROPEAN INLAND FISHERIES ADVISORY COMMISSION.**

Water Quality Criteria for European Fresh-Water Fish.
W75-10609 5C

Water Quality Criteria for European Fresh-water Fish.
W75-10610 5C

**FOREST SERVICE (USDA), BERKELEY, CALIF. PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION.**

A Model of Statistical Errors in Estimating Streamflow from Continuous-Stage Records,
W75-10512 2E

**FOREST SERVICE (USDA), FORT COLLINS, COLO. ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION.**

Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404 3B

Watershed Management in the Rocky Mountain Subalpine Zone: The Status of Our Knowledge,
W75-10405 3B

Simulating Timber Yields and Hydrologic Impacts Resulting From Timber Harvest on Subalpine Watersheds,
W75-10406 3B

Analog Temperature Records from a Linearized Thermistor Network,
W75-10650 7B

A Weibull Prediction of the Tensile Strength-Volume Relationship of Snow,
W75-10651 2C

An Automatic Data Acquisition and Reduction System,
W75-10652 7A

Avalanche Warnings: Content and Dissemination,
W75-10653 2C

Canopy Weight Distribution Affects Windspeed and Temperature in a Lodgepole Pine Forest,
W75-10654 4A

**GEOLOGICAL SURVEY, ANCHORAGE, ALASKA.**

Watershed Management Problems and Opportunities for the Colorado Front Range Ponderosa Pine Zone: The Status of Our Knowledge,
W75-10655 4D

Avalanche Protection in Switzerland.
W75-10656 8C

The Snowy Torrents: Avalanche Accidents in the United States 1967-71,
W75-10657 2C

Snow Avalanche Sites: Their Identification and Evaluation,
W75-10659 2C

Water-Yield Improvement from Alpine Areas: The Status of Our Knowledge,
W75-10660 3B

**FOREST SERVICE (USDA), LARAMIE, WYO. ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION.**

New Engineering Criteria for Snow Fence Systems,
W75-10692 2C

New Snow Fence Design Controls Drifts, Improves Visibility, Reduces Road Ice,
W75-10693 2C

Estimating the Transport and Evaporation of Blowing Snow,
W75-10695 2C

**FOREST SERVICE (USDA), WENATCHEE, WASH. FOREST HYDROLOGY LAB.**

Watershed Behavior After Forest Fire in Washington,
W75-10790 4C

**FOURAH BAY COLL., FREETOWN (SIERRA LEONE). INST. OF MARINE BIOLOGY AND OCEANOGRAPHY.**

Tar Pollution of Sierra Leone Beaches,
W75-10472 5B

**FRONTIER ENGINEERING CORP., HOUSTON, TEX.; AND ZACHRY (H. B.) CO., SAN ANTONIO, TEX. (ASSIGNEES)**

Rotary Desalination Engine and System,
W75-10733 3A

**GCA CORP., BEDFORD, MASS. GCA TECHNOLOGY DIV.**

Waste Automotive Lubricating Oil as a Municipal Incinerator Fuel,
W75-10764 5D

**GENERAL ELECTRIC CO., PHILADELPHIA, PA. RE-ENTRY AND ENVIRONMENTAL SYSTEMS DIV.**

Feasibility Test Program of Application of Coalescing Phase Oil/Water Separators to Self Compensating Fuel Tanks in Surface Ships,
W75-10474 5G

**GEOLOGICAL SURVEY, ALBUQUERQUE, N. MEX.**

Ground-Water Levels in New Mexico, 1972,
W75-10582 4B

**GEOLOGICAL SURVEY, ANCHORAGE, ALASKA.**

Icings Along the Trans-Alaska Pipeline Route,
W75-10592 2C

Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973,
W75-10594 8B

GEOLOGICAL SURVEY, AUSTIN, TEX.
Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1973, W75-10596 7C

GEOLOGICAL SURVEY, BATON ROUGE, LA.
Index to Water Resources Data for Louisiana: Surface Water Records; Water-Quality Records. W75-10590 5A

GEOLOGICAL SURVEY, BOSTON, MASS.
A Comparison of Methods for Estimating Flood Peaks on Streams in Massachusetts, W75-10587 4A

GEOLOGICAL SURVEY, CHEYENNE, WYO.
Temperatures of Wyoming Streams, W75-10604 7C

GEOLOGICAL SURVEY, DENVER, COLO.
Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis, W75-10494 2K

GEOLOGICAL SURVEY, HARTFORD, CONN.
Hydrogeologic Data for the Farmington River Basin, Connecticut, W75-10591 7C

GEOLOGICAL SURVEY, INDIANAPOLIS, IND.
A River-Quality Assessment of the Upper White River, Indiana, W75-10600 5B

GEOLOGICAL SURVEY, JACKSON, MISS.
Water for Industrial Development in Alcorn, Itawamba, Prentiss, and Tishomingo Counties, Mississippi, W75-10581 3E

Low-Flow Characteristics of Mississippi Streams, W75-10605 2E

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
Map of the Antelope Valley-East Kern Water Agency Area, California, Showing Ground-Water Subunits and Areas, Location of Wells, and Water-Level Contours for Spring 1974, W75-10595 7C

Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California, W75-10601 5B

GEOLOGICAL SURVEY, MIAMI, FLA.
The Loxahatchee - A River in Distress, Southeast Florida, W75-10588 4C

GEOLOGICAL SURVEY, PARKVILLE, MD.
Hydrogeology of the Triassic Rocks of Maryland, W75-10584 2F

GEOLOGICAL SURVEY, RALEIGH, N.C.
Sediment Characteristics of Streams in the Eastern Piedmont and Western Coastal Plain Regions of North Carolina, W75-10586 2J

Hydrology of the Albemarle-Pamlico Region, North Carolina--A Preliminary Report on the Impact of Agricultural Developments, W75-10602 4C

GEOLOGICAL SURVEY, RESTON, VA.
Geological and Limnological Factors of Cold Deserts, W75-10457 2C

Report on the River Master of the Delaware River for the Period December 1, 1973-November 30, 1974, W75-10589 4A

Summary Appraisals of the Nation's Ground-Water Resources--Rio Grande Region, W75-10597 4B

Summary Appraisals of the Nation's Ground-Water Resources--Ohio Region, W75-10598 4B

GEOLOGICAL SURVEY, RICHMOND, VA.
A Predictive Computer Model of the Lower Cretaceous Aquifer, Franklin Area, Southeastern Virginia, W75-10599 2F

GEOLOGICAL SURVEY, SALT LAKE CITY, UTAH.
Hydrologic Reconnaissance of the Southern Uinta Basin, Utah and Colorado, W75-10585 3B

Ground-Water Conditions in Utah, Spring of 1975, W75-10606 2F

GEOLOGICAL SURVEY, TACOMA, WASH.
Flood Hazards in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington, W75-10580 7C

Water Resources of the Toppenish Creek Basin, Yakima Indian Reservation, Washington. W75-10603 3F

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.
Hydrological Data From Wells in Southwest Hillsborough County, Florida, 1950-74, W75-10593 7C

GEORGIA INST. OF TECH., ATLANTA. SCHOOL OF CIVIL ENGINEERING.
Statistical Tolerance Limits for a Pearson Type III Distribution, W75-10511 2E

GEORGIA UNIV., ATHENS. COMPUTER CENTER.
Comments on the Statistical Distribution of Rainfall per Period Under Various Transformations, W75-10517 2B

GEORGIA UNIV., SAVANNAH. AGRICULTURAL EXPERIMENT STATION.
Growth Factors in the Fish Meal Components of Catfish Diets, W75-10658 2I

GORHAM INTERNATIONAL, INC., MAINE.
Study of Solid Waste Management Practices in the Pulp and Paper Industry. W75-10366 5D

GREAT SOUTHERN PAPER CO., CEDAR SPRINGS, GA.
Analysis of Alternatives for Removal of Suspended Solids in Pulp and Paper Mill Effluents, W75-10400 5D

GREINER (J.E.) CO., INC., TAMPA, FLA.
The Perimeter Canal - A New Approach Discharge Urban Water into a Coastal M grove Area, W75-10773

GUELPH UNIV. (ONTARIO). DEPT. OF BOTANY AND GENETICS.
Measurement of Hydraulic Conductivity Peats, W75-10536

GUELPH UNIV. (ONTARIO). DEPT. OF LAN RESOURCE SCIENCE.
Phosphorus in Percolates from Man Lysimeters, W75-10573

GUELPH UNIV. (ONTARIO). DEPT. OF ZOOLOGY.
Temperature-Induced Changes in Acute To ty of Zinc to Atlantic Salmon (Salmo salar) W75-10431

HAWAII UNIV.-HILO COLL., HILO.
Water-Soil-Plant Interactions with Terbacil W75-10486

HEBREW UNIV., REHOVOTH (ISRAEL). FACULTY OF AGRICULTURE.
Effects of Soil Moisture on Stress on 2 V ties of Upland Cotton in Israel: IV. Effec Periods of Stress Occurrence, Correlation Regressions, W75-10791

HOWARD UNIV., WASHINGTON, D.C. BIO ENVIRONMENTAL ENGINEERING AND SCIENCES RESEARCH LAB.
Population Dynamics of Protozoa in W water, and Impact of Environmental Chan W75-10689

HYDROCOMP, INC., PALO ALTO, CALIF
Hourly Rainfall Generation for a Network W75-10515

HYDROLOGIC ENGINEERING CENTER, DAVIS CALIF. PLANNING ANALYSIS BRANCH.
Optimal Sizing of Urban Flood-C Systems, W75-10821

HYOGO PREFECTURE FISHERIES EXPERIMENT STATION, AKASHI (JAPA
Physiological Changes in the Serum Hepatopancreas of Yellow Tail Injecte Carbon Tetrachloride, (In Japanese), W75-10630

HYOGO PREFECTURE FISHERIES EXPERIMENT STATION, KOBE (JAPAN)
Studies on the Metabolism of Chlorophe Fish-III Isolation and Identification of a gated PCP Excreted by Goldfish, W75-10611

ILLINOIS STATE NATURAL HISTORY SURVEY, URBANA.
Uptake of Three Polychlorinated Bip DDT and DDE by the Green Sunfish, L Cyanellus Raf., W75-10422

ILLINOIS STATE WATER SURVEY, URI
A Two-Distribution Method for Fittin Distributions in Hydrology, W75-10531

**LINOIS UNIV., URBANA. SCHOOL OF EMICAL SCIENCES.**
Toxic Trace Elements: Preferential Concentration in Respirable Particles,
W75-10482 5A

**DIAN INST. OF TECH., BOMBAY. DEPT. OF EMISTRY.**
apid Extractive Spectrophotometric Determination of Gold (III) With 4-(2-Pyridylazo)-esorcinol,
W75-10499 2K

**TITUT FRANCAIS DU PETROLE, PARIS.**
xperience with the IFP Propane Clarification rocess in Re-Refining Spent Crankcase Oils,
W75-10759 5D

**TITUTE FOR SOIL RESEARCH, GRADE (YUGOSLAVIA).**
edologic Cover of the Watershed of the orecka River,
W75-10551 2A

**TITUTE OF GEOLOGICAL SCIENCES, NDON (ENGLAND). DEPT. OF DROGEOLOGY.**
ydraulic Behaviour of the Chalk Aquifer in e Yorkshire Wolds,
W75-10506 4B

**TITUTE OF MARINE BIOCHEMISTRY, ERDEEN (SCOTLAND).**
he Effect of Heavy Metals on Photosynthesis nd Loss of Cell Potassium in Two Species of arine Algae, Dunaliella tertiolecta and haeodactylum tricornutum,
W75-10447 5C

he Effect of Some Heavy Metal Ions on hotosynthesis in a Freshwater Alga,
W75-10627 5C

**TITUTE OF PAPER CHEMISTRY, LETON, WIS.**
oxicity of Pulping Wastes to Fish,
W75-10403 5C

**TITUTT FOR ATOMENERGI, KJELLER RWAY). ISOTOPE LABS.**
etermination of Nickel in Rocks After ipithermal Neutron Activation,
W75-10493 2K

**'A STATE UNIV., AMES. DEPT. OF CIVIL INEERING.**
atistical Model of Short-Duration Precipitation Events,
W75-10529 2B

**'A STATE UNIV., AMES. DEPT. OF NOMICS.**
eveloping Regional Stochastic Data Bases,
W75-10528 2E

**'A STATE UNIV., AMES. ENGINEERING EARCH INST.**
ve Year Study of Des Moines River Water uality,
W75-10803 5B

**'A UNIV., IOWA CITY. DEPT. OF CIVIL VIRONMENTAL) ENGINEERING.**
nalysis of Wastewater Treatment Systems for Meat Processing Plant,
W75-10687 5D

**'A UNIV., IOWA CITY. INST. OF DRAULIC RESEARCH.**
ydraulics and Mechanics of River Ice Jams,
W75-10556 8B

**JET PROPULSION LAB., PASADENA, CALIF.**
Application of Low-Latitude Microbial Ecology to High-Latitude Deserts,
W75-10459 2C

**KAISER ENGINEERS, OAKLAND, CALIF.**
Nuclear Power Plant Cooling System Selection,
W75-10822 6C

**KANAGAWA UNIV. (JAPAN). BIOLOGY INST.**
The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

**KANSAS STATE SENATE, TOPEKA. 39TH DISTRICT.**
Users' View of Weather Modification,
W75-10776 3B

**KANSAS UNIV., LAWRENCE.**
Waste Water Treatment: Lagoons and Oxidation Ponds,
W75-10374 5D

**KENT STATE UNIV., OHIO. DEPT. OF BIOLOGICAL SCIENCE.**
Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

**KENTUCKY WATER RESOURCES INST., LEXINGTON.**
Derivation of Reservoir Operating Rules by Economic Analysis,
W75-10825 4A

Analysis of Reservoir Recreation Benefits,
W75-10826 6B

The Effect of Landowner Attitude on the Financial and the Economic Costs of Acquiring Land for a Large Public Works Project,
W75-10827 6B

Review of the Economic Benefits and Costs Resulting from Dewey Reservoir,
W75-10828 6B

**KEYSTONE JUNIOR COLL., LAPLUME, PA. DEPT. OF MATHEMATICS.**
Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

**KINNERET LIMNOLOGICAL LAB., TIMBERIAS (ISRAEL).**
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420 5C

**KURITA WATER INDUSTRIES LTD., OSAKA (JAPAN). (ASSIGNEE)**
Method of Treating Aluminum-Containing Waste Water,
W75-10730 5D

**KYOTO UNIV. (JAPAN).**
Determination of Manganese in Natural Waters by Atomic Absortion Spectrometry with a Carbon Tube Atomizer,
W75-10386 5A

**KYUSHU UNIV., FUKUOKA (JAPAN).**
Color of Pulp Industry Waste Liquors. (6). Behavior of Color During Waste Treatments (In Japanese),
W75-10393 5D

Color of Pulp Industry Waste Liquors. (7). Color Reduction by Ultraviolet Treatment (In Japanese),
W75-10394 5D

**KYUSHU UNIV., FUKUOKA (JAPAN). FACULTY OF AGRICULTURE.**
Studies on the Metabolism of Chlorophenols in Fish-II Turnover in Absorbed PCP in Goldfish.
W75-10418 5C

**KYUSHV UNIV., FUKUOKA (JAPAN). FACULTY OF AGRICULTURE.**
Studies on the Metabolism of Chlorophenols in Fish-I Absorption and Excretion of PCP by Goldfish.
W75-10417 5C

**LAMONT-DOHERTY GEOLOGICAL OBSERVATORY, PALISADES, N.Y.**
Floating Glacial Ice Caps in the Arctic Ocean.
W75-10533 2C

**LANDESANSTALT FUER GEWASSERKUNDE UND GEWASSERSCHUTZ NORDRHEIN-WESTFALEN, KREFELD (WEST GERMANY).**
X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz).
W75-10416 5A

**LIVERPOOL UNIV. (ENGLAND). DEPT. OF OCEANOGRAPHY.**
Average Trace Element Composition of Low Level Marine Atmospheric Particulates,
W75-10477 5B

**LOUISIANA STATE UNIV., BATON ROUGE. SCHOOL OF FORESTRY AND WILDLIFE MANAGEMENT.**
The Effects of Crude Oil on the Palatability of Marine Crustaceans,
W75-10428 5C

**LOZIER ENGINEERS, INC., ROCHESTER, N.Y.**
Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

**MACAULAY INST. FOR SOIL RESEARCH, ABERDEEN (SCOTLAND).**
The Determination of Mercury in Soils and Related Materials by Cold-Vapour Atomic Absorption Spectrometry,
W75-10485 5A

**MARITIME ADMINISTRATION, WASHINGTON, D.C.**
Port Reception and Treatment Facilities for Oily Waste from Vessels,
W75-10751 5G

**MARYLAND ENVIRONMENTAL SERVICE, ANNAPOLIS.**
Waste Oil in Maryland: A Pollutant or a Resource,
W75-10744 5B

Waste Oil--Solution to Maryland's Energy Crisis,
W75-10762 5D

**MARYLAND PORT AUTHORITY, BALTIMORE.**
A Program for Handling Emergency Oil Spillages in the Port of Baltimore,
W75-10755 5G

MARYLAND UNIV., SOLOMONS. CHESAPEAKE BIOLOGICAL LAB.
Daily Temperature and Salinity of Surface Water of Patuxent River at Solomons, Maryland, Based on 30 Years of Records (1938-1967),
W75-10535 2E

MASSACHUSETTS UNIV., GLOUCESTER. MARINE STATION.
Decrease of Net Carbon Flux in Two Species of Mussels Caused by Extracts of Crude Oil,
W75-10433 5C

MASSACHUSETTS WATER RESOURCES COMMISSION, BOSTON. DIV. OF WATER POLLUTION CONTROL.
Massachusetts Waste Oil Management Activities,
W75-10763 5D

MATERIALS RESEARCH LABS., MELBOURNE (AUSTRALIA).
Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

MEIJI SEIKI KAISHA LTD., YOKOHAMA (JAPAN). RESEARCH LABS.
Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

MELBOURNE UNIV., PARKVILLE (AUSTRALIA). (ASSIGNEE)
Removal of Pollutants from Water,
W75-10736 5D

MEMORIAL UNIV. OF NEWFOUNDLAND, ST. JOHNS. MARINE SCIENCES RESEARCH LAB.
Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

MICHIGAN DEPT. OF NATURAL RESOURCES, LANSING. BUREAU OF WATER MANAGEMENT.
Toxicity of Chlorinated Municipal Wastes to Fish: An Evaluation Based on Michigan Field Data,
W75-10680 5C

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF FISHERIES AND WILDLIFE.
Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

MICHIGAN UNIV., ANN ARBOR.
The Effect of Certain Organic Pollutants on Copper Toxicity to Fish (Lebistes Reticulatus),
W75-10637 5C

MILLAQUIN SUGAR MILL, QUEENSLAND (AUSTRALIA).
Heat Treatment of Sewage Sludges,
W75-10644 5D

MISSISSIPPI STATE UNIV., MISSISSIPPI STATE. DEPT. OF BIOCHEMISTRY.
Inhibition of ATPases Acitivity in Channel Catfish Brain by Kepone(Trade Name) and its Reduction Product,
W75-10612 5C

MISSOURI DEPARTMENT OF CONSERVATION, JEFFERSON CITY.
Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

MISSOURI UNIV., COLUMBIA. DEPT. OF CIVIL ENGINEERING.
Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

MODESTO IRRIGATION DISTRICT, CALIF.
Automation of an Existing Irrigation System - Part I,
W75-10788 8C

MONTANA UNIV., MISSOULA. DEPT. OF BOTANY.
Effect of the Insecticide Zectran (Mexacarbate) on Several Algae,
W75-10425 5C

MONTANA UNIV., MISSOULA. DEPT. OF ZOOLOGY.
An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

MONTREAL URBAN COMMUNITY (QUEBEC). WATER PURIFICATION DEPT.
Determine Urban Runoff the Simple Way,
W75-10716 2E

N-CON SYSTEMS CO., INC., LARCHMONT, N.Y.
Automated Sequential Composite Sampling. A New Technique for Water Pollution Study and Control,
W75-10690 5A

NAGOYA UNIV. (JAPAN). DEPT. OF SYNTHETIC CHEMISTRY.
Spectroscopic Determination of Atomization Efficiency (CuCl-Cu+Cl) in an Air-Hydrogen Flame,
W75-10498 2K

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WALLOPS ISLAND, VA. WALLOPS STATION.
Error Analysis of Dobson Spectrophotometer Measurements of the Total Atmospheric Ozone Content,
W75-10545 7B

NATIONAL COUNCIL OF THE PAPER INDUSTRY FOR AIR AND STREAM IMPROVEMENT, INC., NEW YORK.
Industrial Wastes: Paper and Allied Products,
W75-10397 5D

NATIONAL ENVIRONMENTAL RESEARCH CENTER, CINCINNATI, OHIO. ADVANCED WASTE TREATMENT RESEARCH LAB.
Waste Water Treatment: Water Reclamation and Reuse,
W75-10372 5D

Problems Encountered in Sludge Treatment and Some Advanced Solutions,
W75-10398 5E

Plant Performance Using Dissolved Oxygen Control,
W75-10452 5D

Coping With Urban Runoff in the United States,
W75-10541 5D

NATIONAL ENVIRONMENTAL RESEARCH CENTER, CINCINNATI, OHIO. WATER SUPPLY RESEARCH LAB.
Treatment Processes for Coping with Variations in Raw-Water Quality,
W75-10705

NATIONAL INST. OF OCEANOGRAPHY, WORMLEY (ENGLAND).
On the Joint Distribution of the Periods and Amplitudes of Sea Waves,
W75-10534

NATIONAL LIME ASSOCIATION, WASHINGTON, D.C.
Water Pollution Problems Associated with Control of Stack Gas Emission,
W75-10691

NATIONAL MARINE FISHERIES SERVICE, ST. PETERSBURG, FLA. SOUTHEAST REGION.
Additional Studies of the Fishes, Macroinvertebrates and Hydrological Conditions of Upland Canals in Tampa Bay, Florida,
W75-10617

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, ROCKVILLE, MD.
International Field Year for the Great Lakes.
W75-10547

International Field Year for the Great Lakes.
W75-10548

International Field Year for the Great Lakes.
W75-10549

International Field Year for the Great Lakes.
W75-10550

NATIONAL SCIENCE FOUNDATION, WASHINGTON, D.C. OFFICE FOR THE INTERNATIONAL DECADE OF OCEAN EXPLORATION.
International Exploration Locates Minerals and Oils,
W75-10467

NATIONAL TAIWAN UNIV., TAIPEI. INST. OF OCEANOGRAPHY.
Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430

NATIONAL WATER QUALITY LAB., DULUTH, MINN.
Multichannel Toxicant Injection System for Flow-Through Bioassays,
W75-10443

NATURE CONSERVANCY, ABBOTS RIPTON (ENGLAND). MONKS WOOD EXPERIMENT STATION.
Herbicides in Aquatic Systems,
W75-10625

NAVAL MATERIAL COMMAND, WASHINGTON, D.C.
The Navy's Oily Wastes Handling and Disposal Program,
W75-10750

NEPTUNE MICROFLOC, INC., CORVALLIS, OREG.
Water-Quality Requirements for the Petroleum Industry,
W75-10465

NETHERLANDS WATERWORKS, RIJSWIJ TESTING AND RESEARCH INST.
Domestic Waste Water Reuse--Aspects of Treatment System,
W75-10708

EVADA UNIV., RENO.
A Method of Disaggregation,
W75-10817 6A

EVADA UNIV., RENO. DESERT RESEARCH NST.
Multisite Streamflow Simulation of Truckee River, Nevada,
W75-10509 2E

EW HAMPSHIRE UNIV., DURHAM. DEPT. F CHEMISTRY.
Organic Matter in Natural Water and Water Treatment,
W75-10351 5B

EW MEXICO STATE ENGINEER, SANTA FE.
Economic Impact of the Conversion of Water from Irrigation to Municipal and Industrial Use in the Rio Grande Basin of New Mexico,
W75-10771 6D

EW MEXICO STATE UNIV., UNIVERSITY ARK. DEPT. OF AGRICULTURAL NGINEERING.
Water Use and Production of Trickle Irrigated Onions,
W75-10785 3F

EW YORK STATE DEPT. OF NVIRONMENTAL CONSERVATION, LBANY.
Waste Water Treatment: Land Disposal of Waste Water,
W75-10373 5E

Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

EW YORK STATE DEPT. OF NVIRONMENTAL CONSERVATION, LBANY. DIV. OF PURE WATERS.
Guidelines for Landfill of Toxic Industrial Sludges,
W75-10487 5G

ORTH CAROLINA STATE UNIV., RALEIGH.
Relationships Between Drouth and Corn Yields on Selected South Atlantic Coastal Plain Soils,
W75-10721 3F

ORTH CAROLINA STATE UNIV., RALEIGH. EPT. OF BIOLOGICAL AND GRICULTURAL ENGINEERING.
A Precipitation Data Simulator Using a Second Order Autoregressive Scheme,
W75-10513 2B

ORTH CAROLINA STATE UNIV., RALEIGH. EPT. OF SOIL SCIENCE.
Phosphorus Availability of Some Philippine Rice Soils as Affected by Soil and Water Management Practices,
W75-10421 3F

UOVO PIGNONE S.P.A., SAN DONATO ILANESE (ITALY). (ASSIGNEE)
Liquefying Refrigerant for Water Desalination with Liquefied Natural Gas and an Intermediate Energy Cycle,
W75-10725 3A

AK RIDGE NATIONAL LAB., TENN.
Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

CEANIC INST., WAIMANALO, HAWAII.
Critical Thermal Maxima of Three Species of Hawaiian Estuarine Fish: A Comparative Study,
W75-10426 5C

OHIO AGRIC. RES. DEV. CENT., WOOSTER,LAB. ENVIRONMENT. STUDIES.
Importance of Plants in Oxygen Production, Carbon Dioxide Consumption and Air Purification,
W75-10715 2I

OHIO STATE UNIV., COLUMBUS. DEPT. OF AGRICULTURAL ENGINEERING.
Sludge Disposal on Agricultural Soil,
W75-10674 5D

OKLAHOMA UNIV., NORMAN. SCHOOL OF CIVIL ENGINEERING AND ENVIRONMENTAL SCIENCE.
Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

ONTARIO MINISTRY OF NATURAL RESOURCES, SAULT STE. MARIE (ONTARIO). FISH AND WILDLIFE RESEARCH BRANCH.
Effects of Temperature on Development and Survival of Rainbow Trout, Salmo Gairdneri, in Acid Waters,
W75-10623 5C

ORANGE COUNTY POLLUTION CONTROL DEPT., ORLANDO, FLA.
Effects of Farming - Urban Drainage on Fresh Water,
W75-10802 5G

OREGON STATE UNIV., CORVALLIS.
A Theory of the Mass Transport of Previously Distributed Chemicals in a Water-Saturated Sorbing Porous Medium: 4. Distributions,
W75-10632 5B

OREGON STATE UNIV., NEWPORT. DEPT. OF FISHERIES AND WILDLIFE.
Effects of the Insecticide Sevin and Its First Hydrolytic Product, 1-Napthol, on Some Early Developmental Stages of the Bay Mussel, Mytilus edulis,
W75-10435 5C

ORLANDO UTILITIES COMMISSION, FLA.
Analysis of a Large Water Distribution System Using Advanced Computer Software,
W75-10720 4A

OSLO UNIV. (NORWAY). DEPT. OF CHEMISTRY.
Atomic-Absorption Spectrometric Determination of Copper, Lead, Cadmium and Manganese in Pulp and Paper by the Direct-Atomization Technique,
W75-10489 5A

Atomic Absorption Spectrometric Determination of Cadmium, Lead, Silver, Thallium and Zinc in Silicate Rocks by Direct Atomization From the Solid State,
W75-10492 2K

OTTAWA-CARLETON REGIONAL MUNICIPALITY, OTTAWA (ONTARIO).
The Master Plan for Water-Supply in the Regional Municipality of Ottawa-Carleton,
W75-10710 3D

OTTAWA UNIV. (ONTARIO). DEPT. OF PHARMACOLOGY.
Persistence of Cadmium-Induced Metabolic Changes in Liver and Kidney,
W75-10478 5A

PERMUTIT RESEARCH AND DEVELOPMENT CENTER, PRINCETON, N.J.
Gravity Dewatering of Metal Hydroxide Sludges,
W75-10500 5D

PERMUTIT RESEARCH CENTER, PRINCETON, N.J.
Concentration of Dilute Waste Streams by Ion Exchange Techniques,
W75-10672 5D

PITTSBURGH UNIV., PA. GRADUATE SCHOOL OF PUBLIC HEALTH.
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

PORT AUTHORITY OF NEW YORK AND NEW JERSEY.
Environmental Action at Port Authority Airports,
W75-10748 5G

PRINCETON UNIV., N.J. DEPT. OF PHILOSOPHY.
Report to the Technical Committee of the Water Resources Centers of the Thirteen Western States,
W75-10809 6B

PURDUE UNIV., LAFAYETTE, IND. AGRICULTURAL EXPERIMENT STATION.
Operational Value of Weather Information in Relation to Soil Management Characteristics,
W75-10367 2G

PURDUE UNIV., LAFAYETTE, IND. SCHOOL OF CIVIL ENGINEERING.
Removal of Periodicities by Differencing and Monthyl Mean Subtraction,
W75-10352 2A

Environmental Problems Associated with the Use of Cooling Towers,
W75-10671 5D

RENSSELAER POLYTECHNIC INST., TROY, N.Y. BIO-ENVIRONMENTAL ENGINEERING DIV.
Treatment of Milk Truck Washing Wastes by Anerobic Digestion,
W75-10673 5D

RHODE ISLAND UNIV., KINGSTON. GRADUATE SCHOOL OF OCEANOGRAPHY.
Arsenate Uptake and Reduction by Pocillopora verrucosa,
W75-10491 5C

RICE UNIV., HOUSTON, TEX. DEPT. OF BIOLOGY.
Biological Bases for Water Quality Standards,
W75-10677 5G

RUSSELL AND AXON, INC., DAYTONA BEACH, FLA.
Heavy Metals Removal from Wood Preserving Wastewater,
W75-10675 5D

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J.
Soils of the High Arctic Landscapes,
W75-10458 2C

SAN ANTONIO MUNICIPAL WASTEWATER TREATMENT PLANT, TEX.
Rate of Phosphorus Uptake by Activated Sludge,
W75-10839 5D

SINGER CO., BRIDGEPORT, CONN. WATER RESOURCES DIV.
Water and Wastewater Facilities for Florida Housing Developments,
W75-10717 5D

SOIL CONSERVATION SERVICE, WASHINGTON, D.C.
Environmental Issues, Effects, and Solutions, W75-10795 6G

SOUTH CAROLINA UNIV., COLUMBIA. DEPT. OF BIOLOGY.
The Effect of Temperature and Salinity on Cadmium Uptake by the Blue Crab, Callinectes sapidus, W75-10448 5C

SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY, RAPID CITY. INST. OF ATMOSPHERIC SCIENCES.
Weather Modification for Use in the High Plains, W75-10775 3B

STATE UNIV. OF NEW YORK, BUFFALO. DEPT. OF CIVIL ENGINEERING.
Physical Model Study of Circulation Patterns in Lake Ontario, W75-10537 2H

STATE UNIV. OF NEW YORK, STONY BROOK.
Effects of Chlorinated Hydrocarbon Pollutants on Growth of Marine Phytoplankton in Culture, W75-10636 5C

STATE UNIV. OF NEW YORK, SYRACUSE. COLL. OF ENVIRONMENTAL SCIENCE AND FORESTRY.
A Note on Mixed Distributions in Hydrology, W75-10527 2E

STOCKHOLM MUNICIPAL SERVICES DEPT. (SWEDEN). DIV. OF TREATMENT PLANT DESIGN.
Stockholm Puts Sewage Plants Underground, W75-10718 5D

STUDLEY SHUPERT AND CO., INC., BOSTON, MASS.
Financing Water Works, W75-10712 3D

SUN OIL CO., PHILADELPHIA, PA.
The Source and Supply of Virgin Lubes, W75-10741 5B

SUPERIOR FARMING CO., BAKERSFIELD, CALIF.
Development of Large Scale Drip Irrigation Systems, W75-10784 3F

SWEDISH WATER AND AIR POLLUTION RESEARCH LAB., GOTEBORG.
Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals, W75-10412 5C

SYRACUSE UNIV., N.Y. DEPT. OF CIVIL ENGINEERING.
Lagoons Plus Spray Irrigation for Effective Bean Cannery Waste Treatment, W75-10678 5D

TABRIZ UNIV. (IRAN). ANALYTICAL LAB.
Fast Separation of Tin (IV) From Tin (II) and From Numerous Metal Ions on Ion-Exchange Papers, W75-10497 2K

TECHNICAL UNIV., LODZ (POLAND). INST. OF CHEMICAL FOOD TECHNOLOGIES.
Automatic Device for the Operational Control of the Filtration Rate of Suspensions(Automatische Vorrichtung zur Technischen Kontrolle der Filtrationsgeschwindigkeit von Suspensionen), W75-10830 5D

TECHNISCHE UNIVERSITAET, DRESDEN (EAST GERMANY).
Studies on Possibilities of Biochemical Purification of Evaporator Condensate Occurring During Sulfite Pulp Manufacture (Untersuchungen ueber die Moeglichkeit der biochemischen Reinigung des bei der Sulfitzellstoffherstellung anfallenden Eindampfkondensates), W75-10382 5D

TEXAS A AND M UNIV., COLLEGE STATION. BIOENGINEERING PROGRAM.
An Analysis of the Mechanics of Guard Cell Motion, W75-10488 2I

TEXAS A AND M UNIV., COLLEGE STATION. ENVIRONMENTAL ENGINEERING DIV.
Effects of an Offshore Crude Oil Unloading Terminal on the Marine Environment, W75-10642 5C

TEXAS OFFICE OF THE GOVERNOR, AUSTIN. WATER TASK FORCE.
Impacts of Rural to Urban Water Use, W75-10772 6D

TEXAS UNIV. AT AUSTIN. DEPT. OF GEOLOGICAL SCIENCES.
Competence of Rivers to Transport Coarse Bedload Material, W75-10540 2J

TEXAS UNIV., PORT ARANSAS. INST. OF MARINE SCIENCE.
The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae, W75-10436 5C

TOKAI REGIONAL FISHERIES RESEARCH LAB., TOKYO (JAPAN).
PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese), W75-10622 5A

TOKYO UNIV. (JAPAN). DEPT. OF PUBLIC HEALTH.
Electron Microscope Autoradiography of Kidney After Administration of PB-210 in Mice, W75-10476 5A

TORONTO UNIV. (ONTARIO). DEPT. OF MECHANICAL ENGINEERING.
Fluid-Dynamic Excitation Involving Flow Instability, W75-10544 8B

TORONTO UNIV. (ONTARIO). DEPT. OF MECHANICAL ENGINEERING; AND TORONTO UNIV. (ONTARIO). INST. OF ENVIRONMENTAL SCIENCES AND ENGINEERING.
Some Problems in Pure and Applied Stochastic Hydrology, W75-10508 2A

TRW SYSTEMS GROUP, REDONDO BEACH, CALIF. ENGINEERING SCIENCES LAB.
Laboratory Measurement of Surface Temperature Fluctuations Induced by Small Amplitude Surface Waves, W75-10505 2L

TULSA UNIV., OKLA.
Pipeline Stress Analysis, W75-10824 8B

UKRAINSKII NAUCHNO-ISSLEDOVATELSKII INSTITUT BUMAGI, KIEV (USSR).
Increasing the Efficiency of Flotation Saveal (Povyshenie effektivnosti raboty flotatsionnyk lovushek), W75-10369 5

UNILEVER LTD., SHARNBROOK (ENGLAND). UNILEVER RESEARCH LAB.
Effect of Water Hardness on the Toxicity of Nonionic Detergent to Fish, W75-10444

Absorption, Metabolism, and Excretion Goldfish of the Anionic Detergent Sodium Laryl Sulphate, W75-10626

UNION CARBIDE CORP., NEW YORK. (ASSIGNEE)
Integral Circular Wastewater Treatment Plant W75-10729

UNION CARBIDE CORP., TUXEDO, N.Y.
How to Purify Effluents, Recover Byprodu With Reverse Osmosis, W75-10391

UNIVERSITY COLL., LONDON (ENGLAND). DEPT. OF GEOGRAPHY.
The Effects of Urbanization on Floods of D ferent Recurrence Interval, W75-10709

UNIVERSITY COLL., LONDON (ENGLAND). DEPT. OF POLITICAL ECONOMY.
Pollution Control and Optimal Taxation: Static Analysis, W75-10359

UNIVERSITY OF NEW ENGLAND, ARMIDA (AUSTRALIA). DEPT. OF GEOGRAPHY.
Flood Waves and Suspended Sediment Pu in Urbanized Catchments, W75-10647

UNIVERSITY OF NEW SOUTH WALES, KENSINGTON (AUSTRALIA). FACULTY OF MILITARY STUDIES.
Valley Design in Urban Growth Centres, W75-10643

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES. DEPT. OF BIOLOGICAL SCIENCES.
DDT : Short Term Effects on Osmoregul in Black Surfperch (Embiotoca Jacksoni), W75-10429

UPPSALA UNIV. (SWEDEN). INST. OF BIOCHEMISTRY.
Cellulose Degradation in Waste Water T ment, W75-10376

USTAV HYGIENY, PRAGUE (CZECHOSLOVAKIA).
Sensitivity of Human Diploid Embryonic Cells from Isolation of Echo Viruses Sewage, W75-10836

UTAH STATE UNIV., LOGAN.
A Connectives Model Relating Water Action Variables to Recreational Oppor Social Indicators, W75-10819

Algorithmic Modeling and the Straw Man W75-10820

**H STATE UNIV., LOGAN. DEPT. OF ICULTURAL AND IRRIGATION INEERING.**
fect of Agricultural Use on Water Quality for ownstream Use for Irrigation,
75-10805 5G

**TORIA STATE RIVERS AND WATER PLY COMMISSION, MELBOURNE STRALIA).**
e Mutual Destruction of Polluting Factors in aste Liquors,
75-10645 5D

**NNA UNIV., (AUSTRIA).**
termination of Cadmium, Copper, and Lead Natural Waters After Anion-Exchange paration,
75-10385 5A

**GINIA INST. OF MARINE SCIENCE, UCESTER POINT.**
ave Climate Model of the Mid-Atlantic Shelf d Shoreline (Virginian Sea), Model Develop-nt, Shelf Geomorphology, and Preliminary sults,
75-10552 2L

**GINIA POLYTECHNIC INST. AND STATE ., BLACKSBURG.**
sponse of Freshwater Protozoan Artificial mmunities to Metals,
75-10440 5C

ll Wastewater Treatment Stop Eutrophica-n of Impoundments,
75-10686 5D

**GINIA POLYTECHNIC INST. AND STATE ., BLACKSBURG. DEPT. OF BIOLOGY.**
richment of Surface Freshwater Microlayers th Algae,
75-10583 5A

e Effect of Sublethal Concentrations of pper and Zinc on Ventilatory Activity, ood Oxygen, and pH in Rainbow Trout almo Gairdneri),
75-10624 5C

**ERBO COLL., LA CROSSE, WIS. DEPT. OF LOGY.**
otake, Elimination and Biotransformation of e Lampricide 3-Trifluromethyl-4-Nitrophenol FM) by Larvae of the Aquatic Midge ironomus Tentans,
75-10629 5C

**ERBO COLL., LACROSSE, WIS. DEPT. OF LOGY.**
ute Toxicities of 3-Trifluoromethyl-4-trophenol (TFM) and 2',5-Dichloro-4'-trosalicylanilide (Bayer 73) to Larvae of the dge (Chironomus Tentans),
75-10698 5C

**SOYUZNYI NAUCHNO-EDOVATELSKII INSTITUT OSNABZHENIYA, KANALIZATSII, ROTEKHNICHESKIKH SOORUZHENII I HENERNOI, GIDROGEOLOGII, MOSCOW R).**
struction for Record Keeping of Water Con-mption at the Enterprises of the Paper Indus-' (Instruktsiya ucheta raskhoda vody na edpriyatiyakh otrasli),
75-10370 3E

**PORA, INC., WASHINGTON, D.C.**
shes of the Hiwassee River System: Ecologi-l and Taxonomic Considerations,
75-10694 5C

**WASHINGTON UNIV., SEATTLE.**
Egalitarianism,
W75-10818 6A

**WASHINGTON UNIV., SEATTLE. COLL. OF FOREST RESOURCES.**
Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

**WASHINGTON UNIV., SEATTLE. DEPT. OF CIVIL ENGINEERING.**
Use of Autoregressive Runoff Models in Reservoir Studies,
W75-10523 2E

Disposal of Digested Sewage Sludge by Landfill,
W75-10682 5D

**WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.**
Toward an Ice-Free Arctic Ocean,
W75-10532 2C

**WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).**
The Consequences of Accepting Industrial Wastes into Sewers; Water Pollution Research at Stevenage,
W75-10842 5D

The Toxicity of Heavy Metal Ions to Anaerobic Digestion,
W75-10843 5D

**WATER RESOURCES ENGINEERS, INC., WALNUT CREEK, CALIF.**
Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

**WATERLOO UNIV. (ONTARIO). DEPT. OF CIVIL (ENGINEERING.**
A Criterion for Vegetation Stiffness,
W75-10782 4A

**WELLTON-MOHAWK IRRIGATION AND DRAINAGE DISTRICT, ARIZ.**
Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

**WILLIAMS COLL., WILLIAMSTOWN, MASS. DEPT. OF ECONOMICS.**
Derived Decision Rules for Pollution Control in a General Equilibrium Space Economy,
W75-10360 6C

**WINONA STATE COLL., MINN.**
Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

**WISCONSIN TISSUE MILLS, NEENAH, WIS.**
Wisconsin Tissue Mills One Year After Startup of the Effluent Plant,
W75-10378 5D

**WISCONSIN UNIV., MADISON.**
Redistribution and Concentration of Mercury in the Environment,
W75-10483 5B

**WISCONSIN UNIV., MADISON. DEPT. OF BACTERIOLOGY.**
Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

Production of Microbial Protein From Waste Cellulose by Thermomonospora Fusca, A Thermophilic Actinomycete,
W75-10538 5C

**WISCONSIN UNIV., MADISON. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.**
Treatability of Leachate from Sanitary Landfills,
W75-10683 5D

**WORCESTER POLYTECHNIC INST., MASS.**
An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

**WRIGHT WATER ENGINEERS, INC., DENVER, COLO.**
Art of Agricultural Drainage Design and Costs,
W75-10797 4A

**WYOMING UNIV., LARAMIE. DIV. OF AGRICULTURAL ECONOMICS.**
Analyzing Reimbursement Mechanisms for Resource Development Projects,
W75-10353 6C

**ZENKOKU REITOGYONIKU KYOKAI, HOKKAIDO (JAPAN). (ASSIGNEE)**
Method of Purification of Waste Water Produced From the Packing of Meat and Aquatic Animals,
W75-10737 5D

# ACCESSION NUMBER INDEX


75-10351 5B
75-10352 2A
75-10353 6C
75-10354 6B
75-10355 6B
75-10356 5G
75-10357 5G
75-10358 6B
5-10359 6E
5-10360 6C
5-10361 6C
5-10362 8I
5-10363 8A
5-10364 8G
5-10365 5D
5-10366 5D
5-10367 2G
5-10368 5D
5-10369 5D
5-10370 3E
5-10371 5D
5-10372 5D
5-10373 5E
5-10374 5D
5-10375 2I
5-10376 5D
5-10377 5C
5-10378 5D
5-10379 5D
5-10380 5D
5-10381 5D
5-10382 5D
5-10383 5F
5-10384 5G
5-10385 5A
5-10386 5A
5-10387 5C
5-10388 5C
5-10389 5D
5-10390 5D
5-10391 5F
5-10392 5A
5-10393 5D
5-10394 5D
5-10395 5D
5-10396 5D
5-10397 5D
5-10398 5E
5-10399 5D
5-10400 5D
5-10401 5D
5-10402 5D
5-10403 5C
5-10404 3B
5-10405 3B
5-10406 3B
5-10407 5C
5-10408 5A
5-10409 5C
5-10410 5C
5-10411 5C
5-10412 5C
5-10413 5C
5-10414 5B
5-10415 5C
5-10416 5A
5-10417 5C
5-10418 5C
5-10419 5A
5-10420 5C
5-10421 3F
5-10422 5C
5-10423 5C
5-10424 5C
5-10425 5C
5-10426 5C
5-10427 5C
5-10428 5C
W75-10429 5C
W75-10430 5A
W75-10431 5C
W75-10432 5A
W75-10433 5C
W75-10434 5C
W75-10435 5C
W75-10436 5C
W75-10437 5C
W75-10438 5C
W75-10439 5C
W75-10440 5C
W75-10441 5C
W75-10442 5A
W75-10443 5A
W75-10444 5C
W75-10445 5C
W75-10446 5B
W75-10447 5C
W75-10448 5C
W75-10449 5C
W75-10450 5C
W75-10451 5C
W75-10452 5D
W75-10453 10C
W75-10454 2C
W75-10455 2C
W75-10456 2C
W75-10457 2C
W75-10458 2C
W75-10459 2C
W75-10460 6D
W75-10461 2C
W75-10462 2C
W75-10463 2C
W75-10464 5B
W75-10465 5D
W75-10466 5G
W75-10467 5B
W75-10468 5G
W75-10469 5G
W75-10470 5G
W75-10471 5G
W75-10472 5B
W75-10473 5D
W75-10474 5G
W75-10475 5D
W75-10476 5A
W75-10477 5B
W75-10478 5A
W75-10479 5B
W75-10480 5C
W75-10481 5B
W75-10482 5A
W75-10483 5B
W75-10484 5A
W75-10485 5A
W75-10486 5C
W75-10487 5G
W75-10488 2I
W75-10489 5A
W75-10490 5A
W75-10491 5C
W75-10492 2K
W75-10493 2K
W75-10494 2K
W75-10495 5A
W75-10496 3F
W75-10497 2K
W75-10498 2K
W75-10499 2K
W75-10500 5D
W75-10501 5F
W75-10502 2C
W75-10503 2C
W75-10504 2C
W75-10505 2L
W75-10506 4B
W75-10507 2A
W75-10508 2A
W75-10509 2E
W75-10510 2A
W75-10511 2E
W75-10512 2E
W75-10513 2B
W75-10514 2B
W75-10515 2B
W75-10516 2B
W75-10517 2B
W75-10518 2B
W75-10519 2B
W75-10520 2B
W75-10521 2B
W75-10522 2J
W75-10523 2E
W75-10524 2J
W75-10525 2E
W75-10526 5B
W75-10527 2E
W75-10528 2E
W75-10529 2B
W75-10530 2E
W75-10531 2E
W75-10532 2C
W75-10533 2C
W75-10534 2L
W75-10535 2E
W75-10536 7B
W75-10537 2H
W75-10538 5C
W75-10539 2C
W75-10540 2J
W75-10541 5D
W75-10542 5B
W75-10543 4A
W75-10544 8B
W75-10545 7B
W75-10546 2F
W75-10547 2H
W75-10548 2H
W75-10549 2H
W75-10550 2H
W75-10551 2A
W75-10552 2L
W75-10553 8H
W75-10554 2L
W75-10555 8H
W75-10556 8B
W75-10557 3F
W75-10558 5B
W75-10559 4A
W75-10560 4A
W75-10561 4A
W75-10562 4A
W75-10563 4A
W75-10564 4A
W75-10565 4A
W75-10566 4A
W75-10567 4A
W75-10568 4A
W75-10569 4A
W75-10570 4A
W75-10571 4A
W75-10572 4A
W75-10573 5B
W75-10574 4A
W75-10575 4A
W75-10576 4A
W75-10577 4A
W75-10578 4A
W75-10579 4A
W75-10580 7C
W75-10581 3E
W75-10582 4B
W75-10583 5A
W75-10584 2F
W75-10585 3B
W75-10586 2J
W75-10587 4A
W75-10588 4C
W75-10589 4A
W75-10590 5A
W75-10591 7C
W75-10592 2C
W75-10593 7C
W75-10594 8B
W75-10595 7C
W75-10596 7C
W75-10597 4B
W75-10598 4B
W75-10599 2F
W75-10600 5B
W75-10601 5B
W75-10602 4C
W75-10603 3F
W75-10604 7C
W75-10605 2E
W75-10606 2F
W75-10607 5G
W75-10608 5G
W75-10609 5C
W75-10610 5C
W75-10611 5A
W75-10612 5C
W75-10613 5C
W75-10614 5A
W75-10615 5C
W75-10616 5B
W75-10617 5C
W75-10618 5A
W75-10619 5C
W75-10620 5B
W75-10621 5C
W75-10622 5A
W75-10623 5C
W75-10624 5C
W75-10625 5C
W75-10626 5C
W75-10627 5C
W75-10628 5C
W75-10629 5C
W75-10630 5C
W75-10631 5G
W75-10632 5B
W75-10633 5G
W75-10634 5G
W75-10635 5G
W75-10636 5C
W75-10637 5C
W75-10638 5C
W75-10639 5G
W75-10640 5B
W75-10641 5C
W75-10642 5C
W75-10643 6B
W75-10644 5D
W75-10645 5D
W75-10646 2A
W75-10647 4C
W75-10648 5B
W75-10649 5A
W75-10650 7B
W75-10651 2C
W75-10652 7A
W75-10653 2C
W75-10654 4A
W75-10655 4D
W75-10656 8C
W75-10657 2C
W75-10658 2I
W75-10659 2C
W75-10660 3B
W75-10661 8A
W75-10662 8B

W75-10663 8B
W75-10664 8B
W75-10665 8B
W75-10666 8B
W75-10667 8B
W75-10668 8B
W75-10669 8B
W75-10670 8B
W75-10671 5D
W75-10672 5D
W75-10673 5D
W75-10674 5D
W75-10675 5D
W75-10676 5D
W75-10677 5G
W75-10678 5D
W75-10679 5D
W75-10680 5C
W75-10681 5D
W75-10682 5D
W75-10683 5D
W75-10684 5D
W75-10685 5D
W75-10686 5D
W75-10687 5D
W75-10688 5A
W75-10689 5D
W75-10690 5A
W75-10691 5B
W75-10692 2C
W75-10693 2C
W75-10694 5C
W75-10695 2C
W75-10697 5C
W75-10698 5C
W75-10699 5C
W75-10700 5C
W75-10701 5C
W75-10702 5C
W75-10703 5C
W75-10704 5C
W75-10705 5F
W75-10706 6C
W75-10707 6C
W75-10708 5D
W75-10709 4C
W75-10710 3D
W75-10711 5F
W75-10712 3D
W75-10713 3D
W75-10714 3F
W75-10715 2I
W75-10716 2E
W75-10717 5D
W75-10718 5D
W75-10719 5D
W75-10720 4A
W75-10721 3F
W75-10722 5D
W75-10723 6B
W75-10724 5C
W75-10725 3A
W75-10726 5G
W75-10727 4A
W75-10728 5G
W75-10729 5D
W75-10730 5D
W75-10731 5D
W75-10732 5D
W75-10733 3A
W75-10734 4A
W75-10735 5D
W75-10736 5D
W75-10737 5D
W75-10738 5D
W75-10739 5D
W75-10740 5D
W75-10741 5B
W75-10742 5G
W75-10743 5D
W75-10744 5B
W75-10745 5D
W75-10746 5B
W75-10747 5G
W75-10748 5G
W75-10749 5D
W75-10750 5D
W75-10751 5G
W75-10752 5B
W75-10753 5B
W75-10754 5B
W75-10755 5G
W75-10756 5D
W75-10757 5G
W75-10758 5D
W75-10759 5D
W75-10760 5D
W75-10761 5D
W75-10762 5D
W75-10763 5D
W75-10764 5D
W75-10765 5C
W75-10766 5B
W75-10767 5G
W75-10768 5D
W75-10769 4A
W75-10770 5B
W75-10771 6D
W75-10772 6D
W75-10773 4A
W75-10774 3B
W75-10775 3B
W75-10776 3B
W75-10777 3B
W75-10778 4B
W75-10779 5B
W75-10780 4A
W75-10781 4B
W75-10782 4A
W75-10783 4A
W75-10784 3F
W75-10785 3F
W75-10786 8B
W75-10787 8C
W75-10788 8C
W75-10789 8C
W75-10790 4C
W75-10791 3F
W75-10792 3F
W75-10793 4A
W75-10794 4A
W75-10795 6G
W75-10796 5G
W75-10797 4A
W75-10798 5D
W75-10799 2D
W75-10800 3C
W75-10801 3F
W75-10802 5G
W75-10803 5B
W75-10804 5G
W75-10805 5G
W75-10806 6B
W75-10807 6B
W75-10808 6B
W75-10809 6B
W75-10810 6A
W75-10811 6A
W75-10812 6A
W75-10813 6A
W75-10814 6A
W75-10815 6A
W75-10816 6A
W75-10817 6A
W75-10818 6A
W75-10819 6A
W75-10820 6A
W75-10821 4A
W75-10822 6C
W75-10823 4A
W75-10824 8B
W75-10825 4A
W75-10826 6B
W75-10827 6B
W75-10828 6B
W75-10829 3F
W75-10830 5D
W75-10831 5A
W75-10832 5D
W75-10833 5D
W75-10834 5D
W75-10835 5G
W75-10836 5C
W75-10837 5C
W75-10838 5D
W75-10839 5D
W75-10840 5D
W75-10841 2K
W75-10842 5D
W75-10843 5D
W75-10844 5A
W75-10845 8C
W75-10846 5B
W75-10847 2J
W75-10848 2J
W75-10849 5C
W75-10850 5B
W75010696 5C

# ABSTRACT SOURCES

| URCE | ACCESSION NUMBER | TOTAL |
|---|---|---|
| CENTERS OF COMPETENCE | | |
| Cornell University, Policy Models for Water Resources Systems | W75-10452<br>10806--10824 | 20 |
| Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology | W75-10364<br>10464--10475<br>10607--10608<br>10633--10642<br>10739--10768<br>10830--10843 | 69 |
| Illinois State Water Survey, Hydrology | W75-10502--10535<br>10537<br>10539--10541<br>10543--10556<br>10558, 10632<br>10769--10790<br>10793--10805 | 89 |
| Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry | W75-10365--10366<br>10368--10374<br>10376--10406 | 40 |
| University of Arizona, Arid Land Water Resources | W75-10453--10463 | 11 |
| University of Florida, Eastern U. S. Water Law | W75-10363 | 1 |
| University of North Carolina, Metropolitan Water Resources Planning and Management | W75-10559--10572<br>10574--10579<br>10705--10713<br>10716--10720<br>10722--10723 | 36 |
| University of Wisconsin, Eutrophication | W75-10351 | 1 |
| University of Wisconsin, Water Resources Economics | W75-10353--10361 | 9 |
| STATE WATER RESOURCES RESEARCH INSTITUTES | W75-10352, 10407<br>10724<br>10825--10828<br>10849--10850 | 9 |

## ABSTRACT SOURCES

| SOURCE | ACCESSION NUMBER | TOTA |
|---|---|---|
| C. OTHER | | |
| Agricultural Research Service | W75-10846--10848 | |
| Army Engineer Waterways Experiment Station | W75-10661--10670 | |
| BioSciences Information Service | W75-10362, 10367<br>10375, 10414<br>10421, 10440<br>10486, 10488<br>10496, 10536<br>10538, 10542<br>10557, 10573<br>10583, 10631<br>10658, 10694<br>10714--10715<br>10721<br>10791--10792<br>10829 | |
| Commonwealth Scientific and Industrial Research Organization, Australia | W75-10643--10649 | |
| Effects of Pollutants on Aquatic Life (Katz) | W75-10408--10413<br>10415--10420<br>10422--10439<br>10441--10451<br>10609--10630<br>10696--10704<br>10844 | |
| Forest Service (USDA) | W75-10650--10657<br>10659--10660<br>10692--10693<br>10695 | |
| Ocean Engineering Information Service (Patents) | W75-10725--10738<br>10845 | |
| U. S. Geological Survey | W75-10580--10582<br>10584--10606 | |
| Vanderbilt University, Metals Pollution | W75-10476--10485<br>10487<br>10489--10495<br>10497--10501 | |

☆ U. S. GOVERNMENT PRINTING OFFICE : 1975 O - 210-951 (7)

## CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey and the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

**Supported by the Environmental Protection Agency in cooperation with WRSIC**

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

## Subject Fields

NATURE OF WATER

WATER CYCLE

WATER SUPPLY AUGMENTATION AND CONSERVATION

WATER QUANTITY MANAGEMENT AND CONTROL

WATER QUALITY MANAGEMENT AND PROTECTION

WATER RESOURCES PLANNING

RESOURCES DATA

ENGINEERING WORKS

MANPOWER, GRANTS, AND FACILITIES

SCIENTIFIC AND TECHNICAL INFORMATION

## INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

U.S. MAIL

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE
COM-211

AN EQUAL OPPORTUNITY EMPLOYER

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

OFFICIAL BUSINESS
PRINTED MATTER

John LIttlewood
Documents Division
220 D Library
Champaign

.33391
48

# SELECTED WATER RESOURCES ABSTRACTS

THE LIBRARY OF THE
DEC 1 - 1975
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

VOLUME 8, NUMBER 22
NOVEMBER 15, 1975

75-10851 -- W75-11350
ODEN. SWRABW

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

# FOREWORD

**Selected Water Resources Abstracts,** a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

**Selected Water Resources Abstracts** is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

## CONTENTS

FOREWORD ..... iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

**01** NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

**02** WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

**03** WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

**04** WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

**05** WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

**06** WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

**07** RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

**08** ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

**09** MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

**10** SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

# SELECTED WATER RESOURCES ABSTRACTS

## WATER CYCLE

### . General

**N'S INFLUENCE ON THE HYDROLOGI-
CYCLE: A DRAFT REPORT OF THE
SCO/FAO WORKING GROUP ON THE IN-
NATIONAL HYDROLOGICAL DECADE.**
d and Agriculture Organization of the United
ons, Rome (Italy). Land and Water Develop-
Div.
and Agriculture Organization of the United
ons, Rome, Water Resources and Develop-
Service, Land and Water Development Divi-
Irrigation and Drainage Paper, Special Issue
. 1973. 71 p.

iptors: *Hydrologic cycle, *Environmental
s, *Water resources development,
rologic data, *Water management(Applied),
ands, Europe, Asia, North America, South
ca, Australia, Africa, Engineering, Irriga-
Groundwater, Reservoir evaporation, Social
s, Hydrologic properties, Land use.

essays explored consequences of human in-
nce with the hydrological cycle. Man's ef-
o control the world's water cycle involves
other than hydrology and engineering;
ical, sociological, economic, cultural, and
l considerations and forces must also be
into account. The first paper explains the
gical cycle of the waters of the earth. A
ng section details human impact on the
gical cycle and finds this impact increas-
gative; pollution of water and air, saliniza-
irrigation districts, mining of groundwater
lands, and potential threats to the stability
hydrologic regime which to date has
d human life. The book concludes with an
tion of man's greatest obstacle in realizing
rologic dreams: man. Examples of interna-
d national failures in planning and execut-
r projects and the prospects presented by
pollution and population are discussed.
75-10864 thru W75-10866) (Bowden-
)
63

**ATURE AND COMPONENTS OF THE
LOGICAL CYCLE,**
ty Coll., Dublin, (Ireland). Dept. of Civil
ing.
ooge.
s Influence on the Hydrological Cycle.
Agriculture Organization of the United
Rome, Irrigation and Drainage Paper
ssue No 17, p 1-18, 1973. 1 fig, 4 tab, 31

rs: *Hydrologic cycle, *Hydrologic data,
mental effects, *Hydrologic properties,
adiation, Atmosphere, Evaporation,
tion, Groundwater, Precipita-
spheric), Movement, Soil water, Chemi-
ns, Physical properties, Biological pro-
ater pollution effects, Water storage, In-
Surface waters.

interests focus on transfer of water
form to another. In the hydrological
total amount of global water remains
Movement of water in the cycle is in-
the supply of energy in the form of in-
lar radiation. Individual hydrological
f precipitation, evaporation and trans-
nfiltration and surface storage, soil
ndwater, channel and lake storage and
e conditions are discussed, describing
rocesses are capable of changing from
gic aspect to another. The secondary
hemical, biologic and pollution) effects
human environment are illustrated,
the consequences which can result
from modification of the hydrological cycle by human activity. (See also W75-10863) (Michael-Arizona)
W75-10864

**BALANCING THE EFFECTS OF MAN'S ACTIONS ON THE HYDROLOGICAL CYCLE,**
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
A. B. Costin, and J. C. I. Dooge.
In: Man's Influence on the Hydrological Cycle, Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper Special Issue No 17, p 19-51, 1973. 2 fig, 64 ref.

Descriptors: *Hydrologic cycle, *Hydrologic aspects, *Land use, *Urbanization, *Water management(Applied), Topography, Water storage, Surface runoff, Soil erosion, Surface waters, Soil water, Evapotranspiration, Percolation, Weather modification, Evaporation control, Transpiration control, Irrigation, Saline water, Drainage practices, Desalination, Forestry, Water pollution.
Identifiers: Moisture interception, Thames River, Mekong River.

Water, the most manageable of the natural resources, is capable of diversion, transport, storage and recycling. However, great care must be taken in developing one aspect of the hydrological cycle so that other hydrologic components are not adversely affected. Hydrological changes resulting from land use practices are discussed, showing how readily terrain alterations affect precipitation, surface, and sub-surface waters. Man's attempts to control hydrological processes by weather modification, evaporation and transpiration controls, control of soil water movement, engineering techniques to increase availability, and irrigation and drainage often have considerable side effects. Natural hydrologic processes can be greatly upset by practices which seem superficially beneficial, including desalination, forestry practices and urbanization. Examples of pollution effects are presented for the Thames and Mekong Rivers. The need for logical decisions in water management is vital and any alteration of one hydrological component must take into consideration all others. (See also W75-10863) (Michael-Arizona)
W75-10865

**HUMAN OBSTACLES TO THE CONTROL OF THE HYDROLOGICAL CYCLE FOR THE BENEFIT OF MAN,**
Technion - Israel Inst. of Tech. Haifa (Israel). Dept. of Agricultural Engineering.
H. Finkel.
In: Man's Influence on the Hydrological Cycle, Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper Special Issue No 17, p 53-69, 1973.

Descriptors: *Hydrologic cycle, *Administrative decisions, *Water law, *Legislation, *Water resources development, Legal aspects, Water allocation(Policy), Water rights, Water policy, Water management(Applied), Government.

Many of the world's hydrological problems are due to inefficient and ineffectual management of development projects. Political, historic and nationalistic factors often weigh heavily on development decisions. Many world wide hydrological problems result from inadequate international legislation and enforcement. On a national level, conflicts often arise between urban, industrial and agricultural interests. Economic and financial troubles internationally and locally often limit water development projects. The central problem of hydrological development is population increase. Due to the annual population growth rates in developing countries, hydrological development programs are often obsolete before completed. Effective planning of hydrological resource development must overcome grave human obstacles including data gaps and education, training, and ability deficits in developing countries (See also W75-10863) (Michael-Arizona)
W75-10866

**PREDICTING RECESSIONS THROUGH CONVOLUTION,**
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
For primary bibliographic entry see Field 2E.
W75-10917

**SUBSURFACE FLOW FROM SNOWMELT TRACED BY TRITIUM,**
Swiss Federal Inst. for Snow and Avalanche Research, Davos-Weissfluhjoch.
For primary bibliographic entry see Field 2F.
W75-10921

**THE HYDROLOGIC CYCLE--AS APPLICABLE TO THE PACIFIC NORTHWEST,**
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W75-10949

**MOISTURE AND ENERGY CONDITIONS IN A DRAINING SOIL MASS,**
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 2G.
W75-11054

**PROCESS STUDIES AND MODELING OF SELF-CLEANING CAPACITY OF MOUNTAIN CREEKS FOR RECREATION PLANNING AND MANAGEMENT,**
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering
For primary bibliographic entry see Field 5B.
W75-11055

**MULTILAG MARKOV MODELS FOR EASTERN AUSTRALIAN STREAMS,**
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-11301

**DETECTION OF CHANGE IN SEQUENCES OF HYDROLOGIC DATA,**
Melbourne and Metropolitan Board of Works (Australia).
For primary bibliographic entry see Field 7C
W75-11302

**GENERATION OF ARID ZONE RAINFALL AND RUNOFF,**
University of New England, Armidale (Australia). School of Natural Resources.
I. H. Fisher.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 90 - 94, May 1975. 2 fig, 1 tab, 17 ref.

Descriptors: *Rainfall-runoff relationships, *Synthetic hydrology, *Pasture management, *Arid lands, *Australia, Computer models, Grazing, Water balance.

In an investigation of optimal management policies for livestock grazing a large paddock in arid southern Australia, a model using synthetic daily rainfall input was required to simulate runoff from, and the wide variation of soil moisture in, the paddock. Some problems associated with the

development of such a model are outlined. A statistical analysis of historical rainfall is presented which supports the separation of the generation of the occurrence of wet and dry days from the determination of the magnitude of the nonzero daily rainfalls when constructing synthetic traces. Modifications made to an existing model to include only those processes important in arid conditions are discussed. Also described is a method devised to allow for horizontal transfer of runoff within a paddock between subdivisions relating to factors of importance to both water balance and grazing management policies. (CSIRO)
W75-11303

## 2B. Precipitation

**WATER RESOURCE OBSERVATORY CLIMATOLOGICAL DATA, WATER YEAR 1973.**
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 7C
W75-11035

**ANALYSIS OF COLORADO PRECIPITATION,**
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
M. Kuo, and S. K. Cox.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 717, $3.75 in paper copy, $2.25 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No 63, June 1975. 36 p, 10 fig, 9 tab, 7 ref. OWRT A-018-COLO(2).

Descriptors: *Precipitation(Atmospheric), *Storms, *Colorado, Data collections, Spatial distribution, Temporal distributions, Seasonal, Thunderstorms, Distribution patterns.

The precipitation trend in Colorado was studied statistically using 56 years of data collected at 61 stations. The precipitation had an annual decrease of 0.01 inches over the 56 year period although this result was not statistically significant. Precipitation periods (referred to as storms) were used to describe the variation of the precipitation in space and time. The state of Colorado was divided into six geographic regions, and area weighted hourly precipitation data were summed to obtain the volume of water yielded by each storm. It was found that 80% of the annual volume is produced by 30% of the storms. The western third of the state shows no marked seasonal variation in precipitation, but its southern half receives more precipitation than its northern half. The middle third of the state receives 60% of its precipitation in the summer, and the eastern part, the high plains, receives 80% during the summer months. Thunderstorms predominate during the summer, large scale storms in the winter. The summer precipitation volume is correlated with the annual volume in all regions. After categorizing the storms by their precipitation volume, it was found that wetter years contain more storm events of all sizes than the driest years with no noticeable change in the distribution of the size of the storms. (Martin-Colorado State)
W75-11040

**AN ELEVATIONAL CONTROL OF PEAK SNOWPACK VARIABILITY,**
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research, and Colorado Univ., Boulder. Dept. of Geography.
For primary bibliographic entry see Field 2C.
W75-11155

**CONDENSATION IN JETS, INDUSTRIAL PLUMES AND COOLING TOWER PLUMES,**
Waterloo Univ. (Ontario). Dept. of Mechanical Engineering.
T. M. I. Wigley
Journal of Applied Meteorology, Vol 14, No 1, p 78-86, February 1975. 7 fig, 3 tab, 15 ref, append

Descriptors: *Condensation, *Jets, *Cooling towers, *Saturation, Buoyancy, Drops(Fluids), Supersaturation, Humidity, Precipitation(Atmospheric), Temperature, Pressure, Environment, Fallout, Equations, Mathematical studies.
Identifiers: Cooling tower plumes, Industrial plumes.

The one-dimensional theory for the condensation of buoyant plumes was extended to include supersaturation as an extra variable. An additional equation describing the dynamics of droplet growth was used to make the system tractable. Some simple mathematical results were obtained which allowed the theory to be related to, and so extended, a commonly used graphical representation of the condensation process. The theory was then simplified to a single nonlinear first-order differential equation for the condensed water content. This was solved numerically for a typical jet, scrubbed industrial plume, and natural-draft cooling tower plume to obtain down-plume profiles of condensed water content, supersaturation, and mean droplet size. High supersaturation was predicted in all three cases, corresponding to mean relative humidities of up to 170% (jet), 150% (scrubbed plume), and 105% (cooling tower). These results may be important in predicting the growth of 'foreign' carry-over droplets in plumes from industrial sources or cooling towers. Predictions of plume length in these cases was found to be insensitive to supersaturation, but plume length was noticeably affected by supersaturation in the case of a jet. In the examples considered maximum mean droplet radii never exceeded 10 micrometers which supports the belief that rainout is caused primarily by carry-over from imperfect mist eliminators. (Jones-ISWS)
W75-11166

**CHARGED DROPLET COLLISION EFFICIENCY MEASUREMENTS,**
National Center for Atmospheric Research, Boulder, Colo.
C. E. Abbott.
Journal of Applied Meteorology, Vol 14, No 1, p 87-90, February 1975. 4 fig, 1 tab, 10 ref.

Descriptors: *Drops(Fluids), *Laboratory tests, *Cloud physics, Efficiencies, Measurement, Photography, Instrumentation, Evaluation, Analytical techniques.
Identifiers: *Collision efficiencies, Charged droplets, Electrostatics.

Experimental measurements were presented for collision efficiencies of highly charged droplets. The drop sizes studied ranged in radius from 10 to 25 micrometers and carry charges of the order of 10 to the -4th power esu. Measured collision efficiencies greater than 100 agreed well with those predicted by Paluch's analytical solution for collision efficiency upper limit. For smaller values, the collision efficiencies predicted from Davis and from Davis and Sartor exceeded those measured. (Jones-ISWS)
W75-11168

**WIND-SNOW RELATIONS AT MARMOT CREEK, ALBERTA,**
Atmospheric Environment Service, Calgary (Alberta).
For primary bibliographic entry see Field 2C.
W75-11226

**DETECTION OF CHANGE IN SEQUENCES OF HYDROLOGIC DATA,**
Melbourne and Metropolitan Board of Works (Australia).
For primary bibliographic entry see Field 7C.
W75-11302

**SOME OBSERVATIONS ON RAINFALL I... WESTERN NEW SOUTH WALES,**
New South Wales Univ., Kensington (Australia). School of Wool and Pastoral Sciences
S. J. Filan
In Hydrology Symposium Armidale Australi... 1975. The Institution of Engineers, Australi... Preprints of Papers, p 95-98, May 1975. 11 ref

Descriptors: *Rainfall, *Probability, *Forecastin... *Arid lands, *Australia, Statistical methods, De... sions making, Sheep, Marketing, Sampling, Es... mating.
Identifiers: New South Wales.

Probability distributions for monthly rainfall... several western New South Wales sites w... required for constructing a simulation model... sheep and wool production and a model for tu... of-marketing decisions for sheep. Standard for... of distribution function were found to fit the d... fairly well, but there were some systematic dep... tures. It was not possible to test the possibility t... this was due to mixed distributions; however... was established that the data exhibit autocorr... tion to a statistically significant degree, indica... that normal sampling and estimation procedu... are of uncertain reliability. The autocorrela... could be expressed in terms suitable for appl... tion in decision-making within the pastoral in... try. (CSIRO)
W75-11304

**ASPECTS OF RAINFALL MEASUREMENT... A NEW ENGLAND LOCATION,**
University of New England, Armidale (Austr...
Dept. of Geography.
I. J. Jackson.
Australian Meteorological Magazine, Vol 22... 2, p 37 - 47, June 1974. 3 fig, 8 tab, 13 ref.

Descriptors: *Rain gages, *Gaging stat... *Rainfall, Measurement, *Australia.

An experiment to assess the impact of mou... and site on rain-gauge catch is described. Fa... considered include site exposure and slope... mounting horizontally or parallel to the... When compared to the magnitude of ra... variations between gauges mounted on a sit... height of 30.5 cm, the influence of mountin... siting was not as great as might have bee... ticipated. (CSIRO)
W75-11309

## 2C. Snow, Ice, and Frost

**DIFFERENTIAL RELEASE OF WATER... ARIZONA SNOWPACKS,**
Arizona Univ., Tucson. Dept. of Wat... Management.
M. E. Jones.
Arizona University, Tucson, Departm... Watershed Management, MS Thesis, 1974. ... fig, 1 tab, 2 append, 25 ref.

Descriptors: *Snowmelt, *Lysimeters, *A... *Melt water, *Snow management, Snow... Runoff, Snow, Melting, Water sources, ... supply, Discharge(Water), Arid climates, S... climates, Ponderosa pine trees.

Installation of Haupt volumetric snow ly... in open and forested areas of Arizona sho... the winter season snowmelt outflow for... was 9.8 inches and runoff efficiency was... cent. The estimated average daily snowm... flow was 0.2 inches per day and 0.4 inches... maximum. The snow lysimeters were u... study to identify optimum sites for m... yield in terms of forest overstories. Iden... of such sites would provide a guide... minimizing the ratio of vapor to liquid w... from the snowpacks. (McLachlan-Arizon...
W75-10860

ASSESSMENT OF SNOWPACK DEPLE-
N-SURFACE RUNOFF RELATIONSHIPS
ORESTED WATERSHEDS,
na Univ., Tucson. School of Renewable
ral Resources.
rimary bibliographic entry see Field 4A.
11049

L'S THEORY OF GLACIATION SUP-
ED BY ISOTOPIC STUDY OF NORWEGI-
ORE K 11,
e National de la Recherche Scientifique, Gif-
vette (France). Centre des Faibles Radioac-
s.
imary bibliographic entry see Field 2J.
1153

ELEVATIONAL CONTROL OF PEAK
PACK VARIABILITY,
do Univ., Boulder. Inst. of Arctic and Al-
Research; and Colorado Univ., Boulder.
f Geography.
ne.
Resources Bulletin, Vol 11, No 3, p 613-
ne 1975. 4 fig, 3 tab, 11 ref. Bureau of
ation Contract 14-06-D-7052.

tors: *Snowpacks, *Mountains, *Snow
, *Variability, *Colorado, Snow cover,
Elevation, Snowfall, Snowmelt, Weather
ation, Model studies, Regression analysis,
ion analysis, On-site investigations, Mea-
nt, Meteorology, Precipita-
nospheric).
ers: *San Juan Mountains(Col), Snow ac-
ion.

ords of the seasonal peaks in snow accu-
on 24 snow courses showed that the rela-
iability (measured by the coefficient of
) is inversely related to elevation in the
n Mountains in southwestern Colorado.
on an annual basis showed that this is due
ency for the peak snowpack at high eleva-
e closer to the long-term mean, while at
s, peak snowpack is further from the nor-
s was true in both above-normal and
rmal accumulation seasons. Extrapola-
0 annual elevation-accumulation trends
that mean accumulation is reached at
r -186 m elevation. This is approximately
t of the topographic barrier of the San
untains, suggesting that the pattern of
is a partial function of an atmospheric-
ic interaction. (Sims-ISWS)
5

OW RELATIONS AT MARMOT
ALBERTA,
ric Environment Service, Calgary

Res. Vol 3, No 4, p 479-485, 1973, Illus.

s: *Canada, Snow, Wind, *Snow
nt, *Snowfall, *Wind velocity, Forest
nt, Clear-cutting.
*Marmot Creek(Alberta), *Snow-wind
ps.

rns are crucial factors to be considered
n of artificial clearings in the forest to
etain snow. Winds at Marmot Creek
Canada) during snowfall are predomi-
heasterly but are quite light; over 80%
w falls with winds less than 4.5 m/s.
winds occur between snowfalls, and
outhwest to northwest quadrant. The
ximum hourly wind per month is less
n the lower reaches but increases with
16 m/s at treeline.--Copyright 1974,
bstracts, Inc.

HOW BP ALASKA CEMENTS THROUGH PER-
MAFROST.
For primary bibliographic entry see Field 8F.
W75-11278

HYDROLOGIC RELATIONS ON UNDISTURBED AND CONVERTED BIG SAGEBRUSH LANDS: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W75-11313

## 2D. Evaporation and Transpiration

EVAPOTRANSPIRATION OF FOUR FOREST TYPES MEASURED WITH THE EDDY CORRELATION TECHNIQUE,
Washington Univ., Seattle. Coll. of Forest Resources.
L. J. Fritschen, H. R. Holbo, and M. O. Smith.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 695, $3.75 in paper copy, $2.25 in microfiche. Completion Report, June 24, 1975. 24 p, 7 fig, 2 tab, 9 ref. OWRT A-061-WASH(1). 14-31-0001-4048.

Descriptors: Eddies, Instrumentation, Measurement, Canopy, *Evapotranspiration, *Forests, Meteorology, Design, Analytical techniques.
Identifiers: *Eddy correlation technique, Forest canopies, Sensible heat flux, Spectral analysis, Fluxation.

Eddy correlation instrumentation for evapotranspiration estimation from forest canopies has been evaluated. The frequency response of the Gill-type propeller is probably adequate for obtaining vertical windspeeds, but fine glass-bead thermistors are not fast enough to capture the temperature fluctuations. A fluxatron for the direct assessment of the sensible heat flux was designed and built. In comparison with covariance and cospectral computations made from high frequency data, the fluxatron exhibited a good potential for independently forming and outputing flux estimates. Spectral analyses of the turbulence above the canopy show a wide range of frequencies, extending much lower in frequency than those normally reported. As a consequence, the bandwidth of the fluxatron must be increased. Due to the short wavelength of some of the turbulence, it will also be necessary to mount the anemometer and the thermometer as close together as practicable.
W75-11044

THE MEASUREMENT AND ESTIMATION OF LAKE EVAPORATION FROM FOUR AUSTRALIAN WATER STORAGES,
Bureau of Meteorology, Melbourne (Australia).
E. D. Hoy, and S. K. Stephens.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 70-74, May 1975. 4 fig, 3 tab, 9 ref.

Descriptors: *Evaporation, *Lakes, *Estimating, Water loss, Reservoirs, Measurement, Heat balance, Evaporation pans, *Australia, Data collections.
Identifiers: Lake Eucumbene(NSW), Cataract Reservoir(NSW), Manton Reservoir(NT), Mundaring Reservoir(WA).

Estimates of lake evaporation by the bulk aerodynamic method and the pan conversion method have been evaluated relative to the heat budget method at four Australian lakes. The results for Lake Eucumbene, Cataract Reservoir and Mundaring Reservoir gave standard errors of estimate of 10% in monthly totals of lake evaporation calculated from both methods. At Manton Reservoir only the bulk aerodynamic method has been shown to estimate monthly lake evaporation totals with a standard error estimate of 10%. Monthly totals of pan evaporation and lake evaporation are presented for all lakes. (CSIRO)
W75-11300

## 2E. Streamflow and Runoff

MEASUREMENT OF COBBLE ABRASION IN NATURAL STREAMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2J.
W75-10881

FLOOD RUNOFF FROM URBAN AREAS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-10904

AUTOMATED DISTRIBUTION OF GAUGE AND SHIFT CORRECTIONS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W75-10911

FLOW FILE OPERATIONS MANUAL,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W75-10913

AUTOMATED HOURLY COMPUTATIONS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W75-10915

PREDICTING RECESSIONS THROUGH CONVOLUTION,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
P. Yates, and W. M. Snyder.
Water Resources Research, Vol 11, No 3, p 418-422, June 1975. 13 fig, 2 tab, 11 ref.

Descriptors: *Recession curves, *Hydrographs, *Streamflow, *Base flow, *Methodology, Optimization, Hydrologic data, Model studies, Watersheds(Basins), Groundwater.
Identifiers: *Convolution method, *Ahoskie Creek(NC).

Streamflow during recessions, that is, during periods of little or no rain, represents a dependable minimum supply of water. However, quantitative mathematical expressions are still lacking for predicting flow during recession periods. A convolutional model of streamflow recession was formulated and tested utilizing sequential values of mean daily discharge, Parameters of the model were determined by optimization wity historical streamflow records. Preliminary relationships of parameters to rate of flow and size of drainage area were explored. (Singh-ISWS)
W75-10917

IMPLICIT NUMERICAL MODELING OF UNSTEADY FLOWS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-10925

RELATIVE IMPORTANCE OF DECISION VARIABLES IN FLOOD FREQUENCY ANALYSIS,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 4A.
W75-10929

STREAMFLOW IN THE NEW YORK PART OF THE SUSQUEHANNA RIVER BASIN,
Geological Survey, Albany, N.Y.
H. F. H. Ku, A. D. Randall, and R. D. MacNish.
New York State Department of Environmental Conservation, Albany, Bulletin 71, 1975. 130 p, 31 fig, 10 tab, 60 ref, 4 append.

Descriptors: *Streamflow, *Hydrologic data, *New York, *Watershed management, Evaluation, Runoff, Discharge(Water), Flow duration, Flood frequency, Droughts, Water quality, Water utilization, Water demand, Correlation analysis.
Identifiers: *Susquehanna River basin(NY), Streamflow summary.

The Susquehanna River basin occupies about 6,500 square miles in south-central New York. Continuous records of streamflow at 60 gaging stations are summarized by tables of flow duration and low-flow frequency for the 1931-60 standard period and (or) for periods of record through 1959 and 1967. Similar statistics are developed by correlation for 110 partial-record stations. Record low flows for one or more periods were set at 26 of 37 long-term gaging stations during the drought of the 1960's, and the cumulative runoff deficiency equaled 1-1/2 years of normal runoff. Maps of annual precipitation and runoff show that precipitation is several inches greater in the eastern part of the basin than in the western part, but evapotranspiration is slightly greater in the west. Requirements for within-year and carryover storage with 2- to 10-percent risks of deficiency are presented for gaged sites and may be estimated for ungaged sites from low-flow and mean-runoff parameters. Flood magnitude and frequency at gaging stations are summarized, and three regions are defined within which floods on major streams have a consistent relation to basin size. (Woodard-USGS)
W75-10931

TEMPERATURES OF KANSAS STREAMS,
Geological Survey, Lawrence, Kans.
C. V. Burns.
Kansas Water Resources Board, Topeka, Streamflow Characteristics Technical Report No 12, July 1975. 220 p.

Descriptors: *Water temperature, *Streams, *Kansas, *Basic data collections, Gaging stations, Sites, Streamflow, Discharge(Water), Hydrologic data, Correlation analysis.
Identifiers: *Water temperature frequency distribution, Discharge frequency distribution, Average temperatures, Maximum temperatures, Minimum temperatures.

Water temperature observations in Kansas, made in conjunction with discharge measurements, are presented for the period of record beginning with three stations in 1948 and increasing to about 240 stations by 1972. Water temperature data for each station are summarized both monthly and for the period of record giving the mean, standard deviation, range between maximum and minimum, and number of observations. Graphs show the frequency distributions of time of observation, discharge, and temperature. A plot of temperature versus data illustrates the distribution of all observed data available during 1948-72. (Woodard-USGS)
W75-10933

ESTIMATED AVAILABILITY OF SURFACE AND GROUND WATER IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUNTY, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W75-10938

LOW-FLOW CHARACTERISTICS OF SELECTED STREAMS IN NORTHEASTERN WASHINGTON,
Geological Survey, Tacoma, Wash.
D. E. LaFrance.
Open-file report, 1975. 22 p, 6 fig, 1 plate, 4 tab, 7 ref.

Descriptors: *Washington, *Low flow, *Streamflow, Analytical techniques, Regression analysis, Average flow, Low flow frequency, Gaging stations, Data collections, Hydrologic data, Correlation analysis, Hydrographs, Maps, Sites, Precipitation(Atmospheric), Water utilization, Watershed management, Water demand.
Identifiers: 7-day flows.

Low-flow-frequency curves developed from streamflow records at nine continuous-recording gaging stations in northeast Washington were used to determine discharges for low-flow frequencies of 7, 30, 60, 90, and 183 days. Computed for the nine gaging stations and tabulated in the report are low-flow-frequency data for the 7-day low flows and monthly average low flows at the 2-year recurrence interval. Regression techniques used to estimate the 7-day low flows at 103 miscellaneous short-term sites indicate that correlation coefficients for all except three sites equaled or exceeded 0.90. Low flows varied widely from year to year, as indicated by slope indexes ranging from 1.16 to 8.16 among the 103 miscellaneous sites. The 7-day low flow of the Colville River at Kettle Falls during the periods 1924-32 and 1934-71 ranged from a minimum of 5.29 cfs in 1931 to a maximum of 128 cfs in 1949. (Woodard-USGS)
W75-10939

ESTIMATED MEAN-MONTHLY AND ANNUAL RUNOFF AT SELECTED SITES IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUNTY, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
L. J. Reiland.
Open-file report 74-150, June 1975. 21 p, 1 fig, 3 tab, 6 ref.

Descriptors: *Streamflow, *Natural flow, *Average flow, *Regression analysis, *New Mexico, Natural streams, Estimating, Runoff, Correlation analysis, Gaging stations, Hydrologic data, Methodology.
Identifiers: *Santa Fe County(N Mex), Ungaged streams.

Estimates are shown for natural mean-monthly and annual runoff at 6 selected sites in the Pojoaque River drainage basin, Santa Fe County, N. Mex. Natural runoff is defined as the runoff that would occur if there were no manmade changes. The sites are: Rio Nambe at Nambe Falls, near Nambe; Rio Nambe near Nambe, plus Nambe canal; Rio En Medio at Nambe Pueblo boundary; Rio Chupadero at Nambe Pueblo boundary; Rio Tesuque at Tesuque Pueblo boundary; and Pojoaque River at mouth. Techniques of regression analysis and runoff-elevation relationships were used to estimate runoff where no streamflow records or only short-term records are available. Comparison of estimated mean-annual runoff, using these techniques, with mean-annual runoff obtained from streamflow records at gaged stations within and near the area indicated that the estimated mean-annual runoff at sites unaffected by excessive channel loss was generally within 10 percent, or less, of the gaged runoff. The natural runoff calculated for each of the six sites is believed to be equivalent to runoff for the water years 1920-1968. (Woodard-USGS)
W75-10943

SOME RESULTS ON MASS TRANSFER PROCESSES IN A DENSITY-STRATIFIED FLOW,
Mississippi Univ. University. Dept. of Mechanical Engineering
For primary bibliographic entry see Field 8B.
W75-11057

EFFECT OF PRESSURE GRADIENT ON WIND WAVES IN A LABORATORY CHANNEL,
Connecticut Univ. Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-11093

TRANSITION IN OSCILLATORY FLOW OVER RIPPLED BEDS,
Cambridge Univ., (England). Dept. of Engineering.
For primary bibliographic entry see Field 8B.
W75-11149

DERIVATION OF SURFACE WATER LAG TIME FOR CONVERGING OVERLAND FLOW,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh.
Water Resources Bulletin, Vol 11, No 3, p 501-513, June 1975. 2 fig, 5 ref.

Descriptors: *Time lag, *Overland flow, *Mathematical studies, Basins, *Rainfall intensity, Mannings equation, Chezy equation, Momentum equation, Theoretical analysis, Surface waters, Watersheds(Basins), Hydrodynamics, *Watersheds(Basins).
Identifiers: *Kinematic wave theory, Converging overland flow.

Lag time was defined as the lapse between the time of occurrence of 50% input and 50% output. Generalized and special forms of explicit analytical solutions of surface water lag time were derived for converging overland flow, utilizing the kinematic wave theory which comprises equations of continuity and motion. These solutions relate lag time to physically measurable quantities of the watershed, including surface roughness and geometrical parameters. Expressions for lag time were derived both from Manning's and Chezy equations. Hydrologically similar basins exhibit similar lag time behavior. A similarity factor is defined for comparing basins. (Singh-ISWS)
W75-11156

LABORATORY INVESTIGATION OF ONE-DIMENSIONAL WAVE MOTION IN OPEN CHANNELS,
Tennessee Univ., Knoxville. Coll. of Engineering.
For primary bibliographic entry see Field 8B.
W75-11172

MULTILAG MARKOV MODELS FOR EASTERN AUSTRALIAN STREAMS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
G. L. Wright.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 75-79, May 1975, 1 tab, 15 ref.

Descriptors: *Markov processes, *Streamflow, *Statistical models, Rivers, *Australia, Synthetic hydrology, Analytical techniques.
Identifiers: Victoria, New South Wales, Queensland.

An examination has been made of the value of lag-one Markov schemes which are commonly used in synthetic streamflow generating models. It has been shown, by consideration of the partial autocorrelation functions calculated for twelve

rivers, that persistence effects for greater
gsone are not usually insignificant. On the
and, after comparing synthetic streamflow
ces produced by Markov schemes up to lag-
no appreciable improvement was found
emes greater than lag-one. (CSIRO)
301

GHTS, DISTRIBUTIONS AND DEPEN-
: AN ANALYSIS OF SOME SYNTHETIC
GENERATION METHODS,
uth Wales Univ., Kensington (Australia).
f Civil Engineering.
ran.
rology Symposium, Armidale, Australia,
he Institution of Engineers Australia,
s of Papers, p 85 - 89, May 1975. 3 fig, 4
ef.

ors: *Low flow frequency, *Synthetic
y, *Streamflow forecasting, *Australia,
, Streamflow, Time series analysis, Com-
dels, Monthly.

ence of zero flows and the closely related
requency problem are of major concern
stralia's highly emphemeral streams.
n techniques of modeling monthly
w data do not always adequately
he properties of the historical data under
litions. An examination is made of vari-
el-parameter estimation procedures in
ication to some Australian streamflow
a method of modelling data with a high
of zeros is discussed. An application of
nt extreme-value parameter estimation
is proposed as a test of the drought-
ability of various streamflow genera-
s. (CSIRO)

TIES IN GAUGING SMALL
ENTS - A CASE STUDY,
Wales Univ., Kensington (Australia).
Civil Engineering.
m, and B. A. Cornish.
ogy Symposium, Armidale, Australia,
Institution of Engineers Australia,
f Papers, p 99 - 103, May 1975. 6 fig, 10

: *Gaging stations, *Small watersheds,
surement, *Stream gages, Rainfall-ru-
nships, Stage-discharge relations, Time
evels.

outlined for the fundamental difficul-
ng high quality streamflow data from
ments. Serious errors may result, but
s are often not easily recognized. Ex-
and hydraulic model studies on a 0.38
ment are used to illustrate the difficul-
ining high gaugings, problems in
tion of streamflow and rainfall
appreciable magnitude of velocity dis-
head effects relative to the low range
these catchments, and stage lag in the
. (CSIRO)

N ARID ZONE STREANGAUGING,
Vales Dept. of Public Works, Sydney
Water Supply and Sewerage Branch.
d K. P. Roberts.
y Symposium, Armidale, Australia,
nstitution of Engineers Australia,
apers, p 104-106, May 1975. 5 ref.

*Arid lands, *Australia, *Network
mflow, Flow measurement, Stream
stations, Data processing.

nce gained in the Northern Territory
uestions are raised concerning the
blishment and operation of a stream gauging network which is most likely to produce information useful to the engineer. It is argued that the common view of hydrologic networks as simple sums of men, machinery and physical phenomena is to be abandoned in favor of a systems approach to obtaining data from the hydrometeorologic system. Attention is drawn to the peculiarities of the Australian arid zone and especially to the need to use non-specialists in many tasks and the need to perform hydrologic calculations as the ultimate check of the value of hydrographic data. (CSIRO)
W75-11307

**VARIABILITY, PERSISTENCE AND YIELD OF AUSTRALIAN STREAMS,**
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
T. A. McMahon.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers, Australia, Preprints of Papers, p 107-111, May 1975. 12 fig, 3 tab, 10 ref.

Descriptors: *Australia, *Streamflow, *Variability, Low flow, Persistence, Water yield, Streams, Discharge(Water), Asia, Europe, North America, Correlation analysis, Duration curves, Water storage, Reservoirs.
Identifiers: Storage-yield relationships.

Low flow hydrologic characteristics of 156 Australian streams were reviewed and results compared with Asian, European and North American streams. Coefficients of variation and skewness, serial correlation, low flows as defined by flow duration curves and storage-yield values were studied. Australian streams were considerably more variable than northern hemisphere ones. The coefficient of variation was more highly correlated with other characteristics than the mean flow. Empirical equations relating reservoir-storage capacity per mean annual flow to the coefficient of variation were developed. (CSIRO)
W75-11308

## 2F. Groundwater

**HYDROGEOLOGY AND WATER RESOURCES OF MIDDLE KIRKLAND CREEK BASIN, YAVAPAI COUNTY, ARIZONA,**
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W75-10872

**SUBSURFACE FLOW FROM SNOWMELT TRACED BY TRITIUM,**
Swiss Federal Inst. for Snow and Avalanche Research, Davos-Weissfluhjoch.
J. Martinec.
Water Resources Research, Vol 11, No 3, p 496-498, June 1975. 3 fig, 8 ref.

Descriptors: *Subsurface runoff, *Melt water, *Tritium, *Tracers, Groundwater movement, Snow, Runoff, On-site investigations, Infiltration, Discharge(Water), Hydrograph analysis, Lysimeters, Dispersion, Velocity, Radioisotopes, Recession curves.
Identifiers: *Residence time, Radioactive decay.

An explanation was offered of the apparent discrepency between the small velocities of subsurface flow and the watershed response. Environmental tritium in the hydrological cycle provided evidence for a new insight into the runoff mechanism. By this concept the quick reaction of outflow to a massive groundwater recharge was brought to agreement with the long residence time of the infiltrated water. (Visocky-ISWS)
W75-10921

**DETERMINATION OF REGIONAL HYDRAULIC CONDUCTIVITY THROUGH USE OF C-14 DATING OF GROUNDWATER,**
Geological Survey, Reston, Va.
B. B. Hanshaw, and W. Back.
Reprint from Memoires de l'Association Internationale des Hydrogeologues, Montpellier, France, Vol 10, No 1, p 195-196, September 1974. 3 fig, 7 ref.

Descriptors: *Hydraulic conductivity, *Groundwater movement, *Radioactive dating, *Carbon radioisotopes, Tracers, Hydrogeology.

In order to model and quantify a hydrologic system, one needs to know the boundary conditions, aquifer thickness, and the regional distribution of the hydraulic conductivity. Obtaining sufficient values for the hydraulic conductivity by means of a few pumping tests, core analyses, and tracer tests, so as to be meaningful on a regional scale, has long been a serious constraint on groundwater modeling. However, by using a form of Darcy's law that relates hydraulic conductivity, porosity, gradient of potentiometric surface, and velocity, it is possible to determine hydraulic conductivity if the other variables are known. Porosity can be estimated by standard methods and hydraulic gradient can be obtained directly from the potentiometric surface. Velocity can be calculated from the C-14 ages of carbonate species dissolved in groundwater. The technique of determining regional hydraulic conductivity distribution and solving the equation of groundwater flow was tried in central Florida and gave values of hydraulic conductivity that are in agreement with values obtained by traditional methods. (Knapp-USGS)
W75-10930

**GROUND WATER IN THE CORVALLIS-ALBANY AREA, CENTRAL WILLAMETTE VALLEY, OREGON,**
Geological Survey, Reston, Va.
F. J. Frank.
Available from Supt. of Documents, GPO, Washington, D.C. 20402, $1.95 in paper copy. Water-Supply Paper 2032, 1974. 48 p, 9 fig, 2 plate, 7 tab, 13 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Hydrologic data, *Oregon, Water wells, Alluvial aquifers, Well data, Drillers logs, Geology, Water supply, Water yield, Water quality.
Identifiers: *Corvallis-Albany area(Ore), Central Willamette Valley(Ore).

The Corvallis-Albany area is part of the alluvial plain that lies between the Cascade and Coast Ranges in the central Willamette Valley in northwestern Oregon. The alluvial deposits (sand and gravel) of the valley plain contain the most productive aquifers in the area and are considered to be the only units feasible for large-scale development of groundwater supplies. During 1971 the seasonal decline of water levels from winter to late summer averaged about 10 feet for the alluvial deposits. The seasonal change of storage was estimated to be about 130,000 acre-feet. Of this volume, about 14,000 acre-feet was pumped from wells; the rest was discharged through seeps and springs by evapotranspiration. The difference between pumpage and natural discharge indicates that a great quantity of additional water is available for development. The storage capacity of the alluvial aquifers is estimated to be about 750,000 acre-feet between depths of 10 and 100 feet. Water from the alluvial deposits is chemically suitable for all uses, as is most of the water from perched-water bodies in the older sedimentary and volcanic rocks. (Woodard-USGS)
W75-10940

**RECHARGE AREAS OF THE FLORIDAN AQUIFER IN SEMINOLE COUNTY AND VICINITY, FLORIDA,**
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-10944

**CONTOUR MAP OF THE BEDROCK SURFACE, NEW BRITAIN QUADRANGLE, CONNECTICUT,**
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-10950

**MAP SHOWING DEPTH TO BEDROCK, WORTHINGTON QUADRANGLE, MASSACHUSETTS,**
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-10951

**MAP SHOWING DEPTH TO BEDROCK, GREENFIELD QUADRANGLE, MASSACHUSETTS,**
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-10952

**MAP SHOWING DEPTH TO BEDROCK, CHESTER QUADRANGLE, MASSACHUSETTS,**
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-10953

**MAP SHOWING DEPTH TO BEDROCK, MOUNT CARMEL QUANDRANGLE, CONNECTICUT,**
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-10954

**STUDY OF CRITERIA AND MODELS ESTABLISHING OPTIMUM LEVEL OF HYDROGEOLOGIC INFORMATION FOR GROUNDWATER BASIN MANAGEMENT,**
Minnesota Univ., Minneapolis. Dept. of Geology and Geophysics.
H. O. Pfannkuch.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 719, $6.25 in paper copy, $2.25 in microfiche. Minnesota Water Resources Research Center, Minneapolis, Bulletin No 81, April 1975. 165 p, 27 fig, 4 tab, 94 ref. OWRT A-027-MINN(1).

Descriptors: *Hydrologic data, *Model studies, *Groundwater, *Water management(Applied), Decision making, *Optimization, Simulation analysis, Data collections, Design.
Identifiers: *Sensitivity analysis

Information is a structural part of the decision making process. The role of the information gathering process can best be described as a Bayes' process to improve preposterior distributions in probability assignments that will serve as basis for decision making processes. Hydrogeologic information is characterized by a low degree of predictability and high variability. The general cost structure of the hydrologic information gathering process is represented in information cost curves which are combined with production cost or opportunity loss curves to give total cost curves. These may display a minimum which is the point of diminishing returns at which exploration activities should be ceased. One of the main unsolved problems is the proper definition of a universally applicable unit of information content. Optimum levels of information can only be established when utility functions can be expressed in monetary terms and give rise to clear objective functions. Three case histories were used to develop guidelines for the design and operation of monitoring systems for special wastes, minimum hydrogeologic information needed in watershed district management, and the need and role of information in the choice and construction of a proposed simulation model for a regional system under complex decision rules. (Waelti-Minnesota)
W75-11042

**MANAGEMENT OF RETARDATION OF SALT WATER INTRUSION IN COASTAL AQUIFERS,**
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
A. I. Kashef.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 721, $8.75 in paper copy, $2.25 in microfiche. Completion Report, July 1975. 281 p, 103 fig, 17 tab, 53 ref. OWRT (C-4061)(No 9013)(2).

Descriptors: *Aquifer management, *Artesian aquifers, *Artificial recharge, *Finite element analysis, *Saline water-freshwater interfaces, *Saline water intrusion, Earth dams, Free surface, Groundwater resources, Optimization, Well spacing.
Identifiers: Artesian recharge wells, *Coastal aquifers, Salt water retardation, Finite element mesh, *Hydraulic forces method, Equipotential lines, Freshwater barriers, Rectangular earth sections, Streamlines, Velocity vectors.

The free surface in rectangular earth sections or cores of earth dams were determined by the finite element method using a new technique of horizontally displaced mesh. Ten cases were solved and compared with a previously developed and simpler method in which the hydraulic forces were analyzed and which resulted in closed form mathematical solutions. The comparison indicated that the method of hydraulic forces can satisfactorily be used in artesian aquifers to locate the saline water-freshwater interface which is analogous to the free surface in earth dams. The solved cases corresponded to a wide range of coverage of practical conditions. The effects of recharge wells under the transient flow conditions were then superimposed on these due to the natural flow in order to determine the degree of salt water retardation. Single wells as well as battery of recharge wells parallel to the coast line were analyzed. In all cases, dimensionless parameters were used to allow for the changes in the pump capacities and the time intervals. Various well locations were examined and in the case of well batteries various spacings were introduced. The optimum conditions corresponding to desired degrees of salt water retardation are indicated. Freshwater barriers resulted under certain conditions yet these were outside the scope of this project.
W75-11058

**DEPRIVATION CONTRIBUTION AND INTERFERENCE EFFECTS OF MULTIPLE WELLS IN A COMMON AQUIFER,**
Oklahoma Univ., Norman. Dept. of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 4B.
W75-11142

**URANIUM MINERALIZATION BY GROUND WATER IN SEDIMENTARY ROCKS, JAPAN.**
Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan). Raw Materials Div.
K. Doi, S. Hirono, and Y. Sakamaki.
Economic Geology, Vol 70, No 4, p 628-646, June-July 1975. 25 fig, 7 tab, 22 ref.

Descriptors: *Groundwater, *Percolating water, *Leaching, *Mineralogy, Water properties, Groundwater movement, Geology, Rocks, Granites, Sedimentary rocks, Fissures(Geologic), Spring waters, Adsorption, Deposition(Sediments), Petrology.
Identifiers: *Uranium, *Japan, Mineralization, Carbonaceous matter, Ores.

To solve the mechanism of uranium concentratio in stratabound uranium deposits occurring in t basal part of Neogene sediments overlying grani basement, attention has been paid to uraniu leaching from weathered granite by circulati carbonated fissure waters, to effective adsorbe for fixing uranium from uraniferous groun waters, to structural features controlling t groundwater circulation, and to other relevant fa tors. The evidence for uranium transportation hydrothermal solutions, including hot spri waters, was had to observe. It was concluded: uranium in the deposits is supplied from surrou ing source rocks, mostly from granite. (2) urani is transported by circulating groundwater so tions; (3) the uranium dissolved in graoundwate fixed in minerals in various ways, the most imp tant being adsorption by carbonaceous matter; ore-grade uranium concentrated from very di solutions occurs by multiple repetition of leaching-and-fixation cycle between minerals adsorbents and circulation uraniferous grou water; and (5) important factors for urani mineralization are sufficient uranium (supp mostly from granite), the existence of effective sorbents such as carbonaceous matter in the h rocks, and favorable geological, geochemical, geophysical environments. The last seem require not only physical and chemical conditi but also corrent flow and volume of groundwa (Sims-ISWS)
W75-11145

**APPROXIMATION FOR STEADY INTERF BENEATH A WELL PUMPING FRESH WA OVERLYING SALT WATER,**
New Mexico Inst. of Mining and Technol Socorro.
For primary bibliographic entry see Field 4B.
W75-11255

**GROUND WATER DEPLETION AND SIDENCE PROBLEMS IN TAIPEI BASIN,**
National Taiwan Univ., Taipei. Hydraulic Lab
For primary bibliographic entry see Field 4B.
W75-11262

## 2G. Water In Soils

**BARRENNESS OF DESERT PAVEMEN YUMA COUNTY, ARIZONA,**
Arizona Univ., Tucson.
H. B. Musick.
Journal of the Arizona Academy of Scienc 10, No 1, p 24-28, February, 1975. 2 fig, 2 t ref.

Descriptors: *Arid lands, *Sierozems, *Soil sis, *Soil texture, *Infiltration, Arid cli Deserts, Semiarid climates, Remote sensing al photography, Shrubs, Soil investigation, soils, Colloids, Flocculation, *Arizona.
Identifiers: *Desert pavement, Yuma ty(Ariz).

Desert pavement, a common feature of desert areas, is a nearly flat soil surface co of a single closely-packed layer of p generally covered with dark brown desert v and devoid of vegetation. Analysis show usually saline-sodic or sodic. Deflocculat soil colloids by exchangeable sodium result soil infiltration of rainfall and reduc moisture supply. The absence of soil m seems to be the most important factor pre the establishment of plant life on the dese ment soil. (Robinett-Arizona)
W75-10868

**SEASONAL VARIATIONS IN THE INF TION RATE OF A WHITEHOUSE S SOUTHERN ARIZONA,**
Arizona Univ., Tucson. Dept. of W Management.

Medina Torres.
ona University, Tucson, Department of
ershed Management, MS Thesis, 1974. 41 p, 9
tab, 1 append, 48 ref.

riptors: *Infiltration, *Infiltration rates,
ced infiltration, *Watershed management,
ge management, *Arizona, Loam, Soil
ure, Rainfall simulators, Soils, Soil types,
ensity, Vegetation, Sands, Seasonal.
ifiers: *White-house sandy loam, Page-Trow-
e Experimental Ranch(Ariz).

periment to test the hypothesis that terminal
ation rates for a White House sandy loam
aried with the seasons of the year was un-
en at the Page-Trowbridge Experimental
in southern Arizona. Infiltration rates were
ted during the winter, early spring, and
summer of 1974. Simulated rainfall was ap-
o plots one-thousandth of an acre in size by
the Rotadisk Rain-ulator. Antecedent soil
re and soil bulk density were measured and
tion growth stage recorded at the time of
nfiltration run. Cover measurements were
t the last infiltration run of all plots. Non-
ant differences influenced by the season of
ar were found in the terminal infiltration
lowever, there was a consistent decrease of
lent soil moisture from January to June.
chlan-Arizona)
873

GEMENT OF SOUTHWESTERN DESERT

Univ., Tucson. Dept. of Soils, Water and
ring.
uller.
ity of Arizona Press, Tucson. 1975. 195 p,
tab.

ors: *Sierozems, *Soil management,
nds, *Soil-water-plant relationships, *Soil
properties, *Soil physical properties,
ironment, Soil texture, Soil treatment,
Soil aggregates, Flocculation, Wettabili-
nicroorganisms, Soil amendments, Fertil-
ganic matter, Soil analysis, Salinity, Soil
, Soil compaction, Compacted soils, Pud-
nd reclamation, Soil water, Soil water
t, Soil stabilization.

imates, soils are under stresses of irriga-
r that is high in salt content, of a high
on rate from surfaces with concurrent
ovement of salts by capillary action, and
ater demand by plants to accommodate
spiration losses under desert conditions.
tern desert soil profiles are explained,
nctions, composition, sources, manage-
maintenance of organic matter in soils
sed. The need for and practical uses of
nd fertilizers are outlined with emphasis
ual chemical and physical properties.
nt of arid lands including reclamation
, salinity control and water use is out-
and water conservation, both essential
soil management, are emphasized.
s for testing desert soil, water, and
resented. (Michael-Arizona)

THE DESERT SOUTHWEST,
iv., Tucson. Dept. of Soils, Water and
,
r.
of Arizona Press, Tucson. 1975. 102 p,

: *Southwest US, *Sierozems, *Arid
s, *Soil classification, *Soil surfaces,
gations, *Soil physical properties, Soil
perties, Soil chemistry, Soil environ-
rosion, Soil formation, Soil horizons,
, Soil properties, Soil structure, Soil
types.

The characteristics of desert soils in the southwestern United States are contrasted and compared with soils for more humid climates. An overview is presented of the physical characteristics, vegetation, and human impact on desert soils. Physical makeup of desert soils, including mineral and organic matter and soil matter and air content is explained. The soil forming features of the desert (climate, vegetation, topography, parent material and time) are discussed individually and their interaction under certain conditions is elaborated. Topsoil appearance and subsurface structure are explained in relation to mineral content, weathering and the desert fauna which exist in the soil. The last chapter demonstrates how to classify soils into groups and the appendix gives soil classification and nutrient cycle charts. (Miller-Arizona)
W75-10878

**SOIL MORPHOLOGY AND SOIL PHYSICAL PROPERTIES: II. MECHANICAL IMPEDANCE AND MOISTURE RETENTION AND MOVEMENT,**
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
K. W. Ayres, R. G. Button, and E. De Jong.
Canadian Journal of Soil Science, Vol 53, No 1, p 9-19, 1973. Illus.

Descriptors: *Soil physical properties, *Moisture content, Soil structure, Soil mechanics, Soil horizons, *Soil density, Chernozems, Porosity, Regression analysis, Hydraulic conductivity, Bulk density.
Identifiers: Solonetzic soils, *Soil mechanical impedance.

The relations among soil structure, soil mechanical impedance and moisture retention and movement were investigated on undisturbed soil cores from soil horizons exhibiting 6 distinct kinds of soil structure (prismatic, columnar, blocky, granular, platy, massive) over a broad range of soil texture. Mechanical impedance was characterized by measurements of bulk density and soil strength. Moisture retention and movement were characterized by measurements of 1/3-atm moisture content and saturated hydraulic conductivity. The columnar structures from Solonetzic soils were singled out as having a higher mechanical impedance and lower hydraulic conductivity than the other structures, most of which were sampled from Chernozemic soils. Total porosity (P) and bulk density (Db) were highly correlated; however, the regression coefficient for P vs. Db for columnar structures was significantly higher than that found for the other 5 structural types. Regression equations predicted that the hydraulic conductivity of platy structures could be zero for samples having as much as 15% air-filled pore space at 1/3-atm suction as compared with 6-8% for the other structures.--Copyright 1973, Biological Abstracts, Inc.
W75-10885

**USE OF AMENDMENTS TO REDUCE WATER REQUIREMENTS FOR STAND ESTABLISHMENT OF SMALL-SEEDED CROPS,**
Arizona Univ., Tucson. Dept. of Plant Sciences.
For primary bibliographic entry see Field 3F.
W75-11045

**MOISTURE AND ENERGY CONDITIONS IN A DRAINING SOIL MASS,**
Georgia Univ., Athens. School of Forest Resources.
W. L. Nutter.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 726, $4.75 in paper copy, $2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No ERC-0875, June 1975. 88 p, 15 fig, 4 tab, 26 ref. OWRT A-025-GA(2), 14-31-0001-3510.

Descriptors: Watersheds(Basins), *Forest watersheds, *Recession curves, Subsurface drainage, *Soil water movement, Percolation, Soil properties, Subsurface flow, Unsaturated Flow, Tensiometers, *Subsurface runoff, Model studies, Slopes, Soil moisture, Moisture content, Energy, Drainage.
Identifiers: *Hillside drainage, Matric potential, Soil mass.

A 6.1 m long, 1.2 m deep and 0.3 m wide soil model was constructed in the laboratory. The model may be mechanically raised from the horizontal to a 27-degree angle. The model was packed with a mixed subsurface horizon soil composed of 51 percent sand, 21 percent silt and 28 percent clay. The objective was to study the effects of slope angle and soil depth on the moisture and energy conditions within a draining soil mass and their relationship to streamflow depletion. Three slopes (25, 15, and 5 degrees) were drained at three depths (120, 80 and 40 cm), a total of nine drainage sequences. As drainage continues the equipotential lines of hydraulic head approach a position normal to the surface. The degree of divergence from normal increases with decrease in slope angle. Water content gradients suggest that a zone of active water movement migrates downslope during drainage and may migrate back upslope during the input of rainfall. The zone may identify the limits of source areas during stormflow. Of the variables studied, slope angle exerts the greatest influence over the nature of drainage from a soil mass. Response of a moderately step and moderately deep slope will be similar to that of a steep and deep slope.
W75-11054

**LIMITATIONS OF USING A SIMULATION MODEL OF THE SOIL UNDER IRRIGATED CULTIVATION TO SIMULATE THE FUNCTIONING OF THE SOIL AS A PURIFYING SYSTEM (LIMITES D'UTILISATION D'UN MODELE DE COMPORTEMENT DU SOL SOUS CULTURE IRRIGUEE POUR SIMULER LE FONCTIONNMENT DU SOL COMME SYSTEME EPURATEUR),**
Institut National de la Recherche Agronomique, Versailles (France). Soils Lab.
For primary bibliographic entry see Field 5B.
W75-11125

**THE USE OF SOIL AS A PURIFYING SYSTEM (L'UTILISATION DU SOL COMME SYSTEME EPURATEUR),**
Institut National de la Recherche Agronomique, Dijon (France). Laboratoire de Microbiologie des Sols.
For primary bibliographic entry see Field 5D.
W75-11126

**SOIL MAP OF THE WORLD, 1:5,000,000, VOLUME IV, SOUTH AMERICA.**
Food and Agricultural Organization of the United Nations, Rome (Italy); and United Nations Educational, Scientific, and Cultural Organization, Paris (France).
For primary bibliographic entry see Field 7C.
W75-11138

**AVAILABLE WATER-HOLDING CAPACITIES OF SOILS IN SOUTHERN IDAHO,**
Idaho Agricultural Experiment Station, Aberdeen.
R. E. McDole, G. M. McMaster, and D. C. Larsen.
Current Information Series No 236, June 1974. 4 p, 2 fig, 3 tab.

Descriptors: *Soil moisture, *Available water, *Retention, *Idaho, Root zone, Soil-water-plant relationships, Wilting point, Moisture content, Field capacity, Subsurface waters, Soils, Soil physical properties, Soil water, Soil texture, Soil types, Laboratory tests, Infiltration, Agriculture.
Identifiers: *Available water-holding capacities.

To manage moisture on agricultural cropland, one must know how much water and soil profile can hold and store for plant use. This is called the available water-holding capacity of the soil and is usually expressed as inches of water per foot of soil depth. The available water-holding capacity of any soil can be calculated from: (1) the thickness of the horizons that make up the soil profile, and (2) the moisture characteristics of these horizons. The first of these - the kind, arrangement and thickness of soil horizons - can be determined by examining the soil profile. The second factor, the moisture characteristics of these horizons, can be determined by laboratory analyses. Laboratory studies that determined water-holding capacities of specific soils (soil series) and soil texture classes in southern Idaho were reported. Samples for this study were collected from agricultural areas across southern Idaho. Each of the samples was analyzed in laboratory pressure chambers to determine water-holding capacity values. A method called ceramic plate extraction was used to establish a desorption curve for each sample. These curves were the basis for determining the permanent wilting point and field capacity. These values, in turn, were used to calculate available water-holding capacity for each soil. (Sims-ISWS)
W75-11140

**CHANGES IN VEGETATION AND SURFACE SOIL PROPERTIES FOLLOWING IRRIGATION OF WOODLANDS WITH MUNICIPAL WASTEWATER,**
Michigan State Univ., East Lansing. Dept. of Forestry.
For primary bibliographic entry see Field 5B.
W75-11243

## 2H. Lakes

**EPIFAUNAL INVERTEBRATES AS INDICATORS OF WATER QUALITY IN SOUTHERN LAKE PONTCHARTAIN,**
New Orleans Univ., La. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W75-10852

**LIMNOLOGY OF DESERT PONDS,**
Arizona Univ., Tucson. Dept. of Biological Sciences.
S. R. Alcorn.
Arizona University, Tucson, Department of Biological Sciences, MS Thesis, 1974. 45 p, 3 fig, 6 tab, 31 ref, 2 append.

Descriptors: *Limnology, *Ponds, *Fisheries, *Warm-water fish, *Arizona, Water properties, Sampling, Water sampling, Data collections, Water analysis, Water temperature, Dissolved oxygen, Hydrogen ion concentration, Aquatic plants, Euphotic zone, Thermal stratification.
Identifiers: Photic zone.

The limnology of five types of ponds in Southern Arizona was studied from October 1972 to September 1973 to provide information for the use of ponds as fisheries. Temperature, oxygen, pH, and photic zone measurements were made monthly. Diel studies of temperature, oxygen, and pH were conducted in July. Weather conditions caused thermal stratification to begin in February and last through October in deeper ponds. Complete nightly summer circulation occurred in most ponds. Shaded ponds were no cooler than open ponds. Winter oxygen concentrations were above 5 mg/l in all ponds. Winter oxygen concentrations were suitable for warm-water fish year round and trout from November through April. The best type of ponds were those filled with well water rather than those supplied by runoff. (McLachlan-Arizona)
W75-10880

**SOME LIMNOLOGICAL CHARACTERISTICS OF ARIVACA LAKE IN SOUTHERN ARIZONA,**
Arizona Univ., Tucson.
J. C. Tash, and C. D. Ziebell.
Journal of the Arizona Academy of Science, Vol 10, No 1, p 8-14, February 1975. 4 fig, 3 tab, 11 ref.

Descriptors: *Arizona, *Limnology, *Aquatic environment, *Sport fishing, *Lake fisheries, *Artificial lakes, Lakes, Water temperature, Dissolved oxygen, Light penetration, Benthos, Aquatic microorganisms, Zooplankton, Aquatic life, Water sampling, Organic matter, Fish, Fish management.
Identifiers: *Arivaca Lake(Ariz).

Scarcity of water in Southern Arizona gives premium value to all waters that provide aquatic-related recreation. Larger lakes, all of which are man-made, receive particularly heavy recreational use primarily in the form of sport fishing. Value and use of these lakes for sport fishing are directly related to the quality and productivity of the water. Data are presented on temperature, dissolved oxygen, zooplankton, and benthos for Arivaca Lake, the most recently constructed of four large man-made lakes. These data can be used for future studies that will improve management of fisheries in other Southern Arizona lakes. (Robinett-Arizona)
W75-10891

**TWO-DIMENSIONAL, HYDROSTATIC SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS,**
Stanford Univ., Calif. Dept. of Civil Engineering.
B. R. Roberts, and R. L. Street.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 535, $6.25, in paper copy, $2.25 in microfiche. Technical Report No. 194, July 1975. 162 p, 32 fig, 6 tab, 32 ref, 2 append. OWRT C-3033(No 3675)(1).

Descriptors: *Thermal pollution, *Thermal stratification, *Lakes, *Computer programs, *Computer models, *Reservoirs, Numerical analysis, Digital computers, Simulation analysis, Currents(Water), Circulation, Thermocline, Equations, Model studies.

The study led to a simplified and two-dimensional, numerical model capable of representing stratification and thermally unstable flows in lakes. The Navier-Stokes equations, a heat balance equation, the continuity equation, and an equation relating fluid density to temperature are combined to form a closed system. The Boussinesq approximation is used; a hydrostatic pressure distribution is assumed. A sub-grid-scale turbulence model provides a variable eddy viscosity for diffusion calculations. The numerical model follows a Marker-and-Cell-style format in variable placement, upstream differencing was used for convection terms, and FORTRAN is the program language. The model was implemented for use on an IBM 370/168. Favorable comparisons with other models were obtained. A long-term, large-scale stratification process was simulated and quantitative agreement with laboratory experiments was obtained. —
W75-10901

**CONCURRENT NITRIFICATION-DENITRIFICATION AT THE SEDIMENT-WATER INTERFACE AS A MECHANISM FOR NITROGEN LOSSES FROM LAKES,**
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W75-10902

**A COMPUTER PROGRAM PACKAGE FOR AQUATIC ECOLOGISTS,**
Cornell Univ., Ithaca, N.Y.
P. J. Godfrey, L. White, and E. Keokosky.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 508, $4.25 in paper copy, $2.25 in microfiche. Technical Report 95, Cornell University Water Resources and Marine Sciences Center, Ithaca, New York, April 1975. 48 p, 7 fig, 1 tab, 3 ref, 1 append. OWRT A-047-NY(2) and B-048-NY(2).

Descriptors: *Aquatic life, *Ecology, *Computer programs, *Data collections, Computers, Lakes, Water quality, Depth, Phytoplankton, Temperature, Water chemistry, Biological properties, Carbon dioxide, Dissolved oxygen.
Identifiers: Data reduction, Pigment ratios.

Aquatic ecology frequently requires the collection of large amounts of field data. These data can be condensed into a manageable and meaningful form using a computer. Several computer programs developed to meet the specialized needs of data common to aquatic ecology are presented. These programs are useful for data reduction and arrangement, and several have been designed to produce output for subsequent use in available statistical program packages. They are flexible and basically simple, thus having wide applicability and appeal to the computer novice. The programs are classified into three groups: (1) generalized programs applicable to many forms of limnological data -- INTEGRATE and AVERAGE, (2) specialized programs for chemical data--CO2 and DO SAT, and PIGMENT RATIO, and (3) specialized programs for biological data--SPECIES and SUCCESSION. The programs are written in Fortran IV except for SPECIES which is written in PL/1. All have been run on an IBM 360 and IBM 370, but conversion to other systems should not be difficult. The programs are described in detail, and an appendix includes program listings and examples of the outputs. (Bell-Cornell)
W75-10908

**A SIMPLE AND INEXPENSIVE TECHNIQUE FOR DETERMINING COLORED LIGHT INTENSITY UNDERWATER,**
Genesee Community Coll., Batavia, N.Y. Mathematics and Science Div.
For primary bibliographic entry see Field 7B.
W75-10919

**WIND EFFECTS ON CHEMICAL FILMS FOR EVAPORATION SUPPRESSION AT LAKE HEFNER,**
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3B.
W75-10920

**THE GEOCHEMICAL CYCLE OF ARSENIC IN LAKE WASHINGTON AND ITS RELATION TO OTHER ELEMENTS,**
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W75-10922

**ROOT:SHOOT AND LEAF AREA RELATIONSHIPS OF MACROPHYTE COMMUNITIES IN CHAUTAUQUA LAKE, NEW YORK,**
State Univ. Coll., Fredonia, N.Y. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-11009

**UTILIZATION OF STREAM-BORNE PHOSPHORUS BY CAYUGA LAKE PHYTOPLANKTON,**
New York State Coll. of Agriculture and Life Sciences, Ithaca, N.Y. Ecology and Systematics Section.
For primary bibliographic entry see Field 5C.
W75-11036

**PRELIMINARY INVESTIGATIONS OF COPPER CYCLING IN INDIAN LAKE,**

IUSETTS: A LAKE TREATED ANNUALLY
I COPPER SULFATE,
achusetts Univ., Amherst. Water Resources
rch Center.
rimary bibliographic entry see Field 5B.
1039

AULIC MODELING OF MIXING
OMENA IN STRATIFIED LAKES,
oma State Univ., Stillwater. School of
nical and Aerospace Engineering.
Moretti, and D. K. McLaughlin.
ble from the National Technical Informa-
rvice, Springfield, Va 22161 as PB-244 725,
in paper copy, $2.25 in microfiche.
oma Water Resources Research Institute,
ter, Completion Report, 1975. 33 p, 16 fig, 1
ref. OWRT A-050-OKLA(3).

tors: *Lakes, *Mixing, *Dispersion,
ication, *Hydraulic models, *Stratified
ensity stratification, Flow characteristics,
tudies, *Oklahoma.
ers: Richardson number, Vertical disper-
orizontal dispersion, Ham's Lake(Okla).

ective was to provide criteria for laborato-
ling of stratified lake flows. Consideration
en to fluid inflows and to flows generated
echanical destratification device. The in-
eriments were designed to investigate the
f scale distortion since vertical scale exag-
is necessary in laboratory size models, to
e increased viscous forces that accom-
size reduction. Experiments were per-
n two inflow lake models which are identi-
rizontal dimensions but differ by a factor
the vertical dimensions. Density profiles
front flow visualization records were
inflows over a range of flow parameters.
stablished that a vertically exaggerated
a stratified lake flow cannot replicate all
s of the mixing process. However, verti-
sion alone can be accurately modeled in
d model of an inflow in a stratified basin
erall Richardson number is used as the
parameter. Similarly horizontal disper-
e accurately modeled if a modification
dson number is used as the basic model-
eter. A vertically exaggerated model of
e was constructed and experiments were
the mechanical destratification of the
rprisingly accurate modeling of the
destratification experiments was
with the model. The appropriate non-
al parameter is the overall Richardson
d the characteristic time used to non-
alize the mixing times was the volume of
ivided by the volume flow rate of the

ME ANALYSIS AS A METHOD FOR
G PHYTOPLANKTON DYNAMICS,
niv., Fayetteville. Dept. of Botany and
y.
bibliographic entry see Field 5C.

ESULTS ON MASS TRANSFER
S IN A DENSITY-STRATIFIED
Univ., University. Dept. of Mechani-
ing.
bibliographic entry see Field 8B.

AFRICAN EUTROPHICATION
: A PERSPECTIVE,
. for Water Research, Pretoria (South
bibliographic entry see Field 5C.

**DISSOLVED ORGANIC MATTER AND LAKE METABOLISM,**
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 5C.
W75-11188

**INVESTIGATION OF THE INFLUENCE OF THERMAL DISCHARGE FROM A LARGE ELECTRIC POWER STATION ON THE TEMPERATURE AND NEAR-SHORE CIRCULATION OF LAKE MICHIGAN,**
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 5C.
W75-11190

**AQUATIC PLANT CONTROL ON LAKE CORPUS CHRISTI,**
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 5G.
W75-11194

**PRIMARY PRODUCTION IN LAKES ONTARIO AND ERIE: A COMPARATIVE STUDY,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-11217

**MICROBIOLOGICAL EXAMINATION OF OFFSHORE LAKE ERIE SEDIMENTS,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-11218

**APPLICATION OF THE MANOMETRIC TECHNIQUE IN THE STUDY OF SEDIMENT OXYGEN DEPLETION,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-11222

**THE EFFECTS OF THE FORMATION OF LAKE KAINJI (NIGERIA) UPON THE INDIGENOUS FISH POPULATION,**
Ife Univ. (Nigeria). Kainji Dam Research Project.
For primary bibliographic entry see Field 5C.
W75-11223

**ACID STRIP MINE LAKE RECOVERY,**
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W75-11224

**THE GROWTH OF SOME EPIPHYTIC ALGAE IN A LAKE RECEIVING THERMAL EFFLUENT,**
Alberta Univ., Edmonton. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W75-11225

**IN SITU MEASUREMENT OF THE SETTLING VELOCITY PROFILE OF PARTICULATE ORGANIC CARBON IN LAKE ONTARIO,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-11227

**A GENERAL DESCRIPTION OF THE OLIGOTROPHIC LAKE PAAJARVI, SOUTHERN FINLAND, AND THE ECOLOGICAL STUDIES ON IT,**
Helsinki Univ. (Finland). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W75-11229

**MAN'S IMPACT ON A NEWLY FORMED RESERVOIR,**
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-11233

**EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. IV. FEEDING OF INTRODUCED AND AUTOCHTHONOUS NON-PREDATORY FISH,**
Warsaw Univ. (Poland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W75-11234

**A CONTRIBUTION TO THE BIOLOGY OF NITELLA HOOKERI A. BR. IN THE ROTORUA LAKES, NEW ZEALAND. II. ORGANIC NUTRIENTS AND PHYSICAL FACTORS,**
Auckland Univ. (New Zealand). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W75-11235

**SEDIMENT PROCESSES IN GREAT LAKES,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W75-11237

**SEASONAL ABUNDANCE OF CRUSTACEAN ZOOPLANKTON AND NET PLANKTON BIOMASS OF LAKES HURON, ERIE, AND ONTARIO,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-11238

**THE UTILIZATION OF SUN-GLINT IN A STUDY OF LAKE DYNAMICS,**
Canada Centre for Inland Waters, Burlington(Ontario).
For primary bibliographic entry see Field 5A.
W75-11239

**PRELIMINARY INFORMATION ON THE NATURE OF ORGANIC MATTER IN THE SURFACE SEDIMENTS OF LAKES HURON, ERIE, AND ONTARIO,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W75-11240

**QUANTITATIVE ESTIMATION OF THE DAILY INGESTION OF PHYTOPLANKTON BY TILAPIA NILOTICA AND HAPLOCHROMIS NIGRIPINNIS IN LAKE GEORGE, UGANDA,**
Queensland Univ., Brisbane (Australia). Dept. of Zoology.
C. M. Moriarty, and D. W. J. Moriarty.
J Zool Proc Zool Soc Lond, Vol 171, No 1, p 15-23, 1973, Illus.

Descriptors: *Phytoplankton, Lakes, *Digestion, Herbivores, *Fish, Africa.
Identifiers: *Haplochromis-nigripinnis, *Tilapia-nilotica, *Uganda(Lake George).

A direct method was used to estimate the amount of phytoplankton ingested per day by herbivorous fish in Lake George, Uganda. The quantities ingested are linearly related to the weight of the fish, as given by the following regression equations: for Tilapia nilotica: $y = 271 + 13.3\ x$ and for Haplochromis nigripinnis: $y = -29.6 + 21.9\ x$, where y is the dry weight of photoplankton (mg) ingested per day and x is the wet weight of the fish (g).--Copyright 1974, Biological Abstracts, Inc.

W75-11268

**THE MEASUREMENT AND ESTIMATION OF LAKE EVAPORATION FROM FOUR AUSTRALIAN WATER STORAGES,**
Bureau of Meteorology, Melbourne (Australia).
For primary bibliographic entry see Field 2D.
W75-11300

**SEASONAL ABUNDANCE AND DIVERSITY OF BENTHOS IN A SOUTHERN ILLINOIS, USA SWAMP,**
Central Michigan Univ., Mt. Pleasant. Dept. of Biology.
J. N. Krull, and W. A. Hubert.
Nat Hist Misc. 190. p 1-4, 1973.

Descriptors: *Benthos, *Illinois, Seasonal, Invertebrates, *Swamps, *Benthic fauna, Organic matter, Oxygen, Environmental effects, *Aestivation, Summer, Wetlands.
Identifiers: *Pine Hill Swamp(Ill).

The benthic invertebrate fauna of a portion of the Pine Hills Swamp (Illinois, USA) exhibited extreme seasonal fluctuations in both abundance and diversity. The dominant benthos was characterized by organisms tolerant of high concentrations of organic material and low O2 levels, as well as possessing aestivation capabilities or life cycle adaptations to overcome severe midsummer environmental conditions.--Copyright 1974, Biological Abstracts, Inc.
W75-11312

## 2I. Water In Plants

**PHENOLOGY OF SELECTED SONORAN DESERT PLANTS AT PUNTA CIRIO, SONORA, MEXICO.**
Arizona Univ., Tucson. Dept. of Biological Sciences.
R. R. Humphrey.
Journal of the Arizona Academy of Science, Vol 10, No 1, p 50-67, February, 1975. 1 fig, 2 tab, 7 ref.

Descriptors: *Phenology, *Mexico, *Plant growth, *Arid climates, *Soil-water-plant relationships, *Desert plants, Biorhythms, Environmental effects, Growth stages, Precipitation(Atmospheric), Seasonal, Climatic data, Weather data, Shrubs, Semiarid climates, Soil moisture, Flowering, Vegetation, Cacti, Arid lands.
Identifiers: Punta Cirio(Mexico), Sonora(Mexico), Baja California(Mexico).

Phenological changes observed at Punta Cirio within an approximate 50 meter radius and no more than 100 meters from the Gulf of California coast were evaluated. Seasonal patterns are evident, particularly with respect to certain taxa, but the important controlling factor may be available moisture rather than temperature or other seasonal variables. Most of the vegetation is comprised of various shrubs, half-shrubs and cacti. Phenological data are presented for 20 Sonoran Desert species. (Robinett-Arizona)
W75-10862

**THE EARLY VEGETATIVE GROWTH OF TWO ANNUAL PASTURE GRASSES (HORDEUM LEPORINUM LINK AND LOLIUM RIGIDUM GAUD.),**
South Australia Dept. of Agriculture, Adelaide.
For primary bibliographic entry see Field 3F.
W75-10876

**ESTABLISHING ALKALI SACATON ON HARSH SITES IN THE SOUTHWEST,**
Forest Service, (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.

W75-10882

**PRODUCTS FROM JOJOBA: A PROMISING NEW CROP FOR ARID LANDS.**
National Research Council, Washington, D.C. Committee on Jojoba Utilization.
For primary bibliographic entry see Field 3F.
W75-10890

**THE GERMINATION AND ESTABLISHMENT OF TWO ANNUAL PASTURE GRASSES (HORDEUM LEPORINUM LINK AND LOLIUM RIGIDUM GAUD.),**
South Australia Dept. of Agriculture, Adelaide.
P. S. Cocks, and C. M. Donald.
Australian Journal of Agricultural Research, Vol 24, No 1, p 1-10, January 1973. 1 fig, 7 tab, 9 ref.

Descriptors: *Soil-water-plant relationships, *Grasses, *Germination, *Seeds, *Plant growth, Soaking, Wetting, Drying, Soil surfaces, Loam, Vegetation establishment, Soil water, Absorption, Water injury, Grasslands, Pastures, Osmotic pressure, Moisture stress, Plant physiology, Seed treatment.
Identifiers: Hordeum leporinum Link, Lolium regidum Gaud.

Studies under controlled conditions show that Hordeum leporinum Link germinates more quickly than Lolium rigidum Gaud. at all temperatures. Lolium requires alternating temperatures for maximum germination; Hordeum shows little response to temperature variation. Germination of both species is depressed at temperatures above 30C and inhibited at 36C and above. Soaking Hordeum seeds for 10 hours and Lolium for 18, then drying and rewetting seeds stimulates germination of both species. Longer soaking depresses germination rates. Controlled experiments on soil surface show Hordeum better able to germinate with small amounts of water. Absorption studies indicate water uptake of seeds is identical for both species. Hordeum was able to germinate in solutions of higher osmotic pressure than was Lolium. (Michael-Arizona)
W75-10897

**ENVIRONMENTAL IMPACT EVALUATION IN FRESHWATER IMPOUNDMENTS BY VEGETATION ANALYSIS OF THE TERRESTRIAL ECOSYSTEM,**
Massachusetts Univ., Amherst. Water Resources Research Center.
P. W. Fairbairn, and C. A. Carlozzi.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 505, $6.25 in paper copy, $2.25 in microfiche. Publication No. 49, Completion Report FY-75-4, April 1975. 141 p, 22 tab, 37 fig, 18 append, 27 ref. OWRT A-053-MASS(1). 14-31-0001-4021.

Descriptors: Evaluation, *Environmental effects, Vegetation, *Ecosystems, *Ecology, Rivers, Floods, *Floodwater, Management, Impoundments, *Vegetation effects, *Massachusetts, Damsites.

The objective was to develop and test a method of analyzing the ecological impact of artificially impounded floodwaters on the terrestrial environment. The approach was to apply techniques of field ecology to three similar river systems each subject to a different management regimen, with a view to determining levels of relative community stability in terms of successional maturity. Degree of environmental impact was described in terms of vegetative characteristics correlated with elevation, including life form, species dominance, diversity indices, biomass, seasonal distribution of flowering, method of seed dispersal, and number of exotics and annuals present. Emphasis was on community rather than single-species attributes. These characteristics were correlated negatively or positively in a consistent fashion with degree of flooding intensity. A composite graph was drawn up displaying in an additive way nine vegetative characteristics. By this means it was possible to show the cumulative impact of flooding across a vertical range of 60 feet. On the strength of the characteristics used it was considered possible to define the relative levels of community stability at each of the three rivers studied, at different levels of flooding stress.
W75-10905

**EFFECT OF SOIL-WATER RELATIONS ON THE ROOT POROSITY, TRANSPIRATION AND ION UPTAKE IN RICE,**
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Dept of Soil Science.
For primary bibliographic entry see Field 3F.
W75-10916

**SPECIES DIVERSITY OF BENTHIC MACROINVERTEBRATES AND LIMNOLOGICAL CONDITIONS IN A 1ST ORDER MOUNTAIN STREAM,**
Bradley Univ., Peoria, Ill. Dept. of Biology.
B. J. Mathis.
Trans Ill State Acad Sci, Vol 66, No 3/4, p 29-3 1973. Illus.

Descriptors: *Invertebrates, *Benthos, *Streams, *Bogs.
Identifiers: Limnological studies. *Mountain streams, *Species diversity, Sphagnum bogs.

Limnological conditions and species diversity were determined in a 1st order spring-fed mountain stream flowing through a sphagnum bog. Aquatic invertebrates (36 spp.) representing 7 orders were collected during the study. Species diversity, and redundancy were similar to 1st order downstream stations.--Copyright 1974, Biological Abstracts, Inc.
W75-10918

**SEASONAL VARIATION IN COMPOSITION, PLANT BIOMASS, AND NET PRIMARY PRODUCTIVITY OF A TROPICAL GRASSLAND AT KURUKSHETRA, INDIA,**
Kurukshetra Univ. (India). Dept. of Botany.
J. S. Singh, and P. S. Yadava.
Ecol Monogr. Vol 44, No 3, p 351-376, 1974, Illus.

Descriptors: *Seasonal, *Primary productivity, *Biomass, *Grasslands, Vegetation, Distribution, Water pollution effects.
Identifiers: *India(Kurukshetra), *Tropical grasslands.

The variation in composition, plant biomass, net primary productivity was analyzed in a tropical grassland situated within the campus of the Kurukshetra University, India, at 29 deg 58' latitude and 76 deg 51' E longitude. A study of forms indicated a therocryptophytic spectrum. Detailed phytosociological values of constituent species of the vegetation were studied at monthly intervals (May 1970-May 1971) through tillering analysis. Most of the species were found to be gregariously distributed. The changes throughout the year in the aboveground plant biomass, standing dead, litter, and belowground biomass showed that maximum aboveground biomass in Sept. (1167 g/sq m) and maximum belowground biomass in Nov. (1167 g/sq m). Examination of vertical distribution of the aboveground biomass of the vegetation as well as of the individual species indicated that different layers of vegetation were dominated by different species in different months. The aboveground net primary production was maximum during the rainy season (1700 g/sq m), and the belowground maximum occurring the winter season (785 g/sq m). Total annual net primary production is estimated to be 3 g/sq m. The system transfer functions revealed that productivity was more aboveground-directed

e wet period and more belowground-directed
g the dry period. Annual efficiency of energy
re by the primary producers was calculated
1.66% on the basis of half total incident solar
ion.--Copyright 1974, Biological Abstracts,

1006

TATION, SOIL, AND CLIMATE ON THE
N MOUNTAINS OF VERMONT,
Univ., New Haven, Conn. School of
try.
Siccama.
Monogr, Vol 44, No 3, p 325-349, 1974. Illus.

ptors: *Vermont, Climates, *Vegetation,
*Beech, *Maple, *Forests, *Soil moisture,

fiers: *Green Mountains(Vt), Boreal
(Vt).

ppalachian extension of the Boreal Forest,
ated by balsam fir, red spruce and white
extends down the slope of the Green Moun-
o about 2600 ft (792 m), where it merges with
stern Deciduous Forest dominated by sugar
beech and yellow birch. These 2 forest for-
is occur well-developed horizontal bands on
ountains, with a distinctive tension zone
between them. In this midslope forest, the
s of neither the deciduous nor boreal forest
le to form well-developed long-lived stands.
ontact between the deciduous and boreal
is climatically, not edaphically, controlled.
rrent vegetation and soil development is the
of the long-term effects of a vertical climatic
tinuity expressed as a nonlinear decline in
gth of the forest-free period across the mid-
ransitional forest and as a marked increase
requency of the cloud base at and above ca.
This results in increased moisture from fog
nd frequent occurrence of hoar frost in
The sharp decrease in the length of the
g season, together with marked changes in
nd atmospheric moisture conditions, limits
ward extension of the beech-maple forest.--
ght 1974, Biological Abstracts, Inc.
1021

ES ON THE RELATIONSHIP BETWEEN
IATTER PRODUCTION AND THE
LOPMENT OF A PINE FOREST ON
AL SAND DUNES (1), (IN JAPANESE),
Univ. (Japan). Dept. of Forestry Manage-

mary bibliographic entry see Field 4A.
1098

VEY OF FISHES AND COMMERCIAL
TEBRATES OF THE NEARSHORE AND
RINE ZONE BETWEEN CAPE ROMANO
APE SABLE, FLORIDA,
al Marine Fisheries Service, Panama City,
lf Coastal Fisheries Center.
Lindall, J. R. Hall, W. A. Fable, and L. A.

ble from the National Technical Informa-
rvice, Springfield, Va 22161 as PB-235 215,
n paper copy, $2.25 in microfiche. South
Environmental Project, Ecological Report
SFEP-74-44, July 1973. 66 p, 8 fig, 2 tab, 26

tors: *Florida, *Marine fish, *Fisheries,
c, *Estuaries, Gulf of Mexico, Baseline
, Deep water, Shallow water, Distribution,
Surveys.
ers: *Cape Romano(Fla), *Cape
Fla), Sponges.

nearshore and estuarine waters of
estern Florida, particularly Florida Bay
jacent areas, provide feeding and nursery
s for the young of many species of fish and
h. The multimillion dollar pink shrimp fishery of the Sanibel and Tortugas grounds is an outstanding example of production derived from this zone. Until comparatively recently the fish fauna of this region were poorly known. Baseline data were compiled on fishes inhabiting the estuarine and nearshore waters between Cape Romano and Cape Sable. Increasing conflicts of interest between the forces of conservation and those of development point to the immediate need for comprehensive evaluation of this area. Fish and commercial invertebrates taken at each station are tabulated. Nearly 32,000 finfish representing 114 species were collected. Fifty-five species were of commercial value and 24 of sport value. Over 2800 individuals of six species of commercial invertebrates were collected. Nomenclature and sequence of fishes are given in the annotated list. Environmental data where each species was collected are summarized. Salinity, water temperature or range, water depth or range, and bottom type or range are given. Sponges and hard or soft corals were also noted. (Jones-Wisconsin)
W75-11189

**THE AQUATIC WEED PROBLEM. 1. IDENTIFICATION,**
Victoria State Coll., Carlton (Australia). Dept. of Plant Physiology.
F. Eady.
New Zealand Journal of Agriculture, Vol 129, No 2, p 40, 41, 43, 45, 1974. 5 fig.

Descriptors: *Aquatic weeds, *Aquatic plants, *Varieties, Plant groupings, Floating plants, Rooted aquatic plants, Submerged plants, Water hyacinth, Pondweed, Foreign countries, Drainage systems.
Identifiers: *New Zealand, Duckweed, Water ferns, Azolla rubra, Azolla pinnata, Salvinia herzogii, Lemna minor, Wolffia arrhize, Spirodela oligorhhiza, Elodea canadensis, Lagarosiphon major, Egeria densa.

Of 34 aquatic weed species which cause problems in New Zealand, 29 are importations. Three broad groups consist of free-floating, submergent, and emergent species. The free-floating weeds are water ferns (Azolla and Salvinia), duckweeds, and water hyacinth. Two Azolla species can be identified by their roots: Azolla rubra roots hang straight down and are unbranched; Azolla pinnata roots branch and have fine hairs. Azolla rubra develops a deep red-brown color. The leaves of Azolla pinnata are more pointed. They reproduce rapidly so are difficult to eradicate. Salvinia herzogii is a brownish-green plant with folded hairy leaves. Three species of duckweed are found. Lemna minor has only one root per green frond. Spirodela oligorhhiza has two or more roots. Wolffia arrhiza var. Australiana (water-meal) has no roots. Eradication is almost impossible. Water hyacinth, Eichhornia crassipes, is hard to eradicate because the seeds are long-lived. Three members of the submerged groups are Elodea canadensis (Canadian pondweed), Lagarosiphon major (oxygen weed), and Egeria densa (egeria). Elodea leaves occur in threes, egeria in fours and fives, and those of Lagarosiphon are alternate. (Buchanan-Davidson--Wisconsin)
W75-11220

**THE ROLE OF ENDOGENOUS ABSCISIC ACID IN THE RESPONSE OF PLANTS TO STRESS,**
Royal Univ. of Malta, Valletta. Dept. of Chemistry.
For primary bibliographic entry see Field 3F.
W75-11319

## 2J. Erosion and Sedimentation

**MEASUREMENT OF COBBLE ABRASION IN NATURAL STREAMS,**
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
F. R. Carlson.
Arizona University, Tucson, Department of Hydrology and Water Resources, MS Thesis, 1974. 64 p, 12 fig, 6 tab, 25 ref, append.

Descriptors: *Abrasion, *Bed load, *Stream erosion, *Sediments, *Arizona, Weathering, Bedrock, Friction, Model studies, Streamflow, Particle size, Mathematical models, Measurement.
Identifiers: *Cobble abrasion.

Particle size of sediment in natural streams is modified by sorting, mixing, solution, and abrasion. Dynamic bed-load friction was not calculable, but varies directly with the size and concentration of moving bed loads. Wear was related to total work by abradibility, roundness, and rock strength. Abrasion efficiency of traceable cobbles in ephemeral streams in southern Arizona varied approximately with discharge squared. Field wear measurements compared well with prior laboratory model measurement. Changes in roundness while being transported over bedrock and en route weathering greatly affected the abrasion efficiency in natural streams. (McLachlan-Arizona)
W75-10881

**FACTORS AFFECTING EROSION IN A SEMI-ARID WATERSHED,**
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
L. R. Davis.
Arizona University, Tucson, Department of Civil Engineering and Engineering Mechanics, MS Thesis, 1974. 89 p, 22 fig, 15 ref.

Descriptors: *Erosion, *Channel erosion, *Stream erosion, *Watersheds(Basins), *Semiarid climates, Erosion control, Sediment transport, Rainfall simulators, Erosion rates, *Arizona, Watershed management, Sediment yield, Sedimentation, Forecasting, Soil physical properties, Equations.
Identifiers: *Sycamore Creek(Arizona), Musgrave equation, Laursen equation.

Three separate erosion studies conducted in the Sycamore Creek watershed of Arizona concluded that a combination of rainfall simulator tests and an analysis of channel sediment-transport capacity provided the best estimate of the erosion potential of the watershed. The erosion rates were not a steady process. Previous studies treated erosion as a steady process and tended to grossly over-predict erosion. The first study was an application of the Musgrave erosion equation to the watershed. The equation predicted erosion with only a small degree of reliability. The second, or channel study was an application of the Laursen equation to the ephemeral stream that transports the erosion material from the watershed. This indicated that the channel could not transport the erosion material. The third, or rainfall simulator study established that the erosion material that could possibly be supplied to the Sycamore Creek channel was less than predicted in the initial study. (McLachlan-Arizona)
W75-10884

**STABILIZATION AND RECONSTRUCTION OF TEXAS COASTAL FOREDUNES WITH VEGETATION,**
Texas Tech Univ., Lubbock.
For primary bibliographic entry see Field 2L.
W75-10887

**CONCURRENT NITRIFICATION-DENITRIFICATION AT THE SEDIMENT-WATER INTERFACE AS A MECHANISM FOR NITROGEN LOSSES FROM LAKES,**
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W75-10902

**STOCHASTIC ANALYSIS OF PARTICLE MOVEMENT OVER A DUNE BED,**
Geological Survey, Bay Saint Louis, Miss.
B. K. Lee, and H. E. Jobson
Open-file report 75-358, March 1975. 205 p, 20 fig, 75 tab, 17 ref

Descriptors: *Sediment transport, *Particle size, *Model studies, *Alluvial channels, *Stochastic processes, Streamflow, Analytical techniques, Equations, Dune sands, Sediments.
Identifiers: River dune bed.

Stochastic models are available that can be used to predict the transport and dispersion of bed-material sediment particles in an alluvial channel. These models are based on the proposition that the movement of a single bed-material sediment particle consists of a series of steps of random length separated by rest periods of random duration and, therefore, application of the models requires a knowledge of the probability distributions of the step lengths, the rest periods, the elevation of particle deposition, and the elevation of particle erosion. The procedure was tested by determining distributions from bed profiles formed in a large laboratory flume with a coarse sand as the bed material. The elevation of particle deposition and the elevation of particle erosion can be considered to be identically distributed, and their distribution can be described by either a 'truncated Gaussian' or a 'triangular' density function. The conditional probability distribution of the rest period given the elevation of particle deposition closely followed the two-parameter gamma distribution. The conditional probability distribution of the step length given the elevation of particle erosion and the elevation of particle deposition also closely followed the two-parameter gamma density function. For a given flow, the scale and shape parameters describing the gamma probability distributions can be expressed as functions of bed elevation. (Woodard-USGS)
W75-10942

**BEACH EROSION CONTROL STRUCTURE,**
For primary bibliographic entry see Field 8A.
W75-11075

**THE WATER QUALITY AND BOTTOM SEDIMENT CHARACTERISTICS OF NEW JERSEY LAGOON DEVELOPMENTS,**
Rutgers - the State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 5B.
W75-11104

**MATAGORDA ISLAND, TEXAS: THE EVOLUTION OF A GULF COAST BARRIER COMPLEX,**
Michigan Univ., Ann Arbor. Dept. of Geology and Mineralogy.
For primary bibliographic entry see Field 2L.
W75-11144

**WEYL'S THEORY OF GLACIATION SUPPORTED BY ISOTOPIC STUDY OF NORWEGIAN CORE K 11,**
Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Centre des Faibles Radioactivities.
J. C. Duplessy, L. Chenouard, and F. Vila.
Science, Vol 188, No 4194, p 1208-1209, June 20, 1975. 1 fig, 16 ref.

Descriptors: *Isotope studies, *Glaciers, *Benthic fauna, *Glacial sediments, Temperature, Sea water, Core logging, Cores, Oxygen, Stable isotopes, Glaciology, Sedimentology, Oceanography, Deep water, Sinks.
Identifiers: *Norwegian Sea, *North Atlantic, Foraminifera.

Oxygen isotopic analyses of pelagic and benthic foraminifera from core K 11 indicate that during the last glaciation Norwegian Sea bottom waters were warmer than in modern times and had the same physical parameters (temperature, oxygen isotope ratio, and salinity) as the North Atlantic deep water. This result indicates that the glacial Norwegian Sea was not a sink for dense surface water, as it is now, and that during glacial times North Atlantic deep water invaded the deep Norwegian basin. (Sims-ISWS)
W75-11153

**DENUDATION STUDIES: CAN WE ASSUME STREAM STEADY STATE,**
Wisconsin Univ., Milwaukee. Dept. of Geography.
S. W. Trimble.
Science, Vol 188, No 4194, p 1207-1208, June 20, 1975. 1 fig, 9 ref.

Descriptors: *Erosion, *Sedimentation, *Streams, *Southeast US, Sediment yield, Erosion rates, Alluvium, Colluvium, Bed load, Suspended load, Suspended solids, Sediment transport, Agriculture, Reservoirs, Rivers.
Identifiers: Gross erosion, Eroded materials.

Contemporary stream sediment loads are dubious indicators of regional denudation. Recent analysis of 10 river basins in the southeastern United States indicates that of the material eroded from upland slopes since European settlement, only about 5% has been exported. The remainder, alluvium and colluvium, will probably not be exported because of extensive reservoir impoundments. (Sims-ISWS)
W75-11154

**MASS-EMPLACED SAND-FINGERS AT MARAROA CONSTRUCTION SITE, SOUTHERN NEW ZEALAND,**
Otago Univ., Dunedin (New Zealand). Dept. of Geology.
R. M. Carter.
Sedimentology, Vol 22, No 2, p 275-288, May 1975. 9 fig, 15 ref.

Descriptors: *Sediments, *Sedimentary structures, *Sediment transport, Mass transfer, Sands, Sand waves, Sedimentation, Sedimentology, Movement, Excavation, Dam construction, Deposition(Sediments), Geomorphology.
Identifiers: *New Zealand, Sand fans, Sand fingers.

During work on a dam construction site in South Island, New Zealand, outflowing groundwater resulted in extensive local mass transport of the sands being excavated. A series of small scale sand fans was built up, probably mainly by laminar mass-flow processes. The surfaces of the fans were made up of a series of complexly interdigitating sand fingers that are inferred to have been emplaced by viscous plug flow. Other sedimentary processes associated with the building and synsedimentary destruction of the fans included rapid grain flow, liquefaction, and progressive slumping. Although small in scale, the Mararoa mass-flow-fans may be a close analogue for some of the many 'fluxoturbidite' or 'proximal flysch' facies described in the sedimentological literature. Their geologic implications were therefore briefly discussed. (Sims-ISWS)
W75-11161

**SIZE-SORTING DURING SUSPENSION TRANSPORTATION--LOGNORMALITY AND OTHER CHARACTERISTICS,**
Indian Statistical Inst., Calcutta. Geological Studies Unit.
S. Sengupta.
Sedimentology, Vol 22, No 2, p 257-273, May 1975. 13 fig, 2 tab, 13 ref.

Descriptors: *Sediments, *Sieve analysis, *Sediment transport, *Particle size, Suspended solids, Sands, Sediment sorting, Sediment load, Bed load, Running waters, Laboratory tests, Flumes, Sedimentation, Sedimentology, Distribution patterns, Velocity, Turbulent flow.
Identifiers: Lognormality.

Grain size distributions of the suspended load above a bed of bimodal size distribution (size range 2.00-0.04 mm) were studied in a laboratory flume at water velocities varying from 42 to 16 cm/s. With increase of velocity, the ph (logarithmic) size distribution of the suspended particles (at 5-20 cm above the bed) changed fro a strongly skewed to a nearly symmetrical unimodal form (nearly lognormal) through an in termediate bimodal stage. At low velocity, th skewness of the distribution changed from pos tive to negative with increase of height. The ex periments indicate that lognormality of 'weigh frequency' distribution of grain sizes is a trans tional feature, attained through size sorting with a critical range of velocity and height above a san bed of a given composition. The observed change in the size distribution patterns were effected by differential rate of increase in weight in the di ferent size classes in suspension with increase flow velocity. The phenomenon could be ex plained by the equation of relative suspension con centration which relates the relative concentratio of a suspended particle of a particular diameter the flow velocity of the turbulent fluid and th height of suspension above the bed. (Sims-ISWS)
W75-11162

**INVESTIGATION OF THE OPERATIN CHARACTERISTICS OF THE IOWA SED MENT CONCENTRATION MEASURIN SYSTEM,**
Iowa Univ., Iowa City. Inst. of Hydraul Research.
F. A. Locher, J. R. Glover, and T. Nakato.
IIHR Report No 170, November 1974. 100 p, fig, 6 tab, 15 ref. Army Contract DACW-72-73- 0022.

Descriptors: *Instrumentation, *Sediment di tribution, *Suspended solids, Laboratory test Calibrations, Sediment load, Entrainmen Laboratory equipment, Measurement, Turb lence.
Identifiers: *Sediment concentration, *Sedime sampler, Spectral analysis, Oscillatory flow, I strument response.

Results of an investigation conducted to evalua the capabilities and limitations of the Iowa Se ment Concentration Measuring System (ISCM were presented. The manner in which the ISCM responded to a group of particles and to a sin particle was presented. Specifically, proble with nonuniformities in the transducer field a problems created by inadequate frequen response were discussed. The results of tests co ducted in an oscillatory flow facility were eva ated and the use of the ISCMS for measuring instantaneous suspended sediment concentrati was reviewed. Recommendations for impro ment of the instrument were also suggest (Adams-ISWS)
W75-11163

**APPLICATION OF THE MANOMETR TECHNIQUE IN THE STUDY OF SEDIME OXYGEN DEPLETION,**
Canada Centre for Inland Waters, Burling (Ontario).
For primary bibliographic entry see Field 5C.
W75-11222

**SEDIMENT PROCESSES IN GREAT LAKES,**
Canada Centre for Inland Waters, Burling (Ontario).
P. G. Sly.
In: Ninth Canadian Hydrology Symposium, Flu al Processes and Sedimentation, May 1973, monton, Alberta, p 465-492. 1 fig, 97 ref.

ors: *Sedimentology, *Great Lakes, *Sedimentation, Erosion, *Geology, t transport, Sediment yield, Cur- ater), Shores, Beaches, Clays, Sands, nt, Dunes, Silts, Bottom sediments, Sedi- stribution, Lake shores, Waves(Water), w, Water circulation, Winds, Upwelling,

reat Lakes, shoreline and nearshore sedi- n processes are influenced by bedrock ional geology but processes controlling to sub-aerial and sub-aqueous influences ly understood. Active beach zones are to narrow vertical ranges, sediment t paths are restricted to basins, floccula- s are slower, and silt size particulates are differentiated from sand and clay. Sedi- nsport by bedload and saltation processes nited importance, as reflected by scarcity entary features. These characteristics in- at energy associated with water level fluc- seiches, and baroclinic circulations is in most tide driven systems of epicon- and partly enclosed areas. Wind wave ac- ss intense and lacks the compounding ef- rface swell generated beyond local areas. s negligible. Physical processes dominate of sedimentary environments but ical and biological processes are impor- ecially in transitional and deep mid-lake ecause lake studies involve 'low energy sensitive environmental indicators are Lake systems are generally closed and distributions reflect decreasing energy rshore to offshore which are sensitive to n effective energy. Variations are related , baroclinic, basotrophic, upwelling, and situations. (Buchanan-Davidson--Wiscon-

37

INARY INFORMATION ON THE NA- F ORGANIC MATTER IN THE SUR- EDIMENTS OF LAKES HURON, ERIE, TARIO,
Centre for Inland Waters, Burlington

Kemp.
edings Symposium on Hydrogeochemis- Biogeochemistry, Vol 1, Earl Ingerson, larke Company, Washington, D.C. 1973, fig, 3 tab, 16 ref.

rs: *Organic matter, *Great Lakes, *Lake sediments, Organic compounds, ology, Bottom sediments, Humic acids, acids, Organic acids, Separation es, Nitrogen, *Lake Huron, *Lake Erie, tario.
s: Bitumens, Humins, Kerogens.

of the top centimeter of sediment from ron, Erie, and Ontario showed little dif- bitumen, humic acids, fulvic acids, and gardless of sediment type, depth, or lo- indicating horizontal mixing of au- us organic matter before sedimenting. uggested a common organic precursor or the lakes. Organic matter in surface appeared to represent complex, relative- olecules, with most of the labile, simpler compounds eliminated in the water A 30-day alkali extraction removed 20% ic and humic acids from the sediment. ic matter contained bitumens (6-10%), fulvic acids (21-36%), and humins (60- e kerogen fraction was proporitional to ic levels, indicating that bottom organ- rimarily responsible for early diagenesis matter in sediments. The organic matter Lakes sediment was similar to that of dra subsoils. Infrared and visible spectra acids were similar to soil humic com- major difference between sediment and the high nitrogen values due to dif- in precursor materials. The elemental analyses indicated that the Great Lakes humic acids are similar to those in small Japanese lakes and marine sediments. (Buchanan-Davidson--Wisconsin)
W75-11240

## 2K. Chemical Processes

**SALT AND SPECIFIC ION EFFECTS ON GERMINATION OF FOUR GRASSES,**
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
J. Ryan, S. Miyamoto, and J. L. Stroehlein.
Journal of Range Management, Vol 28, No 1, p 61-64, January 1975. 1 tab, 2 fig, 12 ref.

Descriptors: *Range grasses, *Range management, *Salt tolerance, *Grazing, *Revegetation, Salts, Germination, Osmotic pressure, Erosion control, Irrigation, Drought tolerance, Ions, Chlorides, Sulfates.
Identifiers: Blue panicgrass, Lehmann lovegrass, Wilman lovegrass, Weeping lovegrass.

The effects of NaCl, CaCl2, MgCl2, Na2SO4, MgSO4, and CaSO4 on four range grasses, blue panicgrass. Lehmann lovegrass, Wilman lovegrass, and weeping lovegrass were investigated. Increased salt concentrations decreased germination, but the species and type of salt varied the extent of the decrease. Inhibition was greatest with Mg and least with Ca salts. At equal osmotic pressures the effect of specific ions also varied. Wilman and weeping lovegrasses were relatively salt tolerant. Germination of range grass species is influenced not only by salt concentrations, but also by the nature of the ions in the salt solution. Based on this information, plant species selections can be chosen that are best adapted to native soil conditions or where the salt composition has been altered by management or irrigation. (Mastic-Arizona)
W75-10894

**NEAR-BOTTOM CHEMISTRY IN THE EASTERN PACIFIC AND NORTH ATLANTIC OCEANS,**
Oregon State Univ., Corvallis. School of Oceanography.
C. H. Culberson, and R. M. Pytkowicz.
Limnology and Oceanography, Vol 20, No 3, p 463-467, May 1975. 1 tab, 30 ref. ONR Contract N00014-67-A-0369-0007.

Descriptors: *Water chemistry, *Atlantic Ocean, *Pacific Ocean, *Inorganic compounds, *Chemistry, Bodies of water, Stratification, Chemical analysis, Salinity, Oxygen, Dissolved oxygen, Hydrogen ion concentration, Alkalinity, Silicates, Phosphates, Nitrates, Chemical properties, Mineralogy, Sea water, Chlorides, Sampling, Sediments.
Identifiers: *Near-bottom chemistry, *Caribbean Sea.

Near-bottom chemistry at depths greater than 2000 m was studied in the eastern tropical Pacific (27 stations), the north-eastern Pacific (9 stations), the Caribbean Sea (1 station), and the North Atlantic (2 stations). Salinity oxygen, pH, alkalinity, silicate, phosphate, and nitrate were measured at eight heights from 0.6 to 300 m above the bottom. No measurable salinity, oxygen, alkalinity, silicate, phosphate, or nitrate gradients were observed. A statistically significant near-bottom increase in pH was found, but the increase was small and could have resulted from undetected analytical or sampling errors. (Henley-ISWS)
W75-10923

**GEOCHEMICAL RECONAISSANCE OF SURFICIAL MATERIALS IN THE VICINITY OF SHAWANGUNK MOUNTAIN, NEW YORK,**
For primary bibliographic entry see Field 5A.
W75-10928

**THE MINOR AND TRACE ELEMENTS, GAS, AND ISOTOPE COMPOSITIONS OF THE PRINCIPAL HOT SPRINGS OF NEVADA AND OREGON,**
Geological Survey, Menlo Park, Calif.
R. H. Mariner, T. S. Presser, J. B. Rapp, and L. M. Willey.
Open-file report, August 1975. 27 p, 2 fig, 9 tab, 11 ref.

Descriptors: *Chemical analysis, *Hot springs, *Basic data collections, *Nevada, *Oregon, Water quality, Thermal water, Geothermal studies, Water quality, Water chemistry, Inorganic compounds, Trace elements, Gases, Sampling, Analytical techniques.

Current interest in the geothermal potential of hot spring areas in Nevada and Oregon makes all data on hot springs in these areas valuable. Tabulated without interpretative comment are compositions of gases (oxygen plus argon, nitrogen, methane, and carbon dioxide), deuterium and oxygen (18) contents of the hot spring waters, trace and minor element chemical data for hot springs sampled in 1972 and 1973, and complete chemical analyses for several hot springs sampled in 1974. The detection limits for nickel and selenium were 0.05 mg/liter and 0.003 mg/liter, respectively. Detectable amounts of nickel were found in Oregon at Olene Gap Hot Spring (0.05 mg/liter) and in Nevada at West Pinto Hot Spring (0.05 mg/liter). Selenium in detectable amounts (0.003 mg/liter or more) was found in Oregon at Hunters Hot Springs (0.008), and in Nevada at the steam geyser at Needle Rocks (0.006), Bog Hot Springs (0.004), and the unnamed hot spring in Jersey Valley (0.003). (Woodard-USGS)
W75-10937

**WATER RESOURCES OF THE LOWER ST. CROIX RIVER WATERSHED, EAST-CENTRAL MINNESOTA,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-10945

**WATER RESOURCES OF THE SNAKE RIVER WATERSHED, EAST-CENTRAL MINNESOTA,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-10946

**WATER RESOURCES OF THE LOWER MINNESOTA RIVER WATERSHED, SOUTH-CENTRAL MINNESOTA,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-10947

**WATER RESOURCES OF THE CANNON RIVER WATERSHED, SOUTHEASTERN MINNESOTA,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7
W75-10948

**CONTINUOUS AUTOMATIC MONITORING OF SURFACE WATER WITH FISH.**
Keuringsinstituut voor Waterleidingartikelen, Rijswijk (Netherlands).
For primary bibliographic entry see Field 5A.
W75-11079

**URANIUM MINERALIZATION BY GROUND WATER IN SEDIMENTARY ROCKS, JAPAN.**
Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan). Raw Materials Div.
For primary bibliographic entry see Field 2F.
W75-11145

A STUDY OF FACTORS CONTROLLING THE CHEMICAL QUALITY OF WATER IN CARTWRIGHT CREEK BASIN, WILLIAMSON COUNTY, TENNESSEE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Geology.
C. L. Sprinkle.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-244 830, $6.25 in paper copy, $2.25 in microfiche. Ms Thesis, Water Resources Research Center Report No 42, August 1973. 147 p, 20 fig, 10 tab, 23 ref, 4 append. OWRT B-018-TENN(2). 1431-0001-3650.

Descriptors: *Water chemistry, *Dissolved solids, *Streams, *Tennessee, Runoff, Groundwater, Water quality, Geology, Rocks, Soils, Chemistry, Chemical analysis, X-ray spectroscopy, Water analysis, Chemicals, Sampling, Leaching, Erosion, Chemical properties, Hydrology.
Identifiers: *Dissolution rates, *Cartwright Creek(Tenn).

This study was made to determine the factors controlling the geochemistry of ground and surface waters in a small carbonate drainage basin. In order to obtain a somewhat geographic sample of the 6 geologic formations and 14 soil types exposed in the basin, a total of 30 individual rock and soil samples were collected. Rates of dissolution for the major chemical constituents from the rock and soil samples were determined after 1, 2, 4, 8, 16, 32, 65, 130, 250 days. Assuming a 0.5 day mean-residence time for most of the water flowing from Cartwright Basin, a simple empirical model related the laboratory-measured dissolution rates of the rock and soil units with their porosities and areal extent in the basin to predict the concentrations of 5 ions common to the water flowing in Cartwright Creek. A water sample collected during high flow in Cartwright Creek on July 17, 1972 (approximately one-half day after a storm) had measured values for the 5 ions that matched the predicted concentrations. The model was less successful in predicting ion concentrations for the 12-month average Cartwright Creek chemical load. (Sims-ISWS)
W75-11164

CONCENTRATION AND GENERA OF ALGAE IN SELECTED ILLINOIS STREAMS, 1971-1973,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W75-11165

SPECIFIC CONDUCTANCE METHOD FOR IN SITU ESTIMATION OF TOTAL DISSOLVED SOLIDS,
Northern Forest Research Center, Edmonton (Alberta).
For primary bibliographic entry see Field 5A.
W75-11167

CHELATION STUDY OF COPPER (II). FULVIC ACID SYSTEM,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W75-11219

EXTRACTION AND ANALYTICAL TECHNIQUES FOR PESTICIDES IN SOIL, SEDIMENT, AND WATER,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5A.
W75-11236

## 2L. Estuaries

STABILIZATION AND RECONSTRUCTION OF TEXAS COASTAL FOREDUNES WITH VEGETATION,
Texas Tech Univ., Lubbock.
B. E. Dahl, B. A. Fall, A. Lohse, and S. G. Appan.
Gulf Universities Research Consortium, Galveston, Texas, Report 139, August, 1974. 343 p, 55 fig, 41 tab, 20 append, 89 ref. DACW 72-72-C-0013.

Descriptors: *Coastal engineering, *Shore protection, *Vegetation effects, *Vegetation establishment, *Erosion control, Texas, Coasts, Beach erosion, Beaches, Soil erosion, Tidal effects, Waves(Water), Dunes, Sands, Wind erosion, Plant populations, Land management, Soil conservation, Soil stabilization, Cover crops, Planting management, Grasses.
Identifiers: *Padre Island, Beach grasses, Sea oats, Bitter panicum.

Experiments were conducted from 1969 to 1974 on Padre Island, Texas, to to establish technical specifications and methodologies for the use of beach grasses to construct and stabilize foredunes along the Gulf Coast as storm surge barriers. Bitter panicum and sea oats were the best adapted species for beach plantings, with winter through spring being the most favorable transplanting period. Foredunes were established across overwash channels by creating an elevated, flat, relatively salt-free surface using parallel rows of two-foot-high sand fencing, and then transplanting both grasses. (Robinett-Arizona)
W75-10887

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOL. II, ASPECTS OF COMPUTATION,
RAND Corp., Santa Monica, Calif.
J. J. Leendertse, and S-K. Liu.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 501, $5.75 in paper copy, $2.25 in microfiche. Completion Report R-1764-OWRT, June 1975. 123 p, 62 fig, 26 ref, 4 append. OWRT C-5252(No 4237)(1).

Descriptors: *Estuaries, *Mathematical models, *Numerical methods, Tides, Fluid dynamics, Computer models, Coastal engineering, *Finite differences, *Simulation analysis, Unsteady flow, *Model studies, Bays, Coasts.
Identifiers: *Three-dimensional flow model.

Different computational aspects of the use of a three-dimensional finite-difference model of estuaries, bays, and coastal seas are described. With this model, salinity and temperature distributions can be computed, together with the flow field, and then coupled to the flow computation by a complicated equation of state. In the model an approximation for the sub-gridscale effects is introduced by use of mass and momentum exchange coefficients. The vertical exchanges are dependent on the Richardson number. The model is tested in bays and estuaries with widely different characteristics (Grevelingen, Chesapeake Bay, San Francisco Bay, and the Strait of Juan de Fuca). The results are presented in graphic form. Effective simulations can be made with the model. (See also W74 04301)
W75-10900

AUTOMATED TIDAL COMPUTATIONS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W75-10912

NEAR-BOTTOM CHEMISTRY IN THE EAS ERN PACIFIC AND NORTH ATLANT OCEANS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2K.
W75-10923

STOCHASTIC ANALYSIS OF PARTIC MOVEMENT OVER A DUNE BED,
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 2J.
W75-10942

A NOTE ON SALINITY AND TEMPERATU IN SOME MOROCCAN BRACKISH WATERS
Ghent Rijksuniversiteit (Belgium). Dept. of Zoology.
C. Heip, E. De Coninck, P. Engels, G. Engler, a G. Verschueren.
Bull Soc Sci Nat Phys Maroc. Vol 52, No 3/4, p 29, 1972.

Descriptors: *Salinity, *Brackish water, *Wa temperature, Sediments, Air temperature, Atla Ocean, Coasts.
Identifiers: *Morocco, Polyhaline waters, Hyp haline salt mines.

A series of measures of temperature and sali was made in brackish waters along the Atla coast of Morocco. All waters examined w polyhaline, except for a series of hyperhaline mines. The importance of temperature in the s ment is discussed: temperature in the top la may rise considerably (7C) above air temperat In the deeper layers the temperature is lowere in the air and the water.--Copyright 1974, Biol cal Abstracts, Inc.
W75-10997

THE INFLUENCE OF THE WARM COOL WATER FROM A FOSSIL FUELED POW PLANT ON OCEANOGRAPHIC CONDITI AND COMPOSITION OF PLANKTON OWASE BAY I. WATER TEMPERATURE RELATION TO DISTRIBUTION MICROPLANKTON, (IN JAPANESE),
Shimonoseki Univ. of Fisheries (Japan).
For primary bibliographic entry see Field 5C.
W75-11030

IMPACT OF THERMAL EFFLUENT FR STEAM-ELECTRIC STATION ON MARSHLAND NURSERY AREA DURING HOT SEASON,
Florida Univ. at Marineland, St. Augustine. Whitney Marine Lab.
For primary bibliographic entry see Field 5C.
W75-11032

MANAGEMENT OF RETARDATION OF S WATER INTRUSION IN COASTAL AQUIFE
North Carolina State Univ., Raleigh. Dept. of Engineering.
For primary bibliographic entry see Field 2F.
W75-11058

MATAGORDA ISLAND, TEXAS: THE EV TION OF A GULF COAST BARRIER C PLEX,
Michigan Univ., Ann Arbor. Dept. of Geology Mineralogy.
B. H. Wilkinson.
Geological Society of America Bulletin, Vo No 7, p 959-967, July 1975. 11 fig, 10 ref.

Descriptors: *Barrier Islands, *Evol *Erosion, *Sedimentation, *Gulf of Me *Texas, Estuaries, Gulf coastal plain, Oc Sands, Sand bars, Island, Coasts, Bayous, R Stabilization, Recent epoch, Pleistocene e Geomorphology.

iers: *Matagorda Island(Tex).

ɔrda Island is a wide, sand-rich, barrier-complex on the central Texas coast. This initially formed as an intermittently emer-and shoal which migrated landward during e Holocene transgression and then became ed as the Gulf of Mexico reached stillstand. baerial portion of the island complex rests lanket of middle Holocene Bay-estuarine hich was desposited behind the landward-ng sand body and then was overridden by llowing stillstand, Matagorda Island led Gulfward approximately 1.6 km. During ogradation, two large tidal passes, which ted the Gulf of Mexico with San Antonio esquite Bays, were closed. The island was modified by migration of Cedar Bayou miles to the west across the island's n end. Two sources of sand contributed to rier complex. Prior to stillstand, erosion of cene strandplain sand and middle Holocene deltaic sand exposed on the shelf supplied the sediment to the early barrier. Follow-stand, with progradation, shelf sands were ply submerged to be eroded by Gulf waves. scharged into the Gulf by the Colorado and Rivers and transported southwestward by re currents was desposited on the beach reface of Matagorda Island. (Sims-ISWS)
144

ON THE MEASUREMENT OF THE NSE OF OCEANOGRAPHIC TEMPERA-SENSORS,
l Bureau of Standards, Washington, D.C.
Basic Standards.
nary bibliographic entry see Field 7B.
146

TS OF ENTRANCE LOSS ON HARBOR LATIONS,
Univ., Gainesville. Dept. of Coastal and graphic Engineering.
nary bibliographic entry see Field 8B.
147

S THEORY OF GLACIATION SUP-D BY ISOTOPIC STUDY OF NORWEGI-RE K 11,
National de la Recherche Scientifique, Gif-tte (France). Centre des Faibles Radioac-

nary bibliographic entry see Field 2J.
53

IOR OF MN, FE, CU, ZN, CD AND PB ARGED FROM A WASTEWATER MENT PLANT INTO AN ESTUARINE ONMENT,
d Univ., College Park. Dept. of Chemis-

ary bibliographic entry see Field 5B.
60

EGIC APPROACH TO ESTUARINE EN-MENTAL MANAGEMENT,
State Univ., Corvallis. Dept. of Civil En-g.
lla.
of the Waterways, Harbors, and Coastal ing Division, Proceedings of ASCE, Vol WW1, Paper No 11109, February 1975. p ig, 13 ref.

ors: *Estuaries, *Management, nmental effects, *Harbors, *Oregon, ehensive planning, Ecology, Water nent(Applied), Environmental engineer-

al systems must be examined from a spec-views ranging from those of high perspec-tive-low detail to those of low perspective-high detail. Such a spectrum should provide complementary views of real world systems, the 'true' nature of which is beyond our capacity to perceive. A high perspective low detail view is employed herein to examine the organization, function, and requirements of whole estuarine systems. Concerns pertinent to comprehensive environmental planning of estuaries are identified. A planning approach that calls for the uneven distribution of development activities among Oregon's estuarine systems is presented. This approach places a high value on environmental variety, including a wide range of undeveloped ecosystems. Cluster communities with intervening open space are called for within systems selected for development. A number of methods, concerns, and problems related to the implementation of this approach are identified. Although the method is recommended for Oregon's estuaries, emphasis is given to general concepts that have wider applicability. (Bell-Cornell)
W75-11179

**AMMONIA EXCRETION BY ZOOPLANKTON AND ITS SIGNIFICANCE TO PRIMARY PRODUCTIVITY DURING SUMMER,**
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W75-11187

**A SURVEY OF FISHES AND COMMERCIAL INVERTEBRATES OF THE NEARSHORE AND ESTUARINE ZONE BETWEEN CAPE ROMANO AND CAPE SABLE, FLORIDA,**
National Marine Fisheries Service, Panama City, Fla. Gulf Coastal Fisheries Center.
For primary bibliographic entry see Field 2I.
W75-11189

**THE ROLE OF PLANKTONIC PROTOZOA IN THE MARINE FOOD CHAIN. SEASONAL CHANGES, RELATIVE ABUNDANCE, AND CELL SIZE DISTRIBUTION OF TINTINNIDA,**
New York Aquarium, Brooklyn. Osborn Labs. of Marine Sciences.
For primary bibliographic entry see Field 5C.
W75-11191

# 3. WATER SUPPLY AUGMENTATION AND CONSERVATION

## 3A. Saline Water Conversion

**PHYSIOCHEMICAL TREATMENT OF WASTE-WATER-SEAWATER MIXTURE BY ELECTROLYSIS,**
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W75-10979

**MEMBRANE DESALTING GETS BIG PUSH,**
Office of Water Research and Technology, Washington, D.C.
M. E. Mattson.
Water and Wastes Engineering, Vol 12, No 4, p 35, 36, 38, 40, 42, April, 1975. 7 fig.

Descriptors: *Waste water treatment, *Municipal water, *Membrane processes, Electrodialysis, Reverse osmosis, Capital costs, Operating costs, Design, Economics, Desalination processes, *Treatment facilities, California, Colorado River.
Identifiers: Brackish water desalting.

Two large brackish water membrane desalting plants are near completion. One, in Santa Ana, California, has planned a multi-phase program for its 75 mgd facility to test reverse osmosis (RO), electrodialysis (ED), and ion exchange. On the lower Colorado River, an even larger desalting plant, of 100 mgd, is planned, with a test facility at Yuma, Arizona to evaluate pre-treatment and to compare reverse osmosis, and electrodialysis and the use of a combination of these two processes. Design characteristics, advantages, problems, and costs of RO and ED are detailed. While both methods have only recently been applied to large municipal water systems (ED in 1962, RO in 1971), treatment plant personnel have been satisfied with each. Economic comparisons of the two membrane processes indicate that: the two desalting applications are competitive with each other; with low salinity brackish waters (under 5000 ppm TDS), ED has a slight advantage over RO; capital costs and operating costs for ED systems decreases more rapidly with increasing plant size; and, RO is not as sensitive to variations in feed salinity as ED. Actual operating and capital costs at several large municipal plants show that local conditions such as plant load factors or fouling problems cause much variation. Both reverse osmosis and electrodialysis are recommended for future usage. (Prague-FIRL)
W75-10982

**CALCIUM SULFATE SOLUBILITY IN BRACKISH WATER CONCENTRATES AND APPLICATIONS TO REVERSE OSMOSIS PROCESSES: POLYPHOSPHATE ADDITIVES,**
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5D.
W75-11004

**ELECTROLYTIC SEA WATER PROCESS,**
Diamond Shamrock Corp., Cleveland, Ohio. (assignee)
R. E. Loftfield, J. E. Bennett, and J. E. Cinke.
U.S. Patent No 3,893,902, 5 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 653-654, July 8, 1975.

Descriptors: *Patents, *Sea water, *Desalination, Waste water treatment, *Water purification, *Electrolysis, Electrodes, Anodes, Cathodes.
Identifiers: Hypochlorite.

A method is provided for the electrolysis of sea water which reduces the formation of undesirable deposits on the electrodes of the cell and produces hypochlorite. The cell is comprised of an enclosure containing vertically placed electrodes in an alternating array of anodes and cathodes. Sea water is introduced to the cell at a point below the electrodes through a series of orifices corresponding in number and location to the cathodes. The direction of the orifices is such that the sea water first impinges primarily on nonelectrode surfaces immediately subjacent the electrodes at a velocity of between 5 and 25 feet per second. The sea water velocity through the cell is maintained sufficient to at least suspend substantially all particulate matter present. Electrolysis is intermittently halted and the cell is flushed with sea water introduced through orifices at a point above, and directed onto the electrodes. This removes a slurry of particulate material from the bottom of the cell and electrolysis can be resumed. (Sinha-OEIS)
W75-11068

**SYSTEM FOR OPTIMAL PRESSURE CONTROL IN A MULTI-STAGE EVAPORATION UNIT,**
Deutsche Texco A.G., Hamburg. (West Germany). (assignee)
A. Hoppe, and W. Geistert.
U.S. Patent No 3,894,915, 4 p, 3 fig, 11 ref; Official Gazette of the United State Patent Office, Vol 936, No 3, p 998, July 15, 1975.

Descriptors: *Patents, *Water quality, *Water pollution treatment, *Evaporation, Condensation, Distillation, Equipment, Evaporators, *Heat exchangers, Desalination.

A system for optimal pressure control in a multi-stage evaporation unit is comprised of two or more series connected evaporation stages with at least one of the stages preceded by a heat source. The fresh or feed solution is passed through heat exchangers where it is heated by means of the vapors from the subsequent evaporation stages. The heat exchanger is adapted to permit free flow of the vapor condensate through the heat exchanger inner portion. The heat exchanger installed in the line through which the vapor effluent leaves the higher-pressure evaporation unit acts as a throttling means to permit unimpeded passage of the vapor condensate and assumes the pressure expanding function formerly performed by the pressure control valve. (Sinha-OEIS)
W75-11070

## 3B. Water Yield Improvement

**DIFFERENTIAL RELEASE OF WATER FROM ARIZONA SNOWPACKS,**
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2C.
W75-10860

**HYDROGEOLOGY AND WATER RESOURCES OF MIDDLE KIRKLAND CREEK BASIN, YAVAPAI COUNTY, ARIZONA,**
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources
For primary bibliographic entry see Field 4B.
W75-10872

**EFFECTS OF PINYON-JUNIPER REMOVAL ON NATURAL RESOURCE PRODUCTS AND USES IN ARIZONA,**
Forest Service (USDA), Phoenix, Ariz. Rocky Mountain Forest and Range Experiment Station.
W. P. Clary, M. B. Baker, P. F. O'Connell, T. N. Johnsen, Jr., and R. E. Campbell.
Research Paper RM-128, October, 1974. 28 p, 12 fig, 9 tab, 78 ref.

Descriptors: *Water yield improvement, *Vegetation effects, *Pinyon pine trees, *Juniper trees, Herbicides, Forages, Small watersheds, Sediment yield, Water quality, Wildlife, Recreation, *Arizona, Multiple-purpose projects.

Results of water yield improvement tests are evaluated with regard to their impacts on multiple uses of the land. Included in this examination are water quality and quantity, overstory vegetation, understory vegetation, potential livestock carrying capacity, wildlife values, and recreation and aesthetics. Pinyon-juniper removal was done by cabling, herbicide, and felling in an attempt to improve water yields. Of the three treatments only the herbicide treatment with picloram appears to provide an increase in water yield, but the negative aesthetic effect of dead standing trees was undesirable. Overstory vegetation removal will result in a severalfold increase in herbage production for livestock and wildlife. There was no meaningful increase in sediment yield as a result of overstory removal. A combination of herbicide treatment and fire appears the most promising method for future juniper control research from the standpoint of water production, forage production, deer response, and economics. (Mastic-Arizona)
W75-10886

**REVEGETATING DISTURBED AREAS IN THE SEMIARID SOUTHWEST,**
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station
For primary bibliographic entry see Field 4D.
W75-10892

**APPROXIMATE ANNUAL WATER BUDGETS OF TWO CHAINED PINYON-JUNIPER SITES,**
Utah State Univ., Logan. Watershed Science Unit.
For primary bibliographic entry see Field 4A
W75-10896

**WIND EFFECTS ON CHEMICAL FILMS FOR EVAPORATION SUPPRESSION AT LAKE HEFNER,**
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
F. R. Crow, and A. L. Mitchell, Jr.
Water Resources Research, Vol 11, No 3, p 493-495, June 1975. 4 fig, 8 ref. Bureau of Reclamation Contract 14-06-5629.

Descriptors: *Evaporation control, *Winds, *Films, *Lakes, *Oklahoma, Evaporation, Hexadecanol, Octadecanol, Slurries, Application equipment, Application methods, Retardants, Thin films, Research and development, Alcohols, Rates of application, Wind velocity.
Identifiers: *Lake Hefner(OK), Wind direction.

An evaporation suppression research project was conducted at Lake Hefner, Oklahoma, where water-based slurries of hexadecanol and octadecanol were applied at the upwind side of the lake by an offshore sprinkler system. The distribution system was designed for maximum film cover under south winds. The chemical was applied at a variable rate adjusted to the demand created by local wind speed and direction. The application rate required to replace film removed by the wind, in terms of pounds per hour per foot of distribution line perpendicular to the wind, averaged 6.5-8 times greater than for an experimental pond with a similar application system. The upper wind speed limit for successful film application was 13 miles per hour (mph). Distribution studies were made to determine the percent of time that wind speeds and directions were favorable to the application of film, i.e., with speeds less than 13 mph and direction between 135 degrees and 225 degrees azimuth. Under wind conditions experienced in Oklahoma it was difficult to maintain continuous film cover because of the frequency of occurrence of high wind speeds and shifts in wind direction. (Roberts-ISWS)
W75-10920

**AN APPRAISAL OF POTENTIAL WATER SALVAGE IN THE LAKE MCMILLEN DELTA AREA, EDDY COUNTY, NEW MEXICO,**
Geological Survey, Reston, Va.
E. R. Cox, and J. S. Havens.
Available from Supt. of Documents, GPO, Washington, D.C. 20402, $1.50 in paper copy, Water-Supply Paper 2029-E, 1974. 26 p, 4 fig, 2 plate, 8 tab, 11 ref.

Descriptors: *Water conservation, *New Mexico, *Evapotranspiration control, *Phreatophytes, *Tamarisk, Reservoirs, Evapotranspiration, Water yield improvement, Water reuse.
Identifiers: *Lake McMillan(N Mex).

The amount of water used by saltcedar in the area of the old delta of Lake McMillan, New Mexico, and the amount of water that might be salvaged by eradication of saltcedar by construction of floodways through the delta area are estimated. Saltcedar growth increased from about 13,700 acres in 1952 to about 17,000 acres in 1960, a 25% increase. Most of this increase was in the areal density range near zero to 30%. The estimated average transpiration of phreatophytes in the Artesia to Lake McMillan reach is 29,000 acre-feet of water per year. In the reach from Artesia to the Rio Penasco, where the regional water table is above the Pecos River, saltcedar eradication might salvage from 10,000 to 20,000 acre-feet of water per year for use downstream. From the Rio Penasco to Lake McMillan, the river is perched above the water table; therefore, elimination of the saltcedar would probably not increase flow in the river, nor would drains be effective. Clearing of the [illegible] however might increase the flow at Malaga Bend Springs below Lake McMillan. However, through this reach would [illegible] evaporation but might [illegible] the sediment [illegible] by floodwater in Lake McMillan. (Woodard-USGS)
W75-10941

**DEVELOPMENT OF A BIBLIOGRAPHIC INFORMATION SYSTEM FOR WATER YIELD IMPROVEMENT PRACTICES,**
Arizona Univ., Tucson. School of Renewable Natural Resources
For primary bibliographic entry see Field 10B
W75-11050

**AN ELEVATIONAL CONTROL OF PEAK SNOWPACK VARIABILITY,**
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research; and Colorado Univ., Boulder. Dept. of Geography.
For primary bibliographic entry see Field 2C.
W75-11155

**WIND-SNOW RELATIONS AT MARMOT CREEK, ALBERTA,**
Atmospheric Environment Service, Calgary (Alberta).
For primary bibliographic entry see Field 2C.
W75-11226

**HYDROLOGIC RELATIONS ON UNDISTURBED AND CONVERTED BIG SAGEBRUSH LANDS: THE STATUS OF OUR KNOWLEDGE,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W75-11313

## 3C. Use Of Water Of Impaired Quality

**USE OF AMENDMENTS TO REDUCE WATER REQUIREMENTS FOR STAND ESTABLISHMENT OF SMALL-SEEDED CROPS,**
Arizona Univ., Tucson. Dept. of Plant Sciences.
For primary bibliographic entry see Field 3F.
W75-11045

**CHANGES IN VEGETATION AND SURFACE SOIL PROPERTIES FOLLOWING IRRIGATION OF WOODLANDS WITH MUNICIPAL WASTEWATER,**
Michigan State Univ., East Lansing. Dept. of Forestry.
For primary bibliographic entry see Field 5B.
W75-11243

**STATUS OF WASTE HEAT UTILIZATION AND DUAL-PURPOSE PLANT PROJECTS,**
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 3E.
W75-11251

## 3D. Conservation In Domestic and Municipal Use

**SOCIAL IMPACTS OF WATER RESOURCES DEVELOPMENTS AND THEIR IMPLICATIONS FOR URBAN AND RURAL DEVELOPMENT: A POST AUDIT ANALYSIS OF THE WEBER BASIN PROJECT IN UTAH,**
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources
For primary bibliographic entry see Field 6B.
W75-10854

**)D RUNOFF FROM URBAN AREAS,**
land Univ., College Park. Dept. of Civil En-ring.
rimary bibliographic entry see Field 5B.
10904

**ASE STUDY OF SOME ECONOMIC CTS OF THE NATIONAL FLOOD IN-NCE PROGRAM,**
ssippi State Univ., Mississippi State. Div. of ess Research.
rimary bibliographic entry see Field 6F.
0906

**STRY AND COMMUNITY IN COOPERA-**
nsult, Lund (Sweden).
imary bibliographic entry see Field 5D.
0985

**ER APPLICATION PRACTICES AND SCAPE ATTRIBUTES ASSOCIATED RESIDENTIAL WATER CONSUMPTION,**
Mexico State Univ., University Park. Dept. rticulture.
otter, and D. B. Croft.
ble from the National Technical Informa-ervice, Springfield, Va. 22161, as PB-244 .75 in paper copy, $2.25 in microfiche. New o Water Resources Research Institute, Las s., Report No 049, Completion Report, nber 1974, 112 p, 18 tab, 57 ref, append. C-4060(No 9012)(1).

ptors: *Landscaping, *Aesthetics, *Water vation, Municipal water, Water consump-Arid climates, Southwest US, Bermuda Fescues, Analytical techniques, New Mex-rveys, Water demand, Social values, Water ion, Measurement.
iers: *Urban landscapes, New Mexico alta Hybrid Bermuda turf, Factor analysis, water demand.

ak water load demand on municipal systems n caused by water used to maintain urban apes. Research was conducted to determine ls for reducing water used on urban land-and to enhance the esthetic role of plants in an landscape. Two broad approaches were ed: evaluation of water application on landscapes in relation to size and type of pe; and description of esthetic dimensions n landscapes in relation to water consumed. nts applied more water than needed to n the landscape, and the specific amounts ed upon the season and landscape type. An ent, the Residential Landscape Descrip-uestionnaire (RLDQ), was developed for he esthetic qualities of a residential land-The evidence indicated the RLDZ was eliable and valid. The most feasible method ucing municipal peak water usage is to ze excesses and utilize landscape design which conserve water and are esthetically ve. In view of the fact that residents tend to p to 50% more water than needed to main-esthetic and health qualities of the land-t is recommended that an educational pro-initiated to improve the water application s as well as the design of landscapes as one ue for reducing the amount of water used ntain residential landscapes. (Hain-New State)
059

**AND WATER RESOURCES SURVEY IN BEL MARRA AREA, THE SUDAN.**
nd Agriculture Organization of the United , Rome (Italy).
nary bibliographic entry see Field 4A.
139

**HYDROLOGIC INVESTIGATION AND DESIGN OF URBAN STORMWATER DRAINAGE SYSTEMS,**
Snowy Mountains Engineering Corp., Canberra (Australia).
For primary bibliographic entry see Field 4A.
W75-11141

**THE DESIGN OF STORM WATER DRAINAGE CHANNELS USING MATHEMATICAL MODEL TECHNIQUES,**
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 8B.
W75-11150

**AN IMPLICIT APPROACH TO PRICING AGRICULTURAL WATER TRANSFERS TO URBAN USES,**
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W75-11178

**VACUUM DISTILLATION/VAPOR FILTRATION WATER RECOVERY,**
General American Transportation Corp., Niles, Ill.
For primary bibliographic entry see Field 5D.
W75-11315

## 3E. Conservation In Industry

**IMPACT OF ENERGY DEVELOPMENT ON THE LAW OF THE COLORADO RIVER,**
California Univ., Los Angeles. School of Law.
For primary bibliographic entry see Field 4C.
W75-10869

**INDUSTRY AND COMMUNITY IN COOPERATION,**
K-Konsult, Lund (Sweden).
For primary bibliographic entry see Field 5D.
W75-10985

**LEGAL AND INSTITUTIONAL PROBLEMS IN THE MANAGEMENT OF SALINITY,**
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 5G.
W75-11047

**IMPROVED DESIGN AND OPERATING CRITERIA FOR RURAL WATER DISTRICTS,**
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 6D.
W75-11056

**DESIGN CONSIDERATIONS--WATER AND EFFLUENT DISPOSAL,**
For primary bibliographic entry see Field 5D.
W75-11128

**STATUS OF WASTE HEAT UTILIZATION AND DUAL-PURPOSE PLANT PROJECTS,**
Oak Ridge National Lab., Tenn.
S. E. Beall, and M. M. Yarosh.
Available from the National Technical Information Service, Springfield, Va 22161 as CONF-73-1101-56, $4.00 in paper copy, $2.25 in microfiche. Presented at the American Nuclear Society meeting, San Francisco, California, November 11-16, 1973. 44 p, 18 fig, 5 tab, 26 ref. AEC 731101-56.

Descriptors: *Heat transfer, *Heated water, *Heating, *Aquiculture, *Return flow, Energy transfer, Powerplants, Tennessee Valley Authority, Commercial shellfish, Catfishes, Steam, Thermal power, Agriculture, Greenhouses, Europe, Heat exchangers, Fish farming, Asia.
Identifiers: *Waste heat, *Dual purpose energy plants, Mariculture, Ploesti(Romania), Japan.

One method for conserving energy is to use heat which has been discharged from some conversion mechanism or industrial process. Although there are incentives to use discarded heat, there are also disincentives: the necessity of locating the user near the heat source, the potential interruptable nature of the service, the possibility of chemical or radioactive contamination, and seasonal variation in source temperature. The status of several pioneering projects in the substitution of once-used heat for heat from fossil fuels is reported. Demonstrations of the economic feasibility of closed-environment agriculture warmed by waste heat, proposed by the Oak Ridge National Laboratory-TVA and by the Northern States Power Company as well as projects already completed by the University of Arizona, are described. The utilization of warm discharge water for irrigation and frost protection for outdoor agriculture and for aquaculture and mariculture is discussed. Salt water shrimp, catfish, oysters, clams and abalone have been successfully raised experimentally in warm waste water enhanced environments. The status of several dual-purpose (electrical power and industrial steam) energy plant projects is assessed. Although significant savings in fuel and improvements in overall efficiency are possible from dual-purpose plants, only limited application of the concept has been made. (Becker-Wisconsin)
W75-11251

**THE WATER INDUSTRY IN TRANSITION,**
National Water Council, London (England).
P. E. Stott.
Conference of British Industry Review, No 13, p 22-31, 1974. 1 fig.

Descriptors: *Water management(Applied), *Water policy, *Administrative agencies, Water supply, Water quality control, Regions, Europe, Sewerage, Financing, Income, Regional analysis, Water districts.
Identifiers: *England, *Wales, *Regional administration.

The implementation of the 1973 Water Act in England and Wales called for a radical restructuring of the administration of water and sewerage functions. Nine regional water authorities in England and the Welsh National Water Development Authority were set up based on river basins, the role of the twelve-member National Water Council was defined, the Water Research Centre was established, and the Water Space Amenity Commission was created. The ten multi-functional regional authorities are responsible for water resources and supply; sewerage and sewage disposal; the prevention of pollution; land drainage and flood protection; fisheries; the recreational and amenity use of their water space; and in some cases, for navigation. The new jurisdictional units need updated information on costs, standards and the state of repair as well as research and development support. Local authorities remain as agents for the development and maintenance of local sewerage systems, and statutory water companies remain as agents for the supply of water within their areas. The coordination of workers from many local authorities remains an important objective. New financing strategies, although authorized, have not been used due to administrative obstacles. A summary of detailed objectives of the massive reorganization is included. (Becker-Wisconsin)
W75-11252

**NON-RENEWABLE, NON-ENERGY RESOURCES,**
Leicester Univ (England). Public Sector Economics Research Centre.
For primary bibliographic entry see Field 6B.
W75-11253

**HOW STEAM IS PRODUCED AND HANDLED AT THE GEYERS,**
For primary bibliographic entry see Field 4B.
W75-11280

**SUBSURFACE WATER -- TOOL FOR PETROLEUM EXPLORATION,**
Mobil Research and Development Corp., Dallas, Tex.
For primary bibliographic entry see Field 4B.
W75-11289

**WASTE WATER SURVEY, ST. REGIS PAPER COMPANY, CANTONMENT, FLORIDA.**
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5D.
W75-11314

**UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 1). IN-PROCESS MODIFICATIONS AND PRETREATMENT,**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 5D.
W75-11320

**UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 2). WASTE TREATMENT,**
Bell, Galyardt and Wells, Omaha, Nebr.
For primary bibliographic entry see Field 5D.
W75-11321

**UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 3). CHOOSING THE OPTIMUM FINANCIAL STRATEGY,**
Commins (J. A.) and Associates, Inc., Fort Washington, Pa.
For primary bibliographic entry see Field 5D.
W75-11322

**POLLUTION ABATEMENT IN A BREWING FACILITY.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 5D.
W75-11323

**UPGRADING METAL-FINISHING FACILITIES TO REDUCE POLLUTION. (PART 1). IN-PROCESS POLLUTION ABATEMENT,**
Oxy Metal Finishing Corp., Madison Heights, Mich.
For primary bibliographic entry see Field 5D.
W75-11324

**UPGRADING METAL-FINISHING FACILITIES TO REDUCE POLLUTION. (PART 2). WASTE TREATMENT,**
Lancy Labs., Inc., Zelienople, Pa.
For primary bibliographic entry see Field 5D.
W75-11325

**UPGRADING TEXTILE OPERATIONS TO REDUCE POLLUTION. (PART 1). IN-PLANT CONTROL OF POLLUTION.**
Institute of Textile Technology, Charlottesville, Virginia.
For primary bibliographic entry see Field 5D.
W75-11326

**UPGRADING TEXTILE OPERATIONS TO REDUCE POLLUTION. (PART 2). WASTE-WATER TREATMENT SYSTEMS.**
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 5D.
W75-11327

**UPGRADING POULTRY-PROCESSING FACILITIES TO REDUCE POLLUTION. (PART 1). IN-PROCESS POLLUTION ABATEMENT,**
Environmental Engineering, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 5D.
W75-11328

**UPGRADING POULTRY-PROCESSING FACILITIES TO REDUCE POLLUTION. (PART 2). PRETREATMENT OF POULTRY-PROCESSING WASTES,**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 5D.
W75-11329

**UPGRADING POULTRY-PROCESSING FACILITIES TO REDUCE POLLUTION. (PART 3). WASTE TREATMENT.**
Giffels Associates, Inc., Detroit, Mich.
For primary bibliographic entry see Field 5D.
W75-11330

**MEASURES IN THE SULFITE PULP INDUSTRY FOR DECREASING WASTE WATER LOAD (MASSNAHMEN DER SULFITZELLSTOFF-INDUSTRIE ZUR MINDERUNG DER ABWASSERBELASTUNG),**
Chemiefaser Lenzing A.G. (Austria).
For primary bibliographic entry see Field 5D.
W75-11339

**POSSIBILITIES OF REUTILIZATION OF KAOLIN FROM BIOLOGICAL WASTE WATER SLUDGES (MOEGLICHKEITEN DER WIEDERVERWERTUNG VON KAOLIN AUS BIOLOGISCHEN ABWASSERCHLAEMMEN),**
Papierfabrik Biberist (Switzerland).
For primary bibliographic entry see Field 5D.
W75-11349

## 3F. Conservation In Agriculture

**EFFECTS OF IRRIGATION IN RAIN-FED FIELDS ON THE GROWTH AND YIELD OF UPLAND RICE VARIETIES, (IN KOREAN),**
Kyungpook National Univ., Taegu (Republic of Korea). Coll. of Agriculture.
S. Y. Jeh.
Res Rep Off Rural Dev (Crop) (Suwon), 16 p 127-132, 1974. Illus.

Descriptors: *Rice, *Irrigation, *Crop production, Growth rate.

Differences of the characters and yield of 14 upland and 2 lowland rice varieties cultivated under irrigated, partially-irrigated and dry field conditions were studied. Under dry conditions, heading and maturity were greatly delayed and ratios of valid tillers, fertilized spiklets and ripening and yield in both rough and brown rice were relatively lower, while numbers of tillers and spikelets and straw weight were greater under the other 2 conditions. There was not substantial difference in growth and yield of rice between the irrigated and partially-irrigated conditions.--Copyright 1975, Biological Abstracts, Inc.
W75-10853

**EFFECTS OF ANTITRANSPIRANTS ON YIELD OF GRAIN SORGHUM UNDER LIMITED IRRIGATION,**
New Mexico State Univ., Clovis. Plains Branch Agricultural Experiment Station.
H. D. Fuehring.
Agronomy Journal, Vol 65, No 3, p 348-351, 1973.

Descriptors: *Antitranspirants, *Crop production, *Sorghum, Irrigation, Stomata, Grain(Crops).
Identifiers: Atrazine, Folicote, Phenylmercuric acetate.

The proper material, method and timing of appl. cation for field use was determined. Under limite irrigation conditions in the field, grain sorghum (Sorghum bicolor (L.) Moench) was sprayed a various rates and times with phenylmercuri acetate (PMA), atrazine and Folicote. Mean grai yield increases of 5-17% were obtained. Rates application required were approximately 60 g/h for PMA, 130 g/ha for atrazine, and 2 l/ha for Fo icote. Application just prior to the boot stage w more effective than a later application.--Copyrigh 1973, Biological Abstracts, Inc
W75-10858

**INTERNATIONAL DEVELOPMENT STRATE GIES FOR THE SAHEL.**
For primary bibliographic entry see Field 4A.
W75-10861

**SUCCESSFUL IRRIGATION: PREPARATION REALIZATION, EXPLORITATION, (SAVOI IRRIGUER: PREPARATION, REALISATION EXPLOITATION),**
California Univ., Davis. Dept. of Irrigation.
R. M. Hagan, C. E. Houston, and S. V. Allison.
Food and Agriculture Organization of the Unite Nations, Rome, 1968. 53 p.

Descriptors: *Irrigation programs, *Planning *Management, *Institutions, *Project planning Costs, Economic feasibility, Water utilization.

Successful irrigation, its planning, development and management, are described to assist polic makers, administrators, and planners to discharg more effectively their roles in the development o irrigated agriculture. Successful irrigation require a skillful combination of the accumulate knowledge in many professional field, includin engineering, water-soil-plant sciences, an economic and other social sciences. Guidelines ar suggested for the preparation of project proposal their appraisal, and implementation. The sul sequent management calls for experienced judg ment, gased on a high degree of professional con petence. (Paylore-Arizona)
W75-10874

**SPRINKLER IRRIGATION PRACTICE, (L PRATIQUE DE L'IRRIGATION PAR ASPE SION),**
California Univ., Los Angeles. Water Resourc Center.
A. F. Pillsbury, and A. Degan.
Food and Agriculture Organization of the Unite Nations, Rome, FAO Agricultural Developme Paper, No 88, 1968. 186 p, 66 fig, 88 refs.

Descriptors: *Sprinkler irrigation, *Irrigati practices, *Operation and maintenanc *Hydraulic equipment, *Pumps, Water distrib tion(Applied), Irrigation systems, Costs, Corr sion, Scaling, Design criteria, Rotational flow.

Discussed are types of land best suited to sprinkl irrigation; types of sprinklers (slow rotation, rea tion rotation, nozzle lines, perforated pipe, a fixed head sprinklers); types of sprinkler syste (hand-move, portable, semi-portable, permanet roll-move, tow units, drag units, solid set, a traveling machines); suitable environments su as soil texture and density, moisture suction, h midity, wind, and evaporation; sprinkler patter as they relate to uniform coverage; system desi and operational criteria, with special reference problems induced by corrosion; system hydrau design; pumping plant design; installation, ope tion, and maintenance; sprinkling in greenhous factors such as pesticides, fertilizers, and fro and economic considerations. (Paylore-Arizona)
W75-10875

**THE EARLY VEGETATIVE GROWTH OF TV ANNUAL PASTURE GRASSES (HORDEU**

ORINUM LINK AND LOLIUM RIGIDUM
UD.),
th Australia Dept. of Agriculture, Adelaide.
. Cocks, and C. M. Donald.
tralian Journal of Agricultural Research, Vol
No 1, p 11-19, January, 1973. 3 fig, 5 tab, 11

criptors: *Germination, *Plant growth,
eds, *Grasses, *Planting management, Soil-
er-plant relationships, *Australia, Weight,
ves, Root systems, Plant physiology, Vegeta-
establishment.
tifiers: Hordeum Leporinum Link, Lolium
lum Gaud.

y vegetative growth of Hordeum leporinum
Lolium rigidum was studied at 10, 17, and 24C
controlled environment cabinet. Growth rates
Lolium were generally higher than for Horde-
and significantly so at 17C. Seedling growth
in each species was more rapid during the
od of endosperm availability than after en-
erm exhaustion. Following emergence, Hor-
n seedlings were larger in total weight, leaf
root weight, root depth and plant height
use of their greater seed size. The duration of
leum's greater size depended upon tempera-
being least (26 days) at 17C, the temperature
Lolium's optimum growth. Implications of
findings in pasture production in southern
ralia are that in sparse stands Lolium
ings will overtake Hordeum, and in dense
ls the reverse will occur. (Michael-Arizona)
-10876

ER CONSUMPTION AND WATER TUR-
ER OF SHEEP GRAZING SEMIARID
TURE COMMUNITIES IN NEW SOUTH
ES,
monwealth Scientific and Industrial Research
nization, Deniliquin (Australia). Riverina

Wilson.
ralian Journal of Agricultural Research, Vol
No 2, p 339-347, March 1974. 4 fig, 3 tab, 18

riptors: *Sheep, *Water consumption,
sses, *Water requirements, Pastures, Vegeta-
effects, Grazing, *Australia, Rainfall, Grass-
.
ifiers: Water turnover, Shade.

r consumption and turnover of Merino sheep
ng on three vegetation communities were stu-
Water requirements are high due to high tem-
ures and low moisture content of the forage
dry season. On Danthonia caespitosa grass-
maximum water intakes were 3 to 3.5 liters
eep per day. On saltbush (Atriplex vesicaria)
belah-rosewood (Casuarina cristata -
odendrum oleifolium) communities, water
es were up to 6 to 7 liters per day in summer.
rovision of shade reduced water turnover by
imum of 0.3 to 0.5 liters per day on some oc-
ns only, indicating that shade is of little im-
nce of woolled sheep. Water turnover was
ured by tritium dilution. The high water in-
of the sheep were attributed mainly to the
mineral content of the Atriplex and Bassia
aten. Shearing in the cool season is clearly a
practice in this region of New South Wales.
ic-Arizona)
10888

INFLUENCE OF DENSITY AND
OGEN ON THE OUTCOME OF COMPETI-
BETWEEN TWO ANNUAL PASTURE
SSES (HORDEUM LEPORINUM LINK AND
UM RIGIDUM GAUD.),
Australia Dept. of Agriculture, Adelaide.
Cocks.
alian Journal of Agricultural Research, Vol
o 2, p 247-258, March 1974. 6 fig, 4 tab, 17

Descriptors: *Competition, *Nitrogen, *Pastures, *Grasses, *Plant growth, Density, *Australia, Growth rates.
Identifiers: Hordeum leporinum Link, Lolium rigidum Gaud.

The hypothesis that the outcome of competition between Hordeum leporinum Link. and Lolium rigidum Guad. depends mainly on the density of the Hordeum in a pasture was tested. The results are explained in terms of the hypothesis and of the different abilities of the two species to absorb soil nitrogen, which is rarely applied to annual pastures and often deficient. In the first experiment, it was found that the competitive ability of Hordeum was closely related to its density. Hordeum was most competitive when its density was highest. In the second experiment, soil nitrogen was an importand modifying factor. At low nitrogen, Hordeum was the successful competitor, and its competitive ability decreased with increases in its density. At high nitrogen, Lolium became the successful competitor. (Mastic-Arizona)
W75-10889

**PRODUCTS FROM JOJOBA: A PROMISING NEW CROP FOR ARID LANDS.**
National Research Council, Washington, D.C. Committee on Jojoba Utilization.
National Academy of Sciences, 1975. 30 p, 8 fig, 7 tab, 11 ref.

Descriptors: *Indian reservations, *Southwest, US, *Desert plants, Arid lands, Water requirements, Cultivation, Crop production, Hydrogenation, Productivity, Wax, Seeds, Seed treatment.
Identifiers: *Jojoba, *Economic plants, Plant uses.

In the expectation that an industry based on the seed oil of the desert bush jojoba (Simmondsia chinensis) would improve the economies of Indian reservations in the southwestern desert regions of the U.S., a scientific and technical assessment was made of the practical uses of jojoba oil. The cultivation of jojoba, the manufacture of products from it, and the utilization of its by-products are discussed, with the conclusion that jojoba oil and its hydrogenated product have marketable properties. Special attention is directed to its value to increase productivity of arid lands not suitable for conventional crops, particularly because of its tolerance to extreme desert temperatures and minimal rainfall. Since the plant needs moisture during the winter and spring, its growth schedule fits well with an arid environment where water is needed when it is scarce. It appears to be tolerant of both saline and alkaline soils and to saline irrigation water. The 1972 harvest of 87,000 pounds of seed from wild plants was used for the laboratory work done to support the Committee's conclusions, but the future of the plant lies in developing it into a cultivated crop. Accompanying tables illustrate the wax and protein content of jojoba seeds, characteristics of sulfurized jojoba and sperm oils, and other comparisons. (Paylore-Arizona)
W75-10890

**SALT AND SPECIFIC ION EFFECTS ON GERMINATION OF FOUR GRASSES,**
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
For primary bibliographic entry see Field 2K.
W75-10894

**OCCURRENCE OF 2, 4, 5-T AND PICLORAM IN SURFACE RUNOFF WATER IN THE BLACKLANDS OF TEXAS,**
Agricultural Research Service, College Station, Tex.
For primary bibliographic entry see Field 5B.
W75-10895

**THE GERMINATION AND ESTABLISHMENT OF TWO ANNUAL PASTURE GRASSES (HORDEUM LEPORINUM LINK AND LOLIUM RIGIDUM GAUD.),**
South Australia Dept. of Agriculture, Adelaide.
For primary bibliographic entry see Field 2I.
W75-10897

**EFFECT OF SOIL-WATER RELATIONS ON THE ROOT POROSITY, TRANSPIRATION AND ION UPTAKE IN RICE,**
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Dept. of Soil Science.
A. K. Saha, B. P. Ghildyal, and M. S. Gangwar.
Indian J Agric Sci, Vol 43, No 5, p 472-477, 1973.

Descriptors: *Roots, *Soil water, *Transpiration, Ions, Absorption, *Rice, Porosity, Loams, Dry matter, Production, Soils.
Identifiers: Oryza-Sativa, *India.

A pot experiment was conducted on a silty clay-loam soil of Nainital tarai (subhumid and submontane belt at the base of the Himalayas) to investigate the influence of soil-water regimes on rice (Oryza sativa L.) cultivars 'Jaya' and 'IR 8,' grown under flooded condition and field capacity. A variation in the soil-moisture regimes from field capacity to flooded condition resulted in a great increase in the total root porosity, transpiration, nutrient uptake and dry matter production. Dry matter production and nutrient uptake showed a high positive correlation with the total amount of water transpired. The amount of water transpired/day/plant was positively correlated with the total root porosity/plant. More nutrient uptake as a result of increased availability of nutrients, together with greater transpirational transfer of water and ions facilitate by increased root porosity, resulted in an increase in the growth of rice plant under flooded condition.--Copyright 1974, Biological Abstracts, Inc.
W75-10916

**ESTIMATION OF SAFE PERIODS FOR CROP PLANNING UNDER DRYLAND AGRICULTURE,**
All-India Coordinated Dryland Agriculture Research Project, Hissar.
O. P. Bishnoi, and S. M. Virmani.
Indian J Agric Sci. Vol 43, No 5, p 429-432, 1973.

Descriptors: *Agriculture, *Crop production, Planning, Plant management, Estimating, *Dry farming.

At Hissar a 90-day (18 June-14 Sept.) safe period of water availability for the rainy crop season was determined using normal weekly values of precipitation at the different significant levels of potential evapotranspiration. For the winter crop season this period was 110-120 days as estimated from plant response to the soil-moisture regime, depending on the meteorological and moisture-release parameters under conditions of stored moisture.--Copyright 1974, Biological Abstracts, Inc.
W75-10926

**AN APPRAISAL OF POTENTIAL WATER SALVAGE IN THE LAKE MCMILLEN DELTA AREA, EDDY COUNTY, NEW MEXICO,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 3B.
W75-10941

**USE OF AMENDMENTS TO REDUCE WATER REQUIREMENTS FOR STAND ESTABLISHMENT OF SMALL-SEEDED CROPS,**
Arizona Univ., Tucson. Dept. of Plant Sciences.
R. E. Dennis, C. E. Edmond, and C. W. Robbins.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 722,

$3.75 in paper copy, $2.25 in microfiche. Completion Report, August 1975. 15 p, 16 ref. OWRT A-034-ARIZ(3). 14-31-0001-5003.

Descriptors: Soils, Alfalfa, Sugarbeets, *Soil amendments, *Southwest U.S., Wheat, Barley, Irrigation water, Water requirements.
Identifiers: *Sulfuric acid, *Phosphoric acid, *Soil crusting.

Soil crusting after planting is a serious problem in stand establishment of small-seeded crops in the Southwest. When crusting occurs in a saline, warm soil, stand establishment problems are especially severe. It is customary to use costly irrigation water to keep seedbed surfaces moist after planting to reduce soil crusting, and to lower soil temperatures. Phosphoric acid (24% and 12%) and sulfuric acid (95%) were evaluated to determine their effectiveness in reducing soil crusting and to reduce the amount of water required to obtain stands of sugarbeets, alfalfa, wheat and barley. Phosphoric acid applied in 4-6 cm bands over the seed row at planting and before irrigation, reduced crusting and significantly increased sugarbeet and alfalfa seedling emergence. Emerged seedlings from phosphoric acid treated plots were larger and one irrigation (10-15 ha cm/ha) was saved in stand establishment. Sulfuric acid applied in bands reduced soil crusting. Soluble salts in the seed zone resulting from band application of sulfuric acid killed or damaged seedlings. Sulfuric acid when applied in irrigation water, to saline-sodic soils, improved plant growth and water use efficiency.
W75-11045

**SCHEDULING AND APPLICATION RATES OF IRRIGATION IN A HUMID CLIMATE,**
Alabama Agricultural Experiment Station, Auburn.
C. D. Busch, and E. W. Rochester.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 760, $3.75 in paper copy, $2.25 in microfiche. Bulletin 470, Agricultural Experiment Station, Auburn University, June 1975. 38 p, 10 fig, 6 tab, 15 ref, 5 append. OWRT A-025-ALA(3).

Descriptors: Irrigation, Weather forecasting, *Rates of application, *Application methods, *Irrigation practice, *Humid climates, *Supplemental irrigation, Soil moisture, Water demand, Crop production, *Cotton, On site investigation.
Identifiers: Simulation studies, Irrigation by demand, Irrigation scheduling.

A four-year study of two irrigation scheduling methods and application rates was conducted to determine more efficient uses of supplemental water in a humid climate. One model based on the decision to irrigate on weather forecast and soil moisture conditions; the other, irrigation by demand, based on soil moisture conditions only. Two application rates of 0.13 in/hr (low) and 0.43 or 0.7 in/hr (high) were used. A computer program was developed to calculate soil moisture and predict irrigation needs in the forest scheduling model. A 0.5 probability of rainfall greater than 0.5 inch was the low limit. The weather forecast also provided the basis of deciding how much rainfall would be included in the soil moisture balance. The inclusion of weather forecast was insignificant. However, irrigation in itself did improve yields. The method of irrigation by demand improved production 160 lbs. of seed cotton per acre for each inch of water applied. Simulation studies following the field experiment supported the results of the field study. In the associated application rate study the low application rate of 0.13 inches per hour was superior in cotton production and in the minimization of soil crust strength. The study also suggested that an exponential relation is appropriate for relating crust strength to crust moisture content
W75-11048

**CONSOLIDATION AND REHABILITATION OF CANALS IN POUDRE VALLEY,**
Colorado State Univ., Fort Collins. Dept of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W75-11061

**CULTIVATION OF NETTED MELON BY USE OF TRICKLE IRRIGATION IN A SAND FIELD PLASTIC GREENHOUSE, (IN JAPANESE),**
Tottori Univ. (Japan). Sand Dune Research Inst.
T. Cho, T. Yamamoto, and Y. Takeuchi.
Sand Dune Research Institute, Bulletin No 14, p 1-8, March 1975 2 fig, 3 tab, 8 ref. English summary.

Descriptors: *Greenhouses, *Sands, *Irrigation, *Irrigation effects, Dunes, Sprinkler irrigation, Irrigation practices, Irrigation systems, Agronomic crops, Plant growth, Plastics, Fertilization, Application methods.
Identifiers: *Trickle irrigation, *Japan.

Two varieties of netted melon, Earls Favorite and Shinhoro, growing in plastic greenhouses in a sand field, were irrigated using the trickle irrigation method. Net fruit development and sugar content of Earls Favorite were greater using trickle irrigation than that obtained using sprinkler irrigation methods. Net development of the fruit of Shinhoro was greater on single vine plants than on two, three, or four vine plants. By examining and correlating nozzle flow rates, trickle times, and liquid fertilizer applications involved in trickle irrigation systems, new methods for netted melon cultivation may be developed. (Frondorf-Arizona)
W75-11095

**NOZZLE HYDRAULICS IN THE TRICKLE IRRIGATION SYSTEM--RELATION BETWEEN WATER TEMPERATURE AND NOZZLE FLOW RATE (IN JAPANESE),**
Tottori Univ. (Japan). Sand Dune Research Inst.
T. Yamamoto, and H. Kawasaki.
Sand Dune Research Institute, Bulletin No 14, p 9-14, March 1975 7 fig, 2 tab, 3 ref. English summary.

Descriptors: *Irrigation, *Application methods, *Rates of application, *Flow rates, *Nozzles, Sprinkler irrigation, Irrigation practices, Irrigation systems, Pressure, Flow, Water temperature.
Identifiers: *Trickle irrigation, *Japan.

The flow rate of the trickle nozzle which connects with the distribution pipe of a trickle irrigation system is dependent on pressure, water temperature, and the dimensions of the spiral flow path. The pressure and dimensions of the spiral flow path constant, nozzle flow rate varies with water temperature, which acts on the kinematic viscosity coefficient. A formula for the calculation of nozzle flow rate at any given temperature is presented. Calculated values are found to agree well with experimentally determined values. (Frondorf-Arizona)
W75-11096

**PRACTICAL APPLICATION OF SURFACE FIXED-SYSTEM FOR MULTI-PURPOSE SPRINKLER IRRIGATION USES, (IN JAPANESE),**
Tottori Univ. (Japan). Sand Dune Research Inst.
T. Cho, T. Yamamoto, Y. Takeuchi, Y. Nomura, and M. Inoue.
Sand Dune Research Institute, Bulletin No 14, p 15-24, March 1975 7 fig, 6 tab, 4 ref. English summary.

Descriptors: *Irrigation, *Sprinkler irrigation, *Irrigation efficiency, *Distribution systems, *Application methods, Irrigation practices, Irrigation systems, Fertilizers, Pesticides, Fertilization.
Identifiers: *Japan.

An investigation of the multiple uses of a surface fixed-system sprinkler irrigation system, including application of liquid fertilizers and pesticides was conducted. Uniformity coefficient and pattern efficiency of the sprinkler system were computed by measuring the height of water caught in cans. These two factors were then used to estimate the sprinkler distribution efficiency. Investigations of the ratio of wetting area of chemical spray to leaf area, for different sprinkler types and for different amounts of spray, were conducted on Dioscorea opposita (chinese yam) and Raphanus sativus (radish). It is concluded that the fixed system is a feasible sprinkler irrigation method for multiple uses. (Frondorf-Arizona)
W75-11097

**IMPROVING PRODUCTIVITY IN LOW RAINFALL AREAS, IN INDIA.**
Food and Agriculture Organization of the United Nations, Rome (Italy).
Food and Agriculture Organization of the United Nations, Rome, Italy. COAG/74/4, Appendix I, April, 1974. 16 p, 2 tab.

Descriptors: *Farm management, *Arid climates, *Land use, *Land management, *Dry farming, Productivity, Plant growth, Climatic zones, Dry seasons, Semiarid climates, Soil types, Soils, Land tenure, Groundwater, Rainfall, Infiltration, Runoff, Crop production, Education, Arid lands, Water utilization, Wells, Fertilizers, Planting management.
Identifiers: *India

A general overview is given of climate, soils, land and culture of areas in India where agricultural projects are under study. These 54 projects in low rainfall areas comprise 30 percent of India's cultivated land area. The study is aimed at determining the most efficient and non-wasteful use of water from wells and rainfall. Crop production techniques, crop varieties, use of fertilizers, planting and after care are examined. Animal husbandry works best in certain climatic and vegetative areas and can be improved through irrigation. Programs of agricultural extension, education, and a federal farm credit program have provided assistance to the participants in the projects. Tables are given on projects, crops grown, yields, and yield increases. The objectives, organization and staffing patterns of dryland research centers and integrated dryland development projects of India are described. (Miller-Arizona)
W75-11099

**THE EFFECT OF IRRIGATION ON THE YIELD AND QUALITY OF MAINCROP POTATOES,**
L. W. Wellings.
Exp Husb, 24 p 54-69, 1973. Illus.

Descriptors: *Irrigation, Crop production, *Potatoes, *Soil moisture.
Identifiers: *Streptomyces-Scabies.

Irrigation significantly increased yield in 4 of the experiments with large increases in 2 seasons. (average irrigation throughout the growing season when soil moisture deficit (S.M.D.) reached 55% of the available water capacity (A.W.C.) in the 30 cm of soil, or irrigation when S.M.D. reached 45% A.W.C. for 4-6 wk after tuber initiation followed by irrigation when S.M.D. reached 100% A.W.C., tended to give higher yields than irrigation at S.M.D.'s of 100-140% A.W.C. after the tubers had reached a diameter of 10-20 mm. Irrigation improved the quality of tubers by decreasing the level of common scab (Streptomyces scabies) and frequent irrigation for 4-6 wk from tuber initiation gave high yields of scab-free tubers from susceptible varieties. Results in 2 yr when there were large responses indicated that 'Majestic' and 'Record' need more frequent irrigation than 'King Edward' and 'Pentland Crown' to produce the best yields. The results are used to indicate a system of irrigation for commercial production of high quality potatoes from light land.--Copyright 1974, Biological Abstracts, Inc.

75-11106

ND AND WATER RESOURCES SURVEY IN
E JEBEL MARRA AREA, THE SUDAN.
od and Agriculture Organization of the United
tions, Rome (Italy).
r primary bibliographic entry see Field 4A.
5-11139

AILABLE WATER-HOLDING CAPACITIES
SOILS IN SOUTHERN IDAHO,
ho Agricultural Experiment Station, Aberdeen.
primary bibliographic entry see Field 2G.
5-11140

IMPLICIT APPROACH TO PRICING
RICULTURAL WATER TRANSFERS TO
BAN USES,
orado State Univ., Fort Collins. Dept. of
icultural Engineering.
primary bibliographic entry see Field 4A.
5-11178

NERATION OF ARID ZONE RAINFALL
D RUNOFF,
versity of New England, Armidale (Australia).
ool of Natural Resources.
primary bibliographic entry see Field 2A.
5-11303

E ROLE OF ENDOGENOUS ABSCISIC ACID
THE RESPONSE OF PLANTS TO STRESS,
al Univ. of Malta, Valletta. Dept. of Chemis-

V. P. Hiron, and S. T. C. Wright.
p Bot. Vol 24, No 81, p 769-781, 1973, Illus.

criptors: *Plant physiology, *Beans, *Leaves,
lting, Dehydration, Stomata, Tomatoes,
eat, Rice, Flooding.
tifiers: *Abscisic acid, Glucose ester,
opersicon-esculentum, Oryza-sativa, Phaseo-
vulgaris, Triticum-aestivum, *Turgor, *Warm

n a continuous stream of warm air (38C) was
cted on to the leaves of dwarf bean (Phaseolus
aris) seedlings they wilted and then gradually
ined turgor. This process of adaptation was
mpanied by an increasing abscisic acid (ABA)
in the leaves and an increase in leaf re-
nce (RL). It is suggested that the leaf-water
cit induced by the warm-air treatment caused
ncrease in ABA level and that the latter was
onsible for stimulating stomatal closure,
ling the plants to regain full turgor. A similar
of adaptation, brought about by an increased
of ABA in the leaves, is believed to occur in
to (Lycopersicon esculentum), dwarf bean,
wheat (Triticum aestivum) plants when they
looded. Predictably, in rice (Oryza sativa), a
ies adapted to a flooded environment,
lings showed no increase in ABA level as a
t of flooding. Adaptation may involve the for-
on of an equilibrium between ABA and its
igate form (i.e. the glucose ester). The ABA-
igate was observed to disperse slowly from
s recovering from a water deficit; and there-
it may act as a metabolic 'back-stop,' enabling
free' ABA to remain high for a period even
the leaves have regained turgor. Abscisic
appears to be responsible for alleviating the
ts of water stress in plants, making it possible
lants to pass through periods of stress with lit-
arm.--Copyright 1974, Biological Abstracts,

-11319

# 4. WATER QUANTITY MANAGEMENT AND CONTROL

## 4A. Control Of Water On The Surface

**COVARIANCE ANALYSIS OF RESERVOIR DEVELOPMENT EFFECTS ON PROPERTY TAX BASE,**
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 6B.
W75-10851

**SOCIAL IMPACTS OF WATER RESOURCES DEVELOPMENTS AND THEIR IMPLICATION FOR URBAN AND RURAL DEVELOPMENT: A POST AUDIT ANALYSIS OF THE WEBER BASIN PROJECT IN UTAH,**
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
For primary bibliographic entry see Field 6B.
W75-10854

**DIFFERENTIAL RELEASE OF WATER FROM ARIZONA SNOWPACKS,**
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2C.
W75-10860

**INTERNATIONAL DEVELOPMENT STRATEGIES FOR THE SAHEL.**
Rockfeller Foundation Report, May 1975. 50 p, 3 fig, 14 ref. Conference held at Bellagio, Italy, October 1974.

Descriptors: *Regional development, *Droughts, *Weather patterns, *River basin development, Water management(Applied), Administration, Research and development, Transportation, Education, Population, Livestock, Carrying capacity, Limiting factors, Arid lands, Environmental effects, *Africa.
Identifiers: *Sahelian zone, Nomadism.

This conference was devoted to an examination of the needs for achievement of long-term development of the Sahel, establishment of priorities, and means for implementation. Interest focussed on the existing Comite' Inter-Etats de Lutte Contre la Secheresse as Sahel (CILSS). Its programs based on participation by Chad, Gambis, Mali, Mauritania, Niger, Senegal, and Upper Volta, include a regional study of water management, including river basin development; transport and communications; improvement of genetic stock; reforestation; and a special development fund. The conference recommended the following strategies: (1) Infrastructure development, emphasizing road and water basin development, (2) improved participation of local people, including mass communications and education to help the people cope with their own needs, (3) long-term development, (4) resource management, (5) bringing nomadic life into better balance with the carrying capacity of the land and the availability of renewable and nonrenewable resources, (6) establishment of a regional Sahelian Institute to aid in research and development by catalyzing and mobilizing resources in the long term to bring about an improvement in the quality of life for its people. The recent drought, degradation of the environment throughout the region, and a recognition of the differences between emergency relief and long-term local management of what was acknowledged as a recurring phenomenon were additional topics for discussion. Summaries are included of papers on Weather and Climate in the Sahel, and Environmental Management. (Paylore-Arizona)
W75-10861

**SHRUB TRANSPLANTING FOR WATERSHED MANAGEMENT AND RANGE IMPROVEMENT IN IRAN,**
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 4D.
W75-10870

**THE INFLUENCE OF RAINFALL ON THE REPRODUCTION OF SONORAN DESERT LAGOMORPHS,**
Arizona Univ., Tucson. Dept. of Biological Sciences.
R. L. Madsen.
Arizona University, Tucson, Department of Biological Sciences, MS Thesis, 1974. 60 p, 11 fig, 5 tab, 4 append, 15 ref.

Descriptors: *Herbivores, *Competition, *Rainfall, *Rainfall intensity, *Arizona, *Range management, Arid climates, Semiarid climates, Mammals, Small animals(Mammals), Wildlife, Grazing, Moisture deficit, Reproduction.
Identifiers: *Avra Valley(Ariz), *Lagomorphs.

Lagomorphs have long been recognized as important herbivores in the Sonoran desert. They are the chief competitors with cattle for the sparse grazing and available water in the southwest. Their size and mobility increase the effect they can have on their habitat. During the period of March 1971 to December 1973 lagomorphs were collected from Avra Valley, Arizona. Reproduction activity was highest during January-March and again in July-August. This roughly corresponds with the rainy seasons of the Sonoran Desert. The variance of rainfall during this period corresponded with the decline and rise in the lagomorphs population. Lack of rainfall often caused high mortality rates or forced migration, while normal rainfall increased the population and competition for grazing and water. (McLachlan-Arizona)
W75-10871

**INTERBASIN WATER TRANSFERS: A CASE STUDY IN MEXICO,**
Resources for the Future, Inc., Washington, D.C.
R. G. Cummings.
Distributed by The John Hopkins University Press, Baltimore, Md 1974 114 p.

Descriptors: *Inter-basin transfers, *Water transfer, *Water resources development, *Mexico, Imported water, Mexican water treaty, Economic impact, Economic justification, Mathematical models, Equations, Model studies, Urban sociology, Rural sociology, Cost-benefit analysis, Groundwater, Groundwater mining, Water table, Pumping, Project planning, Project benefits, Project purposes, Planning.
Identifiers: Northwest Water Plan, Yaqui Valley(Mexico), Costa de Hermosillo(Mexico).

The state of interbasin water transfers in Mexico is explained with detailed description of the current Northwest Project, including the project's conceptual structure and implied directions. A model which gives patterns of water transfer is evaluated for a representative year, treated parametrically from optimum pumping levels and optimal rates of pumping in the Costa de Hermosillo area. Results are applied to projections for interbasin water transfer developments. Net benefits from and costs of the water are examined in light of economic relations between the rural and urban sectors in the study region. An analysis of representative year transfers is presented and the optimum intertemporal exploitation of the Costa Aquifer is discussed. Conclusions are presented and discussed. (Miller-Arizona)
W75-10879

**ESTABLISHING ALKALI SACATON ON HARSH SITES IN THE SOUTHWEST,**
Forest Service, (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.

E. F. Aldon.
Journal of Range Management, Vol 28, No 2, p 129-132, March 1975, 2 fig, 2 tab, 14 ref.

Descriptors: *Grasses, *Vegetation establishment, *Seed treatment, *Soil moisture, *Germination, *Reproduction, Viability, Mulching, *New Mexico, Range management, Southwest US.
Identifiers: *Alkali sacaton.

Despite previous unsuccessful trials in planting alkali sacaton (Sporobolus airoides (Torr.) Torr) on badly eroded sites in flood plains in the semi-desert of the Southwest, experiments conducted under field conditions on the Rio Puerco drainage of northwestern New Mexico proved that this grass can be grown successfully under exacting conditions: (1) plant when soil moisture is at least 14 percent or higher (1 atm tension or less), (2) plant when probabilities for weekly precipitation are greater and soil temperatures will be near 30 degrees C, (3) use large seeds at least 1 year old, (4) saturate the planting site just prior to planting, (5) cover seeds with about 13 mm of mulch to keep them moist and dark, and (6) if storms at planting site do not deposit at least 6 mm of rain within the first 5 days, rewater to bring the soil to saturation. If properly manages, alkali sacaton provides valuable forage and can effectively lower sediment losses. Management steps, outlined above, are based on results that show maximum conditions for survival, taking advantage of summer precipitation when seeds are mature, and the ability of seeds to emerge through as much as 4 cm of sediment deposited during runoff from sudden summer thunderstorms. (Paylore-Arizona)
W75-10882

**STABILIZATION AND RECONSTRUCTION OF TEXAS COASTAL FOREDUNES WITH VEGETATION,**
Texas Tech Univ., Lubbock.
For primary bibliographic entry see Field 2L.
W75-10887

**PRODUCTS FROM JOJOBA: A PROMISING NEW CROP FOR ARID LANDS.**
National Research Council, Washington, D.C. Committee on Jojoba Utilization.
For primary bibliographic entry see Field 3F.
W75-10890

**APPROXIMATE ANNUAL WATER BUDGETS OF TWO CHAINED PINYON-JUNIPER SITES,**
Utah State Univ., Logan. Watershed Science Unit.
G. S. Gifford.
Journal of Range Management, Vol 28, No 1, p 73-74, January 1975. 1 tab, 5 ref.

Descriptors: *Water balance, *Runoff, *Interception, *Vegetation effects, Soil moisture, Pinyon pine trees, Juniper trees, *Utah, Rainfall, Semiarid climates, Precipitation, Seepage, Hydrologic budget.
Identifiers: Chaining.

Two chained pinyon-juniper sites in Utah were studied to obtain an approximate water balance for each of these treatments at each site: natural woodland, chaining-with-debris-in-place, and chaining-with windrowing. Results indicate that most of the annual precipitation falling on each treatment is lost through evapotranspiration, with much of the remainder being lost through interception. When runoff did occur, it was greatest from the windrowed treatments and least from the debris-in-place treatments. The range of annual rainfall for the two sites was about 8 to 11.5 inches. Deep seepage was zero in all cases. (Mastic-Arizona)
W75-10896

**THE LAW OF WATER ALLOCATION IN KENTUCKY,**
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 6E.
W75-10898

**TWO-DIMENSIONAL, HYDROSTATIC SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS,**
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W75-10901

**FLOOD RUNOFF FROM URBAN AREAS,**
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-10904

**ENVIRONMENTAL IMPACT EVALUATION IN FRESHWATER IMPOUNDMENTS BY VEGETATION ANALYSIS OF THE TERRESTRIAL ECOSYSTEM,**
Massachusetts Univ., Amherst. Water Resources Research Center
For primary bibliographic entry see Field 2I.
W75-10905

**THERMAL RESPONSE OF HEATED STREAMS, SOLUTION BY THE IMPLICIT METHOD,**
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W75-10909

**AUTOMATED DISTRIBUTION OF GAUGE AND SHIFT CORRECTIONS,**
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W75-10911

**AUTOMATED TIDAL COMPUTATIONS,**
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W75-10912

**FLOW FILE OPERATIONS MANUAL,**
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W75-10913

**AUTOMATED HOURLY COMPUTATIONS,**
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W75-10915

**PREDICTING RECESSIONS THROUGH CONVOLUTION,**
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
For primary bibliographic entry see Field 2E.
W75-10917

**WIND EFFECTS ON CHEMICAL FILMS FOR EVAPORATION SUPPRESSION AT LAKE HEFNER,**
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3B.
W75-10920

**SUBSURFACE FLOW FROM SNOWMELT TRACED BY TRITIUM,**
Swiss Federal Inst. for Snow and Avalanche Research, Davos-Weissfluhjoch.
For primary bibliographic entry see Field 2F.
W75-10921

**RELATIVE IMPORTANCE OF DECISION VARIABLES IN FLOOD FREQUENCY ANALYSIS,**
IBM Watson Research Center, Yorktown Heights, N.Y.
J. R. Wallis, and N. C. Matalas.
In: Proceedings of Symposium on the Design of Water Resources Projects with Inadequate Data, Volume 1; Madrid, June 1973. sponsored by UNESCO-WMO-IAHS: Comite Espanol para el D H I, p 435-442, 1973. 9 tab, 1 ref.

Descriptors: *Probability, *Monte Carlo method, *Flood frequency, Simulation analysis, Statistical models, Decision making, Flood control

Monte Carlo simulations were used to assess flood and overdesign losses that result from differing choices of assumed frequency distribution, plotting position, criterion of best fit and length of record. The probability of the event that a sequence, having a particular element of the real world set as its underlying distribution, is best fitted by a particular element of imagined world set, relative to a particular method of assigning exceedance probabilities and a particular criterion of best fit, was estimated by N/18,000, where N denotes the number of times the event occurred and 18,000, the total number of times the event could have occurred. (Knapp-USGS)
W75-10929

**STREAMFLOW IN THE NEW YORK PART OF THE SUSQUEHANNA RIVER BASIN,**
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 2E.
W75-10931

**ESTIMATED AVAILABILITY OF SURFACE AND GROUND WATER IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUNTY, NEW MEXICO,**
Geological Survey, Albuquerque, N. Mex.
L. J. Reiland, and F. C. Koopman.
Open-file report 74-151, June 1975. 35 p, 2 fig, 8 tab, 3 ref.

Descriptors: Water resources, *Streamflow, *Groundwater resources, *Hydrologic data, *New Mexico, Water measurement, Discharge(Water), Water yield, Water wells, Withdrawal, Aquifer characteristics, Water levels, Drawdown, Regression analysis.
Identifiers: *Santa Fe County(N Mex), Pojoaque River basin(N Mex).

The natural flow is computed for the Pojoaque River at several points along its course in Santa Fe County, N. Mex., on a monthly basis for the period 1935-72. The recorded flow is tabulated for the Rio Grande at Otowi gaging station on a monthly basis for the period 1935-72. Computations were made to determine the volume of groundwater that could be withdrawn from the Pojoaque River drainage basin, assuming drainage of the aquifer was to depths of 500, 1,000, and 1,500 feet. The results indicate that 3,300,000 acre-feet of water could be withdrawn by draining the aquifer to a depth of 500 feet; 9,500,000 by draining the aquifer to a depth of 1,000 feet; and 14,900,000 by draining the aquifer to a depth of 1,500 feet. (Woodard-USGS)
W75-10938

**LOW-FLOW CHARACTERISTICS OF SELECTED STREAMS IN NORTHEASTERN WASHINGTON,**
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2E.
W75-10939

IATED MEAN-MONTHLY AND ANNUAL
FF AT SELECTED SITES IN THE
AQUE RIVER DRAINAGE BASIN, SANTA
UNTY, NEW MEXICO,
gical Survey, Albuquerque, N. Mex.
imary bibliographic entry see Field 2E.
0943

ARCHIAL MODEL FOR WATER-
Y-SYSTEM CONTROL,
idge Univ. (England). Dept. of Engineering.
side, and P. F. Perry.
dings of the Institution of Electrical En-
, Vol 122, No 4, p 441-443, April 1975. 4 fig,
1 ref.

ptors: Analytical techniques, *Water
, *Model studies, *Computers, *Control
s, Telemetry, Forecasting, Simulation anal-
*Computer models, *Water distribu-
plied).
iers: Hierarchical computer models.

aborative university-industry research pro-
being conducted for the introduction of an
computer control system for a water supply
k in the United Kingdom. Aspects of the
n of water distribution include modelling
nulation, consumption forecasting, waste
on, and optimal control. Each can be con-
as a set of interacting subproblems, within
control effort is subdivided into a hierarchy
rol function of ascending complexity. The
provides a framework for overall control
network including optimal pumping control,
erm demand forecasting and anomalous-
tection, each to be performed online on a
computer and implemented at the plant by
etry scheme. Details of each layer of con-
described and proposed implementation via
computers is discussed. The multilayer con-
f control includes control activities as-
d with a regulator layer, an optimizing
an adaptive layer to compensate for
ances or model induced errors, and a self-
ing control function, which gives feedback
control-system design. (Prague-FIRL)
996

EVALUATION OF WATERCOURSE
GEMENT IN ESSEX,
dge Univ. (England). Dept. of Applied
.
nary bibliographic entry see Field 5G.
008

WATER ECOSYSTEM RESEARCH IN
R QUALITY MANAGEMENT,
aer Polytechnic Inst., Troy, N.Y. Fresh
nst.
nary bibliographic entry see Field 6G.
012

SSESSMENT OF SNOWPACK DEPLE-
URFACE RUNOFF RELATIONSHIPS
RESTED WATERSHEDS,
Univ., Tucson. School of Renewable
Resources.
olliott, and D. B. Thorud.
le from the National Technical Informa-
vice, Springfield, Va 22161 as PB-244 697,
paper copy, $2.25 in microfiche. Comple-
port, August 1975. 4 p, 5 ref. OWRT A-045-
). 14-31-001-5003.

tors: *Snowmelt, *Forest watersheds,
ter models, *Simulation analysis, *Water
, *Arizona, Forest management, Runoff,
ed management, Water supply, Small
eds, Forecasting.
ers: *Snowmelt runoff, *Forest manage-
idelines, New water supply.

A technique was developed for determining daily values of snowmelt runoff efficiencies (i.e., the portion of a snowpack that is converted into recoverable water) from small forested watersheds by coupling a computer program that stimulates Arizona snowmelt processes with graphical procedures of runoff hydrograph separation. Employing this technique, seven watersheds with 14 years of record were used in evaluating changing patterns of snowmelt runoff efficiences within a year. Additionally, an array of physical, biological, and climatic variables were empirically correlated with snowmelt runoff efficiencies to identify the factors affecting efficiencies both within and among snowmelt-runoff seasons. Inventory-prediction equations were also formulated for use in the stratification of high water-yielding watershed source areas.
W75-11049

**MOISTURE AND ENERGY CONDITIONS IN A DRAINING SOIL MASS,**
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 2G.
W75-11054

**PRESCRIPTIVE ECONOMIC MODELS FOR NONSTRUCTURAL FLOOD CONTROL,**
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 6F.
W75-11060

**CONSOLIDATION AND REHABILITATION OF CANALS IN POUDRE VALLEY,**
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
C. F. Lurvey.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 727, $5.75 in paper copy, $2.25 in microfiche. AER 73-74CFL-2, November 1973. 121 p, 20 fig, 15 tab, 9 ref. OWRT B-083-COLO(9). 14-31-0001-3867.

Descriptors: *Irrigation, *Water management(Applied), *Canals, *Colorado, Land resources, Land use, Water balance, Water rights, Rehabilitation, Consolidation, Irrigation canals, Canal linings, Canal seepage, Hydraulic structures, Agriculture, Urbanization, Water distribution(Applied), Water supply, Water shortage, Water transfer.
Identifiers: *Poudre Valley(Col).

The advantages and disadvantages of consolidating certain canals south of Cache la Poudre River were explored. Field investigations were reported regarding the rehabilitation of canals and laterals north of the Cache la Poudre River. The engineering costs and expected water savings of such improvements were explored. The land served by the canals on the south-side of the Cache la Poudre River are rapidly being developed. As land is taken out of production, the irrigation water for that land is sold out of the canal and to the city. This causes a greater percentage of the remaining water in the canal to be lost to seepage. The only feasible canal consolidation proposal for the south-side canals is to consolidate all four canals into the Pleasant Valley and Lake Canal. The only feasible canal lining program would appear to be the high seepage loss sections in the North Poudre Canal and Larimer County Canal. Lining the entire length of the North Poudre Canal would alleviate present water shortages in that system except for a few dry years. (Sims-ISWS)
W75-11061

**COMPARISON OF UREDO EICHHORNIAE, THE WATERHYACINTH RUST, AND UROMYCES PONTEDERIAE,**
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5G.
W75-11092

**STUDIES ON THE RELATIONSHIP BETWEEN DRY-MATTER PRODUCTION AND THE DEVELOPMENT OF A PINE FOREST ON COASTAL SAND DUNES (1), (IN JAPANESE),**
Tottori Univ. (Japan). Dept. of Forestry Management.
R. Ogasawara, M. Hikichi, K. Tsuboi, S. Kinoshita, and Z. Shibayama.
Sand Dune Research Institute, Bulletin No 14, p 25-32, March 1975 4 fig, 4 tab, 14 ref. English summary.

Descriptors: *Trees, *Pine trees, *Sands, *Dunes, *Growth rates, Mass, Dimensions, Size, Biomass, Height, Weight, Nitrogen, Phosphorus, Chlorophyll, Carbohydrates, Moisture content, Leaves.
Identifiers: *Japan, Basal area, Stems, Auxins.

Basal area at breast height of pine trees increases with increasing tree height. Total mass and total increment of trees, as well as the ratio of stem biomass and increment, increased with tree height increase. Net assimilation rate tended to increase with increase in tree height, while leaf weight ratio tended to decrease. Total nitrogen, phosphorus, chlorophyll, and water contents increased while auxins, total carbohydrate, and carbohydrate to nitrogen ratio decreased with increasing tree height. Number of fallen leaves on the ground, as well as the total nitrogen, total phosphorus, and water contents of the fallen leaves, increased with increasing tree height. (Frondorf-Arizona)
W75-11098

**IMPROVING PRODUCTIVITY IN LOW RAINFALL AREAS, IN INDIA.**
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 3F.
W75-11099

**COULD THE SEA BE USED TO STORE WATER FOR SUPPLY.--A POSSIBLE SCHEME,**
G. H. Mortimer.
Water Services, Vol 29, No 949, p 98-103, March 1975. 6 fig, 1 tab, 5 ref.

Descriptors: *Reservoirs, *Reservoir sites, *Water storage, Reservoir storage, *Water supply, Storage capacity, Routing, Dependable supply.
Identifiers: *Underseas water storage.

Due to the objections of an environmentally conscious public to the construction of large inland water reservoirs, a water storage scheme is proposed which may resolve this problem and could also make more efficient use of the rivers as sources of water supply. This system involves taking water from a river above the tidal limit and pumping it to a flow balancing tank located on the coast. Two pipes are connected into this tank, one carrying water to a supply and the other leading to the flexible bags situated on the seabed a few miles offshore. The works have been divided into three parts: works at the river abstraction point (including the initial water treatment); the flow balancing tank; and, the bags. The advantages of an underseas storage scheme include: since no countryside is lost through flooding, undersea storage should be more readily acceptable to the general public; it allows a more efficient use of rivers as sources of water supply than at present; some degree of economic flexibility is inherent since by adding more bags to the system the yield can be increased to meet demand; and there are a large number of possible sites around the coastline of Great Britain conveniently close to cities such as Teesside, Newcastle, London, and Hull. The main disadvantage is that underwater storage has a greater chance of an accident occurring which will cause a failure of supply than does inland storage. (Orr-FIRL)
W75-11129

# Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

## Group 4A—Control Of Water On The Surface

**LAND AND WATER RESOURCES SURVEY IN THE JEBEL MARRA AREA, THE SUDAN.**
Food and Agriculture Organization of the United Nations, Rome (Italy).
Final Report FAO/SF:48/SUD-17, 1968. 72 p, 14 fig, 15 tab, 7 maps, 5 append.

Descriptors: *Land resources, *Water resources, *Surveys, *Maps, Population, Geology, Soil surveys, Land classification, Vegetation, Land use, Water resources development, Agriculture, Forestry, Communication, Railroads, Road construction, Industries, Economics.
Identifiers: *Jebel Marra Area(Sudan), *Sudan.

This report described the first phase of a project under the United Nations Development Programme to assist the Government of the Sudan to obtain technical data on which to base plans for the agricultural development of the Jebel Marra and Wadi Azum areas of the Darfur province. The Government's policy is to broaden the basis of the national economy by geographical dispersal of development activities and crop diversification in agricultural areas. Field operations were carried out from 1963 to 1967. An inventory of basic land and water resources was made and economic studies were carried out. The scope of the introducing more advanced agricultural techniques was examined, together with the social and economic factors involved. The foundation for a follow-up project to support experimental agricultural development was laid. It was recommended that the project be continued with a shift in emphasis from a survey of resources to agricultural development demonstration. The main emphasis should be placed on the production of high gross-value crops which are particularly adapted to the climate and soils of the project area, and which either have to be imported or are only seasonally available. The theme of the report would be extension work among the farmers, to introduce better cultural practices and varieties of crops, and the use of fertilizers and irrigation water. Since pumping from the underground waters of the terrace lands of the Wadi Azum provides the major irrigation possibilities, increased attention should be given to pilot stations and farmer demonstrations of irrigated crops there. (Sims-ISWS)
W75-11139

**HYDROLOGIC INVESTIGATION AND DESIGN OF URBAN STORMWATER DRAINAGE SYSTEMS,**
Snowy Mountains Engineering Corp., Canberra (Australia).
A. P. Aitken.
Australian Water Resources Council Technical Paper No 10, Vol 1, 1975. 140 p, 14 fig, 17 tab, 63 ref, 4 append.

Descriptors: *Urban hydrology, *Urban drainage, *Australia, *Rainfall-runoff relationships, *Mathematical models, *Simulation analysis, Urban runoff, Rational formula, Drainage systems, Hydrographs, Hydrologic data, Hydrology, Routing, Storm runoff, Hydraulic systems, Storm drains, Design, Water quality.
Identifiers: Rainfall-runoff data, Model evaluation, Drainage design techniques.

A comprehensive report dealt with urban hydrology in Australia. Existing sources of urban rainfall-runoff data in Australia were examined in considerable detail. Specific basins were examined and the kinds of available data were discussed. The Rational Method, the Road Research Laboratory Method, the Modified Road Research Laboratory Method, and Laurenson's Runoff Routing Model were described and evaluated. An earlier evaluation of 8 other mathematical simulation models was summarized and these models compared. Consideration was given to water quality aspects of urban drainage and the types of quality data available. (Terstriep-ISWS)
W75-11141

**EFFECTS OF ENTRANCE LOSS ON HARBOR OSCILLATIONS,**
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
For primary bibliographic entry see Field 8B.
W75-11147

**THE DESIGN OF STORM WATER DRAINAGE CHANNELS USING MATHEMATICAL MODEL TECHNIQUES,**
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 8B.
W75-11150

**A STUDY OF FACTORS CONTROLLING THE CHEMICAL QUALITY OF WATER IN CARTWRIGHT CREEK BASIN, WILLIAMSON COUNTY, TENNESSEE,**
Vanderbilt Univ., Nashville, Tenn. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W75-11164

**COMPUTER SYSTEMS AND WATER RESOURCES,**
Polytechnic Institute of New York, Brooklyn; and Illinois Univ., Chicago.
For primary bibliographic entry see Field 6A.
W75-11174

**IMPROVED DESIGN OF DISTRIBUTION NETWORKS BY MINIMUM ROUTE,**
Nihon Suido Consultants Co., Tokyo (Japan).
S. Nakajima.
Journal of the American Water Works Association, Vol 67, No 7, p 390-395, July 1975. 6 fig, 3 tab, 9 equ, 9 ref.

Descriptors: *Water distribution(Applied), *Networks, *Design, *Alternative planning, *Pipes, Construction costs, Size, Head loss, Flow, Pressure, Methodology, Operations research, Computers, Junctions, Economics, Equations, Hydraulics, Hydraulic gradient, Optimization, Distribution systems.
Identifiers: *Minimum-route method, Least-cost, Pipe diameter, Connecting pipe, Transportation theory, Branched pattern, Gridiron pattern.

When designing a workable water-distribution network, three conditions should be considered: water-pressure distribution, flow distribution, and engineering economy. Any attempt to improve the design of a network primarily constitutes determining the pipe diameters that minimize total network construction cost while meeting hydraulic requirements. Described is a simple procedure to design an improved water-distribution network using market-ready pipe, applying minimum-route network-planning techniques. Considered is a network of fixed pipe routes, as a pipe network is governed mainly by the network of streets. An improved network is assumed whereby the allowable minimum hydraulic head is maintained at all outlets while minimizing construction costs of the network. Minimum routes to all outlets are selected and designed for market-ready pipe sizes that satisfy the theoretical, economical hydraulic gradient. An example network of a city is simplified to eliminate junctions for which the number of pipes entering the junction is fewer than three. For a basic branching system, use of the minimum route technique produces an economical pipe diameter of standard market size on the basis of most economical theoretical hydraulic gradient along each minimum route. Piping cost is 18.7% less using this method than with conventional method. (Bell-Cornell)
W75-11175

**AN IMPLICIT APPROACH TO PRICI AGRICULTURAL WATER TRANSFERS URBAN USES,**
Colorado State Univ., Fort Collins. Dept Agricultural Engineering.
W. R. Walker, and G. V. Skogerboe
Water Resources Bulletin, Vol 11, No 4, p 7 758, August 1975. 6 fig, 6 ref.

Descriptors: *Agriculture, *Water transf *Pricing, Urbanization, Optimization, Alterna costs, Water quality, Standards, Management, gorithms, Water supply, Water distri tion(Applied), Waste water treatment, Mathem cal models, Systems analysis, Water values.
Identifiers: *Nonlinear programming, *Ur water systems, *Urban water use.

The increased agricultural efficiency of the Am ican farmer has been a substantial impetus to nation's rapid urbanization. In many western gions where total water supplies are limited, banization has required the transfer of heretof agricultural water rights to the urban use. A ma problem in such transfers has been the valu price of the water. A management level nonlin programming model of a typical urban w system has been developed to find least-cost w supply, distribution, and wastewater treatmen ternatives. The values of agricultural trans were determined as the cost advantages of incr ing allowable reuse levels of urban effluents w imply the use of a downstream right. procedure is justified by the economic theor alternative cost. Results for a test applicatio the Denver, Colorado area indicate values on order of $1,000 per acre-foot of transferable w depending on effluent water quality restrict and operational policies. (Bell-Cornell)
W75-11178

**DISTRIBUTION-SYSTEM OPERATION AN YSIS MODEL,**
Omaha Metropolitan Utilities District, Nebr. vices Dept.
For primary bibliographic entry see Field 5D.
W75-11180

**COMPUTER ANALYSIS OF WATER- TRIBUTION SYSTEMS,**
Springfield Dept. of Water, Light and Power, I
P. Bonansinga.
Journal American Water Works Association, 67, No 7, p 347-350, July 1975. 4 fig.

Descriptors: *Water distribution(Appl *Computer programs, Flow, Costs, Netwo Pumps, *Computers, Data collections, De Optimization, Mathematical models, Syst analysis, Distribution systems.
Identifiers: Flow chart, Hardy Cross method.

Utilizing its speed, a properly programmed puter can solve mathematical models and e tions with a higher degree of accuracy than computerized methods, making the digital puter an effective tool for solving water-dist tion flow problems. This is illustrated by com ing the performance of computer analysis ar manual solution by the Hardy Cross me Besides being more accurate, computer analy more economical. Considered are the proble developing a computer program, i.e., writing a gram in-house or purchasing a program, and c A flow chart is given showing a distribu system analytical program operating within a cal data collection system. Auxiliary program and should be written by the user. A brief des tion is given of the following programs: u from distribution system; growth projection tribution-system data; billing master; and w system load data. Considered are the comput a design tool and computer optimization. puter programs can store tremendous amoun data and can actually eliminate erroneous The computer is ideal for deriving the op

since it can consider many alternatives in a period of time. A sample program demonuse of the computer to evaluate the perce of various system designs. In concluhe disadvantages and advantages of compuion are listed. (Bell-Cornell)
1182

**NCED TECHNIQUES IN THE MATHECAL MODELING OF WATER-DISTRIBUSYSTEMS,**
R. W.) and Associates, Seattle, Wash.
Alexander, N. L. Glenn, and D. W. Bird.
l of the American Water Works Associaol 67, No 7, p 343-346, July 1975. 2 fig.

ptors: *Water distribution(Applied), orks, *Simulation analysis, *Computer pro- *Operations, *Analytical techniques, Conecision making, Planning, Design, Hazenns equation, Hydraulics, Reservoirs, ement, Mathematical models, Systems s, Distribution systems.
iers: Physical data, Operational data, Hardy nethod, Booster pumps, Source pumps.

ped is a network analysis program which is -of-the-art tool for the planning and design er-distribution systems. Entire systems, res of size and complexity, can be modeled. neral-purpose program considered herein erates all the features found in a modern listribution system and accurately simue operation of each component. It provides lete package that can be used as the basis ajor decisions regarding existing system on, future system development, and operacontrol. Discussed is computer application hematical modeling to water-distribution s, which can lead to improved system on. Modeling uses, such as evaluating capa- of an existing system under anticipated demands, are listed. Considered are the l and operational system characteristics. a's direct method and the Hardy Cross e technique are evaluated. The general-puretwork analysis program uses the Hardy nethod for computing the head losses and nd the Hazen-Williams formula for describe head loss versus flow relationship. ed are water system features (i.e., source , initial flows, pressure, and hydraulic ne, analytical and graphical output, updatdata, economic analysis, diagnostics, and n application. (Bell-Cornell)
183

**OSCOPIC DISTRIBUTION-SYSTEM LING,**
Electric Co., Philadelphia, Pa. Re-entry ironmental Systems Div.
oyer, Jr., and L. B. Horwitz.
of the American Water Works Associaol 67, No 7, p 377-380, July 1975. 3 fig, 3 equ, 9 ref.

tors: *Water distribution(Applied), l, Networks, Mathematical models, al models, Hydraulics, Regression analymps, Pipes, Flow, Simulation analysis, Algorithms, Equations, Operations n, Management, Model studies, Distributems.
ers: Macroscopic model, Operating data, Head drop.

ed is a derivation of a regression algorithm ed previously by Gilman et al as an alter- conventional means for modeling waterion systems. The statistical model ed herein is macroscopic, as it deals only jor heads and flows associated with pumps ks. Given are the drawbacks of using a opic, or full network, model for purposes rol. The macroscopic model, designed to ne these limitations, has great speed of solution and accuracy and is kept very up-to-date; it obtains its parameters from continual analysis of operating data, obtains the major heads and flows by a noniterative process, and functions without takeoff assumptions. The model has been developed for a system having only partial information available because of the stochastic nature of customer demand and the constant change in hydraulic network characteristics. The validation procedure shows that the macroscopic model is able to reproduce actual operating data accurately in a two-pump station, two-tank distribution system. It is found to be the exact equivalent of a full network model subjected to proportional loads in a day-long simulation. However, since the accuracy of the macroscopic model will decrease in a district having large nonproportional industrial loads, a full network model should replicate such a district better. (Bell-Cornell)
W75-11185

**FINITE-ELEMENT METHOD FOR WATER-DISTRIBUTION NETWORKS,**
AC1 Environics, Melbourne (Australia).
A. G. Collins, and R. L. Johnson.
Journal of the American Water Works Association, Vol 67, No 7, p 385-389, July 1975. 5 fig, 34 equ, 14 ref.

Descriptors: *Water distribution(Applied), *Networks, *Finite element analysis, *Pipes, Equations, Algorithms, Numerical analysis, Structural analysis, Pipe flow, Head loss, Hydraulics, Computer programs, Temperature, Effects, Hazen-Williams equation, Systems analysis, Methodology, *Distribution systems.
Identifiers: Hardy Cross method.

The finite-element method has been increasingly used in a variety of engineering fields, including structural analysis. The equivalence of structural systems and pipe networks has long been recognized. The specific pipe-network problem may be defined using the finite-element approach, but since the system of equations for structural problems is normally linear, actual solution is difficult due to the nonlinear constitutive equations relating the flow and head loss. Herein, a computational algorithm derives the unique solution for an easily solved linear system equivalent to the true nonlinear system for pipe networks. The successful application of the finite-element method to pipe-network problems shows that the method is not only superior to conventional Hardy Cross techniques, but that further advantages of complete network representation, simplified input data, and unlimited network size can be obtained. The major advantage of the method is its speed of convergence and lack of convergence problems. The program developed allows for solution by either the Hazen-Williams or the Darcy-Weisbach flow-head-loss relationships, and it can consider the effect of temperature variations on head loss throughout the network. GENFEM, a general, very efficient finite-element program, is easily adapted for the pipe-network problem. The mathematical basis and applications of this methodology are described in detail to allow easy adaptation of other finite-element programs for solving water-distribution--network problems. (Bell-Cornell)
W75-11186

**OPERATION CLEAN SWEEP,**
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 5G.
W75-11192

**FIELD TESTS OF SLOW-RELEASE HERBICIDES,**
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 5G.
W75-11193

**AQUATIC PLANT CONTROL ON LAKE CORPUS CHRISTI,**
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 5G.
W75-11194

**AQUATIC PLANT RESEARCH AND CONTROL IN FLORIDA,**
Florida Dept. of Natural Resources, Tallahassee.
J. C. Hudson.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 25-27, August 1974.

Descriptors: *Aquatic weed control, *Research and development, *Florida, Financing, State governments, Participating funds, Water hyacinth.
Identifiers: Elodea, Water milfoil.

The Florida Department of Natural Resources is responsible for coordinating research and control of noxious aquatic plants at an annual expenditure of $2.8 million. Water hyacinth, Florida elodea, and Eurasian water milfoil are the most important, with elodea the major pest. Research efforts involve biological, chemical, and mechanical control methods, such as foreign exploration and introduction of insects and pathogens, botanical and ecological aspects of control, integrated chemical and biological techniques, utilization studies, ditchbank grass control, analysis of herbicides, and literature reviews. Results with mechanical harvesters to control water hyacinths in St. Johns River have not been encouraging. Use of white amur in conjunction with herbicides; establishment and effectiveness of the water hyacinth weevil; and use of foams, inverts, slow-release formulations, and new herbicides are being studied. Increased effectiveness and efficiency are needed, while decreasing drift and herbicide concentration. Airboats and an aircraft with a microfoil boom treated 35,000 acres during 1972-1973. Botanists help establish aquatic plant control programs, update control procedures, and monitor the Aquatic Plant Control Permit System. Training sessions for applicators were planned and new regulations on importation, cultivation, and transportation implemented. Matching state funds are available to local agencies for aquatic plant control. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11195

**CRITERIA FOR HERBICIDE EVALUATION,**
Environmental Protection Agency, Washington, D.C. Office of Pesticide Programs.
For primary bibliographic entry see Field 5G.
W75-11196

**REGISTRATION OF HERBICIDES FOR AQUATIC USE,**
Environmental Protection Agency, Washington, D.C. Office of Pesticide Programs.
For primary bibliographic entry see Field 5G.
W75-11197

**DISSIPATION OF RESIDUES OF PHENOXY HERBICIDES APPLIED FOR WATER MILFOIL CONTROL IN LARGE RESERVOIRS,**
Tennessee Valley Authority, Muscle Shoals, Ala.
For primary bibliographic entry see Field 5B.
W75-11198

**CHEMICAL CONTROL OF EGERIA DENSA,**
Agricultural Research Service, Fort Lauderdale, Fla.
For primary bibliographic entry see Field 5G.
W75-11199

**FIELD TESTING OF AQUATIC HERBICIDES FOR CONTROL OF EGERIA DENSA,**
University of Southwestern Louisiana, Lafayette. Dept. of Plant Industry.
For primary bibliographic entry see Field 5G.
W75-11200

**AQUATIC PLANT CONTROL USING HERBICIDES IN A LARGE POTABLE WATER SUPPLY,**
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.
For primary bibliographic entry see Field 5G.
W75-11201

**BIOLOGICAL CONTROL OF ALLIGATOR WEED, 1959-1972,**
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 5G.
W75-11202

**BIOLOGICAL CONTROL OF EURASIAN WATER MILFOIL,**
Agricultural Research Service, Gainesville, Fla. Biological Control Lab.
N. R. Spencer.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 75-83, August 1974. 1 tab, 8 ref.

Descriptors: *Biocontrol, *Aquatic weed control, Plant ecology, Plant growth, Life cycles, Distribution, Foreign research, Insects, Hosts.
Identifiers: *Eurasian water milfoil, Lepidoptera, Coleoptera, Homoptera, Parapoynx stratiotata, Litodactylus leucogaster.

Eurasian water milfoil, an introduced perennial submersed weed, has reached pest proportions by infesting thousands of acres in Chesapeake Bay, in Tennessee reservoirs, and in Florida and Georgia lakes and river basins by restricting water usage and decreasing property values. It grows under a wide range of conditions and forms a smothering blanket that crowds out other vegetation. Its ecology, growth habits, and life cycle are reviewed. Studies in the United States, Yugoslavia, and Pakistan have uncovered a number of biotic agents that show potential for controlling this plant. Twelve Lepidoptera, ten Coleoptera, one Diptera, and three Homoptera have been associated with Eurasian water milfoil. Many of the species are polyphytophagous and cannot be imported into the United States, but the associations demonstrate that the weed is a suitable host for insects belonging to several orders. At present control in the United States is limited to the use of herbicides and some cultural methods such as water management. One insect species, Parapoynx stratiotata, shows a potential for reducing vegetative reproduction. Litodactylus leucogaster may reduce seed production. Further testing under United States quarantine will be needed to determine which species could be imported for release in North America. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11203

**INTEGRATED CONTROLS ON NOXIOUS AQUATIC PLANTS,**
Texas Parks and Wildlife Dept., San Antonio. Statewide Noxious Vegetation Control Program.
For primary bibliographic entry see Field 5G.
W75-11204

**UTILIZATION OF PHYTOPATHOGENS AS BIOCONTROLS FOR AQUATIC WEEDS,**
Florida Univ., Gainesville. Dept. of Plant Pathology
For primary bibliographic entry see Field 5G.
W75-11206

**TRANSPLANTING SEA GRASS IN MISSISSIPPI SOUND,**
Gulf Coast Research Lab., Ocean Springs, Miss.
L. N. Eleuterius.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 103-106, August 1974.

Descriptors: *Marine plants, *Submerged plants, *Grasses, *Planting management, Spoil banks, Silting, Salinity, Mississippi, Bottom sediments, Estuaries, Slopes, Methodology, Turbidity.
Identifiers: *Sea grass, *Transplantation, Diplanthera wrightii.

The establishment of submerged plants by transplantation on spoil or other barren bottom areas in marine or estuarine systems is described. Effective anchors to moor the transplants covered with 20 feet or more of water were devised. Transplanting to barren bottom areas was possible within limits. The 'best' species, based on survival and extremely rapid growth, was Diplanthera wrightii. No appreciable differences in nutrient levels between vegetated and barren areas existed. Successful transplants were made in early spring and summer following mild winter temperatures or in summer following a severe winter, but low winter temperatures killed fall and winter transplants. Prolonged exposure to low salinity (5 parts per thousand or less) was detrimental. Sedimentation rates exceeding three inches per month also caused death. Spoil banks with steep slopes and spill areas where the substratum was being constantly reworked were unsuitable for transplantation due to erosive forces of waves and currents. Highly turbid water in near-shore areas also restricted plant growth. Sometimes eroded emergent spoil covered submerged spoil and killed the transplants. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11207

**AQUATIC WEED FIELD TEST PROGRAM USING A CO2 ELECTRIC DISCHARGE CONVECTION LASER,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5A.
W75-11208

**CO2 LASER EFFECTS ON WATER HYACINTH,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5G.
W75-11209

**OPERATIONS PLATFORMS,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
B. O. Benn.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 119-127, August 1974. 7 fig.

Descriptors: *Transportation, *Application equipment, *Aquatic weed control, Application methods, Spraying, Barges, Boats, Irradiation.
Identifiers: Laser transport, Archimedes' screw vehicles, Riverine utility craft, Screw propulsion vehicles.

High-mobility operations platforms for herbicide sprayings and laser irradiation of aquatic weeds must be able to move freely in weed-infested waterways with reasonable speeds, have good control, be usable in unfavorable weather, be reliable, economical, and be readily transportable over normal roads between sites. A vehicle running on buoyant Archimedes' screws may be the most suitable. Compared to boats and wheel and tracked vehicles, the two screw vehicles (t marsh screw and the Riverine Utility craft) n well in water, better in marsh areas, but poorly firm soil. The marsh screw is more suitable spray application than the Riverine Utility cra Screw vehicles are one to ten times more effect than small boats or barges used as support vehic for herbicide applications with comparatively lit added cost. The laser system is too heavy for present equipment, except barges, but the scr propulsion principle would be useful for the app cation of herbicide sprays and biological cont organisms in inaccessible areas and as an ancill vehicle for mechanical treatments. (See also W 08289) (Buchanan-Davidson--Wisconsin)
W75-11210

**HERBICIDE CHEMICALS AND THEIR E FECT ON THE AQUATIC ENVIRONMENT,**
Bureau of Sport Fisheries and Wildlife, Washi ton, D.C. Div. of Fishery Research.
For primary bibliographic entry see Field 5C.
W75-11211

**REGISTRATION OF AQUATIC HERBICIDES**
Office of the Chief of Engineers (Army), Washi ton, D.C.
E. O. Gangstad, P. A. Frank, C. R. Walker, and R. Knoll
In: Proceedings, Research Planning Confere on Integrated Systems of Aquatic Plant Cont October 29-30, 1973, Army Engineer Waterw Experiment Station, Vicksburg, Mississippi, p D31, August 1974. 33 ref.

Descriptors: *Aquatic weed cont *Methodology, Herbicides, Biocontrol, Chemc trol, Algal control, Grasses, Floating plants, S merged plants, Canals, Irrigation ditch Mechanical control, Harvesting, Vegetati Rates of application, Application methods.
Identifiers: Emersed weeds, Broadleaved plant

Registration of aquatic herbicides is imperative their use in vegetation management. Forms of noxious aquatic vegetation can be algae or vas lar aquatic plants such as floating, submers emersed, and marginal plants. Agriculture, rec tion, property values, wildlife and fishe management, potable water supplies, and nav tion are affected by aquatic vegetation. Cop sulfate, dichlone, dichlobenil, acrolein, arom solvent, diquat, and endothall are used to mar algae; and 2,4-D, silvex, and diquat control fl ing weeds. To control submersed weeds, acrol aromatic solvent, copper sulfate, diquat, dothall, monuron or diuron can be used in irr tion canals and ditches; acrolein, aromatic solv and copper sulfate in drainage ditches; dichlobenil, diquat, endothall, fenac, 2,4-D, vex, and sometimes acrolein, aromatic solv simazine, and diuron can be applied in la ponds, and reservoirs. Emersed and marg weeds can be treated with 2,4-D or silvex grass and grasslike species with dalapon, 2,4-D monosodium methanearsenate and trichloroac acid. Mechanical control devices, biocon (such as fish, snails, crayfish, insects, pathog and competitive vegetation), and ecolo modifications can be used. The advantages disadvantages of chemical methods are discus (See also W75-08289) (Buchanan-David Wisconsin)
W75-11212

**DISSIPATION OF RESIDUES OF PHEN HERBICIDES APPLIED TO THE WATERSH**
Oregon State Univ., Corvallis. School of Fore
For primary bibliographic entry see Field 5B.
W75-11213

TION OF PHENOXY HERBICIDES AP-
O RIPARIAN VEGETATION,
vania State Univ., University Park. School
try.
ary bibliographic entry see Field 5B.
14

HYACINTH RESEARCH IN PUERTO

gineer Waterways Experiment Station,
g, Miss.
ry bibliographic entry see Field 5G.
5

LEVEL MANIPULATION: A TOOL
ATIC WEED CONTROL,
Wild Life and Fisheries Commission,
uatic Weed Research.
ardson.
edings, Research Planning Conference
ted Systems of Aquatic Plant Control,
9-30, 1973, Army Engineer Waterways
t Station, Vicksburg, Mississippi, p
August 1974.

s: *Aquatic weed control, *Water level
s, *Reservoirs, Rooted aquatic plants,
ed, Water hyacinth, *Louisiana, Sub-
ants, Overflow, Skimming, Floating
wdown, Forages, Deer, Fisheries, Dry-
g.
Duckweed, Bayou DeSiard(La), Lac a

has a severe submergent/emergent
ed problem in 35 of its 40 reservoirs.
manipulation can improve water quali-
fisheries, and control aquatic weeds.
eSiard, a top laminar flow skimmed
om the surface. During an overflow in
, boats pushed alligatorweed mats into
they dried when the water level was
me alligatorweed became terrestrial
ctively browsed by deer. Drying and
ring drawdown can control water
owever first and second year draw-
crease hyacinth infestations, since its
to dry for germination. Fall-winter
give the best broad-range control of
gent and submergent plants but tim-
determined by the target plant. The
stress plants is after the roots have
stored energy and before the plant
gy to its roots. A 40-70% reduction in
ge with 3/4 inch water being removed
is recommended. Time and method
n into the basin must be considered.
gen must be monitored to avoid fish
ment of undesirable plants must be
the public informed of plans. (See
89) (Buchanan-Davidson--Wiscon-

C WEED PROBLEM. 1. IDENTIFI-

Coll., Carlton (Australia). Dept. of
gy.
liographic entry see Field 2I.

LTIMORE'S RESERVOIRS,
Dept. of Public Works, Md. Water
nt and Pumping Div.
liographic entry see Field 5C.

L WAY TO FIND MINIMUM
EA FOR A WELL,
Associates, Inc., Dallas, Tex.
liographic entry see Field 4B.

**GENERATION OF ARID ZONE RAINFALL AND RUNOFF,**
University of New England, Armidale (Australia). School of Natural Resources.
For primary bibliographic entry see Field 2A.
W75-11303

**SOME OBSERVATIONS ON RAINFALL IN WESTERN NEW SOUTH WALES,**
New South Wales Univ., Kensington (Australia). School of Wool and Pastoral Sciences.
For primary bibliographic entry see Field 2B.
W75-11304

**DROUGHTS, DISTRIBUTIONS AND DEPENDENCE: AN ANALYSIS OF SOME SYNTHETIC DATA GENERATION METHODS,**
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-11305

**VARIABILITY, PERSISTENCE AND YIELD OF AUSTRALIAN STREAMS,**
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-11308

**GUIDELINES FOR THE IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS IN THE CONSTRUCTION AND OPERATION OF A RESERVOIR,**
Illinois Univ., Urbana. Dept. of Forestry.
For primary bibliographic entry see Field 5C.
W75-11316

## 4B. Groundwater Management

**HYDROGEOLOGY AND WATER RESOURCES OF MIDDLE KIRKLAND CREEK BASIN, YAVAPAI COUNTY, ARIZONA,**
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
J. H. Randall.
Arizona University, Tucson, Department of Hydrology and Water Resources. MS Thesis, 1974. 57 p, 10 fig, 6 tab, append, 22 ref.

Descriptors: *Hydrogeology, *Aquifers, *Aquifer characteristics, *Sediments, *Basalts, *Alluvial aquifiers, *Arizona, Groundwater, Structural geology, Alluvium, Soil types, Conglomerate rocks, Water yield, Zone of saturation, Flood plains, Soil mechanics.
Identifiers: *Kirkland Creek(Ariz), *Yavapai County(Ariz).

Middle Kirkland Creek basin lies at the northern edge of the basin and range province 20 miles southwest of Prescott, Arizona. The hydrogeologic system of the basin includes two major aquifers, alluvial sediments and basaltic volcanics. The alluvial sediments are a series of granitic pebble conglomerates intercalated with basalt flows in some areas overlaid by fine-grained lacustrine sediments that grade laterally into a pebble conglomerate. Overlying this unit is a thin narrow deposit of unconsolidated sands, gravels, and silts representing the flood-plain alluvium. The basalt aquifer consists of a series of more than 1000 feet of fractured basalt flows interbedded with cinder and conglomeratic layers. The water production potential of the basaltic units in the central portion of the basin is unknown. However, the survey indicates that the hydrogeologic system allows a thick zone of saturation storing large quantities of water. Wells drilled in the Kirkland gorge could have an estimated yield of 200 to 1000 gpm. (McLacklan-Arizona)
W75-10872

**COMPUTER ALGORITHMS USEFUL FOR DETERMINING A SUBSURFACE ELECTRICAL PROFILE VIA HIGH FREQUENCY PROBING,**
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 8G.
W75-10910

**DETERMINATION OF REGIONAL HYDRAULIC CONDUCTIVITY THROUGH USE OF C-14 DATING OF GROUNDWATER,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-10930

**QUALITY OF WATER IN AQUIFERS OF THE AMARGOSA DESERT AND VICINITY, NEVADA,**
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W75-10932

**REVIEW OF CONFERENCE ON HYDROLOGY OF DEEP SEDIMENTARY BASINS,**
Tulsa Univ., Okla. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W75-10935

**THE MINOR AND TRACE ELEMENTS, GAS, AND ISOTOPE COMPOSITIONS OF THE PRINCIPAL HOT SPRINGS OF NEVADA AND OREGON,**
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W75-10937

**ESTIMATED AVAILABILITY OF SURFACE AND GROUND WATER IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUNTY, NEW MEXICO,**
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W75-10938

**GROUND WATER IN THE CORVALLIS-ALBANY AREA, CENTRAL WILLAMETTE VALLEY, OREGON,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-10940

**RECHARGE AREAS OF THE FLORIDAN AQUIFER IN SEMINOLE COUNTY AND VICINITY, FLORIDA,**
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-10944

**HORIZONTAL GROUNDWATER COLLECTORS, HYDRAULICS AND DESIGN,**
International Water Supply Ltd., Montreal (Quebec).
For primary bibliographic entry see Field 8B.
W75-10998

**HORIZONTAL GROUNDWATER COLLECTORS, 'CANADA'S LARGEST WATER WELL',**
Prince George City Engineer's Office (British Columbia).
For primary bibliographic entry see Field 8B.
W75-10999

**ILLINOIS LANDFILL LAW MAY EFFECT NEARBY STATES.**
For primary bibliographic entry see Field 5B.
W75-11011

**HOW SILICA AFFECTS IRON REMOVAL FROM GROUNDWATER,**
Yule, Jordan and Associates, Camp Hill, Pa. Environmental Engineering Div.
For primary bibliographic entry see Field 5F.
W75-11016

**STUDY OF CRITERIA AND MODELS ESTABLISHING OPTIMUM LEVEL OF HYDROGEOLOGIC INFORMATION FOR GROUNDWATER BASIN MANAGEMENT,**
Minnesota Univ., Minneapolis. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2F.
W75-11042

**MANAGEMENT OF RETARDATION OF SALT WATER INTRUSION IN COASTAL AQUIFERS,**
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W75-11058

**ENDEMIC NEPHROPHATHY AND ITS RELATION TO THE CONTAMINATION OF WELL WATER BY PHENOLIC COMPOUNDS IN BARSA-ARAD (NEFROPATIA ENDEMICA SI RELATIA CU IMPURIFICAREA PRIN COMPOUSI FENOLICI IN APELE FINTINILOR DIN COMUNA BARSA-ARAD),**
For primary bibliographic entry see Field 5B.
W75-11105

**DEPRIVATION CONTRIBUTION AND INTERFERENCE EFFECTS OF MULTIPLE WELLS IN A COMMON AQUIFER,**
Oklahoma Univ., Norman. Dept. of Civil Engineering and Environmental Science.
J. F. Harp, and J. G. Laguros.
Ground Water, Vol 13, No 3, p 251-253, May-June 1975. 1 fig, 1 tab.

Descriptors: *Groundwater, *Aquifers, *Management, *Groundwater mining, *Pumping, Overdraft, Water wells, Groundwater resources, Water supply, Drawdown, Water table, Distance, Equilibrium.
Identifiers: *Depleted aquifer, *Interference effects, *Depletion effects, Multiple wells, Deprivation.

A method of assessing groundwater interference effects of multiple wells upon any given well in an aquifer was presented. The method specifically related to depleted aquifers and attempted to assign the responsibility for the depletion effects to all users on a reliable basis. This basis entails the fundamental relationships between the pertinent variables and is not a simple percentage of water usage rates. The method took into account both flow magnitude and radial distances from all users to the given depleted account both flow magnitude and radial distances from all users to the given depleted well. Large flows at longer distances, in general, affected a given well less than smaller flows at closer distances. The methodology applied was developed as a result of a legal suit where relative responsibility among several users for depletion effects had to be assigned. The method assigned the effects, or deprivation contribution, of all water users on any given well in an aquifer common to all the wells. The limitations of the method were also discussed. (Sanderson-ISWS)
W75-11142

**URANIUM MINERALIZATION BY GROUND WATER IN SEDIMENTARY ROCKS, JAPAN.**
Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan). Raw Materials Div.
For primary bibliographic entry see Field 2F.
W75-11145

**A STUDY OF FACTORS CONTROLLING THE CHEMICAL QUALITY OF WATER IN CARTWRIGHT CREEK BASIN, WILLIAMSON COUNTY, TENNESSEE,**
Vanderbilt Univ., Nashville, Tenn. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W75-11164

**SOLID WASTES, ANIMAL REFUSE, AND ORGANIC RESIDUES DISPOSAL, AND THE QUALITY OF GROUND WATER,**
Tuskegee Inst., Ala. School of Applied Sciences.
For primary bibliographic entry see Field 5B.
W75-11244

**APPROXIMATION FOR STEADY INTERFACE BENEATH A WELL PUMPING FRESH WATER OVERLYING SALT WATER,**
New Mexico Inst. of Mining and Technology, Socorro.
R. G. Haubold.
Ground Water, Vol 13, No 3, p 254-259, May-June, 1975. 3 fig, 1 tab, 12 ref.

Descriptors: *Saline water intrusion, *Saline water-fresh water interfaces, *Mathematical models, *Estimating equation, Percolation, Seepage, Interfaces.
Identifiers: *Hele-Shaw model, *Muskat flow through porous media.

The computation of the shape of the interface between fresh water pumped from a well and the salt water beneath it was based on an empirically derived modification of Muskat's approximation for the height of the cone beneath a well. Differing depths of well penetrations and their effect on the upconed interface were investigated with the approximation. The computed interfaces (actually transition zones) were compared with corresponding interfaces determined experimentally in a Hele-Shaw model. Alteration of the length of the production zone of a well at a constant pumping rate did not influence the shape or position of the interface significantly. Though the approximation fits closely with the model, it should be refined further. (Bradbeer-NWWA)
W75-11255

**COLORADO CITY SOLVES ITS SAND PUMPING PROBLEMS,**
Wright Water Engineers, Inc., Denver, Colo.
For primary bibliographic entry see Field 8C.
W75-11261

**GROUND WATER DEPLETION AND SUBSIDENCE PROBLEMS IN TAIPEI BASIN,**
National Taiwan Univ., Taipei. Hydraulic Lab.
C. Wu.
In: International Symposium on Development of Ground Water, November 26-29, 1973, Madras, India, Vol 1, p IIB 17-28 (1973). 9 fig, 1 tab, 3 ref.

Descriptors: *Land subsidence, *Groundwater, *Artesian aquifers, *Clays, Fluid withdrawal, Potentiometric level, Compressibility, Head loss, Instrumentation.
Identifiers: Clay stringers, Pieziometric decline, *Taiwan(Taipei basin).

Releveling of bench marks in 1971 and 1973 indicates that land subsidence of the ground surface in the Taipei Basin has exceeded 1.8 meters since 1957. In the sharp subsidence area, subsidence which was about 0.6 meters in 1966 has doubled. The maximum rate of subsidence in recent years has been about 25 cm per year. As a result of accelerated urbanization of the Basin area, most of the modern ground water development has occurred since 1957. The annual pumpage was 8.9 million cubic meters, 328 million cubic meters, and 435 million cubic meters for 1957, 1964, and 1969, respectively. As a result of an imposition of strict controls, the extracted water was reduced to 24 million cubic meters in 1972. Plots of subsidence versus decline in artesian pressure suggest that pressure decline is a major cause of the subsidence. Consolidation data are used to verify the relationship. However, other causes such as compaction of soil, tectonic adjustment, and loading of the land surface may have contributed to the subsidence. (Bradbeer-NWWA)
W75-11262

**CONOCO TECHNOLOGY CURBS PRODUCTION POLLUTION,**
Continental Oil Co., Houston, Tex.
For primary bibliographic entry see Field 5G.
W75-11267

**FORMULATION OF BOUNDARY CONDITIONS AT THE SURFACE OF A POROUS MEDIUM,**
Alberta Univ., Edmonton.
For primary bibliographic entry see Field 8B.
W75-11269

**UNCONVENTIONAL AIR DRILLING REDUCES WELL COSTS.**
For primary bibliographic entry see Field 8C.
W75-11270

**THE KINETICS OF CRYSTALLIZATION OF SCALE-FORMING MINERALS,**
State Univ. of New York, Buffalo.
For primary bibliographic entry see Field 8G.
W75-11273

**ANALYSIS OF FACTORS INFLUENCING MOBILITY AND ADSORPTION IN THE FLOW OF POLYMER SOLUTION THROUGH POROUS MEDIA,**
Shell Oil Co., Houston, Tex.
For primary bibliographic entry see Field 8B.
W75-11275

**HOW STEAM IS PRODUCED AND HANDLED AT THE GEYERS,**
R. E. Snyder.
World Oil, Vol 180, No 7, p 43-48, June, 1 fig, 1 tab, 6 ref.

Descriptors: *Geothermal studies, *Energy, *Thermal powerplants, Facilities, Industrial plants, Geology, Groundwater, Production, *California.
Identifiers: *Geothermal energy, Superheated steam, The Geysers.

Development by well clusters around a plan necessary when using superheated steam produce energy. The planning of such developments, based on geology, completed wells and current economics is discussed. The actual operation, as well as the payment procedure outlined. (Bradbeer-NWWA)
W75-11280

**TESTS SHOW POTASSIUM MUD VERSATILITY,**
NL Industries, Inc., Houston. Tex. Baroid
For primary bibliographic entry see Field 8
W75-11284

**HOW TO FIND TRANSITION ZONES IN FORMATIONS,**
Continental Oil Co., Houston, Tex.
For primary bibliographic entry see Field
W75-11285

**HOW TO MAKE SQUEEZE CEMENTING SUCCESSFUL,**
Rike Service, New Orleans, La.
For primary bibliographic entry see Field

11286

ING LOG ANALYSTS OF GEOLOGISTS.
imary bibliographic entry see Field 7C.
1288

URFACE WATER -- TOOL FOR
OLEUM EXPLORATION,
Research and Development Corp., Dallas,

Ostroff.
of Petroleum Engineers Journal, Vol 15,
50-64, February, 1975. 7 fig, 2 tab, 92 ref.

tors: *Groundwater, *Water utilization,
ration, *Oil industry, *Mining, Water
ry, Trace elements, Permeability,
Geologic), Dissolved solids, Groundwater
ent, Water circulation, Locating, Alterna-
er use.
ers: Oil exploration.

se association of hydrocarbon accumula-
th subsurface waters has led to the use of
es of these waters as a secondary explora-
l. Both chemical and physical charac-
of subsurface waters have been utilized in
ch for petroleum. The movement of sub-
waters has made a significant contribution
ccumulation of petroleum. In addition to
l organic and inorganic constituents,
namic movement, oxidation-reduction
s, and water classification systems have
ocated for use in petroleum exploration.
roperties have been utilized in locating
lity barriers, faults, geopressured zones,
nformities. Examples of water as an ex-
tool are given. (Bradbeer-NWWA)
9

TICAL WAY TO FIND MINIMUM
GE AREA FOR A WELL,
J.) and Associates, Inc., Dallas, Tex.
ad.
s Journal, Vol 71, No 31, p 118-120, July
fig, 2 tab, 5 ref.

rs: *Reservoir yield, *Water supply,
r-storage, *Groundwater, Supply,
ics, Equations, Forecasting, Oil, Reser-
Oil wells, Aquifers.
: Production capacity, Aquifer develop-

hod of calculating the drainage area and
arbon pore volume assigned to a new
oduced. It assumes that calculation of
e area is dependent on the sensitivity of
re gauge, error in chart reading, the
l noise in the reservoir, the superposi-
wdown and shutin transients, and the
An example solution using the new
s presented. Other applications for the
given. (Bradbeer-NWWA)

G TODAY'S PROBLEM WELLS.
bibliographic entry see Field 8F.

NHOLE TEMPERATURES, PRES-
FECT DRILLING; PART 4: PIT-
VERPRESSURE PREDICTION,
Oil Co., Ponca City, Okla. Production
pt.
bibliographic entry see Field 8G.

NHOLE TEMPERATURES, PRES-
ECT DRILLING; PART 5: PRE-
DICTING HYDROCARBON ENVIRONMENTS WITH WIRELINE DATA,
Continental Oil Co., Houston, Tex. Production Engineering Services.
For primary bibliographic entry see Field 8G.
W75-11295

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 6: CORRELATING GEOPRESSURE GRADIENTS WITH HYDROCARBON ACCUMULATIONS,
Continental Oil Co., Houston, Tex. Production Engineering Services.
For primary bibliographic entry see Field 8G.
W75-11296

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 7: THE SHALE RESISTIVITY RATIO - A VALUABLE TOOL FOR MAKING ECONOMIC DRILLING DECISIONS,
Continental Oil Co., Houston, Tex. Production Engineering Services.
For primary bibliographic entry see Field 8G.
W75-11297

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 8: NEEDLESS SPENDING OF DRILLING AND EXPLORATION MONEY CAN BE PREDICTED-AND PREVENTED,
Continental Oil Co., Houston, Tex. Production Engineering Services.
For primary bibliographic entry see Field 8G.
W75-11298

WATER SYSTEM ACCESSORIES,
For primary bibliographic entry see Field 8C.
W75-11299

## 4C. Effects On Water Of Man's Non-Water Activities

MAN'S INFLUENCE ON THE HYDROLOGICAL CYCLE: A DRAFT REPORT OF THE UNESCO/FAO WORKING GROUP ON THE INTERNATIONAL HYDROLOGICAL DECADE.
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
For primary bibliographic entry see Field 2A.
W75-10863

BALANCING THE EFFECTS OF MAN'S ACTIONS ON THE HYDROLOGICAL CYCLE,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 2A.
W75-10865

IMPACT OF ENERGY DEVELOPMENT ON THE LAW OF THE COLORADO RIVER,
California Univ., Los Angeles. School of Law.
G. D. Weatherford, and G. C. Jacoby.
Natural Resources Journal, Vol 15, P 171-213, January, 1975. 5 fig, 2 tab, 86 ref.

Descriptors: *Water supply, *Water allocation(Policy), *Water law, *Colorado river, *Electric power production, Water management(Applied), Water conservation, Water resources, Water requirements, Water utilization, Natural resources, Water rights, Prior appropriation, Public rights, Water demand, Competing uses, Colorado river basin, Arid lands, Consumptive use, Reasonable use, Fossil fuels.
Identifiers: *Energy development.

Generally, the Colorado river flow is divided among users on the basis of beneficial consumptive use. New societal demands for water along with large economic forces to exploit fossil fuels in the Colorado river basin are causing profound changes in the basin. Claims for greater shares of the flow are being made by Indians, recreationists, environmentalists, supporters of fish and wildlife, and commercial mining interests. The flexibility of the law of the river pertaining to energy development, water demand, and competing forces is discussed. (Robinett-Arizona)
W75-10869

EFFECTS OF PINYON-JUNIPER REMOVAL ON NATURAL RESOURCE PRODUCTS AND USES IN ARIZONA,
Forest Service (USDA), Phoenix, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W75-10886

STABILIZATION AND RECONSTRUCTION OF TEXAS COASTAL FOREDUNES WITH VEGETATION,
Texas Tech Univ., Lubbock.
For primary bibliographic entry see Field 2L.
W75-10887

REVEGETATING DISTURBED AREAS IN THE SEMIARID SOUTHWEST,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W75-10892

APPROXIMATE ANNUAL WATER BUDGETS OF TWO CHAINED PINYON-JUNIPER SITES,
Utah State Univ., Logan. Watershed Science Unit.
For primary bibliographic entry see Field 4A.
W75-10896

BIOCHROME ANALYSIS AS A METHOD FOR ASSESSING PHYTOPLANKTON DYNAMICS, PHASE II,
Arkansas Univ., Fayetteville. Dept. of Botany and Bacteriology.
For primary bibliographic entry see Field 5C.
W75-11052

WATER POLLUTION FROM NONPOINT SOURCES,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5B.
W75-11158

GROUND WATER DEPLETION AND SUBSIDENCE PROBLEMS IN TAIPEI BASIN,
National Taiwan Univ., Taipei. Hydraulic Lab.
For primary bibliographic entry see Field 4B.
W75-11262

## 4D. Watershed Protection

SHRUB TRANSPLANTING FOR WATERSHED MANAGEMENT AND RANGE IMPROVEMENT IN IRAN,
Arizona Univ., Tucson. Dept. of Watershed Management.
N. Nemati.
Arizona University, Tucson, Department of Watershed Management, MS Thesis, 1974. 52 p, 21 fig, 4 tab, 18 ref.

Descriptors: *Watershed management, *Erosion control, *Arid climates, *Shrubs, Erosion, Vegetation, Precipitation, Moisture deficit, Revegetation, Humidity, Evaporation, Range management.

Identifiers: *Iran, Atriplex canescens(Fourwing saltbush).

The central plateau of Iran is virtually void of plant growth due to cold winters, hot summers, low precipitation, low atmospheric humidity, and high evaporation. Transplanting shrub species has been shown to be one possible way to revegetate these rangelands. Fourwing saltbush (Atriplex canescens) was the most adaptable of the three saltbushes tested for growth in nurseries in plastic bags and transplanted in the central plateau of Iran. Their adaptability to the harsh climate will help restore the watershed, provide effective erosion control, and generally improve the vegetation. (McLachlan-Arizona)
W75-10870

**SEASONAL VARIATIONS IN THE INFILTRATION RATE OF A WHITEHOUSE SOIL IN SOUTHERN ARIZONA,**
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2G.
W75-10873

**FACTORS AFFECTING EROSION IN A SEMI-ARID WATERSHED,**
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 2J.
W75-10884

**REVEGETATING DISTURBED AREAS IN THE SEMIARID SOUTHWEST,**
Forest Service (USDA). Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
E. F. Aldon.
Journal of Soil and Water Conservation, Vol 28, No 5, p 223-225, September-October, 1973. 6 fig, 13 ref.

Descriptors: *Soil stabilization, *Semiarid climates, *Southwest U.S., *Vegetation establishment, Rehabilitation, Density, Watershed management.
Identifiers: Fourwing saltbush, Alkali sacaton.

The harsh climatic extremes of the semiarid Southwest make it difficult and often impossible to establish plants for soil stabilization. A 20 year watershed rehabilitation project concentrated on the establishment of two plants native to the area - fourwing saltbush (Atriplex canescens (Pursh) Nutt.) and alkali sacaton (Sporobolus airoides (Torr.) Torr.). A step-by-step planting guide is presented for each plant including growing transplants and field planting procedures. Information is also provided to determine those areas that are suitable for plant establishment and the amount of cover and stabilization that may be expected. (Mastic-Arizona)
W75-10892

**WATER RESOURCES OF THE LOWER ST. CROIX RIVER WATERSHED, EAST-CENTRAL MINNESOTA,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-10945

**WATER RESOURCES OF THE SNAKE RIVER WATERSHED, EAST-CENTRAL MINNESOTA,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-10946

**WATER RESOURCES OF THE LOWER MINNESOTA RIVER WATERSHED, SOUTH-CENTRAL MINNESOTA,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-10947

**WATER RESOURCES OF THE CANNON RIVER WATERSHED, SOUTHEASTERN MINNESOTA,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-10948

**AN ASSESSMENT OF SNOWPACK DEPLETION-SURFACE RUNOFF RELATIONSHIPS ON FORESTED WATERSHEDS,**
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 4A.
W75-11049

**GUIDELINES FOR REVEGETATION AND STABILIZATION OF SURFACE MINED AREAS IN THE WESTERN STATES,**
Colorado State Univ., Fort Collins. Dept. of Range Science.
C. W. Cook, R. M. Hyde, and P. L. Sims.
Colorado State University, Fort Collins Range Science Department, Range Science Series No 16, December, 1974. 70 p, 5 fig, 9 tab, 1 append.

Descriptors: *Revegetation, *Mining, *Land reclamation, *Arid lands, *Rehabilitation, *Limiting factors, Coals, Evapotransporation, Mine wastes, Reclamation, Oil shales, Fossil fuels, Uranium radioisotopes, Soils, Drought tolerance, Precipitation intensity, Erosion, Environmental effects, Southwest US.

Rehabilitation procedures should be site specific. They must be implemented by those familiar with the ecological sturucture and successional responses characteristic of the site to be reclaimed. Factors to be considered in reclamation efforts are physical and chemical properties of the soils, degree of slope and exposure, dominant plant species present before the disturbance, and the area's climatic variability. Moisture is the limiting factor in successful rehabilitation of lands disturbed by mining and exploration for coal, oil shale, and uranium in the western states. Most areas of the West are difficult to reclaim because precipitation is not only low but the occurrences are also erratic and unpredictable. In most desert areas natural plant regeneration takes place only every five to seven years when two or more successive favorable moisture years occur. Therefore, they are subject to great stress from intermittent precipitation, extremely low and high temperatures, strong winds, and excessive evaporation. This study offers guidelines to aid reclamation efforst in the difficult western region. (Bowden-Arizona)
W75-11100

**DERIVATION OF SURFACE WATER LAG TIME FOR CONVERGING OVERLAND FLOW,**
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W75-11156

**DIFFICULTIES IN GAUGING SMALL CATCHMENTS - A CASE STUDY,**
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-11306

**HYDROLOGIC RELATIONS ON UNDISTURBED AND CONVERTED BIG SAGEBRUSH LANDS: THE STATUS OF OUR KNOWLEDGE,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
D. L. Sturges.
Research Paper RM-140, March 1975. 23 p, 18 fig, 41 ref, 4 tab.

Descriptors: *Range management, *Watershed management, *Water yield improvement, Climates, Soils, Vegetation, *Snow management, Brushlands, Grasses, Shrubs, Sagebrush, Hydrology, Brush control, Snowmelt, Runoff, Management, Land management
Identifiers: Artemisia tridentata

Watershed management for big sagebrush rangelands is discussed. Climate, soils, vegetation, snow accumulation, and water yields are described, followed by a review and discussion of how management practices alter vegetative composition and the hydrologic regime. Potential hydrologic benefits from managing blowing snow in the big sagebrush type are outlined, and research needs are highlighted. (Witt-IPC)
W75-11313

**WATERSHED MANAGEMENT IN THE BLACK HILLS: THE STATUS OF OUR KNOWLEDGE,**
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
H. K. Orr.
Research Paper RM-141, 12 p, March 1975. 10 ref.

Descriptors: *Watershed management, Climatology, Geology, Soils, Vegetation, Water yield, Research priorities, Data collections, Model studies, Surface waters, Groundwater recharge, *South Dakota, Watersheds(Basins), Great plains, Water yield improvement.
Identifiers: *Black Hills(SD).

Climate, geology, soils, vegetation, and water yields are briefly described, followed by a review and discussion of watershed management research and problems unique to the Black Hills. Research needs with respect to water quality, data collection, and model development are highlighted. (Witt-IPC)
W75-11318

# 5. WATER QUALITY MANAGEMENT AND PROTECTION

## 5A. Identification Of Pollutants

**EPIFAUNAL INVERTEBRATES AS INDICATORS OF WATER QUALITY IN SOUTH LAKE PONTCHARTAIN,**
New Orleans Univ., La. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W75-10852

**PHYTOPHTHORA SPECIES IN ARIZONA, OCCURRENCE IN RECYCLED IRRIGATION WATER,**
California Univ., Berkeley. Dept. of Plant Pathology.
S. V. Thomson, and R. M. Allen.
Progressive Agriculture in Arizona, Vol 27, p 8-9, May-June, 1975. 2 fig, 11 ref.

Descriptors: *Recycling, *Citrus fruits, *Irrigation water, *Spores, *Fungi, *Pollutant identification, *Arizona, Return flow, Water reuse, Hydrology, Tailwater, Epiphytology.
Identifiers: *Phytophthora.

A study was made of the effect of irrigation flow to citrus orchards in the vicinity of Phoenix, Arizona, when this recycled water carried spores of the parasitic fungi Phytophthora. The presence of zoospores in water recycled to the crop and from which it was collected posed a serious threat for several reasons, including the danger of infection to clean orchards; the pathogenicity of species of Phytophthora, particularly since they are well adapted to an aquatic environment.

ct possible with tree trunks during flood ir-
on. Water from 20 sites in citrus groves was
ed over a period of a year from the tailends
rigation ditches, 9 sumps, recycled water at
ad-ends of 4 irrigation ditches, and project
at 2 canal locations. The method of
sing the samples is given. Phytophthora spp.
solated in 93 of 599 samples, and with one
ion, all were identified as present in waste
from citrus orchards. Well-water, initially
ely free from fungi, was heavily con-
ted after passage through a citrus orchard
r cropped acreage. Infection is more likely
s tree trunks from flood irrigation by recy-
ater contaminated with Phytophthora spp.
injuries to the trunk from cultivation
ures were already present. (Paylore-
a)
883

PLE AND INEXPENSIVE TECHNIQUE
ETERMINING COLORED LIGHT IN-
Y UNDERWATER,
Community Coll., Batavia, N.Y. Mathe-
nd Science Div.
ary bibliographic entry see Field 7B.
19

OCHEMICAL CYCLE OF ARSENIC IN
ASHINGTON AND ITS RELATION TO
ELEMENTS,
ton Univ., Seattle. Dept. of Oceanog-

ary bibliographic entry see Field 5B.
22

MICAL RECONAISSANCE OF SURFI-
ATERIALS IN THE VICINITY OF
GUNK MOUNTAIN, NEW YORK,
tham.
Mus Sci Serv Map Chart Ser, 21 p 1-20,

rs: *Geochemistry, *New York, Copper,
inc, *Surveys, Streams, Sediments,
oxicity, *Heavy metals, Analytical
, Mountains, *Pollutant identification,
ution effects.
*Shawangunk Mts(NY).

issance survy of stream sediments and
e vicinity of Shawangunk Mountian,
nge, and Sullivan Counties, New York,
made for combined heavy metals (Cu,
ing dithizone field methods and other
laboratory techniques. A number of
areas are defined by the drainage
gh concentrations were observed in the
he old Pb Zn mines and prospects that
ong known in the valley and a number
malies or extensions of the previously
areas of mineralization were observed.
discussed and located on the accom-
ps. Soil surveys on the valley floor
e anomalous profiles, but difficulty in
the data led to abandonment of this
Vaters in a few small streams in the
f Wurtsboro and Otisville contain
oxic concentrations of Pb, surface and
rs in these areas should be analyzed
s a water supply (for humans).--Copy-
iological Abstracts, Inc.

DUCTIVITY OF PERIPHYTON TO
WATER QUALITY,
rvey, Menlo Park, Calif.
ibliographic entry see Field 5B.

AND TRACE ELEMENTS, GAS,
PE COMPOSITIONS OF THE PRIN-

CIPAL HOT SPRINGS OF NEVADA AND OREGON,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W75-10937

POPULATION DYNAMICS OF PROTOZOA IN WASTEWATER,
Howard Univ., Washington, D.C. Bioenvironmental Engineering and Sciences Research Lab.
For primary bibliographic entry see Field 5D.
W75-10957

ACTIVATED CARBON IN THE WATER TREATMENT PLANT,
Massachusetts Dept. of Public Health, Lawrence. Lawrence Experiment Station.
For primary bibliographic entry see Field 5D.
W75-10992

MINITEST METHOD FOR MONITORING EFFLUENT QUALITY,
Uppsala Univ. (Sweden). Algal Assay Lab.
For primary bibliographic entry see Field 5D.
W75-10994

ADVANCES IN THE DETECTION OF WATER POLLUTANTS,
Canada Centre for Inland Waters, Burlington (Ontario).
S. Barabas.
Chemistry in Canada, Vol 27, No 6, p 26-29, June 1975. 45 ref.

Descriptors: *Analytical techniques, *Reviews, *Pollutant identification, Organic matter, Municipal wastes, Industrial wastes, Spectrophotometry, Gas chromatography, Mass spectroscopy, Remote sensing, Phenols.
Identifiers: Coprostanol, Cholesterol, Voltammetry.

A review of analytical methodology of water for the Canada Centre for Inland Waters (CCIW) from December 1973 to November 1974 is given. All research of the CCIW is done as a response to needs of a federal regional laboratory, a research component of the CCIW, or an international organization in which Canada is actively collaborating. Progress in chromatography/mass spectrometry included the methodology for analyzing organochlorinated pesticides, dithiocarbamates, and 1,4-oxathiins as well as a number of industrial pollutants. Methods were gas chromatography, high pressure liquid chromatography, thin-layer chromatography, GC/MS, NMR, and infrared. The analysis of organic pollutants (phenols, formaldehyde), inorganic pollutants (chlorides, arsenic, antimony, selenium), and detergents (phosphate, citric acid) has also been developed. Methods were spectrophotometry, of the types UV, visible, molecular fluorescence, IR, and atomic absorption. Publications have been made under electro-analytical methodology, involving activities in the area of applying selective ion electrodes to multi-element analysis. Other related developments were in voltammetric applications. Biological analysis utilized coprostanol and cholesterol as indicators of excretal pollution in sewage and industrial treatment. Radiochemistry, electron microscopy, and remote sensing studies were also discussed. (Prague-FIRL)
W75-10995

STABILITY OF NITROSAMINES IN SAMPLES OF LAKE WATER, SOIL, AND SEWAGE,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
For primary bibliographic entry see Field 5B.
W75-11019

A FIELD STUDY OF PHYSICO-CHEMICAL STATES OF ARTIFICIAL RADIONUCLIDES IN SEAWATER,
National Inst. of Radiological Sciences, Chiba (Japan). Dept. of Environmental Contamination.
For primary bibliographic entry see Field 5B.
W75-11022

RETENTION OF CADMIUM IN MICE STUDIED BY WHOLE BODY AUTORADIOGRAPHY,
National Inst. of Radiological Sciences, Chiba (Japan). Div. of Training Schools.
H. Shibata.
J Radiat Res, Vol 15, No 2, p 107-110. 1974. Illus.

Descriptors: *Cadmium, *Pollutant identifications, *Rodents, Absorption.
Identifiers: Mice, *Radiography.

The time-course of distribution of Cd (an environmental pollutant) in mice was investigated for up to 180 days after administration of 109Cd by whole body autoradiography and by radioactivity counting. Very little accumulated 109Cd was excreted from the body; it remained mainly in liver, kidneys and pancreas for a long time. The pattern of retention of 109Cd varied with organs: in liver, gastrointestinal wall and salivary glands, the concentration of 109Cd decreased with time in pancreas, spleen and lungs, it decreased very little; in kidneys, it increased. Liver retained a larger amount of 109Cd than any other organ even after a long period. In kidneys, most of 109Cd was retained in the cortex.--Copyright 1974, Biological Abstracts, Inc.
W75-11024

RELATIONS BETWEEN ALGAL POPULATIONS AND THE PH OF THEIR MEDIA.
Bor Ilan Univ., Ramat-Gan (Israel). Dept. of Life Sciences.
For primary bibliographic entry see Field 5C.
W75-11028

PATHOGENIC FREE-LIVING AMOEBAE IN ARKANSAS RECREATIONAL WATERS,
Arkansas Univ., Fayetteville. Dept. of Zoology.
L. W. Bone, and D. A. Becker.
Available from the National Technical Information Service, Springfield, Va. 22161. as PB-244 709, $3.25 in paper copy, $2.25 in microfiche. Arkansas Water Resources Research Center, Fayetteville, Completion Report, 1975. 9 p, 1 tab, 11 ref. OWRT A-028-ARK(1), 14-31-0001-5004.

Descriptors: *Arkansas, *Recreation, Animal populations, Water quality, Animal pathology, Cultures, *Pollutant identification, *Pathogenic bacteria, Isolation, Human diseases.
Identifiers: *Pathogenic anoebic, Limax, *Amoebae population density, Species diversity, Pathogenic strains(Amoebae).

Selected recreational waters of Arkansas were sampled for pathogenic free-living limax amoebae. Water quality parameters were determined for correlation with amoebic population densities and species diversity. Cultural criteria and animal inoculation revealed no pathogenic strains. The feasibility of introduction and/or induction of pathogenic amoebic strains by environmental factors necessitates further ecological investigations.
W75-11053

DEVICE FOR AUTOMATIC DETERMINATION OF SUSPENDED SOLIDS CONTENT IN WATER,
Agency of Industrial Science and Technology, Tokyo (Japan). (assignee)
H. Sunahara, Y. Ishihara, and N. Nakayama.
U.S. Patent No 3,893,333, 6 p, 6 fig, 1 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 469, July 8, 1975.

## Group 5A—Identification Of Pollutants

Descriptors: *Patents, Water quality, *Water quality control, *Water pollution control, Water purification, *Suspended solids, Sampling, Automation, Measurement, *Pollutant identification.

The device for the automatic determination of the suspended solids content of water comprises a sample liquid collection unit, a specimen preparation unit, a filter paper feeding unit, a filter paper transfer unit, a suspended solids filtration unit, a drying unit, a weighing and display unit and a process control unit. All processes are automatic. All steps of operation are carried out by having relevant mechanisms automatically actuated by means of the timer of the automatic process control unit. Thus, the determination can be performed accurately and rapidly. Further, absence of manual operation serves to eliminate human error and ensures perfectly reliable determination. (Sinha-OEIS)
W75-11063

**MERCURY CONTENTS IN BIOLOGICALLY PRESERVED SPECIMENS OF MENUKE (SEBASTES BARAMENUKE AND S. FLAMMEUS),**
Iwate Prefecture Fisheries Experimental Station, Kamaishi (Japan).
S. Kamimura.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 41, No 4, p 487, April 1975. 1 tab, 2 ref.

Descriptors: Marine fish, *Metals, *Mercury, Laboratory tests, Analytical techniques, Environmental effects, *Pollutant identification.
Identifiers: *Menuke, Deep sea fish, Sebastes baramenuke, Sebastes flammeus, *Tissue analysis, *Bioaccumulation, Preserved fish, Atomic absorption spectrometry.

Five specimens of the deep sea fish, menuke (Sebastes baramenuke and S. flammeus), caught in 1939 and subsequently preserved in formaldehyde were analyzed for mercury content. Mercury content ranged from 0.05 to 0.88 mg/kg wet muscle in the specimens. Compared with recently caught menukes, there did not appear to be a significant difference in total mercury content in the preserved specimens. (Katz)
W75-11078

**CONTINUOUS AUTOMATIC MONITORING OF SURFACE WATER WITH FISH,**
Keuringsinstituut voor Waterleidingartikelen, Rijswijk (Netherlands).
C. L. M. Poels.
Water Treatment and Examination, Vol 29, part 1, p 46-56, 1975. 4 fig, 9 ref.

Descriptors: *Design, *Laboratory tests, *Water quality, *Toxicity, Electrical equipment, Environmental effects, Methodology, *Monitoring, Control systems, Rainbow trout, *Pollutant identification.
Identifiers: *Flow-through systems.

An electronic system for registration of fish behavior and a flow-through system for continuous monitoring of surface water with fish were designed. Advantages of these systems were discussed including more sensitive criteria than death used for the indication of toxic substances, and faster detection of toxic substances. (Katz)
W75-11079

**INFLUENCE OF OIL ON NUCLEIC ACIDS OF ALGAE,**
Institute of Biology of the Southern Seas, Odessa (USSR).
For primary bibliographic entry see Field 5C.
W75-11080

**EFFECTS OF SOME COMPONENTS OF CRUDE OIL ON YOUNG COHO SALMON,**
Alaska Univ., College. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W75-11088

**THE USE OF SNAKES AS A POLLUTION INDICATOR SPECIES,**
Mesa Coll., Grand Junction, Colo. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W75-11089

**MEASURES OF BIODEGRADABILITY AND REFRACTORY ORGANICS IN WASTEWATERS: (ANALYSIS, INTERPRETATION, AND APPLICATION OF MEASUREMENT TECHNIQUES),**
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5D.
W75-11103

**THE WATER QUALITY AND BOTTOM SEDIMENT CHARACTERISTICS OF NEW JERSEY LAGOON DEVELOPMENTS,**
Rutgers - the State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 5B.
W75-11104

**OXIDATION OF ORGANIC COMPOUNDS IN WATER (OXIDATION ORGANISCHER VERBINDUNGEN IN WASSER),**
For primary bibliographic entry see Field 5D.
W75-11118

**NOTE ON THE MEASUREMENT OF THE RESPONSE OF OCEANOGRAPHIC TEMPERATURE SENSORS,**
National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
For primary bibliographic entry see Field 7B.
W75-11146

**BEHAVIOR OF MN, FE, CU, ZN, CD AND PB DISCHARGED FROM A WASTEWATER TREATMENT PLANT INTO AN ESTUARINE ENVIRONMENT,**
Maryland Univ., College Park. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W75-11160

**A STUDY OF FACTORS CONTROLLING THE CHEMICAL QUALITY OF WATER IN CARTWRIGHT CREEK BASIN, WILLIAMSON COUNTY, TENNESSEE,**
Vanderbilt Univ., Nashville, Tenn. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W75-11164

**CONCENTRATION AND GENERA OF ALGAE IN SELECTED ILLINOIS STREAMS, 1971-1973,**
Illinois State Water Survey, Urbana.
S. D. Lin, R. L. Evans, and D. B. Beuscher.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-244 819, $4.25 in paper copy, $2.25 in microfiche. Report of Investigation 80, 1975. 50 p, 2 fig, 3 tab, 18 ref.

Descriptors: *Pollutant identification, *Algae, *Water quality, *Surface waters, *Illinois, *Streams, Aquatic life, Diatoms, Phytoplankton, Cyanophyta, Chlorophyta, Nutrients, Water analysis, Plankton, Analysis, Chlorophyll, Analytical techniques, Eutrophication, Aquatic microorganisms, Seasonal.
Identifiers: *Algae type, *Algae density, *Algae composition, Diversity index, Desmid, Flagellates.

During the period October 1971 to Septem 1973, samples of water from 35 Illinois streams 41 locations were collected monthly and examin to determine the type, genera, and concentrat of algae. Data for the 2-year period have b evaluated for algal density, composition, diver indices, and seasonal succession for each locat Most stations had algal densities of from 50 2000 cts/ml, had between 15 and 24 different genera (41 genera total), and had a diversity i equal to or greater than 1.10. Stations on the Des Plaines, and Kaskaskia Rivers had algal de ties in excess of 5000 cts/ml. This report shou useful to persons responsible for developing, lating, or managing water resources in Ill (Henley-ISWS)
W75-11165

**SPECIFIC CONDUCTANCE METHOD FO SITU ESTIMATION OF TOTAL DISSOL SOLIDS,**
Northern Forest Research Center, Edm (Alberta).
T. Singh, and Y. P. Kalra.
Journal of the American Water Works As tion, Vol 67, No 2, p 99-100, February 1975. tab, 10 ref.

Descriptors: *Specific conductivity, *Dis solids, *Water analysis, *On-site *Conductivity, Water properties, Electrica ductance, Physical properties, Evalu Analytical techniques, Estimating, Instru tion, Canada, Testing procedures, Che Statistical models, Mineralogy, Ions.

Two methods are commonly used for deter total dissolved solids in water. Another was proposed - determination by means of cal conductance measurement. An excelle tionship was discovered between specif ductance and total dissolved solids of streams. (Henley-ISWS)
W75-11167

**EVIDENCE OF ATMOSPHERIC TRAN OF OZONE INTO URBAN AREAS,**
New York State Dept. of Environmental vation, Albany. Div. of Air Resources.
P. E. Coffey, and W. N. Stasiuk.
Environmental Science and Technology No 1, p 59-62, January 1975. 6 fig, 5 ref.

Descriptors: *Ozone, *Pollutant identi *Air pollution, Rural areas, Cities, Mixing tion, Path of pollutants, *New York, Summer, *Path of pollutants.

In late spring and continuing throug summer, concentrations of ozone in exce ppm are commonly found in rural area York State. Widely separated rural sites similar ozone concentrations with very s nal fluctuations. During episodes of ozone concentrations, urban areas also e high ozone peak concentrations, typica early afternoon. A transport and mixing is was made which interprets these ur peak concentrations as primarily the re high background level of ozone and photochemical generation. (Sims-ISWS)
W75-11169

**AQUATIC WEED FIELD TEST USING A CO2 ELECTRIC DISCHA VECTION LASER,**
Army Engineer Waterways Experime Vicksburg, Miss.
P. A. Smith.
In: Proceedings, Research Planning on Integrated Systems of Aquatic Pla October 29-30, 1973, Army Engineer Experiment Station, Vicksburg, Mi 107-109, August 1974.

ptors: *Aquatic weed control, *Irradiation, ion, Equipment, Design, Mechanical equip- Pollutant identification.
iers: *Laser.

l prototype closed-cycle carbon dioxide discharge convection laser was fabricated ted. One end of the laser glass tube had a with completely reflective material; the nd had a mirror with a 3/4 inch hole in the which was sealed with a sodium chloride to form a vacuum. The laser beam is when stimulated photons traveling along of the glass tubing contain enough energy nitted from the sodium chloride window. ciency of the laser is 5 to 12%. Much of the wer is converted to heat. All of the com- of the system generate heat (except the hangers) which must be removed by cool- water. The laser head consists of four e tubes through which the laser gas (4% ioxide, 39% nitrogen, 57% helium) circu- tical power is extracted using folded un- ptics and transmitted to the atmosphere he sodium chloride window. The availa- al power is over six kilowatts and the tput power 2-4 kilowatts. Enclosures pro- nst shock, and plate glass shields protect ator from reflected radiation. (See also 9) (Buchanan-Davidson--Wisconsin)
8

ION STUDY OF COPPER (II): FULVIC STEM,
Centre for Inland Waters, Burlington

ry bibliographic entry see Field 5B.
9

TION AND ANALYTICAL UES FOR PESTICIDES IN SOIL, T, AND WATER,
Univ., Madison. Water Resources

s, H. G. Pionke, and T. C. Daniel.
ides in Soil and Water,' Soil Science America, Inc., Madison, Wisconsin, -549. 18 tab, 291 ref, append.

: *Pesticide residues, *Analytical *Sediments, *Soils, *Water, techniques, Persistence, DDE, DDT, ated biphenyls, 2,4-D, Herbicides, lapon, Dieldrin, Endrin, Heptaclor, Al- t, Paraquat, Monuron, Aliphatic pesti- amate pesticides, Thiocarbamate pesti- logenated pesticides, Chlorinated n pesticides, Aroclors, Or- orus pesticides, Phosphothioate pesti- ine pesticides, Uracil pesticides, Urea Sampling, Chemical analysis, Labora- Measurement, Reliability, Diazinon, identification, *Reviews, ies.

xtraction and sample analysis is without elaborating on specific Methodological design and evaluation empirical, circumvents lack of nd compensates for the effect of unk- ldefined relationships. Empirically tested techniques must be clearly are only valid under the original ex- nditions, and should not be extrapo- limits imposed by those conditions rimentation. Factors which must be ior to sample collection, methods for ls, waters, and sediment; methods d to preserve samples; and extrac- , and analysis of organic pesticides d. Tabulated data defining and thodology for pesticide classes and npounds are presented giving extrac- n technique, fortification conditions recovery efficiency of added pesti- e concentration in fortified sample, equilibration time and conditions between fortification and extraction, sample pretreatment, and recovery values. Systemized monitoring is discussed. Development of methods and equipment for complex multi-residue analysis may have far-reaching effects of monitoring programs. An appendix gives the common and chemical names of organochlorine pesticides, organophosphorus insecticides, acidic pesticides, carbamate, substituted urea, uracil, benzonitrile, analides, analines, amide pesticides, and triazine and dipyridinium. (Buchanan-Davidson--Wisconsin)
W75-11236

**THE UTILIZATION OF SUN-GLINT IN A STUDY OF LAKE DYNAMICS,**
Canada Centre for Inland Waters, Burlington(Ontario).
R. P. Bukata, and W. D. McColl.
In: Proceedings No 17, American Water Resources Association, Remote Sensing and Water Resources Management, p 351-367, 1973. 10 fig, 6 tab, 4 ref.

Descriptors: *Lakes, *Remote sensing, *Aerial photography, *Reflectance, Lake Ontario, Upwelling, Thermal properties, Circulation, Mass transfer.
Identifiers: *Sun-glint.

Features demarcated by mirror-reflected solar illumination (sun-glint) in aerial photographs of Lake Ontario and the role of sun-glint in evaluating the nature of dynamic processes occurring within the lake which display surficial characteristics is described. Under sun-glint conditions visible and infra-red photography may delineate dynamic interfaces between thermally different water masses. A time-sequential series should enable quantitative estimates of the nature of dynamic processes to be made. Sun-glint usage requires modification of surface solar reflective properties by lake dynamics. Imagery of upwelling areas indicated that surficial glitter patterns are induced when spatial variations of thermal time-gradients change. Such conditions are present in onset and decay phases of upwelling. Sun-glint discerned dynamics of river mouth thermal effluent injections, surface slicks, coastal mass transport, and lake circulation patterns if conditions were not in a dynamic equilibrium state. Sun-glint was used to evaluate the dynamics of the June 7, 1972 upwelling off the north shore of Lake Ontario. Using aerial photography and ground-truth data, it was concluded that spatial and temporal changes in thermal time-gradient are required to produce surface features discernable in sun-glint. (Bauchanan-Davidson--Wisconsin)
W75-11239

**PRELIMINARY INFORMATION ON THE NATURE OF ORGANIC MATTER IN THE SURFACE SEDIMENTS OF LAKES HURON, ERIE, AND ONTARIO,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W75-11240

**THE TOXICITY OF DRILLING FLUID COMPONENTS TO AQUATIC BIOLOGICAL SYSTEMS, A LITERATURE REVIEW,**
Fisheries and Marine Service, Winnipeg (Manitoba).
For primary bibliographic entry see Field 5C.
W75-11266

**SOME OBSERVATIONS CONCERNING PREPARATION AND STORAGE OF STREAM SAMPLES FOR DISSOLVED INORGANIC PHOSPHATE ANALYSIS,**
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
A. H. Johnson, D. R. Bouldin, and G. W. Hergert.
Water Resources Research, Vol 11, No 4, p 559-562, August, 1975. 3 fig, 9 ref, 4 tab.

Descriptors: *Water analysis, *Phosphates, *Storage, Time, Inorganic compounds, Analytical techniques, Water pollution sources, Trace elements, Water pollution, Phosphorus compounds, Water properties, Freezing, Refrigeration, Pollution identification, New York.
Identifiers: Fall Creek(NY).

The influence of storage conditions and duration of storage was studied by using about 100 stream samples from Fall Creek collected near Ithaca, New York. Freezing and refrigerated storage were unsatisfactory, since changes in measured concentrations were usually observed after relatively short periods of time (24 hr). An isobutanol extraction procedure is described which minimizes storage problems and is useful for routine analysis of water samples for dissolved inorganic phosphate. (Witt-IPC)
W75-11336

**DETERMINATION OF CHEMICAL OXYGEN DEMAND, COD(CR), IN WASTE WATERS OF PULP AND PAPER MILLS (BESTIMMUNG DES CHEMISCHEN SAUERSTOFFBEDARFES, CSB(CR), IN RESTABWAESSERN VON ZELLSTOFF UND PAPIERFABRIKEN).**
English translation of Wochenblatt fur Papierfabrikation, Vol 103, No 9, p 326-327, May 15, 1975. 1 illus.

Descriptors: *Pulp wastes, *Water analysis, *Chemical oxygen demand, *Testing procedures, Testing, Analytical techniques, Sampling, Water quality, Water pollution, Water pollution sources, Pollutant identification.
Identifiers: *Potassium dichromate.

This proposed method for COD determination by means of dichromate is not identical with the DEV (Deutsche Einheitsverfahren zur Wasser-, Abwasser- und Schlammuntersuchung) H 4.2 standard method and is to be used only if control experiments show agreement with that method, which has been officially approved. (Ward-IPC)
W75-11337

**INTERFERENCE OF MERCURY(II) IN THE COLORIMETRIC DETERMINATION OF INORGANIC PHOSPHATE IN WATER,**
Massey Univ., Palmerston North (New Zealand).
R. W. Tillman, and J. K. Syers.
The Analyst, Vol 100, No 1190, p 322-324, May, 1975. 7 ref, 2 tab.

Descriptors: *Water analysis, *Phosphates, *Mercury, *Colorimetry, Inorganic compounds, *Analytical techniques, Chemical analysis, Water pollution sources, Trace elements, Water pollution, Chemical precipitation, Phosphorus compounds, Water chemistry, Water properties, Water quality, *Pollutant identification.

Mercury(II) caused a significant positive interference in the colorimetric determination of inorganic phosphate in the range 0-0.080 microgram/liter by the procedure of Murphy and Riley. The interference resulted from the formation of a precipitate that varied in particle size and was not always visible to the naked eye. With higher levels of inorganic phosphate (0.800 microgram/liter) a coarse precipitate formed that partially removed the molybdophosphate complex ion from solution. Elimination of this interference was achieved by complexing the mercury(II) with chloride or thiosulfate. (Witt-IPC)
W75-11340

**MODIFICATION OF THE IODIMETRIC TITRATION METHOD FOR THE DETERMINATION OF BROMIDE AND ITS APPLICATION TO MIXED DOMESTIC-INDUSTRIAL WASTE EFFLUENTS,**
National Environmental Research Center, Cincinnati, Ohio. Methods Developments and Quality Assurance Research Lab.

## Group 5A—Identification Of Pollutants

D. F. Bender.
The Analyst, Vol 100, No 1191, p 400-404, June, 1975. 5 ref, 2 tab.

Descriptors: *Waste water(Pollution), *Water analysis, *Volumetric analysis, *Bromides, *Analytical techniques, Chemical analysis, Water pollution sources, Hydorgen ion concentration, Instrumentation, Municipal wastes, Industrial wastes, Wastes, Iodides, Halogens, *Pollutant identification.

The iodimetric titration method for the determination of bromide involves the observation of various color changes, making the method unsuitable for use with samples that are highly colored. A modification is described, which extends the usefulness of the method to highly colored samples, such as sewage and industrial effluents. A pH meter was substituted for indicators and the use of standardized concentrations and amounts of reagents was incorporated into the method. The procedural steps were studied in order to optimize the sensitivity while minimizing interfering side reactions. The modified method was applied to a mixed domestic-industrial effluent spiked with bromide and iodide. The experimental details and statistical parameters for samples spiked at different levels are presented. (Witt-IPC)
W75-11341

**APPARATUS FOR CONCENTRATION OF VOLATILE ORGANIC POLLUTANTS IN WATER,**
Tekmar Co., Cincinnati, Ohio.
J. O. Grote.
American Laboratory, Vol 7, No 7, p 47-48, 50, July, 1975. 7 fig, 3 ref.

Descriptors: *Organic compounds, *Water analysis, *Pollutant identification, *Instrumentation, Analytical techniques, Water pollution sources, Trace elements, Sampling, Water chemistry, Water properties, Waste water(Pollution), Potable water, Pollutants.

In the liquid sample concentrator described, produced by Tekmar Company, an inert gas is bubbled through a water sample containing organic compounds. The volatile organics exhibiting low solubility in water are quantitatively partitioned into the gas phase, and the gas is passed through a trap that retains the organics but allows the water vapor and the purge gas to pass through. The concentrated sample is passed to a measuring instrument. By varying the type of adsorbent in the trap, the specificity of the technique can be changed to accommodate various classes of organic compounds. Data are presented illustrating the recovery of organic compounds such as acetone, methylene chloride, chloroform, carbon tetrachloride, and benzene from spiked water and drinking water. The apparatus is a useful tool for the analysis of volatile organic pollutants in water at the parts-per-billion level. Its compatibility with existing gas chromatographs and detector systems makes it adaptable to a variety of gas chromatographs and measurement devices. (Witt-IPC)
W75-11342

**INTERFERENCE OF SULFATE ION ON SPADNS (SODIUM 2-(SULFOPHENYLAZO)-1,8-DIHYDROXYNAPHTHALENE-3,6-DISULFONATE) COLORIMETRIC DETERMINATION OF FLUORINE IN WASTE WATERS,**
Calgon Corp., Pittsburgh, Pa. Calgon Labs.
R. F. Devine, and G. L. Partington.
Environmental Science and Technology, Vol 9, No 7, p 678-679, July, 1975. 4 ref.

Descriptors: *Waste water(Pollution), *Water analysis, *Colorimetry, *Sulfates, *Fluorides, Analytical techniques, Chemical analysis, Electrodes, Ions, Water pollution sources, Trace elements, Water chemistry, Water properties, Water pollution, *Pollutant identification.
Identifiers: Sodium 2-(sulfophenylazo)-1,8-dihydroxynaphthalene-3,6-disulfonate.

The approved method for the determination of fluoride ion is the SPADNS colorimetric procedure preceded by distillation from a sulfuric acid solution. This procedure is based upon the measurement of the loss of color of a zirconium-dye lake owing to the reaction of fluoride ion with zirconium to form a colorless complex ion. The dye used is sodium 2-(p-sulfophenylazo)-1,8-dihydroxynaphthalene-3,6-disulfonate (SPADNS). Serious errors in this method are caused by sulfate ion carry-over from the initial distillation step. The use of a fluoride ion electrode is suggested as a better method. (Witt-IPC)
W75-11343

**CHROMATOGRAPHIC DETERMINATION OF PHENOLS IN WATER,**
Ames Lab., Iowa.
C. D. Chriswell, R. C. Chang, and J. S. Fritz.
Analytical Chemistry, Vol 47, No 8, p 1325-1329, July, 1975. 2 fig, 3 tab, 13 ref.

Descriptors: *Water analysis, *Phenols, *Anion exchange, *Gas chromatography, Separation techniques, Analytical techniques, Chemical analysis, Natural streams, Potable water, Water chemistry, Water properties, Water quality, Water pollution sources, Pollutants, *Pollutant identification, Organic compounds, Resins, Ion exchange, Chromatography, Oxidation, Chlorination.
Identifiers: A-26 resin, Chlorinated phenols.

Phenols in natural waters and treated drinking water are determined by sorption on macroporous anion-exchange resin (A-26 resin from Rohm and Haas Chemical Company), elution with acetone, and measurement by gas chromatography. Techniques are given for preventing phenol losses caused by chlorination, oxidation, and other reactions during their determination. Common inorganic ions and many organic substances cause no interference; neutral organics that are retained by the resin can be removed by a methanol wash. The method gives accurate results for phenol, alkyl-, and chloro-substituted phenols in the parts/billion to parts/million concentration range. (Witt-IPC)
W75-11344

## 5B. Sources Of Pollution

**EXPERIMENTAL STUDY OF THE COOLING WATER SYSTEM, SETUBAL POWER PLANT, RIO SADO, PORTUGAL,**
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
G. Jirka, J. Lee, and D. R. F. Harleman.
Ralph M. Parsons Laboratory for Water Resources and Hydrodynamics, Report No 185, April 1974. 101 p, 24 fig, 4 tab, 7 ref.

Descriptors: *Powerplants, *Design criteria, Optimum development plans, *Cooling water, Hydraulic models, Channels, *Discharge(Water), Thermal pollution.
Identifiers: *Portugal(Rio Sado), Once-through cooling system, Cooling water systems.

The Setubal power Plant is a fossil fueled generating station located on the Rio Sado in Portugal. It employs a once-through cooling system. The objective was to arrive at an optimal design for the cooling water system with respect to two criteria: (1) minimization of heat recirculation at the cool water intake and (2) small surface velocities in the vicinity of the discharge zone to avoid any hazard to navigation. Two designs for the condenser discharge were considered: discharge by means of a surface channel and discharge by means of a submerged multiport diffuser. The intake design is a skimmer wall that selectively withdraws cooling water from the ambient stratified water. Existing theoretical models were used to obtain preliminary estimates of design parameters. A hydraulic scale model for the discharge-intake zone was constructed. Tests were carried out to investigate the variability of the criteria of concern to the design parameters under the full range of ambient conditions. Based on the results of the experiments, a surface discharge channel is recommended as the optimal design for the cooling water system. Experimental data for both the surface discharge and the submerged diffuser were compared with existing mathematical models.
W75-10855

**OCCURRENCE OF 2, 4, 5-T AND PICLOR... IN SURFACE RUNOFF WATER IN T... BLACKLANDS OF TEXAS,**
Agricultural Research Service, College Stat... Tex.
R. W. Bovey, E. Burnett, C. Richardson, M. G. Merkle, and J. R. Baur.
Journal of Environmental Quality, Vol 3, No 1, 61-64, January-March, 1974. 8 tab, 12 ref.

Descriptors: *2-4-5-T, *Runoff, *Herbici... *Irrigation water, *Return flow, Rainfall, Stre... Small watersheds, Water sources, Texas, *Pa... pollutants, Water pollution sources.
Identifiers: *Picloram, Texas blacklands.

A study was made to determine the amount of 5-T and picloram in surface runoff water pastures and rangeland sprayed with the h... cides as a result of major rainfalls following ... ments. Soil, grasses, and runoff water ... analyzed periodically following herbicide ... ment. Herbicide content in the soil remained throughout the investigation. Herbicide conte... grass was high immediately following treat... but degraded rapidly. Plant washoff was the source of the herbicide in runoff water. Co... trations were moderately high if heavy rainf... curred immediately after herbicide treatmen... were low if major storms occurred one mo... longer after the treatment. No damage occur... cotton or sorghum located adjacent and bel... herbicide-treated watersheds from either ... drift or surface runoff water. (Mastic-Arizon...
W75-10895

**TWO-DIMENSIONAL, HYDROSTATIC ... LATION OF THERMALLY-INFLUE... HYDRODYNAMIC FLOWS,**
Stanford Univ., Calif. Dept. of Civil Engine...
For primary bibliographic entry see Field 2H...
W75-10901

**FLOOD RUNOFF FROM URBAN AREAS,**
Maryland Univ., College Park. Dept. of C... gineering.
R. H. McCuen.
Available from the National Technical I... tion Service, Springfield, Va 22161 as PB-... $4.75 in paper copy, $2.25 in microfiche. M... Water Resources Research Center, Colleg... Technical Report No. 33, June 1975. 70 p... A-025-MD(2). 14-31-0001-5020.

Descriptors: Simulation analysis, Path ... tants, *Urban hydrology, *Storm water, ... ment, *Storage, Land use, Water quality, ... Runoff, Cities, Urbanization, Forecastin... mating, *Peak discharge, *Design floods, ... forecasting, Model studies.

This study examined several important a... urban water resources management and re... the following: (1) a set of prediction equa... can be used to estimate different land us... teristics from selected demographic ... teristics; (2) a set of design curves rela... discharge and the land use intensity ra... function of the exceedence probability (... period); (3) a set of design curves showi... fect of rooftop detention on peak disc...

s land use intensity ratings and exceedence
ilities; (4) a computer model of a storm
detection facility; (5) a model study com-
he effect of the individual-site approach to
ional approach to storm water detention; (6)
f design curves that can be used in the
of storm water detention facilities for areas
erized by high concentrations of impervi-
as (e.g., streets and parking lots); (7) a
uality simulation model that can predict the
eight pollutants in runoff from urban and
n streets; (8) a set of prediction equations
be used to predict water use of selected
cial establishments.
004

IPUTER PROGRAM PACKAGE FOR
IC ECOLOGISTS,
Univ., Ithaca, N.Y.
ary bibliographic entry see Field 2H.
08

AL RESPONSE OF HEATED
IS, SOLUTION BY THE IMPLICIT
D,
niv., Iowa City. Inst. of Hydraulic
.
y, and E. O. Macagno.
ort No. 165, May 1974. 71 p, 10 fig, 1 tab,
ppend. NSF Grant GK-35910X.

rs: *Path of pollutants, *Thermal pollu-
Ice cover, *Numerical analysis,
atical models, *Mississippi River,
n, Rivers, Winter, Analysis, Equations,
ure, Distribution, Effluents, Heated
charge(Water), Diffusion.

al response of natural streams to artifi-
nputs from thermal power stations was
ically represented by the one-dimen-
nvection-diffusion equation, for fully
w conditions. The unsteady one-dimen-
vection-diffusion equation is a nonlinear
partical differential equation, due to the
f the surface heat exchange term which
ex function of the water temperature. In
has been difficult to obtain closed-form
of this governing equation by analytic
numerical solution, utilizing a predic-
or scheme, was developed to predict
nt-period as well as the steady-state
e distributions in thermally loaded
der changing thermal input rates and
ical conditions. An example case was
several different conditions and the
e presented. (Adams-ISWS)

CHEMICAL CYCLE OF ARSENIC IN
SHINGTON AND ITS RELATION TO
EMENTS,
Univ., Seattle. Dept. of Oceanog-
ius.
and Oceanography, Vol 20, No 3, p
y 1975. 3 fig, 2 tab, 29 ref. NSF Grant

*Washington, Path of pollutants,
npounds, *Lake sediments, *Sodium
alytical techniques, *Water analysis,
ompounds, Separation techniques,
Neutron activation analysis, Chemis-
entation, Sediments, Chemical pro-
nical analysis, Aluminum, Biological
Iron, Manganese, Geochemistry,
fall, Suspended solids, Pollutant
,
Lake Washington(Wash), Antimony,
er.

igh arsenic concentrations (greater
dry weight) in the surface sediments
ington are attributed to atmospheric input of partially soluble arsenic-rich dust from a copper smelter 35 km upwind and removal of dissolved As from the lake water by bacteria on an inorganic reaction. The suspended matter in the deeper lake water contains 9% iron, 8% manganese, and 350 ppm arsenic. Cores dated by Pb210 indicate that As levels began to increase in the sediments when the smelter began operation in 1890. An arsenic budget for the lake shows equal supplies from the atmosphere and from rivers, and removal by outflowing water (45%) and by accumulation in the sediments (55%). A similar cycle was observed for antimony which is released by the smelter in much smaller amounts than arsenic. About two-thirds of the As in rain and lake water was in the form of arsenate; however, in the interstitial water 55% of the dissolved As was present as arsenite and a few percent as dimethylarsinic acid. (Henley-ISWS)
W75-10922

**SURFACE TENSION REDUCTIONS AND URBAN WASTES IN THE NEW YORK BIGHT,**
State Univ. of New York Stony Brook. Marine Sciences Research Center.
C. D. Hardy, and E. R. Baylor.
Journal of Geophysical Research, Vol 80, No 18, p 2696-2699, June 20, 1975. 1 fig, 21 ref.

Descriptors: *Path of pollutants, *Surface tension, *Surfactants, Water properties, *Monomolecular films, New York Properties, Tension, Surfaces, Wettability, Detergents, Water pollution sources, Sewage sludge, Water quality, Sea water, Sludge disposal, Films, Waste disposal, Sewage effluents, Pollutants, Metals, Aerosols.
Identifiers: *Urban wastes, *New York Bight, *New York Harbor, Oil drop method, Lipophilic pollutants, Metallic pollutants.

The distribution of surface tension in the New York Bight was calculated from oil drop spreading measurements at sea. Reductions in surface tensions of greater than 30% (less than 50.9 dyn/cm) of that calculated for clean seawater were associated with sewage sludge dumping and urban waste discharges. The potential role of surface films as an agent in the transport of metallic and lipophilic pollutants was briefly discussed. (Henley-ISWS)
W75-10927

**QUALITY OF WATER IN AQUIFERS OF THE AMARGOSA DESERT AND VICINITY, NEVADA,**
Geological Survey, Denver, Colo.
B. P. Robinson, and W. A. Beetem.
Available from National Technical Information Service, Springfield, Va 22161 as USGS-474-215 (NTS-123), $5.45 in paper copy, $2.25 in microfiche. Report USGS-474-215 (NTS-123), 1975. 64 p, 1 fig, 1 tab.

Descriptors: *Water pollution sources, *Groundwater, *Nuclear explosions, *Nevada, Water quality, Water wells, Pumping, Aquifers, Chemical analysis, Data collections, Sampling.
Identifiers: *Nevada Atomic Test Site.

The U.S. Geological Survey has interpreted the rate and direction of groundwater movement away from the Nevada Atomic Test Site by using hydrologic data including results of hydraulic tests and geophysical surveys in deep wells. Samples of water were collected from 25 sources including supply wells, irrigation wells, and springs in the Pahrump, Amargosa, and Indian Spring Valleys and at the Nevada Test Site during a single sampling sweep. Analyses in the field indicated that the composition of the pumped or discharging water approximated the composition of the aquifer water. The composition of the water did not change with extended pumping time. On-site examination of the samples of water included measurement of specific conductance, temperature, pH, dissolved oxygen, dissolved carbon dioxide, alkalinity, and ferrous-ferric iron ratios. Laboratory examination of the samples included chemical, radiochemical, and spectrochemical analyses. (Woodard-USGS)
W75-10932

**HEAVY METALS AND OTHER TRACE ELEMENTS,**
Geological Survey, Menlo Park, Calif.
H. V. Leland, E. D. Copenhaver, and D. J. Wilkes.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1635-1656, June 1975. 1 tab, 201 ref.

Descriptors: *Water pollution sources, *Heavy metals, *Trace elements, *United States, *Reviews, Surface waters, Sediments, Rivers, Estuaries, Natural streams, Ecosystems, Biological communities, Marine biology.

This literature review describes the effects of heavy metals and trace elements in surface waters of the United States under the following headings: (1) Trace Elements in Natural Waters; (2) Trace Elements in Sediments; (3) Physical-Chemical Forms of Trace Elements; (4) Trace Element Partitioning in Aquatic Ecosystems; and (5) Bioaccumulation and Toxicity of Trace Elements. Scattered and intensive chemical surveys of natural waters in the U.S. continue to show that many trace elements, including As, Cd, Pb, Hg, and Zn, are widely distributed but at low concentrations relative to the limits established for drinking waters. The geographic distributions of Cd, Pb, and Zn have distinct regional patterns. Pollution sources and rainfall are apparently the major contributors of Cd and Pb in river water. (Woodard-USGS)
W75-10934

**REVIEW OF CONFERENCE ON HYDROLOGY OF DEEP SEDIMENTARY BASINS,**
Tulsa Univ., Okla. Dept. of Earth Sciences.
P. A. Dickey, and P. H. Jones.
American Association of Petroleum Geologists Bulletin, Vol 59, No 7, p 1198-1201, July 1975.

Descriptors: *Sedimentology, *Hydrology, *Geology, *Reviews, *Conferences, Groundwater, Subsurface waters, Hydrogeology, Groundwater movement, Sediments, Oil-water interfaces, Sediment-water interfaces, Permeability, Oil shales, Evaluation, Water pollution, Oil pollution.
Identifiers: *Deep sedimentary basins.

The conference on Hydrology of Deep Sedimentary Basins sponsored by the American Association of Petroleum Geologists (AAPG) was held at Shangri-la resort, Afton, Oklahoma, October 7-11, 1974. Participants numbered 60, and included representatives from oil company laboratories, government bureaus, and universities. The conference produced an interesting difference of opinion on the movement of deep subsurface waters. Most of the hydrologists present, and some of the petroleum geologists, believe that deep subsurface pore waters are moving both parallel with and perpendicular to bedding planes. The movement is caused by the compaction of sediments, phase changes in the minerals, and head differences caused by topography. These people believe that the salt in subsurface brines was concentrated by reverse osmosis, that hydrodynamically tilted water-oil contacts are common, and that updip or downdip flows of water in sandstones can enhance or destroy petroleum traps. Others believe that shales commonly lose all their permeability to water, at least in a direction perpendicular to the bedding. (Woodard-USGS)
W75-10935

**USE OF PRODUCTIVITY OF PERIPHYTON TO ESTIMATE WATER QUALITY,**
Geological Survey, Menlo Park, Calif.
L. J. Tilley, and W. L. Haushild.

Journal Water Pollution Control Federation, Vol 47, No 8, p 2157-2171, August 1975. 8 fig, 4 tab, 29 ref.

Descriptors: *Water quality control, *Path of pollutants, *Waste water disposal, *Washington, Streams, Estuaries, Methodology, *Periphyton, Growth rates, Chlorophyll, Nutrients, Phosphates, Ammonia, Nitrates, Water quality, Streamflow, Flow rates, *Bioindicators, Pollutant identification.
Identifiers: *Duwamish-Green River(Wash).

In a comprehensive study of the effects of changes in wastewater disposal practices on the Duwamish River (Wash.) estuary, the amount and rate of change of chlorophyll a was used to determine the net primary productivity of the periphyton growing upstream from the estuary in the Duwamish-Green River. The net primary productivity varied among three stream environments sampled in the study during the summer and fall of 1969. Net primary productivity averaged 3.6 mg/wk/sq m in a mountainous reach, increased to 6.2 in a lowland reach, and was as much as 17.5 in an estuarine reach. The productivity of periphyton was related to concentration of selected nutrients (nitrate, nitrite, ammonia, and phosphate) in the stream. The small temperature changes along the stream probably had a minor influence on the differences in periphyton growth rates. (Woodard-USGS)
W75-10936

**ILLINOIS LANDFILL LAW MAY EFFECT NEARBY STATES.**
Solid Wastes Management, Vol 17, No 8, p 36, 46, 58, 72, 78-79, August, 1974.

Descriptors: *Landfills, *Solid wastes, *Waste disposal, *Legislation, *Illinois, Regulation, permits, Environmental sanitation, Water pollution sources, Water pollution control.

The Pollution Control Board of Illinois was developed a broad-based policy on the control of landfill operations. The key provision states that no person in any state may allow a sanitary site to be maintained so as to threaten or permit the discharge or emission of pollutants into the environment so that they may in any way contaminate the air and/or water within the state of Illinois. This means that any individual or organization that is in violation of the law is liable for his act even though the initial polluting may have occurred outside of the state of Illinois. An outline of the legislation is presented. Subjects covered include permits, methods of operation, type of wastes that may be deposited, features that must be included in a landfill site, and items that must be contained in an application for a landfill permit. Development permits are required for the development of any new solid wastes management site or for the modification of an existing site. Operating permits are required to operate a site. Experimental permits will be issued for methods that do not satisfy the current standards if the applicant can show proof that the method has a reasonable chance for success and that there are minimal environmental hazards. (Orr-FIRL)
W75-11011

**PREVENTING BACKFLOW IN PIPING CROSS CONNECTIONS,**
Watts Regulator Co., Lawrence, Mass.
J. F. Keegan.
Plant Engineering, Vol 29, No 8, p 229-231, April 17, 1975. 6 fig, 2 tab.

Descriptors: *Water pollution sources, *Potable water, Pipes, Water supply.
Identifiers: Cross connections, Piping, Backflow.

Inadvertent contamination of potable water supplies may be avoided by preventing backflow in piping cross connections. Two types of uncontrolled cross connections which permit unwanted reverse flow are back siphonage and backpressure. Siphonage occurs when a water supply system is subjected to an unexpected pressure drop. Backflow from backpressure results when a system component such as a pump or a boiler under pressure produces a pressure exceeding that of the water supply main. In some cases, a combination of back siphonage and backpressure cause backflow. To overcome the possibility of contamination by backflow, in-plant cross connection control programs should be implemented. Backflow prevention devices are described. These cross connections are either the inlet type or the pressure type. In the inlet type, the connection is used for filling a receptacle open to the atmosphere while in the pressure type, water supply is connected to another line or to a pressurized vessel. In the latter, connections are often fitted with shutoff or check valves to isolate nonpotable systems from the potable supply. Selection of the proper prevention device depends upon the type of cross connection to be connected and the degree of hazard existing. (Prqgue-FIRL)
W75-11018

**STABILITY OF NITROSAMINES IN SAMPLES OF LAKE WATER, SOIL, AND SEWAGE,**
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
R. L. Tate, III, and M. Alexander.
Journal of the National Cancer Institute, Vol 54, No 2, p 327-330, February, 1975. 5 fig, 17 ref.

Descriptors: *Nitrogen compounds, *Soil environment, *Sewage, *Lakes, Water pollution sources, Microbial degradation, Persistance, Pollutant identification, Laboratory tests, Testing, Public health, *Path of pollutants.
Identifiers: *Nitrosamines, *Carcinogens.

Interest in nitrosames is prompted because of their possible carcinogenic, teratogenic, and mutagenic properties. Their possible synthesis in fresh waters, polluted waters, and soil is of some concern because the precursors are widespread. The significance of the formation of N-nitroso compounds depends upon the stability of these carcinogens in natural systems and their possible entry into public water supplies, fish, and edible plants. This study assessed the stability of simple nitrosamines (N-nitrosodimethylamine, N-nitrosodiethylamine, and N-nitrosadi-n-propylamine) in lake water, soil, and sewage. No degradation of these nitrosamines was observed in lake water during a 3.5 month period. A slow disappearance was noted in soil after a lag of several weeks. The loss was more rapid in sewage, but even after two weeks more than half of the nitrosamine remained. The results of the experiments of sewage and soil suggest a microbial involvement in the slow decomposition of the nitrosamines. (Orr-FIRL)
W75-11019

**SOME OBSERVATIONS ON BEHAVIOR OF THE TREATED SEWAGE DISPOSED IN THE SEA,**
Nihon Univ., Tokyo (Japan). Dept. of Fisheries.
D. Inaba, S. Arazaki, H. Murooka, Y. Deguchi, and S. Kadota.
Bulletin of the College of Agriculture and Veterinary Medicine, Nihon University, No 31, p 54-78, 1974. 15 fig, 8 tab, 4 ref.

Descriptors: *Sludge disposal, *Oceans, *Environmental effects, Marine animals, Analytical techniques, Sewage treatment, Monitoring, Pollutant identification, Water quality control, Ultimate disposal, *Path of pollutants, Dispersion, Mixing.
Identifiers: Pollutant dispersal, *Japan.

A survey of marine disposal of sludge from sewage treatment was conducted in Japan, in order to obtain information on dispersal characteristics in the ocean and to detect effects of this disposal method on water quality and marine life. Color differentiation between sludge water surface and clean water areas was observed just after introduction of the sludge. Vertical sedimentation rate was measured by optical monitoring through marine television, echo sounder devices and an underwater illuminometer. Particles precipitated into the water at different rates of descent due to specific gravity and differences in particle shape. Water quality analysis was done in relation to ammonia density, BOD, and pH parameters, indicating that these factors did not cause any significant qualitative changes to the environment. Strong winds and high waves provided a rapid dispersal and mixing of the sludge in the aquatic environment. These rapid mixing and dispersal factors are also illustrated by an unexpectedly low general and coliform bacteria count. (Prague-FIRL)
W75-11020

**A FIELD STUDY OF PHYSICO-CHEMICA STATES OF ARTIFICIAL RADIONUCLIDES I SEAWATER,**
National Inst. of Radiological Sciences, Chib (Japan). Dept. of Environmental Contamination.
Y. Nagaya, and K. Nakamura.
Journal of the Oceanographical Society of Japa Vol 30, p 179-184, 1974. 1 fig, 3 tab, 15 ref.

Descriptors: *Radioactive wastes, *Fallout, F ters, *Radioisotopes, Oceans, Water pollutio Analytical techniques, *Radiochemical analys Pollutant identification, Water pollution sources
Identifiers: 90Sr, 137Cs, 144Ce, Marine pollutio

The behavior of artificial radionuclides in s water has been shown to differ from the behav of natural isotopes, at least within a duration time after the artificial substances have been troduced into the sea. The physico-chemical sta of artificial radionuclides 90Sr, 137Cs, and 144 in seawater were studied by radio-chemical ana sis of filtered and unfiltered seawater, in orde understand and predict the radioactive contami tion of the marine environment. These fal radionuclides were analyzed, and the differenc radionuclide concentrations between unfilte and filtered seawater was defined as the part late form radioisotope. A considerable amoun 144Ce was found to be particulate. Almost no greater than 0.22 microns in size was observe either coastal or open seawaters, but much 13 seemed to be insoluble in coastal waters. For Kashima-nada area, the possible occurence of ticulate radionuclides greater than 0.22 micro size was estimated, and was found to one per or less for 90Sr and 6 percent for 137Cs. In co water, 80 percent of 144Ce were in partic form, but very little particulate 144Ce was f in the open seawater. The influence of suspe matter to 137Cs and 144Ce concentration leve seawater is as yet undetermined. (Prague-FIR W75-11022

**MERCURY CONTENT OF WHALES, JAPANESE),**
K. Nagakura, S. Arima, M. Kurihara, T. Koga and T. Fujita.
Bulletin of the Tokai Regional Fisheries Labo ry, No 78, p 41-46, June 1974. 7 tab, 5 ref.

Descriptors: Aquatic animals, *Heavy m *Mercury, *Animal physiology, Path of tants, Food chains, Environmental effects, pollution effects.
Identifiers: *Whales, Fin whale, Sei whale, whale, Balaenoptera physalus, Balaen borealis, Physeter catoden, *Methyl me Bioaccumulation, Tissue analysis.

The mercury content of the meat of fin Balaenoptera physalus, sei whale, B. boreal sperm whale, Physeter catoden, was deter Total mercury content of the sei and fin (baleen whales) was 0.01-0.07 ppm and 0.0 ppm, respectively; methyl mercury conte

n 0.008 ppm. Total mercury content of
vhale, a toothed whale, was 0.65-1.57 ppm
n Pacific and 0.54-1.48 ppm in Antarctic
, of which 70% in both areas was methyl
. The variance in mercury content was as-
o the difference in feeding habits of the
le types. (Katz)
29

TOXICITY IN BUSYCON CANALICU-
L.,
land Univ., Kingston. Graduate School of
raphy.
ry bibliographic entry see Field 5C.
1

NARY INVESTIGATIONS INTO
CYCLING IN INDIAN LAKE, MAS-
ETTS: A LAKE TREATED ANNUALLY
PPER SULFATE,
setts Univ., Amherst. Water Resources
Center.
mes.
from the National Technical Informa-
e, Springfield, Va 22161 as PB-244 716,
per copy, $2.25 in microfiche. Publica-
7, Completion Report FY-75-2, April
, 9 fig, 6 tab, 28 ref. OWRT A-064-
14-31-0001-4021.

s: Copper, *Massachusetts, Lakes,
treatment, *Copper sulfate,
ation, *Water pollution treatment,
ollutants, Metals, Absorption, Lake
Biota.
*Indian Lake(Mass), Macrophytes.

e is a shallow, soft-water, eutrophic
l within the city limits of Worcester,
vatershed is well-developed and since
60's the lake has suffered from severe
s. Copper sulfates has been applied
er since then to control the problem.
was undertaken to provide knowledge
oncentrations and cycling in a treated
r inputs to Indian Lake included an
4 kg soluble and 18 kg particulate
the watershed between Aug. 6, 1973,
1974, and 345 kg soluble from copper
ment during July and Aug. 1973. Less
he total copper input left the system
lake outlet, approximately 2% was
luble and particulate form in the water
y given time, and the remainder was
into Indian Lake sediments and
plication of copper sulfate to Indian
lowed by rapid conversion of soluble
rticulate forms which were deposited
bottom. Conversion and deposition
nately 90% complete by the 10th day
atment. Although resuspension of
ents did occur, release of copper to
mn from circulating sediments was
t extensive. Macrophytes in the shal-
in of Indian Lake absorbed copper
r following the application of copper
equent declining copper concentra-
nts may have been due to release of
nto the water, but large increases in
water adjacent to the plants during
declining plant copper concentra-
observed.

MODELING OF MIXING
IN STRATIFIED LAKES,
te Univ., Stillwater. School of
l Aerospace Engineering.
liographic entry see Field 2H.

**BIOCHROME ANALYSIS AS A METHOD FOR ASSESSING PHYTOPLANKTON DYNAMICS, PHASE II,**
Arkansas Univ., Fayetteville Dept. of Botany and Bacteriology.
For primary bibliographic entry see Field 5C.
W75-11052

**PROCESS STUDIES AND MODELING OF SELF-CLEANING CAPACITY OF MOUNTAIN CREEKS FOR RECREATION PLANNING AND MANAGEMENT,**
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
C-L. Chen, and K. D. Davis.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-244 690, $4.25 in paper copy, $2.25 in microfiche. Utah Water Research Laboratory, Logan, Report PRWG135-1, June 1975. 79 p, 5 fig, 5 tab, 36 ref, 2 append. OWRT B-095-UTAH(1), 14-31-0001-4132.

Descriptors: *Dispersion, *Dissolved oxygen, Mathematical models, Mixing, *Reaeration, Turbulence, *Self-purification, Recreation, Planning, Management, Streams, *Utah, Model studies, Tracers, Dye dispersion, *Path of pollutants.
Identifiers: Summit Creek(Utah), Mountain creeks.

Reaeration process studies were conducted on a mountain creek and a large laboratory flume. The method of evaluating the dispersion coefficient, mean velocity, and reaeration coefficient for both creek and flume consisted of finding these values for a deoxygenated portion of the flow containing a conservative tracer (dye). The deoxygenated slug is measured as it moves downstream and the three values are best fit in the analytical solution of the longitudinal dispersion equation which dynamically describes the flow of the dispersing slug in the stream. The best fit was accomplished by using the method of least squares in which the sum of squares of the differences between the dissolved oxygen and dye concentrations calculated from the dispersion equation and those obtained from the actual measurements is minimized. A reaeration coefficient prediction model of general form was developed. The model is composed of two dimensionless parameters which were identified from the normalized dissolved-oxygen balance equation. A simplified model which has two model parameters was also developed. Both model parameters were evaluated specifically for the mountain creek and laboratory flume. A comparison of this simplified model with existing models revealed that most existing models are incomplete in form. Inclusion of the dispersion coefficient in the reaeration coefficient model improved the prediction accuracy. The information obtained from this study would aid in the determining of oxygen balance of mountain creeks which is essential to the resource management of mountain watersheds.
W75-11055

**A REEVALUATION OF THE COMBINED EFFECTS OF TEMPERATURE AND SALINITY ON SURVIVAL AND GROWTH OF BIVALVE LARVAE USING RESPONSE SURFACE TECHNIQUES,**
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5C.
W75-11081

**STANDARD CURVES FOR NUVACRON, MALATHION, SEVIN, DDT, AND KELTHANE TESTED AGAINST THE MOSQUITO CULEX PIPIENS L. AND THE MICROCRUSTACEAN DAPHNIA MAGNA STRAUS,**
Alexandria Univ. (Egypt). Faculty of Agriculture.
I. A. Rawash, I. A. Gaaboub, F. M. El-Gayar, and A. Y. El-Shazli.
Toxicology, Vol 4, No 2, p 133-144, May 1975. 8 fig, 2 tab, 7 ref.

Descriptors: *Pesticides, *Insecticides, *DDT, Daphnia, *Mosquitos, *Growth stages, *Bioassay, *Toxicity, *Mortality, Methodology, Laboratory tests, Water pollution sources, Mature growth stage, Water pollution effects.
Identifiers: Sevin, Malathion, Nuvacron, Kelthane, Standard log concentration-probit, LC-P, LC-50, *Daphnia magna, *Culex pipiens, Bioaccumulation, Fourth instar.

The fourth instar larvae of the mosquito Culex pipiens and adults of microcrustacean Daphnia magna were used as bioassay test organisms for the preparation of the standard log concentration-probit (lc-p) regression lines for five pesticides-nuvacron, malathion, sevin, DDT, and kelthane. The LC50's indicated that Daphnia magna was far more sensitive than C. pipiens to all five pesticides. (Katz)
W75-11082

**THE ACCUMULATION OF CADMIUM, COPPER, MANGANESE AND ZINC BY FUCUS VESICULOSUS IN THE BRISTOL CHANNEL,**
Institute for Marine Environmental Research, Plymouth (England).
A. W. Morris, and A. J. Bale.
Estuarine and Coastal Marine Science, Vol 3, No 2, p 153-164, April 1975. 7 fig, 3 tab, 13 ref.

Descriptors: *Phaeophyta, *Metals, *Copper, *Zinc, *Cadmium, *Manganese, *Primary productivity, Plant physiology, Sampling, Laboratory tests, Path of pollutants, Environmental effects, Absorption, Water pollution effects.
Identifiers: *Fucus vesiculosus, Bioaccumulation, Tissue analysis, Bristol Channel(UK).

Comparison of the cadmium, copper and zinc contents of brown algae, Fucus vesiculosus at various sites in the Bristol Channel, with a detailed investigation of dissolved trace metal concentrations to which they are subjected, demonstrated a passive nature of accumulation. Consistent concentration factors had been obtained over a range of mean ambient dissolved concentrations of these metals. In contrast, manganese accumulation appeared to be partially regulated. (Katz)
W75-11083

**ABSORPTION AND ELIMINATION OF PHOTODIELDRIN BY DAPHNIA AND GOLDFISH,**
Illinois Univ., Chicago. Dept. of Biological Sciences.
H. M. Khan, S. Neudorf, and M. A. Q. Khan.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 5, p 582-587, May 1975. 3 fig, 1 tab, 14 ref.

Descriptors: *Daphnia, Freshwater fish, *Insecticides, Algae, *Dieldrin, *Organic pesticides, *Absorption, Plankton, Analytical techniques, Photometry, Food chains, Path of pollutants, Laboratory tests.
Identifiers: Ankistrodesmus spiralis, *Goldfish, Carassius auratus, Elimination, *Photodieldrin, Decontamination, Bioaccumulation.

The alga, Ankistrodesmus spiralis, became saturated with photodieldrin in 8 hours. Daphnia eliminated 50% of the absorbed photodieldrin in 4 days which increased up to 70% in 7 days. Continuous exposure of daphnids to photodieldrin resulted in increased absorption and accumulation of the insecticide. Transfer of contaminated goldfish, Carassius auratus, to clean water resulted in initial elimination in 24 hours whose rate was subsequently reduced. (Katz)
W75-11085

**UPTAKE OF CADMIUM, ZINC, COPPER, LEAD AND CHROMIUM IN THE PACIFIC**

**OYSTER, CRASSOSTREA GIGAS, GROWN IN THE TAMAR RIVER, TASMANIA,**
Tasmanian Dept. of the Environment, Hobart (Australia).
G. M. Ayling.
Water Research, Vol 8, No 10, p 729-738, October 1974. 4 fig, 7 map, 1 tab, 13 ref.

Descriptors: *Oysters, *Metals, *Cadmium, *Zinc, *Copper, *Lead, *Chromium, *Mud, *Bioassay, Food chains, Animal physiology, Water pollution, Laboratory tests, Path of pollutants, Shellfish farming.
Identifiers: *Pacific oyster, *Crassostrea gigas, *Bioaccumulation, *Tissue analysis, Tamar River(Tasmania).

Pacific oysters (Crassostrea gigas) and mud samples from the Tamar River were analyzed for copper, cadmium, zinc, lead and chromium. Concentrations of cadmium, zinc and copper found in oysters were 10-40 times the concentrations in inhabited muds. Copper and chromium appeared to be absorbed up to a weight limited by oyster size and was independent of metal concentration in the mud. Lead was not absorbed through any physiological demand, but was randomly incorporated at sites containing high concentrations in the mud. Zinc and cadmium were accumulated dependent on their concentrations in the mud. The concentrations of zinc and cadmium in muds may be used to indicate whether a site is grossly unsuited for the culture of oysters. (Katz)
W75-11086

**STUDIES ON THE INORGANIC COMPONENTS OF MARINE ANIMALS-III, ON THE CONTENTS OF CADMIUM, ZINC, COPPER, LEAD AND IRON IN MUSCLE AND VISCERA OF MARINE ANIMALS CAPTURED IN THE WEST SEA AREA OF KYUSHU, (IN JAPANESE),**
Nagasaki Univ. (Japan).
For primary bibliographic entry see Field 5C.
W75-11087

**THE USE OF SNAKES AS A POLLUTION INDICATOR SPECIES,**
Mesa Coll., Grand Junction, Colo. Dept. of Biological Sciences.
B. Bauerle.
Copeia, No 2, p 366-368, 1975. 1 tab, 2 ref.

Descriptors: *Snakes, *Chlorinated hydrocarbon pesticides, *Lead, *Path of pollutants, Animal physiology, DDT, DDE, Dieldrin, Metals, Laboratory tests, Environmental effects, Pollutant identification, *Bioindicators.
Identifiers: *Gopher snakes, Pituophis catenifer, *Prairie rattlesnakes, Crotalus viridis, Bioaccumulation, Tissue analysis, Beta-benzene hexachloride, Heptachlor epoxide.

Male gopher snakes, Pituophis catenifer, and prairie rattlesnakes, Crotalus viridis, were analyzed for 36 herbicides, pesticides, organophosphates, and lead in an ecosystem where these substances have seldom, if ever, been applied. The snakes sampled had low levels of chlorinated hydrocarbons in their adipose tissue and low levels of lead in their livers. The most common chlorinated hydrocarbons found included DDE, DDT, dieldrin, beta-benzene hexachloride and heptachlor epoxide. (Katz)
W75-11089

**A MATHEMATICAL MODEL FOR OPTIMAL WASTE LOAD ALLOCATIONS,**
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 5G.
W75-11102

**THE WATER QUALITY AND BOTTOM SEDIMENT CHARACTERISTICS OF NEW JERSEY LAGOON DEVELOPMENTS,**
Rutgers - the State Univ., New Brunswick, N.J.
E. H. Thurlow.
Available from University Microfilms, Inc., Ann Arbor, Mich, 48106. Order No 75-8450. PhD Thesis, 1974, 360 p.

Descriptors: *Waste disposal, *Lagoons, *Sewage, *Water quality control, *New Jersey, Heavy metals, Sedimentation, Pollutant identification, Water pollution sources.
Identifiers: Bottom sediments.

A three year study of four lagoon developments near Ocean County, New Jersey, was conducted to determine the nature of the water and bottom sediments, and the effects of types of waste disposal systems. It was found that each lagoon development had its own characteristic channel arrangement, amount and type of fresh water input, and inland penetration. Depth was a major factor influencing water quality; depths within and between lagoon systems were variable. Because lagoon areas are usually deeper than the adjacent bay, there was a hindering of water exchange and stagnant conditions are created in the bottom waters. As the shallowest area of the lagoon is usually at the mouth, the deeper remote points tended to be slightly more polluted due to depth, fresh water input, or poor water circulation. NH4(N), NO3(N), NO2(N), PO4, Cl, SO4, and some heavy metals, as well as anaerobic conditions were found accumulated in very deep lagoon areas. Lagoon sediments tended to be high in organic matter, total nitrogen content, CEC, and exchangeable cations, and to be black musks with H2S odors. An increase in population had an adverse effect on both the water quality and bottom sediments through increased addition of pollutants and organic materials from sewage, homes, and boats. Water quality in unsewered lagoons was better than quality of water in sewered lagoons, but bottom sediments of each were similar. (Prague-FIRL)
W75-11104

**ENDEMIC NEPHROPHATHY AND ITS RELATION TO THE CONTAMINATION OF WELL WATER BY PHENOLIC COMPOUNDS IN BARSA-ARAD (NEFROPATIA ENDEMICA SI RELATIA CU IMPURIFICAREA PRIN COMPOUSI FENOLICI IN APELE FINTINILOR DIN COMUNA BARSA-ARAD),**
N. Mustata, and S. Matei.
Clujul Medical, Vol 47, No 3, p 543-547, 1974. 2 tab, 8 ref.

Descriptors: *Public health, *Water supply, *Phenols, *Potable water, Wells, Human pathology, Mortality, Water pollution sources, Water pollution effects, Water wells.
Identifiers: *Endemic nephropathy, *Romania(Barsa-Arad).

Phenolic compounds were found in the water of wells in the commune of Barsa-Arad. Eleven persons died after drinking this water and 9 other persons were ill with endemic nephropathy. The concentrations of phenolics varied between 28 and 203 gamma/liter. The concentration levels were found to be distributed in three rows at the base of the ground level elevation existing in this locality of the bank of the Morilor channel. A similarity was determined to exist between the peculiarities of contamination with phenolic compounds in the Barsa-Arad region and of other zones of endemic nephropathy in the Secaseni (Caras-Severin District) and Strehaia (Mehedinti District) of Romania. (Orr-FIRL)
W75-11105

**LIMITATIONS OF USING A SIMULATION MODEL OF THE SOIL UNDER IRRIGATED CULTIVATION TO SIMULATE THE FUNCTIONING OF THE SOIL AS A PURIFYING SYSTEM (LIMITES D'UTILISATION D'UN MODELE DE COMPORTEMENT DU SOL SOUS CULTURE IRRIGUEE POUR SIMULER LE FONCTIONNMENT DU SOL COMME SYSTEME EPURATEUR),**
Institut National de la Recherche Agronomique, Versailles (France). Soils Lab.
P. Graffin
Annales Agronomiques, Vol 25, No 2/3, p 157-17 1974. 4 fig, 14 ref.

Descriptors: *Model studies, *Simulation analysis, Irrigated land, Land use, Drainage, Soil wate Groundwater, Waste disposal, Waste water trea ment, Water reuse
Identifiers: *Land disposal.

The use of a simulation model of the soil under rigated cultivation was aimed at forecasting t results of organic wastes purification by the s and subsequent environmental effec Researchers in the United States considered su a model, combining the dependent factors water circulation in non-saturating conditio ionic exchanges between the solid phase and liq phase; displacement of soluble elements; transf mation of organic matter in aerobic conditio and water and nitrate absorption by plants. T DUTT model is not applicable for general wa spreading on land or for conditions involv evolution in an anaerobic medium. The model however, useful for land application of wa under classical agricultural practices involv moderate quantities of organic matter. Comp tion of the drainage water as well as any change soil composition, are central variables in gramming this model. (Prague-FIRL)
W75-11125

**DRUG RESISTANT COLIFORMS CALL RE-EVALUATION OF WATER QUAL STANDARDS,**
National Inst. for Water Research, Pretoria (S Africa).
W. O. K. Grabow, O. W. Prozesky, and L. S. Smith.
Water Pollution Control, Vol 74, No 2, p 217 1975. 1 tab, 120 ref.

Descriptors: *Coliforms, *Sewage bac Pathogenic bacteria, *Water quality stand Sewage treatment, Enteric bacteria, Public h E. coli, Water pollution sources.
Identifiers: *Drug resistant bacteria, *R facto

Evidence is presented to support the idea water polluted with coliform and other ba generally considered as non-pathogenic tributes to the incidence of drug resistance a bacteria involved in disease. Resistance to dr imparted by chromosomal resistance and sistance (R) factors. R factors are trachromosomal nucleic acid elements (pla which replicate autonomously. R factors are missible among Gram negative bacteria such terobacteria including E. coli, Salmonella and Shigella dysenteriae. Ingestion of bacter rying R factors (R+ bacteria) can result transfer of these factors to the normal int flora. These organisms then act as a reser resistance which they may transfer to se bacteria involved in disease. The two which are involved in the spread of R+ b are drug resistance which selects for res plasmids and the transmission of these org from excretors to the rest of the pop through sewage. Two percent of the colif sewage and in sewage polluted water can pected to carry R factors (maximum 26 hospital effluent). Current water quality st regard coliforms as purely indicators of fe lution. However, since plasmid infected co have been shown to be joined with bact creasingly involved in disease, they can n be regarded as harmless. This necessitat evaluation of quantitative and qualitativ criteria as well as increasing the list of rea more advanced sewage treatment. (Orr-FI W75-11130

H AFRICAN EUTROPHICATION
LEMS: A PERSPECTIVE,
al Inst. for Water Research, Pretoria (South
.
mary bibliographic entry see Field 5C.
131

LOOK AT POLLUTION PREVENTION
WLAND RIVERS,
Water Authority, London (England).
nary bibliographic entry see Field 5G
132

OF THE OPTIMAL OUTFALL
1 FOR A STREAM RECEIVING THER-
ID ORGANIC WASTE DISCHARGES,
State Univ., Manhattan. Inst. for Systems
nd Optimization.
, L. T. Fan, and C. L. Hwang.
esearch, Vol 9, No 7, p 623-630, July 1975.
ab, 17 ref. OWRT B-037-KAN(2).

ors: *Outlets, *Sewers, *Cooling water,
ewers, Computer models, Model studies,
mperature, Biochemical oxygen demand,
l oxygen, Drainage systems, Streams,
ality, Water cooling, Discharge(Water),
ater, Aeration, Water pollution sources,
llution, Waste assimilative capacity,
ollution, Organic wastes, Temperature,
esign criteria.

synthesis technique was employed for
the 'best' outfall configuration for a
t receives multiple thermal and organic
harges. The optimal locations for the
ater and organic waste discharges, the
llocations of the wastes to these
oints, and the optimal artificial aeration
licies were simultaneously determined.
ter quality constraint on the minimum
tration and the maximum BOD concen-
s imposed in order to ensure that the
ity be maintained above a minimum
rement. The complex pattern search
ng with the modified algorithm of the
principle was used to generate the
formation. A specific example of dou-
system was solved to illustrate the
development. (Sims-ISWS)

POLLUTION FROM NONPOINT

search Inst., Kansas City, Mo.
oy, S. Y. Chiu, J. W. Nebgen, A.
. E. Vandegrift.
rch, Vol 9, No 7, p 675-681, July 1975.

*Water pollution sources,
*Water pollution, *United States,
Mine wastes, Acid mine water, Salini-
netals, Nutrients, Fertilizers, Pesti-
ulture, Mining, Forest management,
, Organic wastes, Water quality.
Non-point pollutant sources.

llutant sources exert a significant in-
water quality in the United States.
d use data, more than 97% of the land
.S. is a potential source of nonpoint
portant pollutants are sediment,
sticides, organic wastes, thermal
id mine drainage, salinity, radioac-
ial pollutants, and heavy metals.
specially cropland, is responsible for
of large quantities of sediment,
pesticides. Because of the produc-
quantities of organic wastes from
ations, these wastes can be potential
r quality degradation, if not handled
iculture is a source of sediment.
nts originating from silvicultural
clude very limited quantities of nutrients, pesticides, and thermal discharges. Surface mining is a major source of erosion sediment. Acid mine drainage, salinity, and heavy metals are other important pollutants from mining. Sediment is a major pollutant from construction industry. (Sims-ISWS)
W75-11158

**DISSOLVED GAS SUPERSATURATION AND DILUTION IN THERMAL PLUMES FROM STEAM ELECTRIC GENERATING STATIONS,**
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
G. F. Lee, and P. H. Martin.
Water Research, Vol 9, No 7, p 643-648, July 1975. 2 tab, 9 ref.

Descriptors: *Supersaturation, *Gases, *Cooling water, *Powerplants, Nitrogen, Oxygen, Waste dilution, Discharge(Water), Thermal powerplants, Nuclear powerplants, Electric powerplants, Fish, On-site investigations, Water pollution, Velocity, Heated water, *Thermal pollution.

The use of natural waters for waste heat dissipation for steam electric generating stations using once-through cooling creates potential problems of dissolved gas supersaturation in the thermal discharge plume for fish that can reside in the plume. Computations were presented which show the amount of dissolved gas supersaturation that would be expected in thermal discharge plumes employing offshore high velocity discharge and onshore low velocity discharge. It was predicted that dissolved gas supersaturation problems would be rare for steam electric generating stations utilizing high velocity offshore discharge for cooling water/heat dissipation because of the rapid dilution that occurs in the discharge plume. However, problems of this type would be expected for low velocity discharges. It was also shown that the rate of dilution from high velocity discharges would tend to minimize the environmental impact of chemicals (such as chlorine) used for condenser fouling control. (Sims-ISWS)
W75-11159

**BEHAVIOR OF MN, FE, CU, ZN, CD AND PB DISCHARGED FROM A WASTEWATER TREATMENT PLANT INTO AN ESTUARINE ENVIRONMENT,**
Maryland Univ., College Park. Dept. of Chemistry.
G. R. Helz, R. J. Huggett, and J. M. Hill.
Water Research, Vol 9, No 7, p 631-636, July 1975. 6 fig, 1 tab, 23 ref. NSF Grant GI-38973.

Descriptors: *Trace elements, *Metals, *Water pollution, *Estuaries, *Maryland, Manganese, Iron, Copper, Zinc, Cadmium, Lead, Heavy metals, Pollutants, Sampling, Chemical analysis, Water pollution sources, Wastes, Sewage effluents, Sediments, Path of pollutants.
Identifiers: *Back River(Md).

To obtain information on the fate of trace metals discharged to an estuarine environment, analyses were made on water and sediment samples from Back River, Maryland, and on effluent from the large wastewater treatment plant that discharges there. Within 2-3 km of the outfall, the concentration (in micrograms/liter) of all metals decreases as follows: Mn, greater than 120-90. Fe, greater than 570-300; Cu, 53-7; Zn, 280-9; Cd, 3.5-0.5 and Pb, 31- less than 4. Except possibly for Mn and Fe, these decreases are much greater than can be ascribed to simple dilution, so physical, chemical or biological processes must be removing metals to the sediments. Correspondingly, sediment concentrations of Cu, Zn, Cd, and Pb are approximately one order of magnitude higher than normally found in uncontaminated areas. After the initial decrease, concentrations of Mn and Cd in the water begin to rise again, suggesting remobilization from the sediments. Comparison of the estimated annual discharge of 8 trace metals to the Chesapeake Bay from wastewater treatment plants and from rivers suggests that the wastewater input may be within one order of magnitude of the fluvial input for Cr, Cu, Zn, Cd, and Pb. Of the metals studied, Cd presents the greatest potential for serious pollution because its input from wastewater probably exceeds fluvial input, it appears to be readily remobilized from sediments, and it is known to be toxic to many organisms. (Sims-ISWS)
W75-11160

**EVIDENCE OF ATMOSPHERIC TRANSPORT OF OZONE INTO URBAN AREAS,**
New York State Dept. of Environmental Conservation, Albany. Div. of Air Resources.
For primary bibliographic entry see Field 5A.
W75-11169

**MUTAGENS AND POTENTIAL MUTAGENS IN THE BIOSPHERE: I. DDT AND ITS METABOLITES, POLYCHLORINATED BIPHENYLS, CHLORODIOXINS, POLYCYCLIC AROMATIC HYDROCARBONS, HALOETHERS,**
National Center for Toxicological Research, Jefferson, Ark.
L. Fishbein.
Sci Total Environ, Vol 2, No 4, p 305-340, 1974. Illus.

Descriptors: *DDT, *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, Distribution, Path of pollutants, Reviews, Toxicity.
Identifiers: Aromatic hydrocarbons, Biosphere, Chlorodioxins, Ethers, Metabolites, *Mutagens, Toxicology

For proper assessment of actual risks, the interactions between different modes of administration of a toxicant must be understood and the probable impingement of the environmental substances upon the various portals of entry must be known. To best understand this last requirement we must know how the toxicants in question are distributed in and are transported through the environment to finally impact on man. In this review, a small number of mutagens and potential mutagens (e.g., DDT and its metabolites, polychlorinated biphenyls, chlorinated dioxins, polycyclic aromatic hydrocarbons and haloethers) are evaluated in terms of their occurrence, use patterns, distributions and impact in the environment. In many cases the information is fragmentary; e.g., patterns of region and local variation of the toxicants have been only superficially investigated and the detailed pathways of residues within the trophic networks are poorly understood. The physiological and ecological effects of the toxicants at sublethal levels are also to a large extent unknown. More information is needed as to the production (nature of reactants, amounts, reactivity, disposal, etc.), import and export data for specific potential environmental toxicants, the nature and routes of their global transport, and the concentration, longevity, biochemical and toxicological activity of their residues (including specific chemical nature) that occur in their various biosphere compartments including air, water, soil, and biota. (See also W75-11171)--Copyright 1974, Biological Abstracts, Inc.
W75-11170

**MUTAGENS AND POTENTIAL MUTAGENS IN THE BIOSPHERE: II. METALS--MERCURY, LEAD, CADMIUM AND TIN,**
National Center for Toxicological Research, Jefferson, Ark.
L. Fishbein.
Sci Total Environ, Vol 2, No 4, p 341-371, 1974.

Descriptors: Metals, Heavy metals, *Mercury, *Lead, Cadmium, Reviews, Toxicity, Distribution, Path of pollutants, Environmental effects.
Identifiers: *Biosphere, *Mutagens, Tin, Toxicology.

Comparative data (wherever available) are presented on the amounts and residues in the environment of a small number of mutagenic and potentially mutagenic metals focussing on Hg, Pb, Cd and Sn (and their principal derivatives). Primary consideration is given to aspects of their production and/or occurrence, reactivity, disposal, concentration, transfer, longevity, biochemical and toxicological nature of their residues in the various biosphere compartments. (See also W75-11170)--Copyright 1974, Biological Abstracts, Inc.
W75-11171

**DISSIPATION OF RESIDUES OF PHENOXY HERBICIDES APPLIED FOR WATER MILFOIL CONTROL IN LARGE RESERVOIRS,**
Tennessee Valley Authority, Muscle Shoals, Ala.
W. W. Barnes.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 37-41, August 1974.

Descriptors: *Monitoring, *Aquatic weed control, *2-4-D, *Bioassay, *Pesticide residues, *Tennessee Valley Authority, Tennessee River, Benthos, Clams, Mussels, Insects, Rates of application, Bottom sediments, Fish, Potable water, Tennessee, Alabama, Reservoirs.
Identifiers: Water milfoil.

Eurasian water milfoil in seven TVA reservoirs from Melton Hill in east Tennessee to Wilson Dam north Alabama was treated with 2,4-D butoxyethanol ester. 2,4-D did not depress benthic insects (especially Hexagenia nymphs), clams, and mussels, but milfoil eradication eliminated substrates for epiphytic insects (immature midges, mayflies, and dragonflies). Forty percent of samples of mud, fish, milfoil, mussels, and Asiatic clams contained less than 0.10 ppm of 2,4-D residues; fish showed little uptake, mussels some, and some mud samples contained significant concentrations for 10 months. Net tests showed that 40-100 pounds 2,4-D per acre caused some movement of fish from treated areas, but there were no distressed or dead native fish. Laboratory tests indicated that complete control of milfoil can be obtained with exposures of 3 ppm 2,4-D for 5 hours, 1 ppm for 48 hours, or 0.1 ppm for about 30 days. A sensitive bioassay technique for measuring 2,4-D residues in reservoirs was developed. Following treatment with granular 2,4-D, 2,4-D residues were initially high at the water surface, then decreased. The rate of decrease depended on the degree of dilution by water movement. Water treatment plants along the Tennessee River system were monitored for 2,4-D residues using carbon filters. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11198

**DISSIPATION OF RESIDUES OF PHENOXY HERBICIDES APPLIED TO THE WATERSHED,**
Oregon State Univ., Corvallis. School of Forestry.
L. E. Norris.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p E5-E12, August 1974. 5 tab, 6 ref.

Descriptors: *Pesticide residues, *Weed control, *Watersheds(Basins), *Vegetation, *Oregon, Herbicides, 2-4-D, 2-4-5-T, Path of pollutants, Leaching, Persistence, Surface runoff, Streams, Forests.
Identifiers: Cascade Creek Watershed(Ore), Eddyville Watershed(Ore), Malheur National Forest(Ore), Terrestrial vegetation.

Spray projects in Oregon illustrate application methods to minimize residues of phenoxy herbicides in streams and runoff. When the Cascade Creek Watershed was sprayed with 2,4,5-T and the Eddyville Watershed and Malheur National Forest were treated with 2,4-D, there was usually a short period of contamination. The magnitude of contamination was not a function of the herbicide or geographical location, but was closely related to the manner in which the treatment area was laid out with respect to live streams. When spray boundaries were close to, but did not include, live streams, downstream herbicide concentrations were low and persisted for only a short time. When there was standing water and a high water table, high concentrations of herbicides were found shortly after application and persisted for long periods of time. Leaching and surface runoff can move chemicals from deposit areas to streams. Surface flow can carry large amounts of chemicals long distances in a short time. This rarely occurs in western forests since the infiltration capacity of the forest floor and soil is much larger than the precipitation. Most pesticide residues enter the soil where absorption prevents their movement. Leaching is slow and moves only small amounts of herbicide short distances. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11213

**DISSIPATION OF PHENOXY HERBICIDES APPLIED TO RIPARIAN VEGETATION,**
Pennsylvania State Univ., University Park. School of Forestry.
W. E. Sopper.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p E13-E16, August 1974.

Descriptors: *Herbicides, *Pesticide residues, *Riparian plants, Banks, Brush control, Spraying, Streams, Watershed management, Watersheds(Basins), *New Jersey, *Pennsylvania, 2-4-D, 2-4-5-T, Vegetation, Potable water, Rates of application.

To determine the extent of streamflow contamination following the spraying of riparian vegetation with phenoxy herbicides, the banks of small headwater streams of the Newark, New Jersey watershed and Stone Valley Experimental Forest in Pennsylvania were sprayed with a 2,4,5-T ester or emulsifiable acid during a low streamflow period (flow less than 0.1 cfs (45 gpm)). During the three weeks after treatment, odor contamination was only observed in the treated reach of the stream immediately after spraying and after the first large storm. No contamination was found downstream. The ester formulation had completely killed 70-81% of the brush stems, and the emulsifiable acid had killed 58-78%. From 17-32% of the remaining stems were partially killed. A subsequent treatment in 3-5 years should eliminate the remaining stems. New streambank vegetation was primarily grasses and herbaceous species which should eventually predominate. Phenoxy herbicides can therefore be used to control riparian vegetation on municipal watersheds if properly applied with normal precautions. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11214

**CHELATION STUDY OF COPPER (II): FULVIC ACID SYSTEM,**
Canada Centre for Inland Waters, Burlington (Ontario).
V. Cheam.
Canadian Journal of Soil Science, Vol 53, No 4, p 377-382, 1973. 2 fig, 1 tab, 29 ref.

Descriptors: Analytical techniques, *Humic acids, *Chelation, *Fulvic acids, *Copper, *Volumetric analysis, Electrodes, Chemical reactions, Organic acids, Ions, Chemical analysis, *Pollutant identification, *Water pollution.

Complexing of humic compounds was studied using an ion-selective electrode. Chelation between copper ion and fulvic acid using a solid state electrode reversible to this ion occurred at the salicyclic acid-like bidentate sites of fulvic acid, which consists of phenolic hydroxyl groups ortho to ionized carboxyl groups. The mass action quotient (equilibrium quotient) varied with pH and mole fractions less than 0.3. The pH 3 curve of copper-fulvic acid chelation leveled off at mole fractions of 0.3-0.7, indicating that the equilibrium constant does not depend on reactant concentrations; this is consistent with the assumption that the chelate is a 1:1 type complex. In this composition range the best mass action quotient value is 2.2. Assuming that the pH 4 and 5 curves behaved similarly in this mole fraction range, the mass action quotients would be about 0.6 and 0.25, respectively. Under these conditions fulvic acid appeared to be a stronger chelating agent than salicyclic acid. Higher complexes may exist when the mole fraction is smaller than 0.3. Under conditions found in natural lake waters, copper is probably strongly bonded to fulvic acid. Other trace elements may act in a similar way toward fulvic acid and humic substances. (Buchanan-Davidson--Wisconsin)
W75-11219

**SEDIMENT PROCESSES IN GREAT LAKES,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W75-11237

**THE UTILIZATION OF SUN-GLINT IN STUDY OF LAKE DYNAMICS,**
Canada Centre for Inland Waters, Burlington(Ontario).
For primary bibliographic entry see Field 5A.
W75-11239

**PRELIMINARY INFORMATION ON THE NATURE OF ORGANIC MATTER IN THE SURFACE SEDIMENTS OF LAKES HURON, ERIE AND ONTARIO,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W75-11240

**CHANGES IN VEGETATION AND SURFACE SOIL PROPERTIES FOLLOWING IRRIGATION OF WOODLANDS WITH MUNICIPAL WASTE WATER,**
Michigan State Univ., East Lansing. Dept. Forestry.
D. P. White, G. Schneider, E. A. Erickson, and Urie.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-798, $4.75 in paper copy, $2.25 in microfic Completion Report, Institute of Water Resear Michigan State University, East Lansing, Au 1975. 76 p, 11 fig, 17 tab, 17 ref. OWRT A-MICH(1), 14-31-0001-3522.

Descriptors: *Water reuse, *Waste water t ment, Soil properties, Irrigation, Munic wastes, Sewage effluents, Soil surfaces, chemistry, *Biodegradation, Nutrients, W quality, *Humus, *Decomposing organic ma *Michigan, Forests, Vegetation, Water poll sources.
Identifiers: Soil water quality, Humus decom tion, Vegetation growth, Red pine forest, M beech hardwood forest.

The impact of municipal wastewater irrigatio soil water quality, Vegetation growth and nu status, soil chemistry, and humus decompo in a 20-year old red pine plantation and m beech hardwood forest in southern Michiga studied. The pine plantation was spray irri

ewage stabilization pond effluent during the
er and early fall of 1972-4. The hardwood
site received 25, 50 and 75 mm/week of
lary sewage effluent and 50 mm/week of
ater through a trickle irrigation system dur-
72-3. Observations and measurements were
on water quality; renovation of percolating
as determined by analysis of samples from
lysimeters; growth and nutrient status of
ion; changes in soil chemistry; changes in
mus and fungi. Recommendations included
ion of irrigation infiltration rates to 3
ur and weekly loadings to 50 mm. Max-
on of vegetative growth should be subor-
to maintaining the ecosystem in a viable
on. Toxicity of effluent pollutants such as
ould be a serious threat to certain types of
on and may limit the use of pine planta-
potential wastewater disposal sites.
243

WASTES, ANIMAL REFUSE, AND OR-
RESIDUES DISPOSAL, AND THE
TY OF GROUND WATER,
e Inst., Ala. School of Applied Sciences.
elson.
e from the National Technical Informa-
vice, Springfield, Va. 22161, as PB-244
25 in paper copy, $2.25 in microfiche.
ion Report, (1975). 66 p, 14 fig, 19 tab, 8
OWRT C-3089(No 3732)(1).

ors: Landfills, *Leachate, *Groundwater,
riteria, Soils, Metals, Trace elements,
Soil types, Water quality, Farm wastes,
stes, Waste disposal, Feed lots, *Path of
s, Water pollution sources.
s: Leachate production, Cover material.

n a field sanitary landfill on a laboratory
andfills, and on an animal feedlot were
d to correlate the design criteria, field
emperature and subsidence patterns of
l wastes, and the vegetative covers with
cal and ground water pollutional charac-
f the leachates generated by the decom-
stes. These data were interpreted in rela-
field densities of the compacted refuse,
ative covers, time, and the eventual
character of leachates after having
rough a prescribed distance of soil in a
. The results indicate that there are no
lationships between precipitation, time,
olume of leachate drained from the
compacted to two levels of compaction.
were generated only after the buried
re saturated which represent a six week
during which 5.56 ft of rain fell on the
5.7 liters of rainfall per the 6 ft x 6 ft x 6
n of each lysimeter, and producing 3.92
f leachate in the 6th week after burial).
tes (pH 6.98 - 11.35) had high concentra-
e chemical constituents initially (at the
solid waste interface) but decreased as
ate was generated, or as the leachate
ven total concentration passed through
is, with the lowering of the pH (down to
licates that the soil removes chemical
rom the permeating leachates.

OXICITY OF PETROCHEMICAL
FLUIDS COMPONENTS AND
O FISH,
and Marine Service, Winnipeg
Resource Management Branch.
bibliographic entry see Field 5C.

R PHOSPHATE IN STREAMS AND

Coll. of Advanced Education

In: Fertilizers and the Environment. Proceedings of a Symposium, Wesley College, University of Sydney, May 13-15, 1974. Australian Institute of Agricultural Science (New South Wales Branch), Sydney, p 103-109, 1974. 1 tab, 26 ref.

Descriptors: *Fertilizers, *Phosphorus compounds, *Water pollution effects, *Path of pollutants, Reviews, Leaching, Phosphates, Agriculture, Water pollution sources, Eutrophication.

Studies of the amount and route of fertilizer phosphorus movement from the point of application into natural waters are reviewed. Generally such studies have shown that the leakage of phosphate from treated areas is low in proportion to the amount applied. However, what is considered low as a loss from the agricultural system may be considered substantial as an input to aquatic ecosystems. (CSIRO)
W75-11310

**NATURAL AND FERTILIZER NITROGEN IN STREAMS AND LAKES,**
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research.
P. Jakobsen.
In: Fertilizers and the Environment. Proceedings of a Symposium Wesley College, University of Sydney, May 13 - 15, 1974. Australian Institute of Agricultural Science, (New South Wales Branch), Sydney, p 53-59, 1974. 47 ref.

Descriptors: *Nitrogen compounds, *Eutrophication, *Fertilizers, *Water pollution effects, *Path of pollutants, Nitrogen cycle, Lakes, Streams, Ecosystems, Reviews.

The major conditions and reactions relevant to the effects of nitrogen in eutrophication are reviewed. These include the major access routes of nitrogen to streams and lakes, accession of ions caused by disruption of ecosystems, characteristics of streams and lakes affecting the occurrence and rate of eutrophication, and the effects of nitrogen loading on aquatic ecosystems as influenced directly by biological and chemical factors and indirectly by environmental constraints. (CSIRO)
W75-11311

**BIODEGRADATION OF COMPONENTS OF PULP WASTE EFFLUENTS BY BACTERIA. (1). DEGRADATION OF KRAFT LIGNIN (IN JAPANESE),**
Nagoya Univ. (Japan). Faculty of Agriculture.
H. Kawakami, M. Sugiura, and T. Kanda.
Japan Tappi, Vol 29, No 6, p 309-315, June, 1975. 5 fig, 13 ref, 8 tab, English summary.

Descriptors: *Lignins, *Biodegradation, *Pulp wastes, Water pollution sources, Industrial wastes, Wastes, Pseudomonas, Aerobic bacteria, Bacteria, Microorganisms, Aquatic bacteria, Water pollution, Incubation, Decomposing organic matter, Organic compounds, Oxidation, Foreign research, Pine trees, Softwood, Hardwood, Molecular structure.
Identifiers: Beech trees(Fagus), Pseudomonas ovalis, Japan.

The degradation of pine and beech kraft lignin in natural water systems by Pseudomonas ovalis was investigated. After 60-day incubation, pine lignin was much more decomposed than beech lignin. The high-molecular-weight portion of the softwood lignin was appreciably affected and showed a marked increase in carbonyl groups, as well as an extreme decrease in vanillin-producing groups. These groups and syringyl groups decreased only slightly in the hardwood lignin while biphenyl, condensed 5-guaiacyl, and syringyl structures increased upon bacterial decay. Although MeO groups decreased with progressive biodegradation, phenolic and catecholic OH groups decreased also in the residual lignin. On permanganate oxidation, the residual lignin showed increases in p-hydroxyphenyl and 4-methoxyisophthalic acid groups. It appears that Ps. ovalis causes demethoxylation, rather than demethylation of kraft lignins. (Brown-IPC)
W75-11346

## 5C. Effects Of Pollution

**EPIFAUNAL INVERTEBRATES AS INDICATORS OF WATER QUALITY IN SOUTHERN LAKE PONTCHARTAIN,**
New Orleans Univ., La. Dept. of Biological Sciences.
M. A. Poirrier, J. S. Rogers, M. A. Mulino, and E. S. Eisenberg.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 533, $4.25 in paper copy, $2.25 in microfiche. Louisiana Water Resources Research Institute, Baton Rouge, Technical Report No 5, May 1975. 43 p, 6 fig, 34 tab, 28 ref. OWRT A-035-LA(1).

Descriptors: Physicochemical properties, Chemical analysis, Bioassay, *Bioindicators, *Invertebrates, *Pollutant identification, Water quality, Estuarine environment, Correlation analysis, Frequency analysis, *Louisiana, Nutrients, Phytoplankton, Primary productivity, Distribution, Eutrophication.
Identifiers: *Lake Pontchartrain(La), *Epifaunal invertebrates.

The distribution and relative abundance of estuarine epifaunal invertebrates can be used to detect water quality differences. Epifaunal invertebrate associations were affected by salinity and storm-water discharge. Differences among both biological and physico-chemical stations were related to discharge of more saline water by the Industrial Canal and quality differences of outfall canal discharge. In 1973 the opening of the Bonnet Carre Spillway added alkaline nutrient-rich, fresh water from the Mississippi River and affected all water quality parameters. Gradual changes occurred as the river water was flushed from the lake. Increased phytoplankton growth resulted from the addition of nutrients. Epifaunal invertebrates were not greatly affected because 26 predominantly estuarine taxa were present 6 weeks after the spillway was closed. Storm-water discharge by outfall canals adds plant nutrients, coliform bacteria and other undesirable substances to the lake. Salinity was lower, but alkalinity, pH and nutrient values were higher due to the spillway opening and heavy rainfall. There was a west-to-east gradient of changing water quality in near-shore stations. Stations near outfall canals in Jefferson Parish had higher nutrient values and lower dissolved oxygen concentration than did similar areas in Orleans Parish. Salinities were higher in Orleans Parish and highest near the Inner Harbor Navigation Canal. Near-shore areas should no be used for recreational activities such as swimming or water skiing because of high concentrations of fecal coliform bacteria.
W75-10852

**SOME LIMNOLOGICAL CHARACTERISTICS OF ARIVACA LAKE IN SOUTHERN ARIZONA,**
Arizona Univ., Tucson.
For primary bibliographic entry see Field 2H.
W75-10891

**OIL POLLUTION AND SEABIRDS IN DENMARK 1935-1968,**
Game Biology Station, Ronde (Denmark).
A. H. Joensen.
Dan Rev Game Biol. Vol 6, No 8, p 1-24, 1972, Illus.

Descriptors: *Oil pollution, *Birds, Swans, Ducks(Wild), Gulls, Water pollution effects.

Identifiers: Alca-torda, Anas-platyrhynchos, Aythya-fuligula, Clangula-hyemalis, *Denmark, Duck, Fulicaaatra, Melanitta-fusca, Melanitta-nigra, Somateria-molissima, Uria-aalge, *Seabirds.

The number of cases of pollution involving birds increased during the period, but the increase is not so great as the increase in amount of oil transported through Danish waters. Cases of oil pollution occur throughout the year, but great numbers of birds die especially in the 2 coldest months, Jan. and Feb. Throughout the period, most Danish waters were regularly affected by cases of widespread bird mortality. Mortality due to oil mainly affected by spp., which in general are found in the sea far from shore: Somateria mollissima, Melanitta nigra, Melanitta fusca, Clangula hyemalis, Alca torda and Uria aalge. Swans were often reported oiled, but total numbers killed are comparatively small. Other species which occur in Denmark in large numbers confined mostly fresh- and brackish water and areas close to the coasts were seldom reported oiled. This is the case for Anas platyrhynchos and other dabbling ducks, Aythya fuligula, Fulica atra and gulls.--Copyright 1974, Biological Abstracts, Inc.
W75-10893

**CONCURRENT NITRIFICATION-DENITRIFICATION AT THE SEDIMENT-WATER INTERFACE AS A MECHANISM FOR NITROGEN LOSSES FROM LAKES,**
Wisconsin Univ., Madison. Dept. of Soil Science.
D. R. Keeney, S. Schmidt, and C. Wilkinson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 503, $3.25 in paper copy, $2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS WRC 75-07, August 1975. 21 p, 4 tab, 37 ref. OWRT A-057-WIS(1). 14-31-0001-4050.

Descriptors: *Nitrification, Ammonia, *Denitrification, Interfaces, *Lake sediments, Water quality, Nitrogen, *Sediment-water interfaces, Lakes, Nitrates, *Aeration, Oxidation-reduction potential, *Nutrient removal, Lakes.
Identifiers: Artificial aeration, *Ammonium-nitrogen.

Conditions at the sediment-water interface can, in theory, have a major impact on the nitrogen balance of the lake system. Unless the bottom waters are completely anoxic, nitrification should proceed just above the sediment. If the nitrate thus formed diffuses into the anaerobic sediment, denitrification can occur. The feasibility of nitrification-denitrification at the sediment-water interface and the effect of cyclic artificial aeration on the rate of these aerations were investigated. The approach used was to aerate a model sediment-water system, then cease aeration and allow the system to go anaerobic. This cycle was repeated several times over a 106-day period. Performance was monitored by determination of inorganic N in the water, Eh of the water, and N distribution in the sediment. Aeration of the systems consistently resulted in a decrease in ammonium-N and an increase in nitrate-N in the water and a corresponding rise in Eh to +300 to +380 mV. When the systems were not aerated, nitrate-N and Eh declined, and ammonium-N increased. The sediment remained anaerobic (-220 mV). Pore water ammonium-N and exchangeable ammonium-N in sediment cores taken after the experiment increased with sediment depth, indicating that ammonium-N was released from the sediment to the overlying water. Mass balance calculations indicated a loss of about one-third of the available N in the system. Thus, it is conceivable that nitrification-denitrification by hypolimnion aeration could remove a portion of the N loading of a lake.
W75 10902

**GEOCHEMICAL RECONAISSANCE OF SURFICIAL MATERIALS IN THE VICINITY OF SHAWANGUNK MOUNTAIN, NEW YORK,**
For primary bibliographic entry see Field 5A.
W75-10928

**A WATERBORNE GASTROENTERITIS EPIDEMIC IN PICO RIVERS, CALIFORNIA,**
Los Angeles County Health Services Dept., Calif. Immunization Project.
For primary bibliographic entry see Field 5F.
W75-11005

**SEASONAL VARIATION IN COMPOSITION, PLANT BIOMASS, AND NET PRIMARY PRODUCTIVITY OF A TROPICAL GRASSLAND AT KURUKSHETRA, INDIA,**
Kurukshetra Univ. (India). Dept. of Botany.
For primary bibliographic entry see Field 2I.
W75-11006

**ROOT:SHOOT AND LEAF AREA RELATIONSHIPS OF MACROPHYTE COMMUNITIES IN CHAUTAUQUA LAKE, NEW YORK,**
State Univ. Coll., Fredonia, N.Y. Dept. of Biology.
S. A. Nicholson, and D. G. Best.
Bull Torrey Bot Club. Vol 101, No 2, p 96-100, 1974.

Descriptors: *New York, *Roots, *Leaves, Growth rates, Lakes, Water pollution effects.
Identifiers: *Chatauqua Lake(NY), *Macrophytes, Potamogeton-richardsonii, Shading, Vallisneria-americana.

Root:shoot, Leaf:shoot, and leaf surface area:weight ratios were consistent in Vallisneria americana and Potamogeton richardsonii from Chautauqua in all except the smallest individuals. Root:shoot ratio increased across the aquatic hydrosere, i.e., from submergent to floating leaf to emergent communities, but leaf area index (LAI) varied little. LAI in most undisturbed native communities ranged between 5-7 sq m/sq m but disturbed communities dominated by the alien Potamogeton crispus had LAI's of 11 sq m/sq m or more. Since these communities are very unstable and characterized by explosive growth, decreased life span, and spontaneous dieoff, and since P. crispus is an introduced species, the high LAI's may be maladjusted to local conditions. A community exhibiting high LAI's soon suffers excessive shading and spontaneous dieoffs.--Copyright 1974, Biological Abstracts, Inc.
W75-11009

**SOME OBSERVATIONS ON BEHAVIOR OF THE TREATED SEWAGE DISPOSED IN THE SEA,**
Nihon Univ., Tokyo (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5B.
W75-11020

**EFFECT OF DDT AND M.S. 222 ON LEARNING A SIMPLE CONDITIONED RESPONSE IN RAINBOW TROUT (SALMO GAIRDNERI),**
Alberta Univ., Edmonton. Dept. of Zoology.
P. G. McNicholl, and W. C. Mackay.
Journal of the Fisheries Research Board of Canada, Vol 32, No 5, p 661-665, May 1975. 1 fig, 2 tab, 33 ref.

Descriptors: *Salmonids, *Rainbow trout, *DDT, *Toxicity, *Mortality, *Fish physiology, *Fish behavior, Laboratory tests, Design, Water pollution effects.
Identifiers: MS222, LD50, Learning rate, Conditioning experiments, Bioaccumulation.

Rainbow trout (Salmo gairdneri) were force fed, with and without M.S. 222 anesthesia, pellets containing DDT equivalent to 0, 10 and 100% of the 96-h LD50 dose of 0.03 mg DDT/g body weight. DDT at the LD50 dose significantly increased learning rate 48 and 72 h after treatment. Although the 10% LD50 group did not learn significantly faster than controls, their slightly improved learning rate indicated a dose-dependent response curve. M.S. 222 did not affect learning rate of a simple conditioned response whether or not the anesthetic was combined with DDT. (Katz)
W75-11025

**TOXAPHENE EFFECTS ON GROWTH AND BONE COMPOSITION OF FATHEAD MINNOWS, PIMEPHALES PROMELAS,**
Fish and Wildlife Service, Columbia, Mo. Fish Pesticide Research Lab.
P. M. Mehrle, and F. L. Mayer, Jr.
Journal of the Fisheries Research Board of Canada, Vol 32, No 5, p 593-598, May 1975. 1 fig, 1 tab, 23 ref.

Descriptors: Marine fish, *Minnows, *Fish physiology, *Bioassay, *Metabolism, *Growth rates, *Toxicity, *Halogenated pesticides, *Chlorinated hydrocarbon, Laboratory tests, Water pollution effects, Insecticides.
Identifiers: *Fathead minnows, Pimephales promelas, Tissue analysis, Bioaccumulation, *Toxaphene, *Organochlorine insecticides.

Fathead minnows *Pimephales promelas) were exposed to toxaphene (55-1230 ng/liter) in a flow through diluter system for 150 days. Growth was not affected by toxaphene for up to 90 days of exposure, but within 150 days it was significantly reduced at all concentrations. Collagen content of the backbone was decreased ($P < 0.05$), amino acid composition was changed, and calcium concentration was increased. Results suggest that toxaphene altered the development and quality of the backbone, and induced biochemical manifestations of the 'broken-back' syndrome. (Katz)
W75-11026

**FACTORS INFLUENCING ACUTE TOXICITY ESTIMATES OF HYDROGEN SULFIDE TO FRESHWATER INVERTEBRATES,**
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
D. M. Oseid, and L. L. Smith, Jr.
Water Research, Vol 8, No 10, p 739-746, October 1974. 2 fig, 14 tab, 11 ref.

Descriptors: *Invertebrates, *Amphipods, *Isopods, *Toxicity, *Hydrogen sulfide, *Bioassay, *Mortality, Aquatic animals, Environmental effects, Water pollution effects, Laboratory tests.
Identifiers: Ephemeroptera, LC50, Survival rate, Sublethal level, Assellus militaris, Crangonyx richmondensis, Gammarus pseudolimnaeus, Baetis vagans, Ephemera simulans, Hexagenia limbata, Bioaccumulation.

Acute bioassay tests of hydrogen sulfide were run on freshwater invertebrates (Assellus militaris, Crangonyx richmondensis, Gammarus pseudolimnaeus, Baetis vagans, Ephemera simulans, and Hexagenis limbata. Size and type of test chamber, type of substrate for burrowing forms or for seeking shelter in gravel, oxygen concentration, pH, and season of collection influenced the sensitivity of organisms. Hydrogen sulfide exposure of sublethal levels reduced feeding activity of Gammarus. 96-h LC50 hydrogen sulfide concentrations ranged from 1.07 mg/l for Assellus to 2.70 mg/l for Baetis. (Katz)
W75-11027

**RELATIONS BETWEEN ALGAL POPULATIONS AND THE PH OF THEIR MEDIA,**
Bor Ilan Univ., Ramat-Gan (Israel). Dept. of Life Sciences.
Z. Dubinsky, and J. Rotem.
Oecologia, Vol 16, No 1, p 53-60, 1974. 5 fig, 1 ref.

tors: *Algae, *Diatoms, *Hydrogen ion tration, *Temperature, Laboratory tests, nmental effects, Aquatic environment, Pri- oductivity, Water pollution effects, Pollu- ntification.
ers: Achnantes minutissima, Synedra radi- nedra ulna, Synedra acus, Cymbella af- omphonema parvulum.

, mixed algal populations (Achnantes sima, Synedra radians, S. ulna, Cymbella and Gomphonema parvulum) grew well in l media of different pH levels between 5 Algal growth caused marked changes in the ie culture media, raising the low pH values ering the high ones. Within 3-4 weeks all reached the pH range of 8.5-11.0, while ontrols retained a much wider range of 4.0- nal pH values and the rate of pH change nperature dependent. (Katz)
028

RY CONTENT OF WHALES, (IN ESE),
ary bibliographic entry see Field 5B.
029

FLUENCE OF THE WARM COOLING FROM A FOSSIL FUELED POWER ON OCEANOGRAPHIC CONDITIONS COMPOSITION OF PLANKTON IN BAY I. WATER TEMPERATURE IN ON TO DISTRIBUTION OF PLANKTON, (IN JAPANESE),
seki Univ. of Fisheries (Japan).
ta, and S. Tawara.
rnal of the Shimonoseki University of s, Vol 23, No 3, p 121-136, 1975. 7 fig, 2 ef.

ors: Effluents, Waste water(Pollution), l pollution, *Thermal powerplants, productivity, *Secondary productivity, n, Copepods, Sampling, Environmental Seasonal, Cooling water, *Water tempera- ater pollution effects, *Cooling water,

rs: Warm cooling water, *Chromonadae, a nauplii, Bacillariophyceae, wase Bay).

ence of warm cooling water from a fossil ower plant on oceanographic conditions kton in Owase Bay was investigated. The on of temperature of the water surface l on the interaction of the warm cooling ie Naka River, and the oceanic water. groups, chromonadae, showed seasonal Copepoda nauplii and Bacil- ceae were less abundant in the area af- the discharged water from the power in the other areas. (Katz)
30

TOXICITY IN BUSYCON CANALICU- L.,
and Univ., Kingston. Graduate School of aphy.
zer, and P. P. Yevich.
ogy Bulletin, Vol 148, No 1, p 16-25, 1975. 6 fig, 2 tab, 13 ref.

rs: *Copper, *Metals, *Gastropods, *Toxicity, *Traces, Animal physiology, mits, Path of pollutants, Bioassay, ry tests, Water pollution effects.
s: 64Cu, *Busycon canalicalatum, Tissue Bioaccumulation, Histology.

ts of high concentrations of copper in upon channeled whelk, Busycon canal- were followed histologically, by deter- of tissue Cu concentrations, and by trac- e with radioactively labelled copper Whelks showed a high resistance to ionic Cu, with a tolerance limit between 200-500 micrograms/liter at normal temperatures for the exposure period of 54-77 days. At lethal concentration, Cu was accumulated at the gill and osphradium. (Katz)
W75-11031

**IMPACT OF THERMAL EFFLUENT FROM STEAM-ELECTRIC STATION ON A MARSHLAND NURSERY AREA DURING THE HOT SEASON,**
Florida Univ. at Marineland, St. Augustine. C.V. Whitney Marine Lab.
W. E. S. Carr, and J. T. Giesel.
Fishery Bulletin, Vol 73, No 1, p 67-80, January 1975. 6 fig, 5 tab, 14 ref.

Descriptors: Effluents, Freshwater fish, *Bioassay, *Water pollution effects, *Thermal powerplants, *Seasonal, *Summer, *Marshes, Temperature, Laboratory tests, Environmental effects, *Thermal pollution.
Identifiers: *Steam-electric plants, Mullet, Silverside, Spot, Atlantic menhaden, Silver perch, Atlantic tread herring, Mugil curema, Mugil cephalus.

Fish were collected during the hot season from three similar marshland creeks situated at various distances from a steam-electric station and analyzed for species composition and for density and biomass per unit area. 48 species were identified. In the thermally affected creeks, both the numbers and biomass of juveniles were 3-10 fold smaller than those obtained from the creek at ambient temperature. (Katz)
W75-11032

**STUDIES ON TOXICITY OF SODIUM NIFURSTYRENATE (NFS-NA) IN CULTURED YELLOWTAIL (IN JAPANESE),**
Nagasaki Univ. (Japan).
T. S. Ishihara, S. Kashiwagi, and M. Yasuda.
Bulletin of the Faculty of Fisheries on Nagasaki University, No 37, p 17-22, August 1974. 5 fig, 4 tab, 10 ref. (English abstract).

Descriptors: *Fish, *Fish physiology, *Fish diseases, *Toxicity, *Organic compounds, Mortality, Aquaculture, Fish farming, Environmental effects, Water pollution effects.
Identifiers: *Yellowtail, *Sodium nifurstyrenate, NFS-Na, Bioaccumulation, Bacterial pseudotuberculosis, Pasteurella piscicida.

Bacterial pseudotuberculosis, caused by pasteurella piscicida was associated with serious mortality of cultured young yellowtail during the summer months in many yellowtail farms. Sodium nifurstyrenate (NFS-Na) was effective against the pathenogenic organism. Determination of long-term toxicity of NFS-Na was sought. (Katz)
W75-11034

**UTILIZATION OF STREAM-BORNE PHOSPHORUS BY CAYUGA LAKE PHYTOPLANKTON,**
New York State Coll. of Agriculture and Life Sciences, Ithaca, N.Y. Ecology and Systematics Section.
J. P. Barlow.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 714, $3.25 in paper copy, $2.25 in microfiche. Research Project Technical Completion Report. Cornell University Water Resources and Marine Sciences Center, August 1975. 7 p, 8 ref. OWRT A-053-NY(1). 14-31-0001-5032.

Descriptors: *Lakes, *Streams, *Phosphorus, *Phytoplankton, Ecosystems, Biota, Bioassay, Tributaries, Management, Runoff, Flow, Measurement, Sampling, Estimating, Surveys, Research, Photosynthesis, Temperature, Mixing, *New York, Eutrophication, Water pollution effects.
Identifiers: *Cayuga Lake(NY), Rainstorms, Transparency, *Salmon Creek(NY).

Studies indicate that in the tributaries to Cayuga Lake, most of the phosphorus discharged is in the particulate form, during periods of high runoff. The effect of stream-borne phosphorus on lake ecosystems on whether it can be utilized by lake biota. For efficient lake management, a better understanding of the availability of phosphorus and its rate of introduction into lakes by streams is needed. Discussed are studies made to determine how much of the phosphorus introduced into Cayuga Lake by streams is available to phytoplankton. Salmon Creek was chosen for the initial studies; it supplies about 10% of the phosphorus input to the lake and is close to shore facilities at Portland Point. All observations were made just after rainstorms. Observed were changes in abundance and rates of photosynthesis of lake communities supplied with phosphorus in various forms. 'Batch' cultures to estimate relative availability of phosphorus in stream water and continuous flow experiments to determine rates of utilization were used. Bioassay techniques are useful for determining potential utilization of allochthonous phosphorus by lake phytoplankton. The difference in composition of stream and lake water offers an excellent opportunity to make quantitative studies of the fate of stream phosphorus in the lake. (Bell-Cornell)
W75-11036

**PRELIMINARY INVESTIGATIONS INTO COPPER CYCLING IN INDIAN LAKE, MASSACHUSETTS: A LAKE TREATED ANNUALLY WITH COPPER SULFATE,**
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W75-11039

**ADAPTATION OF COPEPOD POPULATIONS TO THERMAL STRESS,**
Maryland Univ., Catonsville. Div. of Biological Sciences.
B. P. Bradley.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 706, $3.75 in paper copy, $2.25 in microfiche. Maryland Water Resources Research Center, College Park, Technical Report No 34, (1975). 16 p, 6 tab, 9 ref. OWRT A-027-MD(1). 14-31-0001-5020.

Descriptors: *Copepods, *Thermal stress, *Adaptation, Temperature, *Salinity, *Thermal pollution, Water pollution effects.
Identifiers: *Eurytemora affinis, Acclimation, *Temperature tolerance.

The range of temperatures tolerated by the copepod Eurytemora affinis was found to increase with increasing salinity and with temperature acclimation. Developmental temperature also had a positive influence, as did sex, at least at higher acclimation temperatures. The effects of salinity and acclimation were independent. Female adults were equally or more tolerant than males and pre-adult stages were significantly ($P < .01$) more tolerant than adults. Thus, the range of successful reproduction, and so survival, probably depends on the tolerance range of adults. Considerable individual flexibility, at <1 ppt and without prior acclimation, was demostrated by animals tolerating an increase in temperature from 3C to 33C in less than 2 hours. There was evidence of long-term (genetic) flexibility, which would allow the species to adapt to novel thermal environments.
W75-11046

**SURVIVAL AND GROWTH RATE OF CHANNEL CATFISH AS A FUNCTION OF DISSOLVED-OXYGEN CONCENTRATION,**
Arkansas Univ., Little Rock. Dept. of Electronics and Instrumentation.
R. W. Raible.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 708, $3.75 in paper copy, $2.25 in microfiche. Arkansas Water Resources Research Center, Fayettesville, Publication No 33, June 1975. 35 p, 13 fig, 7 tab, 7 ref. OWRT A-019-ARK(1), 14-31-0001-3804.

Descriptors: *Dissolved oxygen, *Growth rates, *Channel catfish, Fish farming, *Mortality, Fish management, Water pollution effects.

Channel catfish were raised in water-recirculating systems for several periods of about six months duration each. Initial stock was fingerling size fish (10 to 20 grams). At dissolved-oxygen levels below 2.5 parts per million, mortality was high. Fish raised in tanks held at dissolved-oxygen levels between 3.0 and 6.8 parts per million showed increased gains of weight for each increment of added oxygen. Weight gains were as much as 50 percent higher at 6.8 parts per million compared with weights at 3.0 parts per million. Feed conversion was good in all cases. When feeding was limited to demand, feed conversion was about the same at all oxygen levels, indicating that reduced oxygen levels resulted in reduced appetites for those fish at lower oxygen levels. The dissolved-oxygen level should be held as close to saturation as circumstances allow for maximum gain rate.
W75-11051

**BIOCHROME ANALYSIS AS A METHOD FOR ASSESSING PHYTOPLANKTON DYNAMICS, PHASE II,**
Arkansas Univ., Fayetteville. Dept. of Botany and Bacteriology.
R. L. Meyer.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 710, $4.25 in paper copy, $2.25 in microfiche. Arkansas Water Resources Research Center, Fayetteville, Publication No 32, June 1975. 58 p, 12 fig, 8 ref, 2 append. OWRT B-037-ARK(1), 14-31-0001-4060.

Descriptors: *Phytoplankton, Reservoirs, Lakes, *Arkansas, *Algae, *Chlorophyll, Effluents, Eutrophication, Ammonia, Nitrates, Phosphates, Missouri, *Temporal distribution, *Spatial distribution, Primary productivity, Land use, Water temperature, Dissolved oxygen, Silicates, Water pollution effects.
Identifiers: Beaver Lake(Ark), White River, *Biochrome analysis.

Selected chemical, physical and biological parameters were determined for a man-made lake, Beaver Lake, on the White River of Arkansas and Missouri. The research program determined the qualitative and quantitative aspects of the temporal and spatial distribution of the algal subcommunities. The epipelic, epilithic, epizooic and metaphytic subcommunities had little influence on the euplanktonic subcommunity. The relationship between the qualitative and quantitative analysis of the biochromes chlorophyll-a, -b, and -c and the phytoplankton species clustered into biochrome sets is discussed. The temporal and spatial distributional patterns of temperature, oxygen, ammonia-N, nitrate-N, orthophosphate-P and silicates are described in parallel with the biological parameters. These data are related to land use practices on the two major feeder streams. One source is influenced by agricultural runoff and the other by suburbanization plus a sewage outfall from a small city. The effect of the transition from riverine to lentic conditions are also considered. (See also W75-06073)
W75-11052

**PATHOGENIC FREE-LIVING AMOEBAE IN ARKANSAS RECREATIONAL WATERS,**
Arkansas Univ., Fayetteville. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W75-11053

**INFLUENCE OF OIL ON NUCLEIC ACIDS OF ALGAE,**
Institute of Biology of the Southern Seas, Odessa (USSR).
I. A. Davavin, O. G. Mironov, and I. M. Tsimbal.
Marine Pollution Bulletin, Vol 6, No 1, p 13-15, January 1975. 6 tab, 10 ref.

Descriptors: *Algae, *Chlorophyta, *Rhodophyta, Plant physiology, Biochemistry, *Oil pollution, Water pollution effects, Analytical techniques, Laboratory tests, Primary productivity, Oil wastes, Pollutant identification.
Identifiers: Ulva lactuca, Grateloupia dichotoma, Polysiphonia opaca, DNA, RNA, Polymerization, *Nucleic acids, Biosynthesis, Tissue analysis, Bioaccumulation.

Three species of algae, Ulva lactuca, Grateloupia dichotoma, and Polysiphonia opaca were exposed to 0.1, 1.0 and 10 ml/l concentrations of Romashkinskaya oil. DNA separation to determine the degree of polymerization was carried out for labile and stable DNA and total DNA. Quantitative determinations were made of nucleic acids. Oil appeared to inhibit biosynthesis of DNA and RNA and to modify the degree of polymerization of deoxyribonucleic acids. (Katz)
W75-11080

**A REEVALUATION OF THE COMBINED EFFECTS OF TEMPERATURE AND SALINITY ON SURVIVAL AND GROWTH OF BIVALVE LARVAE USING RESPONSE SURFACE TECHNIQUES,**
Oregon State Univ., Corvallis. School of Oceanography
R. G. Lough.
Fishery Bulletin, Vol 73, No 1, p 86-94, January 1975. 9 fig, 3 tab, 9 ref.

Descriptors: *Growth stages, *Mollusks, Aquatic animals, *Temperature, *Salinity, *Larvae, Equations, *Clams, *Oysters, Water quality, Aquaculture, Environmental effects, Water pollution effects.
Identifiers: Bivalves, Tolerance studies, Mercenaria mercenaria, Mulinia lateralis, Survival rates, Sublethal limits.

The combined effects of temperature and salinity on larval survival and growth of Crassostrea virginica, Mercenaria mercenaria and Mulinia lateralis as reported in the literature were critically examined using response surface techniques. The late veliger larvae generally have a greater tolerance to both temperature and salinity than the developing embryos. Each species shows its own characteristic change in temperature-salinity tolerance as it develops and approaches the range normally tolerated by adults as it matures. Maximum growth of the veliger larvae required higher temperatures and somewhat higher salinities than maximum survival. Differences in temperature-salinity ranges estimated for maximum survival and growth were significantly different for all three species. In each case growth showed a significant temperature-salinity interaction. Response surface plots are given for early larvae survival and late veliger survival and growth. Inferences of tolerance studies are made to the fields of pollution and aquaculture. (Katz)
W75-11081

**STANDARD CURVES FOR NUVACRON, MALATHION, SEVIN, DDT, AND KELTHANE TESTED AGAINST THE MOSQUITO CULEX PIPIENS L. AND THE MICROCRUSTACEAN DAPHNIA MAGNA STRAUS,**
Alexandria Univ. (Egypt). Faculty of Agriculture
For primary bibliographic entry see Field 5B.
W75-11082

**THE ACCUMULATION OF CADMIUM, COPPER, MANGANESE AND ZINC BY FUCUS VESICULOSUS IN THE BRISTOL CHANNEL,**
Institute for Marine Environmental Research, Plymouth (England).
For primary bibliographic entry see Field 5B.
W75-11083

**A COMPARISON OF EFFECTS OF ELEVATED TEMPERATURE VERSUS TEMPERATURE FLUCTUATIONS ON REEF CORALS AT KAHE POINT, OAHU,**
Hawaiian Electric Co., Inc., Honolulu. Environmental Dept.
S. J. Coles.
Pacific Science, Vol 29, No 1, p 15-18, January 1975. 2 fig, 2 ref.

Descriptors: *Electric generators, *Temperature, *Thermal pollution, *Coral, Marine animals, Discharge(Water), Water pollution effects, Environmental effects, Mortality, Lethal limit, Monitoring.
Identifiers: *Pocillopora meandrina, Sublethal effects.

Bottom temperature and the condition of live corals in the vicinity of the discharge plume from an electric generating station were monitored. Mortality to Pocillopora meandrina was no greater under conditions of maximum thermal enrichment near the living reef fringe in the discharge area (1-2 m depth) than in an area (4-5m depth) more distant from the discharge. Although bottom temperatures in the discharge area continually varied 3-4 degrees within minute periods during every low tide, live corals seldom encountered temperatures exceeding 31 degrees C. The limited damage indicated that upper absolute temperatures are more critical in producing coral damage than are short-term temperature shocks near upper lethal limits. (Katz)
W75-11084

**ABSORPTION AND ELIMINATION OF PHOTODIELDRIN BY DAPHNIA AND GOLDFISH,**
Illinois Univ., Chicago. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W75-11085

**UPTAKE OF CADMIUM, ZINC, COPPER, LEAD AND CHROMIUM IN THE PACIFIC OYSTER, CRASSOSTREA GIGAS, GROWN IN THE TAMAR RIVER, TASMANIA,**
Tasmanian Dept. of the Environment, Hobart (Australia).
For primary bibliographic entry see Field 5B.
W75-11086

**STUDIES ON THE INORGANIC COMPONENTS OF MARINE ANIMALS-III. ON THE CONTENTS OF CADMIUM, ZINC, COPPER, LEAD AND IRON IN MUSCLE AND VISCERA OF MARINE ANIMALS CAPTURED IN THE WEST SEA AREA OF KYUSHU, (IN JAPANESE),**
Nagasaki Univ. (Japan).
Y. Nozaki, and S. Miyahara.
Bulletin of the Faculty of Fisheries of Nagasaki University, No 38, p 117-120, December 1974. 2 tab, 20 ref.

Descriptors: Aquatic animals, *Metals, Heavy metals, *Copper, *Cadmium, *Zinc, *Lead, *Iron, Animal physiology, Laboratory tests, Path of pollutants, Water pollution effects.
Identifiers: *Bioaccumulation, *Tissue analysis, Muscle, Viscera, *Japan(West Sea Area-Kyushu).

Cadmium, zinc, copper, lead and iron content of muscle and viscera of marine animals from the West Sea area of Kyushu were investigated. Results were as follows: the contents of Cd, Zn,

and Fe in muscle of 31 species were 0.01-
n, 2.23-15.89 ppm, 0.48-7.25 ppm, 0.10-0.96
d 5.08-50.62 ppm, respectively. The con-
Cd, Zn, Cu, Pb and Fe in viscera of 10 spe-
e 0.18-0.39 ppm, 8.12-22.80 ppm, 0.79-4.69
1-1.12 ppm and 23.68-152.37 ppm respec-
Katz)
087

**'S OF SOME COMPONENTS OF OIL ON YOUNG COHO SALMON,**
Univ., College. Dept. of Biological

rrow, R. L. Gritz, and M. P. Kirton.
No 2, p 326-331, 1975. 1 fig, 2 tab, 8 ref.

ors: *Salmonids, *Salmon, *Juvenile
stage, *Organic compounds, *Toxicity,
tes, Fish physiology, Fish behavior, En-
ital effects, Laboratory tests, Water pol-
fects, Pollutant identification.
rs: *Coho salmon, Oncorhynchus kisutch,
nulation, Tissue analysis, Blood analysis.

il components tested for toxicity to young
mon, Oncorhynchus kisutch, aliphatic
ds produced no significant mortalities.
clic aromatics were generally toxic; the
toxicity increasing with the degree of un-
n. It was suggested that the toxicity of
stances resulted through alteration of cell
e permeability, especially in the gills.
lted in a rapid increase in the concentra-
onovalent ions in blood and probably in-
vith CO2-HCO3 regulation. The behavior
eated with the various pure substances
ccelerated and exaggerated version of the
under crude oil. (Katz)
8

**FECTS OF CRUDE OILS AND THE ANT COREXIT 8666 ON SEA URCHIN ES AND EMBRYOS,**
Univ. (Norway). Inst. of Biology and

g, and B. E. Hagstrom.
n Journal of Zoology, Vol 23, No 2, p
April 1975. 9 fig, 2 tab, 14 ref.

rs: Marine animals, *Growth stages,
ic growth stage, *Toxicity, Animal
y, Microscopy, Oil wastes, Environmen-
, Laboratory tests, Water pollution ef-

: *Sea urchins, Psammechinus miliaris,
inus lividus, *Corexit 8666, *Gametes,
nesis, Fertilization, *Oil dispersants,
ulation.

tes and embryos of sea urchins, Psam-
miliaris and P. lividus, were used to
the effects inflicted by Kuwait and
ude oil and/or the oil dispersant Corexit
nost experiments the substances were
roughout the development, but also
treatments were carried out. The test
had a moderate effect on fertilization
development, whereas harmful in-
were observed during the further dif-
n of the embryo. The ultramicrographs
licate any morphological changes in the
after oil treatment. Corexit 8666
out an increase and an aggregation of oil
ithin the cells. (Katz)

**CTS OF OIL DISPERSANTS ON THE FERTILIZATION AND DEVELOP-**
niv. (Norway). Inst. of Biology and

, and B. E. Hagstrom.
Journal of Zoology, Vol 32, No 2, p
ril 1975. 2 tab, 10 ref.

Descriptors: *Marine fish, *Marine Animals, *Animal physiology, *Fish physiology, *Embryonic growth stage, *Fish eggs, Oil wastes, Environmental effects, Water pollution effects, Laboratory tests, Microscopy, Mortality.
Identifiers: *Sea urchins, *Oil dispersants, Strongylocentrotus draebachiensis, Strongylocentrotus pallidus, Gradus morrhua, Pleuronectes platessa, *Fertilization, *Gametes, Embryogenesis, Bioaccumulation.

The effects of oil dispersants were tested on larvae from sea urchins (Strongylocentrotus droebachiensis and S. pallidus) and marine fishes (Gadus morrhua and Pleuronectes platessa). The substances used were: BP1100, BP1100X, Corexit 8666, Corexit 7664, Dasic slickgone LT 2, Emulsol/Isopar M, Emulsol with Shellsol, Finasol OSR-2, and Superb Universal Cleaner. All substances affected the fertilization of the sea urchins negatively, and during development inhibition of skeleton and endoderm was often registered. Both in larvae from sea urchins and fishes some substances caused pathological larvae and rapid cytolysis. (Katz)
W75-11091

**ENDEMIC NEPHROPHATHY AND ITS RELATION TO THE CONTAMINATION OF WELL WATER BY PHENOLIC COMPOUNDS IN BARSA-ARAD (NEFROPATIA ENDEMICA SI RELATIA CU IMPURIFICAREA PRIN COMPOUSI FENOLICI IN APELE FINTINILOR DIN COMUNA BARSA-ARAD),**
For primary bibliographic entry see Field 5B.
W75-11105

**SOUTH AFRICAN EUTROPHICATION PROBLEMS: A PERSPECTIVE,**
National Inst. for Water Research, Pretoria (South Africa).
D. F. Toerien.
Water Pollution Contol, Vol 74, No 2, p 134-142, 1975. 2 fig, 7 tab.

Descriptors: *Eutrophication, Water pollution sources, Nutrient removal, Municipal wastes, Phosphorus, Aquatic algae, Oligotrophy, Nutrients, Industrial wastes, Africa, Impoundments.
Identifiers: *South Africa.

The problem of eutrophication in South Africa is discussed in terms of the nature and prevention of the problem, the restoration of eutrophic impoundments, present and future levels of eutrophication in South African waters, and a comparison of two South African impoundments. The following conclusions were made: eutrophication is a danger to the water quality of South African impoundments; the extent of this danger must be determined; most impoundments in South Africa are still oligotrophic; the eutrophic impoundments are those which receive effluents from urban-industrial complexes; phosphorus is presently the most important algal growth-limiting nutrient; oligotrophic conditions were found to exist below 30 microg-P/liter and eutrophic conditions above 75 microg-P/liter; the range of eutrophication problems already experienced include problems in water treatment, aesthetics, recreation, water weeds, livestock losses, tastes, and odors; the population and per capita were consumption increases expected will lead to more effluents reaching impoundments and to more eutrophication problems unless corrective measures are taken; eutrophication problems have a complex nature and their control is intimately associated with nutrient addition and economics; prevention of eutrophication problems can only be effected through the prevention of enrichment; successful prevention requires detailed knowledge of the specific impoundments under consideration; and, decisions to restore eutrophic lakes depend on many factors such as the uses of the water and the financial implication of restoration techniques. (Orr-FIRL)
W75-11131

**TENSIDS (SYNDETS) AND THE WATER POLLUTION PROBLEM, (GESUND-HEITLICHE ASPEKTE DES TENSID-GEBRAUCHS),**
Bundesgesundheitsamt, Berlin (West Germany). Institut fuer Wasser-, Bodenund Lafthygiene.
For primary bibliographic entry see Field 5D.
W75-11134

**BIOMAGNIFICATION OF DIELDRIN RESIDUES BY FOOD CHAIN TRANSFER FROM CLAMS TO BLUE CRABS UNDER CONTROLLLED CONDITIONS,**
Texas A and M Univ., College Station. Dept. of Biochemistry and Biophysics.
S. R. Petrocelli, J. W. Anderson, and A. R. Hanks.
Bulletin of Environmental Contamination and Toxicology. Vol 13, No 1, p 108-116, January 1975. 1 fig, 3 tab, 27 ref.

Descriptors: *Mollusks, *Clams, Crustaceans, *Crabs, *Dieldrin, *Chlorinated hydrocarbon, Pesticides, *Food chains, *Bioassay, Design, Estuaries, Laboratory tests, Environmental effects, Pesticide residues, Water pollution effects.
Identifiers: Rangia, Callinectes, *Blue crab, Biomagnification, Bioaccumulation, Tissue analysis.

The possibility of biological magnification of dieldrin residues in a two-part food chain consisting of clams, Rangia, and blue crabs, Callinectes, was tested. Clams with dieldrin concentrations of 193 and 181 micro-g/kg were fed to the crabs. Crabs incorporated 47%-78% of the dieldrin and concentrated dieldrin residues to 4.7 and 6.8 times the daily dose after 10 days of feeding. Implications of the magnification of organochlorine insecticide residues were discussed. (Katz)
W75-11135

**SOME EFFECTS OF COPPER ON THE POLYCHAETE PHYLLODOCE MACULATA,**
Stirling Univ. (Scotland). Dept. of Biology.
D. S. McLusky, and C. N. K. Phillips.
Estuarine and Coastal Marine Science, Vol 3, No 1, p 103-108, February 1975. 1 fig, 1 tab, 7 ref.

Descriptors: *Worms, Aquatic animals, *Metals, *Copper, *Bioassay, *Toxicity, *Lethal limit, Physiology, Laboratory tests, Water Pollution effects.
Identifiers: *Polychaetes, *Phyllodoce maculata, Bioaccumulation, Tissue analysis, LC-50, LT-50, Sublethal concentrations.

The lethal concentration of copper (0.08-1.00 part/million) and the accumulation of copper various uptake concentrations for the polyc Phyllodoce maculata were determined. The uptake may be the lethal factor, rathe amount of copper accumulated. (Katz)
W75-11136

**THE EFFECTS OF EX... BLACKFLY (DIPTERA: SIMU... VICIDING WITH ABATE, DURSBAN AND METHOXYCHLOR ON STREAM INVERTEBRATES,**
Waterloo Univ. (Ontario). Dept. of Biology.
R. R. Wallace, A. S. West, A. E. R. Downe, and H. B. N. Hynes.
Can Entomol, Vol 105, No 6, p 817-831, 1973. Illus.

Descriptors: *Diptera, Invertebrates, Water pollution effects, *Larvicides, Aquatic insects, Ecology, *Insecticides, Aquatic drift, Sampling.
Identifiers: *Abate, *Blackfly, *Dursban, *Methoxychlor, Simuliidae.

The effects of Abate, Dursban, and Methoxychlor and their diluents on blackfly larvae and on 'non-

target' stream invertebrates were evaluated by means of cone, rock, Surber, and drift samples. Blackfly larvae were found in many post-treatment Surber samples, although concurrent cone and rock samples often indicated that blackfly larvae were either greatly reduced in numbers or eradicated from the streams. The insecticide diluents (heavy aromatic naphtha and fuel oil) caused detachment of blackfly larvae from cones, but less than that obtained when insecticide was added. The heavy post-treatment drift of 'non-target' invertebrates in treated streams was indicative of a considerable disturbance to the aquatic invertebrate community. However, post-treatment samples indicated that the 'non-target' organisms studied were not eradicated from the streams. There were several indications that the catch of invertebrate drift was altered by pools, which possibly exerted a delaying action on drifters in the treated streams. Most of the drifting invertebrates found in post-treatment drift nets were dead.--Copyright 1974, Biological Abstracts, Inc.
W75-11157

**WATER POLLUTION FROM NONPOINT SOURCES,**
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5B.
W75-11158

**DISSOLVED GAS SUPERSATURATION AND DILUTION IN THERMAL PLUMES FROM STEAM ELECTRIC GENERATING STATIONS,**
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5B.
W75-11159

**CONCENTRATION AND GENERA OF ALGAE IN SELECTED ILLINOIS STREAMS, 1971-1973,**
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W75-11165

**MUTAGENS AND POTENTIAL MUTAGENS IN THE BIOSPHERE: I. DDT AND ITS METABOLITES, POLYCHLORINATED BIPHENYLS, CHLORODIOXINS, POLYCYCLIC AROMATIC HYDROCARBONS, HALOETHERS,**
National Center for Toxicological Research, Jefferson, Ark.
For primary bibliographic entry see Field 5B.
W75-11170

**MUTAGENS AND POTENTIAL MUTAGENS IN THE BIOSPHERE: II. METALS--MERCURY, LEAD, CADMIUM AND TIN,**
National Center for Toxicological Research, Jefferson, Ark.
For primary bibliographic entry see Field 5B.
W75-11171

**AMMONIA EXCRETION BY ZOOPLANKTON AND ITS SIGNIFICANCE TO PRIMARY PRODUCTIVITY DURING SUMMER,**
Washington Univ., Seattle. Dept. of Oceanography.
M. Jawed.
Available from the National Technical Information Service, Springfield, Va 22161 as RLO-2225-T26-12, $4.00 in paper copy, $2.25 in microfiche. Report RLO-2225-T26-12, (1973). 26 p, 2 fig, 2 tab, 23 ref. NR 083 012. AEC AT(45-1)2225, NO0014-67-A-0103-0014.

Descriptors: *Marine microorganisms, *Zooplankton, *Pacific Ocean, *Ammonia, *Nitrogen, Primary productivity, Shallow water, Plankton, Jelly fish, Columbia River, Nitrates, Oceans, *Washington, *Oregon, Coasts, Upwelling, Entrainment.
Identifiers: *Ammonia excretion, Nutrient sources.

To understand biological processes in relation to environmental factors, ammonia excretion by zooplankton was studied off the coasts of Washington and Oregon. Ammonia excretion rates off these coasts varied from 0.16-0.60 micrograms of ammonia nitrogen per mg dry weight/day for planktonic animals and 0.02 to 0.06 for jellyfish. The effect of size of the various species was not observed. Seawater ammonia concentration was low in offshore regions. In the Columbia River plume offshore, excreted ammonia accounted for about 90% of the total nitrogen requirements for observed primary productivity in the summer. Ammonia excreted by zooplankton in the upper oceanic waters contributed about 36% of the total nitrogen requirements of primary production. In inshore waters, nitrogenous excretion by zooplankton was relatively unimportant. Replenishment of nitrogenous sources in surface layers of inshore waters was greatly enhanced by river-induced entrainment and wind-induced upwelling of deeper water. (Buchanan-Davidson--Wisconsin)
W75-11187

**DISSOLVED ORGANIC MATTER AND LAKE METABOLISM,**
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
R. G. Wetzel.
Available from the National Technical Information Service, Springfield, Va 22161 as COO 1599-79, $4.00 in paper copy, $2.25 in microfiche. Technical Progress Report COO-1599-79, April 1973-March 1974. 31 p, 1 fig, 2 tab, 29 ref. AEC AT(11-1)1599.

Descriptors: *Dissolved solids, *Organic matter, *Lakes, *Metabolism, *Michigan, *Eutrophication, Cycling nutrients, Organic compounds, Nutrient requirements, Chemical analysis, Phytoplankton, Sessile algae, Nitrogen cycle, Carbon cycle, Inorganic compounds, Bacteria, Chelation, Growth rates, Sediments, Littoral, Photosynthesis, Productivity, Decomposing organic matter, Inflow, Deep water, Detritus, Trophic level.
Identifiers: *Lawrence Lake(Mich).

This annual report describes investigations on qualitative and quantitative cycling of particulate and dissolved organic matter in lakes. Interactions of dissolved organic matter with inorganic nutrient cycling and regulation of the metabolism of micro- and macroflora were studied. Sources, fates, pathways, and interactions of dissolved organic matter in inorganic chemical cycling, allochthonous sources, metabolism, and inputs to lake systems of increasing stages of eutrophication as related to nutrient physiology and metabolism of phytoplankton, sessile algae, macrophytes, and bacteria were studied. Regulatory mechanisms of growth and rates of carbon recycling were evaluated by studying quantitative control mechanisms among microflora of pelagial zones of lakes of progressively greater eutrophy, littoral photosynthetic producer-decomposer complex, and allochthonous inorganic-organic influxes and their biotic processing. Quantification of the dynamic carbon fluxes among these components and their rate control mechanisms was fundamental to the elucidation of the rate functions of lake eutrophication. A functional detrital carbon budget was evaluated for an oligotrophic lake (Lawrence Lake, Michigan) and is being extended to more productive lakes. The fate and mechanisms regulating the qualitative and quantitative utilization and losses of organic carbon are being studied. (Buchanan-Davidson--Wisconsin)
W75-11188

**INVESTIGATION OF THE INFLUENCE OF THERMAL DISCHARGE FROM A LARGE ELECTRIC POWER STATION ON THE TEMPERATURE AND NEAR-SHORE CIRCULATION OF LAKE MICHIGAN,**
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
C. H. Mortimer, and G. K. Sato.
Available from the National Technical Information Service, Springfield, Va 22161 as COO 2158-9, $4.00 in paper copy, $2.25 in microfiche. Progress Report COO-2158-9, July 1973-September 1973. 4 p, 1 fig, AEC AT(11-1)2158.

Descriptors: *Lake Michigan, *On-site data collections, Technology, *Thermal pollution, Water circulation, Electric powerplants, *Wisconsin, Heated water, Water temperature, Wind velocity, Anemometers, Currents(Water), Current meters, Histograms.
Identifiers: *Oak Creek Power Plant(Wis).

This quarterly progress report on nearshore circulation of Lake Michigan near the Oak Creek Power Plant, Oak Creek, Wisconsin presents information on data obtained from current meters and wind data obtained from anemometers at the Milwaukee Airport and at the power plant. The data is being processed, analyzed, and compared with previous data. Progressive vector diagrams will be made to provide information on the characteristics of nearshore circulation. Instead of developing histograms of current direction and speed, a computer program will be developed to compute vector frequency plots. These plots will combine speed and direction frequencies into one diagram and indicate dominant speeds and directions. Difficulties concerning the premature release of current meters and their defective recording are being investigated. (Buchanan-Davidson--Wisconsin)
W75-11190

**THE ROLE OF PLANKTONIC PROTOZOA IN THE MARINE FOOD CHAIN. SEASONAL CHANGES, RELATIVE ABUNDANCE, AND CELL SIZE DISTRIBUTION OF TINTINNIDA,**
New York Aquarium, Brooklyn. Osborn Labs. of Marine Sciences.
K. Gold.
Available from the National Technical Information Service, Springfield, Va 22161 as COO-3390-7, $4.00 in paper copy, $2.25 in microfiche. Progress Report COO-3390-7, May 1972-April 1973. 21 p, 17 fig. AEC AT(11-1)3390.

Descriptors: *Biological communities, *Marine microorganisms, *Protozoa, *Systematics, Dimensions, Sea water, Neritic, Cultures, Invertebrates, Surf, Measurement, Coasts, Diet, Growth rates, Seasonal, Water temperature, *New York.
Identifiers: *Tintinnida, Codonella acuta, Stenosemella oliva, Tintinnopsis beroidea, Tintinnopsis tubulosa, Coney Island(NY), Eurythermic organisms.

Tintinnida species identified in the winter-spring plankton community collected beyond the surf zone near Brooklyn, New York, were Codonella acuta, Stenosemella oliva, Tintinnopsis beroidea, and T. tubulosa, in order of relative abundance. Plots of species lorica length and width showed variability in species size. In February the Codonella population increased and in April the dimensions were more variable. The width dimension was a better guide to speciation than length: length:width ratio. Length was an excellent guide to cell growth and division. During winter T. tubulosa was actively growing with both juvenile and older forms but in April no juvenile forms were present. Time of exposure to elevated temperature had little effect on size distribution of T. tubulosa. Casting off empty loricas was independent of temperature and cell age. When T. beroidea and T. tubulosa were grown in culture, growth was proportional to amount of phytoflagellate food and was affected by diatom flora present; neither biotic or predatory effects were observed between the species. Food requirements increased at

C cell yield declined; T. tubulosa could not
and the grazing pressure of Strobilidium.
nan-Davidson--Wisconsin)
1191

X STUDIES ON THE WHITE AMUR,
of Sport Fisheries and Wildlife, Stuttgart,
sh Farming Experiment Station.
anley.
ceedings, Research Planning Conference
grated Systems of Aquatic Plant Control,
r 29-30, 1973, Army Engineer Waterways
nent Station, Vicksburg, Mississippi, p 89-
gust 1974. 5 fig.

tors: *Aquatic weed control, *Fish steri-
Fish, *Fish reproduction, Fish stocking,
iets, Cycling nutrients, Energy budget,
Nitrogen, Phosphorus, Oxygen require-
Biomass, Number fish per acre, Carp,
ia, *Arkansas.
ers: *White amur, *Unisex fish,
enesis, Elodea, Goldfish, Hybrid fish.

formance of white amur without danger of
ction and permanent establishment, artifi-
ogenesis, requiring contact of spermatozoa
um without fusion, was studied using white
x-irradiated milt on eggs, followed by cold
but yields were small. Hybridization
n goldfish-amur and common carp-amur
d successful crosses, with carp-amur
better survival; aquatic vegetation was
imary food. Amur excreted more nitrogen
s present in the elodea they consumed, but
f the phosphorus was excreted. Amur
l vegetation inefficiently but converted as-
d food into fish biomass well, due to low
ic rates. They stopped feeding at approxi-
2.5 ppm oxygen. In Georgia stocking ap-
tely 100 pounds amur/acre was ineffective
olling elodea, thus higher stocking rates
e required where winter plant die-offs do
ur. At the Fish Farming Development
Kelso, Arkansas 55 or more fin-
/acre amur controlled Pithophora, Najas,
kweed. The native fish yield was ten times
n ponds with 55-96 amur fingerlings/acre;
nur decreased fish yields and depleted
on. Amur did not eat the same food as
catfish, largemouth bass, bluegill, or
unfish, but competed with buffalo and
ee also W75-08289) (Buchanan-Davidson--
in)
05

IDE CHEMICALS AND THEIR EF-
N THE AQUATIC ENVIRONMENT,
of Sport Fisheries and Wildlife, Washing-
. Div. of Fishery Research.
lker.
eedings, Research Planning Conference
rated Systems of Aquatic Plant Control,
29-30, 1973, Army Engineer Waterways
ent Station, Vicksburg, Mississippi, p C3-
gust 1974. 72 ref.

ors: *Toxicity, *Herbicides, *Aquatic
trol, *Aquatic environment, 2-4-D, Pesti-
sidues, Pesticide toxicity, Pesticide
Pesticides, Persistence, Insecticides,
rinated biphenyls, Chlorinated hydrocar-
icides, Catfishes, Carbamate pesticides,
Minnows, Sunfishes, Fish, Channel cat-
s, Fish control agents, Antimycin A,
nsects, Food chains, Water pollution ef-

relationship exists between the chemical
of water and the flora and fauna it sup-
iocide effects on aquatic environment
studied and safety and environmental
onsidered in pesticide selection. No re-
aquatic herbicide meets criteria for all
as been labeled with residue to tolerance
water, fish, or shellfish. The fate of herbi-
cide residues and effects on fish, fish-food organisms, and other aquatic organisms must be ascertained. Residue toxicities of different 2,4-D esters on various fish differ. The butoxyethanol ester of 2,4-dichlorophenoxyacetic acid (2,4-D BEE) was only present in fish livers; other organs contained 2,4-D acid. Excretion occurred via the kidneys and gills. High tissue 2,4-D BEE residues tranquilized fish. Hydrolysis of 2,4-D BEE in water was rapidly accelerated by the presence of fish. Basic research on the effects of weed control methods on plant nutrients and energy in aquatic ecosystems and selective use of biocides to maximize fish yields is needed. Effects of fish toxicants, insecticides, and herbicides have been studied. Pesticides must be adequately labeled, screened, and evaluated. Cost-benefit aspects of pesticide use must include analysis of energy flow limiting factors and biomass produced at each trophic level with respect to the species managed. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11211

**PRIMARY PRODUCTION IN LAKES ONTARIO AND ERIE: A COMPARATIVE STUDY,**
Canada Centre for Inland Waters, Burlington (Ontario).
W. A. Glooschenko, J. E. Moore, M. Munawar, and R. A. Vollenweider.
Journal of the Fisheries Research Board of Canada, Vol 31, No 3, p 253-263, 1974. 10 fig, 2 tab, 19 ref.

Descriptors: *Lake Ontario, *Lake Erie, *Great Lakes, *Primary productivity, Photosynthesis, Measurement, Ecological distribution, Spatial distribution, Temporal distribution, Carbon, Trophic level, Eutrophication, Seasonal, Annual succession, Fluctuations, Chlorophyll.

A study of temporal and spatial variations in primary production in Lakes Erie and Ontario is described. Surface and integral measurements using C14 were used to compare productivity in terms of trophic status. Lake Ontario primary production was low in winter, reached a maximum in midspring, declined in summer, and increased in fall. Inshore water production rate increased more in spring and early summer, with a greater maximum reached earlier than in offshore waters. Assimilation numbers (mg C fixed/mg chlorophyll-a per hour) had a yearly range of 1.2-1.6. Primary production in both lakes showed a linear relationship to chlorophyll-a. Lake Erie primary production varied; the Eastern Basin production was highest in spring, declined in midsummer, and increased slightly in fall; the Western Basin had a midsummer maximum; and the Central Basin had peaks in late summer and early fall. Assimilation numbers showed a westerly increase. Surface production was equal in both lakes until early summer and in November-December, but integral photosynthesis was higher in Lake Ontario. Lake Erie summer production was higher. From April-December the total estimated yield for Lake Ontario was 170 g C/sq m and for the Lake Erie basins, 160, 210, and 310 g C/sq m. (Buchanan-Davidson--Wisconsin)
W75-11217

**MICROBIOLOGICAL EXAMINATION OF OFFSHORE LAKE ERIE SEDIMENTS,**
Canada Centre for Inland Waters, Burlington (Ontario).
B. J. Dutka, J. B. Bell, and D. L. S. Liu.
Journal of the Fisheries Research Board of Canada, Vol 31, No 3, p 299-308, 1974. 5 fig, 2 tab, 30 ref.

Descriptors: *Microorganisms, *Lake Erie, *Lake sediments, Cores, Bacteria, Oxygen demand, Great Lakes, Distribution patterns, Oxidation-reduction potential, Microbiology.

Bacterial distribution and density were studied in sediment cores of the Central and Western Basins of Lake Erie. Eh values indicated cores were devoid of oxygen and oxygen uptake rates differed between the Central and Western Basin sediments. The biological oxygen demand in surface sediments was 75% and in the lower sediments, 11-45%. Heterotrophic bacteria concentrations were proportional to available organic matter and reflected the number of heterotrophs surviving by facultative mechanisms in a deoxygenated environment. Sulfate reducing bacteria were constant through the core. Large organic sulfur reducing populations indicated an organic matter supply. Sulfur oxidizing bacteria were high in the top three cm. Densities of nitrogen cycle bacteria at sediment-water interfaces were similar at both basins but ammonifying and denitrifying bacteria in lower core layers varied. Nitrifying bacteria were found throughout the cores. Phosphate solubilizing bacteria were high in the top 5-6 cm and decreased below 10 cm. Iron and manganese oxidizing bacteria were low in deeper sediments. Overlying waters contained fewer bacteria than those in surface sediments. Offshore sediments not directly influenced by land inputs contained similar homogeneously distributed bacterial populations which varied little between surface sediment and the 5 cm level. (Buchanan-Davidson--Wisconsin)
W75-11218

**ALGAE IN BALTIMORE'S RESERVOIRS,**
Baltimore City Dept. of Public Works, Md. Water Supply Treatment and Pumping Div.
J. A. Valcik.
Journal of the American Water Works Association, Vol 67, No 3, p 109-113, 1975. 2 fig, 12 ref.

Descriptors: *Water treatment, *Algae, *Reservoirs, *Nuisance algae, *Maryland, Agricultural runoff, Chlorides, Nitrates, Runoff, Hydrogen ion concentration, Water pollution sources, Industrial wastes, Odor, Water costs, Municipal wastes, Potable water, Chlorella, Color, Land use, State jurisdiction, Legislation, Diatoms, Chlorophyta, Cyanophyta, Eutrophication.
Identifiers: *Baltimore(Md), Loch Raven Reservoir(Md), Prettyboy Reservoir(Md).

Reservoirs supplying water for Baltimore, Maryland experience problems related to seasonal occurrences of nuisance algae. Surveys in 1970-1971 showed that most of the pollution then was the result of poor agricultural practices; industrial and domestic waste water effluents were secondary nutrient sources. Water in the Montebello Filter Plant gradually deteriorated, and in 1974 a serious algal problem was observed in raw water entering the plant. Chlorella predominated, followed by Oocystis, and a greenish-yellow color was present in sedimentation basin effluents. A green algal bloom occurred in the Loch Raven Reservoir. Seasonal application of an algicide, reservoir aeration, use of a coagulant, and activated carbon were considered as treatment measures. Algal blooms were observed in the Liberty Reservoir in the 1960's, and diatoms caused reductions in the filter-run times of the Ashburton Filter Plant in 1967-1968. Similar problems are expected to increase in the future. Correctional treatment is costly. State and local agencies must cooperate to limit discharges of nutrient wastes into watersheds by legislative control of land usage and land management practices to limit discharges of nutrient wastes into the watersheds. (Buchanan-Davidson--Wisconsin)
W75-11221

**APPLICATION OF THE MANOMETRIC TECHNIQUE IN THE STUDY OF SEDIMENT OXYGEN DEPLETION,**
Canada Centre for Inland Waters, Burlington (Ontario).
D. Liu.
Canadian Research and Development, Vol 6, No 2, p 35-37, 1973. 6 fig, 1 tab, 10 ref.

Descriptors: *Analytical techniques, *Manometers, *Bottom sediments, *Oxygen sag, *Oxygen demand, Hypolimnion, Measurement, Anaerobic conditions, Biochemical oxygen demand, Chemical oxygen demand, Carbohydrates, *Lake sediments, Lake Erie, Lake Ontario.

The results of the manometric technique used in oxygen budget research are described. In addition to showing the rate and extent of oxygen consumption, the effects of other environmental conditions, such as temperature, pH, etc., may also be ascertained. This technique was used to study Lakes Erie and Ontario sediments with regard to the profile of oxygen consumption in the sediment column, the differential of the biological oxygen consumption from the chemical oxidative process by the use of a metabolic inhibitor, and the correlation between carbohydrate content and the community respiration rate. A Gilson differential respirometer was used to study the profile of oxygen consumption in lake sediment to a depth of 20 cm below the water-mud interface. The high sensitivity of the manometric method (it will detect changes of 20 microgram oxygen) has an overwhelming advantage over the conventional titration method. But application to a real lake system depends on the solution of the problem of how to reproduce the lake mixing processes in the laboratory. Shaking or disturbance greatly increases the lake sediments' oxygen consumption rate, therefore caution must be exercised when considering plans to use mechanical dredging for the removal of polluted sediment from Lake Erie. (Auen-Wisconsin)
W75-11222

**THE EFFECTS OF THE FORMATION OF LAKE KAINJI (NIGERIA) UPON THE INDIGENOUS FISH POPULATION,**
Ife Univ. (Nigeria). Kainji Dam Research Project.
D. S. C. Lewis.
Hydrobiologia, Vol 45, No 2/3, p 281-301, 1974. 3 fig, 18 ref.

Descriptors: *Fish populations, *Africa, *Post-impoundment, *Environmental effects, Reservoirs, Fish food organisms, Rivers, Succession, Prey fish, Herbivores, Bottom fish, Fish establishment, Fish types, Detritus, Omnivores, Carnivores.
Identifiers: *Nigeria, *Lake Kainji(Nigeria), River Niger(Nigeria), Isectivores.

Closure of Kainji Dam resulted in conversion of 137 kilometers of the River Niger into Kainji Lake, thus transforming a fluvatile environment into a lacustrine environment. When reactions of each component of the fish population to the environmental transition were studied, profound changes in the relative abundance of many species were observed. The immediate changes were a decline in Mormyridae numbers, increases in numbers of Citharinidae (especially Citharinus citharus), Characidae (especially Hydrocynus forskali and Alestes baremose), Schilbeidae (especially Eutropius niloticus), and Lates niloticus; and a change in the relative abundance of various species of Mochochidae. After the lake had been in existence for a year, further recorded changes included a decline in numbers of Citharinidae (especially Citharinus citharus) and Lates niloticus, and increases in Characidae, Cichlidae (especially Tilapia galilaea), and clupeids. Overall population trends resulting from the lake's formation showed a decline in the number of bottom feeding insectivores, increase in the number of detritus feeders immediately after the lake was formed, followed by a decline; and an increase in numbers of planktivores, omnivores, and carnivores. The population changes had a number of features common to changes which occurred in other African man-made lakes. (Buchanan-Davidson--Wisconsin)
W75-11223

**ACID STRIP MINE LAKE RECOVERY,**
Missouri Univ., Columbia. Dept. of Civil Engineering.
D. L. King, J. J. Simmler, C. S. Decker, and C. W. Ong.
Journal Water Pollution Control Federation, Vol 46, No 1, p 2301-2315, 1974. 11 fig, 1 tab, 20 ref. OWRT A-038-MO(3).

Descriptors: *Strip mine lakes, *Neutralization, *Coal mine wastes, Productivity, Hydrogen ion concentration, Chemical reactions, Pyrite, Waste water treatment, Reduction(Chemical), Acid mine water, Mine acids, Clay minerals, Bacteria, Sulfur bacteria, Aluminum, Alkalinity, Bicarbonates, Vegetation effects, Nutrients, Reclamation, Organic matter, Hydrogen sulfide.
Identifiers: *Lake rehabilitation.

Acid strip mine lakes formed by oxidation of iron-sulfur pyrites and marcasites left on the surface after coal removal can be made alkaline and support aquatic communities. Factors aiding this recovery process are clay minerals, reaction with alkali metal compounds, activity of sulfate-reducing bacteria, creation of anaerobic conditions, reducing conditions, depth of water, light, aluminum concentration, and formation of bicarbonate alkalinity. The amount of vegetated land near the lake, seasonal changes in temperature, wind-induced mixing, time, bacteria, and algal nutrients are also important. Recovery can be accelerated by the addition of organic matter. The carbon:nitrogen:phosphate ratio should be considered in choosing the organic material to be used. The advantages of accelerating the recovery process would be elevation of pH, loss of acidity and metals, and use of organic wastes. The major disadvantage is evolution of hydrogen sulfide, which may be controlled by limiting the amount of organic matter added to the lake. The recovered strip mine lake will be in an early eutrophic state. The biological, chemical, and physical interaction from acid formation to a recovered lake could be avoided by covering acid-producing materials with non-acid soil when coal is strip-mined. (Buchanan-Davidson--Wisconsin)
W75-11224

**THE GROWTH OF SOME EPIPHYTIC ALGAE IN A LAKE RECEIVING THERMAL EFFLUENT,**
Alberta Univ., Edmonton. Dept. of Botany.
M. Hickman, and D. M. Klarer.
Archiv fur Hydrobiologie, Vol 74, No 3, p 403-426, 1974. 12 fig, 2 tab, 44 ref.

Descriptors: *Periphyton, *Algae, *Lakes, *Thermal pollution, *Canada, Bulrushes, Water temperature, Growth rates, Period of growth, Powerplants, Seasonal, Light intensity, Nutrients.
Identifiers: *Lake Wabamun(Alberta), Achnanthes minutissima, Oedogonium, Spirogyra, Gomphonema parvulum, Diatoma elongatum, Fragilaria capucina, Fragilaria vaucheriae, Stigeoclonium tenue, Cocconeis placentula, Gomphonema gracile, Epithemia turgida, Mougeotia.

Discharge of heated water into Lake Wabamun, Alberta, caused changes in the standing crop size of epiphyton associated with Scirpus validus and in the algal species composition. Seasonal growth cycles of twelve dominant species of epiphytic algae were studied using cell count data to determine effects of inflow of heated water on their growth. During winter in the heated areas nitrate-nitrogen, phosphate-phosphorus, and dissolved silica concentrations increased, reaching maximum levels in the spring, then decreased during ice break-up. The longer growing season was responsible for the early development and early spring maxima of Achnanthes minutissima, Oedogonium, Spirogyra, Gomphonema parvulum, Diatoma elongatum, Fragilaria capucina, and F. vaucheriae; extending autumn maximum of Stigeoclonium tunue into winter; and presence of large populations of Cocconeis placentula and Gomphonema gracile from autumn through winter. Heated water adversely affected growth of Epithemia turgida and Mougeotia and benefited growth of Spirogyra and Stigeoclonium tenue. Temperature alone did not account for all the differences when growth in heated and non-heated areas was compared; factors such as light intensity, daylength, and inorganic and organic nutrients in the water were also important. (Buchanan-Davidson--Wisconsin)
W75-11225

**IN SITU MEASUREMENT OF THE SETTLING VELOCITY PROFILE OF PARTICULATE ORGANIC CARBON IN LAKE ONTARIO,**
Canada Centre for Inland Waters, Burlington (Ontario).
N. M. Burns, and A. E. Pashley.
Journal of the Fisheries Research Board of Canada, Vol 31, No 3, p 291-297, 1974. 4 fig, 2 tab, 13 ref.

Descriptors: *Phytoplankton, *Settling velocity, Laboratory equipment, Particle size, Organic compounds, Carbon, Measurement, *Lake Ontario, On-site tests, Vertical migration, Thermocline, Epilimnion, Phosphorus, Nutrients.
Identifiers: *Organic carbon.

Calm water settling velocity profiles of particulate organic matter were measured using special sampling bottles. To determine phytoplankton settling velocity under natural conditions, species, light conditions, cell concentrations, growth rate, nutrient concentrations, cell physiological state, zooplankton grazing effects, and density stratification must be considered. The sampling bottles had a horizontal dividing shutter, two triggers sensitive to small and large diameter messengers, and a vane assembly and swivel clamp which enabled it to rotate freely on the mooring line to line up with the current and suffer minimum vibration due to vortex-shedding before retrieving the bottles. Samples were subdivided into upper and lower portions so settling velocities could be calculated. The settling velocity profile of Lake Ontario varied between -0.4 and +2.0 m/day. Net settling velocities measured at the top of the thermocline were used to estimate net settling fluxes from the epilimnion; these varied between -0.074 and +0.336 millimoles phosphorus/sq m/day. Net settling flux can differ from sedimentation flux out of the epilimnion. Negative settling can add nutrients to the epilimnion during the stratified period. Settling flux and diffusion flux have similar magnitudes, occasionally acting together or in opposition. (Buchanan-Davidson--Wisconsin)
W75-11227

**A GENERAL DESCRIPTION OF THE OLIGOTROPHIC LAKE PAAJARVI, SOUTHERN FINLAND, AND THE ECOLOGICAL STUDIES ON IT,**
Helsinki Univ. (Finland). Dept. of Botany.
R. Ruuhijarvi.
Annales Botanici Fennici, Vol 11, No 2, p 95-104, 1974. 4 fig, 4 tab, 39 ref.

Descriptors: *Lakes, *Europe, *Oligotrophy, *Humus, Trophic level, Hydrography, Lake morphometry, Geomorphology, Climatic data, Vegetation, Land use, Water chemistry, Forests, Aquatic plants.
Identifiers: *Lake Paajarvi(Finland).

Lake Paajarvi, a mesohumic, oligotrophic lake in southern Finland, has a maximum depth of 90 meters. Mineral bottoms predominate. It has two systems of shear zones and is located between two terminal-moraine systems of glacial origin. Ice covers the lake about 140 days a year. Its thermal structure is dimictic. The drainage basin lies in the southern boreal vegetation zone and consists of half coniferous forests plus cultivated land, peatlands, lakes, and deciduous forests. Agricultural

and sewage are causing eutrophication. gae are present in the littoral-profundal oating-leaved plants cover 0.37% and sub- plants 10.9% of the lake. Isotherms show a ing overturn, a stagnation period, and an l drop in water temperature. Wind in- thermal stratification. Water level varies ) cm. Inflow of organic matter follows is in stream discharge. Water chemistry ments do not vary with season or stations. c carbon is higher and pH and oxygen n values are lower in the hypolimnion ilimnion. Electrolytic conductivity and sphorus, potassium, and sodium contents but nitrogen high. Lake Paajarvi is a rela- pical Finnish lake in its chemical proper- hanan-Davidson--Wisconsin)
29

IVESTIGATION OF GLYCOLATE ION IN TWO SPECIES OF BLUE- ALGAE,
iv., Downsview (Ontario). Dept. of Biolo-

eng, A. G. Miller, and B. Colman.
Serl.), Vol 103, p 110-116, 1972. 1 fig, 3 f.

rs: *Cyanophyta, *Anabaena, istry, *Alcohols, Photosynthesis, al studies, Carbon dioxide, Carbon ganic compounds.
s: *Glycolic acid, *Excretion, Glycolate.

etion of organic compounds by two spe- lamentous blue-green algae during short f photosynthesis was studied by allowing to assimilate radioactive bicarbonate. nt of C14 glycolate excreted by Oscilla- Anabaena flos-aquae was less than 1% of ixed by the algae during photosynthesis. of cells grown on 5% carbon dioxide in edium of low bicarbonate concentration ent of the cells with isonicotinyl hydra- g photosynthesis caused little increase in excretion. Alpha-hydroxysulfonates imulate massive excretion of glycolate. these blue-green algae excreted little a significant proportion of the hetically fixed carbon was excreted in of basic, neutral, and acidic compounds, excretion was greater in 5% carbon diox- cells than in air-grown cells. Amino e up the majority of labeled compounds The acid fraction consisted of residual e, an unknown compound eluted with nd glycolate. The usual pathway of tilization through glycine and serine did r to be very active in these algae. -Davidson--Wisconsin)

CE OF OIL ON NUCLEIC ACIDS OF

of Biology of The Southern Seas, (USSR).
vin, O. G. Mironov, and I. M. Tsimbal.
llution Bulletin, Vol 6, No 1, p 13-15, 10 ref.

s: *Marine algae, *Plant physiology, stry, *Oil pollution, Water pollution ef- odophyta, Inhibitors, Organic acids, l wastes, Organic compounds.
*Nucleic acids, Ribonucleic acid, nucleic acid, Ulva lactuca, Grateloupia Polysiphonia opaca.

e algae, Ulva lactuca, Grateloupia and Polysiphonia opaca, were exposed kinskaya oil and C14 labeled sodium Deoxyribonucleic acid (DNA) rom Ulva showed no substantial dif- degree of polymerization between sta- bile DNA. Activity increases in low gments indicated DNA depolymeriza- tion. Stable DNA was more resistant to oil and labile DNA more sensitive, possibly causing destruction of the mechanism of expression of heredity, synthesis of anomalous proteins, and death. Ulva DNA and RNA specific activities depended on length of exposure and oil concentration; increasing oil concentrations caused decreased specific activity. Complete inhibition of nucleic acid biosynthesis at high concentrations of oil occurred after 48-72 hours. With all algae there was simultaneous inhibition of DNA and RNA, but there were variations due to differences in their systemic positions and individual peculiarities. Oil pollution decreased RNA and DNA contents of red algae by inhibition of biosynthesis. It is concluded that the influence of oil on algae was due to modification of the degree of DNA polymerization and inhibition of DNA and RNA biosynthesis, thus reducing the nucleic acid content. (Buchanan-Davidson--Wisconsin)
W75-11232

**MAN'S IMPACT ON A NEWLY FORMED RESERVOIR,**
New Mexico Univ., Albuquerque. Dept. of Biology.
E. W. Hansmann, D. E. Kidd, and E. Gilbert.
Hydrobiologia, Vol 45, No 2-3, p 185-197, 1974. 6 fig, 5 tab, 9 ref. NSF GI-29422.

Descriptors: *Reservoirs, *Eutrophication, *Productivity, *Recreation, *Colorado River, Arizona, Utah, Climatic data, Geomorphology, Seasonal, Annual.
Identifiers: *Lake Powell(Ariz-Utah).

The impact of recreation on eutrophication was studied in the Lake Powell Reservoir which resulted from the Glen Canyon Dam built on the Colorado River at the Arizona-Utah border. Water quality was determined by measuring primary net productivity using C12. Recreational activities in the Wahweap area had a stimulating effect on net productivity and eutrophication of the area compared to other sites, especially during the summer season. Higher production at the Navajo site during the winter season did not appear to be related to recreational activities thus must be assumed to be due to natural unknown abiotic conditions. Lake Powell can be classified as a naturally eutrophic body of water with a mean production rate at its lower end of 645.7 mg/C12/sq m/day. It is not known if the complete Lake Powell system is naturally eutrophic or only the area under study. The results are undoubtedly an underestimation of the total carbon production of the area. Benthic primary communities have been observed in several bays and canyons and must be accounted for in analyzing the results. (Buchanan-Davidson--Wisconsin)
W75-11233

**EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. IV. FEEDING OF INTRODUCED AND AUTOCHTHONOUS NON-PREDATORY FISH,**
Warsaw Univ. (Poland). Dept. of Hydrobiology.
A. Prejs.
Ekologia Polska, Vol 21, No 31, p 465-503, 1973. 8 fig, 12 tab, 81 ref.

Descriptors: *Fish management, *Fish stocking, *Fish diets, Fish food organisms, Carp, Fish populations, Spatial distribution, Competition, Herbivores, Feeding rates, Benthic fauna, Zooplankton, Aquatic plants, Europe.
Identifiers: *Lake Warniak(Poland), Bream, Roach, Tench.

Introduction of carp and bream into a shallow, eutrophic lake, the effect of the considerably increased and changed fish stock on the biocenosis of the water body, and the practical aspects of fishery management were studied. Studies on the feeding of non-predatory fish dealt with food composition of introduced fish and of dominant autochthonous non-predatory species; feeding intensity of examined species; analysis of food relations in the changed community of non-predatory fish due to introduction of new species. Carp, bream and tench feed mainly on bottom fauna and fauna associated with plants; crucian carp feed on zooplankton, and roach prefer plant food, with macrophytes the first choice. In the years of studies, together with the increase of fish stock their grazing intensity decreased and their feeding habits changed. In the year with the most numerous fish stock the introduced species (carp and bream) ate about 60% of the bottom fauna biomass and fauna associated with plants; about 30% of zooplankton biomass was consumed by the whole community of non-predatory fish. Data on the differentiation of the distribution of basic feeding grounds of particular fish species are presented. (Jones-Wisconsin)
W75-11234

**A CONTRIBUTION TO THE BIOLOGY OF NITELLA HOOKERI A. BR. IN THE ROTORUA LAKES, NEW ZEALAND. II. ORGANIC NUTRIENTS AND PHYSICAL FACTORS,**
Auckland Univ. (New Zealand). Dept. of Botany.
M. B. Starling, V. J. Chapman, and J. M. A. Brown.
Hydrobiologia, Vol 45, No 2-3, p 157-168, 1974. 5 fig, 2 tab, 21 ref.

Descriptors: *Algae, *Chara, *Nutrient requirements, *Growth rates, Cultures, Vitamins, Weight, Water temperature, Light intensity.
Identifiers: *Nitella hookeri, *Rotorua Lakes(New Zealand), Thiamine, Pyridoxin, Nicotinamide, Cobalamin, Riboflavin, Biotin, Ascorbic acid, Giberellic acid, Kinetin, Indole acetic acid.

Growth of Nitella hookeri A. Br. in non-axenic cultures, with or without soil extract, is not significantly stimulated by addition of most vitamins, coenzymes, and growth hormones. Thiamine, pyridoxin, and nicotinamide increased growth slightly but only at concentrations greater than those found under field conditions. Kinetin inhibited growth. Nitella propagules are not typical adult vegetative cells in their responses but form naturally in the lakes so may indicate possible factors governing growth for certain periods of the year. The best growth measured by linear increment, dry weight, and fresh weight was at 17C; growth ceased at 10C or 25C. Growth increased with increased light intensities, but 600 lux for a 12-hour day appeared to be the best long term condition. However growth responses to varying temperature and light conditions were confused thus a more rigid growth assessment is needed. The same general trends were observed in these experiments as were observed under natural conditions in the New Zealand Rotorua Lakes and help explain the natural distribution of Nitella in these lakes. However winter growth occurs at a temperature of about 10C in these lakes, indicating that laboratory culture conditions have not defined all growth factors. (Buchanan-Davidson--Wisconsin)
W75-11235

**SEASONAL ABUNDANCE OF CRUSTACEAN ZOOPLANKTON AND NET PLANKTON BIOMASS OF LAKES HURON, ERIE, AND ONTARIO,**
Canada Centre for Inland Waters, Burlington (Ontario).
N. H. F. Watson, and G. F. Carpenter.
Journal of the Fisheries Research Board of Canada, Vol 31, No 3, p 309-317, 1974. 2 fig, 5 tab, 15 ref.

Descriptors: *Seasonal, *Zooplankton, *Plankton, *Biomass, *Lake Erie, *Lake Huron, *Lake Ontario, Microorganisms, Fluctuations, Spring, Summer, Autumn, Cladocera, Copepods, Phytoplankton, Dominant organisms, Crustaceans, Shallow water, Littoral, Varieties, Great Lakes, Daphnia.

Crustacean zooplankton and net plankton biomass changed from April to December in Lakes Huron, Erie, and Ontario. Species were generally identical but times of maxima and relative species composition differed. Net biomass changes were due to changes in species composition, total crustacean numbers and phytoplankton quantities. Numbers were lower in the main part of Lake Huron than Lake Ontario, but net biomass values were equal or greater than those in Lake Ontario open waters because the organisms were larger and net phytoplankton amounts differed. Crustacean concentrations and biomass were highest in inshore water in all lakes, but fluctuated more than in offshore areas, especially in Lake Huron. Fluctuations in crustacean numbers were related to seasonal cycles of cladocerans and cyclopoid which often had summer maxima. Calanoids had more stable numbers. Biomass fluctuations were related to phytoplankton blooms. Calanoid copepods were most abundant and diverse in Lakes Huron and western Lake Erie, and cyclopoids and cladocerans in Lakes Erie, Ontario, and Saginaw Bay of Lake Huron. Diacyclops bicuspidatus thomasi was the most abundant cyclopoid all year in all lakes, Tropocyclops prasinus in Lake Ontario, and Acanthocyclops vernalis in Lake Erie. Cladocerans were most numerous in Lakes Erie and Ontario. (Buchanan-Davidson--Wisconsin)
W75-11238

**EFFECTS OF OZONE-TREATED SEAWATER ON THE SPAWNED, FERTILIZED, MEIOTIC, AND CLEAVING EGGS OF THE COMMERCIAL AMERICAN OYSTER,**
S. A. Maclean, A. C. Longwell, and W. J. Blogoslawski.
Mutat Res, Vol 21, No 5, p 283-285, 1973.

Descriptors: Water pollution effects, *Ozone, *Oysters, Sea water, *Spawning, *Fertilization, Commercial shellfish, *Fish eggs.
Identifiers: *American oyster eggs, Crassostrea-virginica, Parthenogenesis, Protoplasm, Meiotic eggs(Oysters).

Fertilization of Crassostrea virginica eggs occurred less readily in O3 treated water, as evidenced by a decrease in polyspermy and an increase in parthenogenesis. Larger numbers of eggs retarded in their completion of meiosis were noted and there was an increased incidence of abnormal polar bodies in the ozonized water. Most prominent in the O3-treated water were the large numbers of cleaving eggs with abnormal nuclei. The decomposition of ozone in water produces the same positive radicals (OH and HO2) generally considered the biologically active products of irradiation of protoplasm and the cytological and cytogenetic effects of ozone appear radiomimetic.--Copyright 1974, Biological Abstracts, Inc.
W75-11256

**ACUTE TOXICITY OF PETROCHEMICAL DRILLING FLUIDS COMPONENTS AND WASTES TO FISH,**
Fisheries and Marine Service, Winnipeg (Manitoba). Resource Management Branch.
M. R. Falk, and M. J. Lawrence.
Technical Report Series No CEN-T-73-1, April, 1973, 108 p. 9 fig, 10 tab, 7 ref.

Descriptors: *Toxicity, *Drilling fluids, *Rainbow trout, Fish, Lethal limit, Pollutants, Water pollution effects, Oil fields, Oil wells, Water wells, Mud, Slurries, Wells, Bentorite, Bicarbonate, Potassium compounds, Waste disposal, Sumps, Drainage, Surface water.
Identifiers: *Lake chub(Fish), *Lignosulfate, *Barium sulfate, Waste containment.

A study conducted in 1972 consisted of a field program to acquire information on the nature and amounts of drilling fluid compounds used, the efficiency of waste containment facilities and on toxicities of drilling and sumps fluids, and a laboratory phase to determine acute toxicities of drilling fluids and their constituent chemicals. Drilling fluids were acutely toxic to lake chub and rainbow trout with 96 hour LC50's of 0.83 to 12.0 percent. Sump fluids were less toxic with one sump yielding 96 hour LC50's of 22.5 and 81.0 percent for composite and surface sump fluids, respectively. Out of 27 common components of drilling fluids, seven were toxic and six were moderately toxic. The field program was conducted in the Mackenzie delta area, Northwest Territories, Canada. Recommendations on waste containment, treatment and future studies are given. A brief description of the nature and function of drilling fluids and their constituent chemicals is also included. (Bradbeer-NWWA)
W75-11265

**THE TOXICITY OF DRILLING FLUID COMPONENTS TO AQUATIC BIOLOGICAL SYSTEMS, A LITERATURE REVIEW,**
Fisheries and Marine Service, Winnipeg (Manitoba).
B. Land.
Technical Report No 487, 1974. 33 p, 8 tab, 58 ref.

Descriptors: Publications, *Reviews, *Bibliographies, *Data collections, *Toxicity, *Fish, *Drilling fluid, Marine biology, Aquatic animals, Suspended solids, Suspended load, Environment, Pollution, *Water pollution effects, Surface waters.
Identifiers: Barite, Lignosulphate.

A literature review is presented on the toxicity to aquatic biological systems of drilling fluid components in northern Canada. This review includes aquatic toxicity literature that was available prior to January 31, 1974. The components of drilling fluids include suspended solids, chlorides, alkaline sources, chromium compounds, bactericides, organic polymers, dispersants, defoamers, lubricants and detergents. On the basis of quantities used and of the harmful long-term effects produced, the alkaline sources, bactericides, barium sulphate, bentonite, chromium salts and potassium chloride compromise the major sources of aquatic toxicity. (Bradbeer-NWWA)
W75-11266

**FERTILIZER PHOSPHATE IN STREAMS AND LAKES,**
Canberra Coll. of Advanced Education (Australia).
For primary bibliographic entry see Field 5B.
W75-11310

**NATURAL AND FERTILIZER NITROGEN IN STREAMS AND LAKES,**
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research.
For primary bibliographic entry see Field 5B.
W75-11311

**SEASONAL ABUNDANCE AND DIVERSITY OF BENTHOS IN A SOUTHERN ILLINOIS, USA SWAMP,**
Central Michigan Univ., Mt. Pleasant. Dept. of Biology.
For primary bibliographic entry see Field 2H.
W75-11312

**GUIDELINES FOR THE IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS IN THE CONSTRUCTION AND OPERATION OF A RESERVOIR,**
Illinois Univ., Urbana. Dept. of Forestry.
F. L. Johnson, and D. T. Bell.
Research Report No. 75-6, June 1975. 36 p, 2 fig, 52 ref.

Descriptors: *Reservoir construction, *Reservoir operation, *Environmental effects, Air pollution effects, Microclimatology, Soil properties, Ecology, Wildlife, Vegetation, Groundwater, Surface waters, Water quality, Land forming, Recreation, Natural resources, Aesthetics, Reservoirs, Construction, Operations.

This guide summarizes how the construction and operation of a reservoir will affect the attributes of the biophysical environment. The latter include air quality, microclimate, soil conditions, ecological relationships, fauna, flora, groundwater hydrology, surface water, land forms and processes, outdoor recreation, preservation of natural resources, special interest areas and sites, aesthetics, and surface water quality. Construction operations and associated activities are outlined and described. (Witt-IPC)
W75-11316

**EFFLUENT CHARACTERISTICS AND TREATMENT OF MECHANICAL PULPING EFFLUENTS,**
B.C. Research, Vancouver(British Columbia).
For primary bibliographic entry see Field 5D.
W75-11331

## 5D. Waste Treatment Processes

**PHYTOPHTHORA SPECIES IN ARIZONA: IT OCCURRENCE IN RECYCLED IRRIGATIO WATER,**
California Univ., Berkeley. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5A.
W75-10883

**ORGANIC COLOR IN GROUNDWATER MISSISSIPPI,**
Mississippi State Univ., Mississippi State. Dept. Civil Engineering.
For primary bibliographic entry see Field 5F.
W75-10907

**REVIEW OF CONFERENCE ON HYDROLO OF DEEP SEDIMENTARY BASINS,**
Tulsa Univ., Okla. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W75-10935

**AN APPRAISAL OF POTENTIAL WAT SALVAGE IN THE LAKE MCMILLEN DEL AREA, EDDY COUNTY, NEW MEXICO,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 3B.
W75-10941

**PILOT-PLANT STUDY OF DENITRIFICATI USING A SUBMERGED SAND FILTER AT R MEADS SEWAGE WORKS,**
B. Collinson.
Water Pollution Control, Vol 73, No 6, p 685-
1974. 6 fig, 3 tab, 19 ref.

Descriptors: *Waste water treatment, *Filt *Nitrates, *Sewage treatment, Effluents, plants, Runoff, *Denitrification, Anaerobic t ment, Filtration.
Identifiers: Auto analyzer, Rye Meads(Gt B Submerged sand filter.

The reduction of nitrate from all sources in River Lee at Chingford, Great Britain was vestigated. Major sources of nitrate are sewag fluent, drainage and surface runoff from agr tural land. Of the possible methods of ni reduction, removal from effluent by the add of a methanol carbon source and an anaer flooded sand filter was chosen. A pilot plant s at the Rye Meads Sewage Works used a

sand filter for sewage effluent treatment. s of amm. N, chloride, phosphate, anionic ic detergents and nitrate were made using o Analyzer. No significant differences in between the work's effluent or the ied effluent were found. Suspended solids educed from 10 mg/liter to 5 mg/liter by through the sand filter. The COD values d were used as an indication of residual ol. The methanol requirement is dependent trate concentration and continuous moni- of nirtate would be necessary for a large ant. During seven months of testing the cation unit, it was shown that 96 percent of N was removed from approximately 8000 r day of effluent with a contact period of inutes and 100 mg/liter of methanol added rbon source. The Rye Meads Works is le to denitrification using this process. plans include modification of the existing avity sand filter, enabling up to 4540 cu m per day to be denitrified. (Prague-FIRL) 955

AND WASTEWATER DISINFECTION OZONE: A CRITICAL REVIEW,
ati Univ., Ohio.
nman.
itical Reviews in Environmental Control, p January, 1975. 2 fig, 3 tab, 17 ref.

ors: *Ozone, *Waste water treatment, treatment, Chlorine, Costs, Biochemical demand, Municipal water, Potable water, , Environmental effects, Design criteria, nt facilities, Monitoring, *Reviews, ction.

al literature on ozone disinfection, as an ve to chlorine, is reviewed. General state- ade include: ozone is a powerful bacteri- l a powerful virucide in water or waste nost waters and waste waters require a nount of ozone than chlorine on a mg/liter accomplish the same disinfection; costs of ion with chlorine are lower than those Also, ozone will probably not be widely he United States for municipal water dis- unless the requirement in most states for disinfectants in the water after a specific ime is changed, and unless cost is not con- is the major design consideration. Ozone ion may be implemented as a unit process water reclamation plants for potable plication. Additional research on ozone as ctant was suggested in the areas of: disin- fficiency against organisms not yet stu- w contacting schemes to reduce capital l increase mass transfer; ozone measuring itoring systems; ozone production equip- icity of ozonation products in disinfected nysiological effects of low concentrations to man; and, BOD5, COD, and TOC rela- in ozone disinfection. (Prague-FIRL) 56

TION DYNAMICS OF PROTOZOA IN WATER,
Univ., Washington, D.C. Bioenvironmen- eering and Sciences Research Lab.
rma, H. E. Finley, and G. H. Bennett.
Water Pollution Control Federation, Vol , p 85-92, January, 1975. 5 fig, 2 tab, 20

ors: *Waste water treatment, *Bacteria, al treatment, *Protozoa, Digestion, ry investigations, Microorganisms, ion, Municipal wastes, *District of , Pollutant identification.
s: Opercularia, Vorticella, Protozoa n dynamics, Blue Plains Treatment shington, DC.

was conducted to identify the dominant in the various parts of the waste water treatment processes of the Blue Plains Treatment Plant, Washington, D.C. Its second objective was to observe the dominant protozoa in the secondary effluent, within laboratory conditions simulating the plant, in order to determine whether or not the populations are influenced by environmental factors. Finally, the laboratory equipment simulating plant conditions was seeded with two peritrichs, Vorticella and Opercularia, and the common bacteria from the plant effluent; buffers and organic nutrients, sucrose and glutanic acid, were then added to determine whether these additives affected the growth of the protozoan populations. From the investigations, the relative importances of bacteria and protozoa was waste water treatment were examined. It was concluded that Vorticella, which is responsible for clarification, is dominant in secondary effluent. The death rate of Opercularia was not significantly affected by pH changes, while the Vorticella population was more sensitive to such changes. Also, when glutamic acid was added, the Opercularia population increases in number. These findings indicate that further tests should be made to determine the optimum protozoa:microorganism ratio at various substrate concentrations existing in a treatment plant. Tests are necessary to compare catalase activity with the ratio and also to determine whether the bacteria are dead or alive when they are digested by protozoa. (Prague-FIRL)
W75-10957

**THE MECHANISM OF FLOCCULATION PROCESSES IN THE PRESENCE OF HUMIC STUBTANCES,**
Technion - Israel Inst. of Tech., Haifa.
N. Narkis, and M. Rebhun.
Journal of the American Water Works Association, Vol 67, No 2, p 101-108, February, 1975. 8 fig, 19 ref.

Descriptors: *Organic compounds, *Flocculation, *Waste water treatment, Polyelectrolytes, Cations, Anions, Suspended solids, Biological treatment, Fulvic acids, Humic acids, Colloids, Organic acids.
Identifiers: Organo-clay complexes.

The mechanism of flocculation is detailed for a system with organic matter, particularly with clay suspensions interacting with humic and fulvic acids. A radioactively labelled cationic polyelectrolyte was used to facilitate this study. The phenomenon of flocculation is similar in any system where suspended solids interact with dissolved organic matter, such as in raw sewage or effluents from biological treatment plants. It was demonstrated that the salts of humic and fulvic acids, which are anionic polyelectrolytes, react chemically with the polycationic flocculant through carboxylate and phenolate groups and thus form colloidal-reaction-product flocculates which are removed by settling. In this case, a cationic polyelectrolyte was added to an organo-clay complex suspension dispersed in humate or fulvate solution. The polyelectrolyte was shown to react first with free humates and fulvates and only after the complete reaction with free organic acids did flocculation of the suspension occur. Because the presence of organic matter in solution or as a complex on the mineral clay particle surface inhibits the process of flocculation, large doses of the flocculant are necessary to produce reaction conditions favorable for complete reaction. (Prague-FIRL)
W75-10958

**OZONE TREATMENT LICKS COLOR PROBLEM.**
Water and Sewage Works, Vol 122, No 4, p 52-54, April, 1975. 3 fig.

Descriptors: *Waste water treatment, *Water supply, *Ozone, *Chlorination, *Treatment facilities, Color, Odors, Filtration.
Identifiers: *Color removal, Watchgate Treatment Works(Gt Brit), Ozonization.

The scheme of water supply treatment for the city of Manchester, England, and the Watchgate Treatment Works is described. The Works consists of Five units--control, filter, washwater, contact tank, and ozone. Basic treatment involves rapid gravity filtration, super-chlorination and contact, pH correction, and chlorine residual control of the finished waters. A basic problem in the system was color reduction, associated with removal of particulate matter and sterilization. Water from Windermere and Haweswater, two of four sources, had color up to 7 degrees and 30 degrees Hazen respectively. Required characteristics of the treated water are pH 7.5 to 8.0, color less than 5 degrees Hazen, and turbidity less than 2 ppm. To remove color from the Haweswater water, pretreatment by filtration and chlorination is followed by ozonization in three separate streams. The use of ozone is particularly suited to the limited head available throughout the plant. Ozone may also be used to sterilize Haweswater water if chlorine is not available, and to control tastes and odors when required. A plan of the Watchgate Treatment Works is detailed, whereby the ozone unit may be utilized or by-passed. The layout includes administrative offices, Laboratories, a control room, an equipment room, and chemical storage facilities; the site provides for alternative treatment methods. (Prague-FIRL)
W75-10959

**FIRST STAGE OF THE WORLD'S LARGEST PURE OXYGEN SEWAGE PLANT TO UNDERGO TEST.**
Engineering News-Record, Vol 194, No 2, p 16-17, January 9, 1975.

Descriptors: *Oxygen, *Aeration, *Sewage treatment, Pilot plants, Municipal wastes, Treatment facilities, *Waste water treatment, Michigan, Oxygen.
Identifiers: *Detroit(Mich), Hydrocarbons.

The Detroit Metro Water Department, of Detroit, Michigan, has built a 300-mgd pure oxygen treatment system for municipal wastes. A 600-mgd capacity additional facility is under construction for 1977, which will make the system the world's largest pure oxygen plant. The system was chosen on the basis of space considerations, successes with pure oxygen aeration elsewhere, and tests with a 100,000 gpd pilot plant. The new system has been tested to be capable of reducing BOD and suspended solids in effluent to 20 ppm, which is below the design goal of 30 ppm. Two identical aeration tanks were built five years ago at the projects inception, one with oxygen and one with air equipment. In July, a comparison will be made, and it is hoped that the air system will be converted to oxygen. The new installation needs only 48% of the air system's power because the partial pressure of oxygen in air is 160 mm of mercury, whereas the partial pressure of pure oxygen is 760 mm. Thus, a pure oxygen system has almost five times the internal driving force of an air system, requiring less pumps, condensers, and mixers. The system, including the Detroit plant's high-capacity final clarifiers should cut operating and capital costs by $21 per million gallon each year. Because the Detroit plant is landlocked, the sewage plant has installed deep tanks to conserve space. Other design considerations include air sampling for automatic shutdown should volatile hydrocarbons in sewage, reach 20% of their explosive limit. Further tests will demonstrate the systems operation in cold weather. (Prague-FIRL)
W75-10960

**SOME STUDIES ON NITRIFICATION IN THE ACTIVATED SLUDGE PROCESS,**
Sheffield Water Pollution Control Dept. (England).
I. R. Hall.
Water Pollution Control, Vol 73, No 45, p 538-547, 1974. 4 fig, 2 tab, 22 ref.

Descriptors: *Waste water treatment, *Nitrification, *Sewage treatment, Ammonia, Industrial wastes, Toxicity, Activated sludge, Hydrogen ion concentration.
Identifiers: Ammonia removal, Nitrosomonas.

Nitrification in the activated sludge plant for removing ammonia at Sheffield's Blackburn Meadows sewage works was investigated. This sewage contains about 25 percent industrial waste water, including metal finishing wastes. It was thought that nitrification would be the most economical method of removing ammonia. Results of experimental testing showed that sewage from this plant can be consistently nitrified using the activated sludge method. The rates of growth of Nitrosomonas in activated sludges grown on an industrial and domestic sewage, when ammonia was not rate-limiting, were higher than those reported elsewhere for low temperature domestic sewage. The pH value for nitrification was always above 6.3 and nitrifying activity of activated sludges was independent of pH value in the range of 7 to 9. Discussed also was a simplified method to predict whether nitrification will occur, from consideration of either sludge loading or sludge wastage. In addition, it was suggested that new discharges to sewers be screened for potential toxic hazards. (Prague-FIRL)
W75-10961

**PRESERVING ACTIVATED SLUDGE,**
Wiggins-Rimer and Associates, Durham, N.C.
J. A. Nissen, and P. A. Vesilind.
Water and Sewage Works, Vol 121, No 8, p 48-52, August, 1974. 7 fig, 5 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Preservation, Analysis, Analytical techniques, Testing, Biodegradation, Sludge digestion, Microbial degradation.
Identifiers: *Formaldehyde.

Many problems result when the sludge from pilot or bench-scale experiments is transported to consultants, equipment manufactures, or commercial laboratories for analysis. A cheap, readily available method of preserving waste water sludges is needed that is capable of stopping all biological action, without changing the physical characteristics of aerobic or anaerobic sludge. The preservative agent should possess the following attributes: be able to kill the types of organisms found in biological sludge before biological action can alter the physical characteristics of the sludge; the physical structure of the cells killed should not be changed by the action of the preservative; the required dosage should not be large enough to significantly dilute the sample; the preservative should not be hazardous to humans; and, the preservative should be economical and readily available. As a result of the experiments performed, formaldehyde is considered an acceptable preservative for activated and digested sludge. Dosages sufficient to effectively kill activated sludge organisms are in the range of 0.5-1.0 percent commercial grade formaldehyde (by volume). Activated sludge which undergoes anaerobiasis and becomes anaerobic demonstrates much better settling characteristics and a lower viscosity than the fresh or preserved sludge. Digested sludge organisms were found to be sensitive to very small dosages of formaldehyde. Small dosages of formaldehyde do not significantly change the physical nature of digested sludge or interfere with the action of chemical conditioners. (Orr-FIRL)
W75-10962

**DISINFECTING WASTEWATER WITH CHLORINATION/DECHLORINATION PART 1,**
G. C. White.
Water and Sewage Works, Vol 121, No 8, p 70-71, August, 1974. 1 fig.

Descriptors: *Waste water treatment, *Chlorination, *Coliforms, *Disinfection, Chemical reactions, Mathematical models, Biochemical oxygen demand, Suspended solids, Chemistry, Potable water, Water treatment, Sewage treatment.

The disinfection of waste water is an important in waste water treatment as BOD, suspended solids, and grease removal. The chemistry of waste water chlorination is described. When a chlorine solution from a conventional gas chlorinator enters the waste water stream the reaction that takes precedence over all others is the reaction between free chlorine and ammonia nitrogen to form chloramine and water. This reaction is 99% complete in a fraction of a second at 60-65F and pH 7.5. The mechanism of disinfection is generally accepted to be penetration through the cell wall of the microorganism by the chlorine compound and a chemical reaction between the compound and the vital parts of the microorganism so that reproduction is ended. When potable water is chlorinated that contains only an excess of ammonia nitrogen, the resulting compounds are almost all monochloramines. However, if organic nitrogen is present in amounts greater than 0.15 mg/liter, dichloramine begins to form. This compound or similar compounds have a poisoning effect on chlorine residuals that are only a few minutes old and for this reason back-mixing or short circuiting in a chlorine contact chamber should be avoided. The mathematics of the most probable number (MPN) of coliform concentration from a quantitative viewpoint is presented. The following equation was developed from a pilot plant system that had excellent mixing: y=y sub o (1 + 0.23 ct) where y=MPN in chlorinated waste water at end of time t; y sub o=MPN in effluent prior to chlorination; c=total chlorine residual in mg/liter; and, t=contact time in minutes. This mathematical model illustrates the importance of waste water quality on the attainment of a low coliform concentration. (See also W75-10964) (Orr-FIRL)
W75-10963

**DISINFECTING WASTEWATER WITH CHLORINATION/DECHLORINATION PART 2,**
G. C. White.
Water and Sewage Works, Vol 121, No 9, p 93-95, September, 1974. 1 fig.

Descriptors: *Chlorination, *Disinfection, Equipment, *Wastewater treatment, *Potable water, Control, Water purification, Water treatment Sewage treatment, Water quality control.

The three major factors that account for the difference in the sensitivity between potable water and waste water to the disinfection process by chlorine are the magnitude of coliform concentration prior to chlorination, the ammonia nitrogen content, and the relatively high organic nitrogen content in waste water effluents. The most efficient chlorination disinfection systems studied had four attributes in common: very good initial mixing; sufficient contact time (at least 30 min. at peak flow) in an outfall conduit or a well designed basin; a good automatic chlorine residual control system; and, competent operating personnel. Mixing should ideally be completed in a fraction of a second. In actual operation, mixing completed within one to three seconds is considered excellent. A tubular type of reactor or a closed conduit are both good mixing devices. A chlorine contact chamber should provide sufficient residence time for the chlorine to reduce the harmful and objectionable microorganisms to acceptable levels. Closed conduits are the best contact chambers followed by long narrow outfall channels as the second best type. There are two types of chlorine residual control systems: straight residual control where the analyzer controls both the change in flow rate and chlorine demand of the waste water; measuring device and from a residual analyzer. The compound loop system is recommended because of its ability to cope with sudden changes in flow. (See also W75-10963) (Orr-FIRL)
W75-10964

**NITROGEN REMOVAL BY CATALYST-AID BREAKPOINT CHLORINATION.**
Environmental Quality Research and Development Unit, New York State Dept of Environmental Conservation, Albany.
W. N. Stasiuk, L. J. Hetling and W. W. Shuster.
Journal Water Pollution Control Federation, 46, No 8, p 1974-1983, 1974. 7 fig, 2 tab, 10 ref.

Descriptors: Nitrogen, *Ammonia, *Al *Chlorination, *Waste water treatment, W pollution, Nitrification, Denitrification, exchange, Oxidation, Activated carbon, Nitro compounds, Nutrient removal, Adsorption.
Identifiers: Chloramine formation, *Breakp chlorination, Air stripping, Nitrogenous oxy demand, Trichloramine, Monochloram Dichloramine, *Nitrogen removal

Under certain conditions, the removal or con sion of nitrogenous species in waste water necessary. Ammonia must be removed to a with no direct oxygen demand when amm nitrogen exerts a large drain on the oxy resources of the receiving waters. When nutrient that limits algae growth is nitro removal is needed to eliminate nuisance blooms. Methods developed for the convers reduction, or removal of ammonia nitroge waste waters include biological nitrifica denitrification, selective ion exchange, stripping at elevated pH, and breakpoint chlo tion. A technique for reducing nitrogenous oxy demand submitted to the New York State Dep ment of Environmental Conservation utilized sorption of chloramines on activated car Chloramines are formed in chlorinated waters taining ammonia and hypochlorous acid. Prev chloramine formation studies were handicap by the occurrence of decomposition reaction low, pH, as well as Cl:N ratios greater tha These consisted of the loss of oxidizing chlo and ammonia nitrogen, and are called breakp chlorination reactions. An advantage would realized if monochloramine were adsorbed on tivated carbon. The theoretical Cl:N ratio for per cent removal of ammonia would decrease 76:1 for breakpoint to approximately 5:1 for formation of monochloramine to be adsorbed the carbon. (Leibowitz-FIRL)
W75-10965

**DEWATERS SLUDGE.**
Water and Wastes Engineering, Vol 11, No 8, August, 1974. 1 fig.

Descriptors: *Sludge, *Dewatering, Water p tion control, *Centrifugation, Industrial wa Municipal wastes, Commercial wastes, *W water treatment, Alum, Activated sludge, E ment.
Identifiers: Sludg-a-Tron.

A centrifuge called the Sludg-a-Tron is being ized in pollution control and processing ser for dewatering and concentrating a wide ran industrial, municipal, institutional and comme sludge wastes. The centrifuge is able to con trate sludges from one percent, solids up to 35 cent solids by weight and higher, treating ae cally digested sludges, biological sludges, activated sludges, water treatment alum slu and other industrial wastes. The Sludg-a-Tr expected to be broadly utilized in waste treat facilities on two-stage dewatering systems. A solids capture rate, with efficiencies ranging 99 percent, is achievable without the us polyelectrolytes or flocculants. The centrifug achieve a uniformity of cake, and a high degr cake compaction, without regard to feed ra composition. Some advantages listed are imum installation space, low operating s minimum power requirements, design simpl choice of driving arrangements, and a large of options and accessories. (Leibowitz-FIRL)
W75-10966

EWATER TREATMENT USING ALGAE ARTEMIA,
s State Univ., Normal. Coll. of Applied e and Technology.
acobson.
Works, Vol 105, No 10, p 114, October,

ptors: *Eutrophication, *Organic wastes, , *Artemia, *Waste water treatment, ge treatment, Aeration, Tertiary treatment. iers: Raw wastes, Mariculture.

system of controlled eutrophication for waste water or high organic wastes was in- ted. Laboratory studies used Chlorella and elmis algae in conjunction with Artemia (brine shrimp) to provide controlled purifi- of raw and treated waste. Artemia could be d to live in secondary treated waste with no n, raw waste with aeration, or raw waste in Tetraselmis or Chlorella had bloomed. The l treatment for raw waste was: algal growth tificial light; addition of Artemia; decanta- ollowed by additional algal growth; and, ecantation. Sanitary chemical methodology sed to determine parameters of total ded solids, biochemical oxygen demand, y, odor, orthophosphate, nitrate, nitrite, nmonia. All of these parameters were d by the process to levels associated with at conventional secondary treatment and y tertiary treatment. Implications of mar- were also discussed. (Prague-FIRL) 967

ERATURE EFFECTS ON MICROBIAL TH IN CSTR'S,
Univ., Ithaca, N.Y. Dept. of Agricultural ering.
uck, and C. P. L. Grady.
of the Environmental Engineering Divi- ol 100, No EE5, p 1147-1163, October, ig, 5 tab, 33 ref.

tors: *Waste water treatment, rature, *Biological treatment, Engineer- Microbial degradation, Microorganisms, ory tests, Nutrient removal, Bacteria, rates.
ers: Continuous Stirred Tank Reactors.

r to apply sound engineering judgment to s concerning biochemical processes, in- the removal of soluble organics in waste eatment, it is necessary to quantify the ef- various parameters acting upon them. The of temperature upon the four parameters escribe the continuous of growth of a natu- obial population in a Continuous Stirred actors (CSTR's) are discussed. Results of ratory studies conducted showed that the m specific growth rate constant and the decay rate constant increased with in- in temperature according to the Arrhenius over the temperature range of 10 C-30C. o of the temperature characteristics for that for growth was 1.11. The true growth s observed to increase as the temperature eased from 10C to 20C, but to decrease ther rises in temperature. The saturation decreased slightly when the temperature n 10C to 20C, and then rose greatly when erature was increased to 30C. The results udy agree with the findings of other wor- eported in the literature. It seems that the characteristics of the experimental nay have some effects on the effects of ure on the saturation constant. The escriptive parameters analyzed are inde- of the operational conditions imposed on ater treatment systems. By utilizing the s presented, design engineers can choose er treatment conditions for an effluent aving to rely on generalizations about the f temperature on plant performance. (Orr-

58

**SLURRY DELIQUORING BY EXPRESSION,**
Nagoya Univ. (Japan). Dept. of Chemical Engineering.
M. Shirato, T. Murase, and T. Aragaki.
Dechema Monographien, Vol 74, No 1432/1451, p 9-39, 1974. 27 fig.

Descriptors: *Separation techniques, *Sewage treatment, *Waste water treatment, Sewage sludge, Equations, Filtration.
Identifiers: Solid-liquid systems, Compression, Slurry deliquoring, Expression.

The theoretical developments and subsequent experiments to verify equations concerning the expression process, defined as the separation of a liquid from a solid-liquid system by compression, are discussed. The expression method of deliquoring is widely used in both chemical process industries and in sewage sludge treatments. Its mechanisms consist of two steps of flow phenomena, which may be analysed first by filtration theory and second by consolidation theory. Expression operations are seen to be classified into three types: constant pressure; constant rate; and variable pressure-variable rate operations; according to the time-pressure and flow rate relations. Basic laws govern the flow of fluids through porous media, and conventional definitions of filtration and consolidation characteristics aid in developing basic consolidation equations, as well as new definitions of filtration ratio, consolidation ratio, and modified consolidation coefficient. Good agreement between theories and experiments by using compression-permeability cell data was demonstrated. (Prague-FIRL)
W75-10969

**CHLORINE-CONTAINING ORGANIC CONSTITUENTS IN CHLORINATED EFFLUENTS,**
Oak Ridge National Lab., Tenn.
R. L. Jolley.
Journal Water Pollution Control Federation, Vol 47, No 3, p 601-618, March, 1975. 3 fig, 7 tab, 29 ref.

Descriptors: *Waste water treatment, *Chlorine, Analytical techniques, Chromatography, Municipal wastes, Effluents, *Chlorination, Organic compounds, Sewage treatment.
Identifiers: Organic constituents.

An examination was made of the chlorine-containing compounds present in the chlorinated primary and secondary effluents from two domestic waste water treatment plants. A 36C1 tracer, high resolution chromatographic method was used in the examination. Conclusions reached as a result of the study as are follows: stable chlorine-containing organic constituents were present after effluents had been chlorinated to a 1 to 2 mg/liter chlorine residual; anion-exchange chromatographic elution positions were established for these constituents; the chlorination yield was about one percent for a typical chlorinated secondary effluent; the chlorination yield was approximately constant with respect to chlorine dosage, but increased with increasing reaction time; the chlorination yield was about equal for both primary and secondary effluents; the major portion of the available chlorine in the chlorination of effluent was consumed in oxidation reactions; and, essentially equivalent results were obtained regardless of whether the effluent was chlorinated with chlorine gas or with hypochlorite solution. (Orr-FIRL)
W75-10970

**AERATION DEVICES: BASIC THEORY,**
Cape Town Univ. (South Africa). Dept. of Water Resources and Public Health Engineering.
G. v. R. Marais.
Water Pollution Control, Vol 74, No 2, p 172-173, 1975.

Descriptors: *Waste water treatment, *Aeration, Equipment, Air entrainment, Bubbles, Aerobic conditions, Oxygen, Mixing, Dissolved oxygen, Oxidation.
Identifiers: Diffused-air bubble aerators, *Mechanical aerators.

Aeration in waste water treatment is the process by which oxygen is supplied to the liquor so that the organisms present are able to oxidize the organic content of the waste water. The three stages of transfer of oxygen from the gaseous to liquid phase are: transfer of the oxygen molecules from the air to the liquid interface; passage of the oxygen through a liquid film of about three molecules thick by molecular diffusion; and, dispersion of the oxygen into the body of liquid by further diffusion and convection. The two basic types of aeration devices, diffused-air bubble aerators and mechanical aerators, both utilize the first stage of oxygen transfer. The diffused-air principle introduces small air bubbles through diffusers; oxygen transfer from the interface to the body of liquid is governed principally by the process of molecular diffusion and therefore is greatly affected by surface impurities in the liquid. In mechanical aeration, the shearing action of the impellers creates new interfaces; mass transfer is governed by surface renewal and only slightly affected by diffusion transportation. Manufacturers of aeration equipment usually give a figure for the oxygen transfer rate, the mass of oxygen that the aeration device can introduce into a body of water per unit of time-per unit of power absorbed at the aerator shaft. Equations are presented which enable one to modify the manufacturer's figure for oxygen transfer rate to allow the non-standard conditions during operation. (Orr-FIRL)
W75-10971

**ADJUDICATING TENDERS FOR AERATION DEVICES: BEST VALUE AND RELIABILITY,**
J. Halliday.
Water Pollution Control, Vol 74, No 2, p 184-185, 1975.

Descriptors: *Aeration, Equipment, *Waste water treatment, Costs, Economics.
Identifiers: *Aeration devices.

In deciding which aeration device to choose one must consider more than just the capital cost. One method for doing this is to calculate the annual interest and redemption on the capital and add this to a calculated cost of power required. For a conventional aeration plant the annual power cost may equal the annual interest and redemption on the aeration equipment, while for an extended aeration plant the cost of power may be twice that of interest and redemption. The efficiencies of all the components of an aeration device must be examined in relation to their particular mode of operation. Efficiencies of all the components of an aeration device tend to decrease with reduced load. This reduction in efficiency must be considered where water levels vary considerably or if there is to be oxygen control by means of two-speed motors or varying the depth of aerator immersion. In terms of reliability attention should be given to the drive for the aerator, the gearboxes, bearing life, to methods which prevent the total loss of oil from the gearbox in the event of the failure of the oil seal, and which prevent moisture from getting in the gearbox. Ensuring reliability in the plant begins in the specifications. Reliability costs money and is dependent upon good basic mechanical design. The purchaser should set his minimum standards in the specifications and then perhaps place weight on the additional features which may be offered by various aeration devices. (Orr-FIRL)
W75-10972

**SETTLEMENT AND SLUDGE RETURN IN ACTIVATED-SLUDGE TYPE PACKAGE PLANTS,**
P. B. B. Vosloo.
Water Pollution Control, Vol 74, No 2, p 197-198, 1975. 2 ref.

Descriptors: *Activated sludge, *Waste water treatment, Aeration, Sludge, Dissolved oxygen, *Sludge treatment, *Treatment facilities.
Identifiers: Packaged plants, Sludge return.

The sludge in most activated sludge package plants occasionally tends to be light and bulky. This is frequently due to over aeration. To control this, the oxygen input should be arranged so that at peak flow the DO drops to below one mg/liter, while at low flows it rises to 3 or 4 mg/liter. Because of the tendency of package plants to produce a light, flocculent sludge, it is recommended that their sedimentation sections provide for a lower rise rate than that which is normally acceptable for larger plants. It is better to by-pass a portion of the incoming flow when a period of abnormally high flow coincides with a period of abnormally light sludge, rather than to pass everything through the plant and risk losing a large proportion of the activated sludge. Many packaged plants do not have mechanical means for returning sludge but rely instead on the slight difference in density between sludge in the lower portions of the settling zone and the mixed liquor in the aeration zone to make the sludge flow back into the aeration zone by gravity. This type of system has been found unsatisfactory. The best type of package plant has a pump for the return of the sludge. Sludge return ratios in excess of 1:1 are unnecessary unless the sluge level in the settling zone rises to near the overflow level in which case the the ratio may be increased to 1.5:1 or even 2:1. (Orr-FIRL)
W75-10973

**UNDERGROUND WASTEWATER TREATMENT PLANTS,**
Vattenbyggnadsbyran Ltd., Stockholm (Sweden). Water and Environmental Div.
E. Isgard.
Journal Water Pollution Control Federation, Vol 47, No 4, p 684-687, April, 1975. 1 fig, 1 tab, 4 ref.

Descriptors: *Waste water treatment, *Construction costs, Water reuse, Design criteria, Odor control, *Treatment facilities.
Identifiers: *Underground treatment plants, Ventilation, *Sweden.

The underground construction of water reclamation plants is an established technique in Sweden. Problems encountered in design and operation of underground plants are discussed. While underground facilities were originally designed for civil defense, the present advantages of undergrounding are saving of space in urban areas, ease in expansion of facilities, environmental control, and protection against adverse weather. Specific cost problems are related to construction in various types of rock. Design criteria must consider expandability; for example, at Kappala, a transport tunnel was built between the existing and future plants. Proper heating and ventilation are necessary, particularly ventilation of hydrogen sulfide from pre-aeration. Measures must be designed for odor control and to prevent inundation and explosions. Careful tightening of excavation is also required to prevent drainage of soil above the excavations and settling of streets or buildings. Such design difficulties have been overcome at many underground facilities in the Stockholm area, providing favorable treatment results. (Prague-FIRL)
W75-10974

**INNOVATIVE PROCESS TREATS WASTEWATER,**
D. A. O'Sullivan.
Chemical and Engineering News, Vol 53, No 18, p 27-28, May, 1975. 1 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Aeration, *Biological treatment, *Aerobic conditions, Equipment, Pilot plants, Treatment facilities.
Identifiers: Deep shaft process.

A deep shaft process for waste water treatment may be considered as the most significant advance in sewage technology in the past 60 years. The advantages of this technique over conventional water treatment methods include: low capital and operating costs; more economical use of land; absence of offensive odor; and, lower production of sludge. The process involves continuous circulation of waste water throughout a vertical shaft. Aerobic bacteria feed on the entrained organic matter. A stream of air injected into the shaft provides both the driving force to maintain circulation and the oxygen necessary for aerobic biological treatment. The unit is a cylindrical steel or concrete shaft, with a diameter between 0.4 and 10.0 m, which extends into the ground to a depth of 100-300 m. The dimensions depend on the volume of effluent to be treated. A unit 135 m deep is capable of efficiently accepting and transferring one kg of oxygen/hr/cu m of effluent. The process results in an overall land saving of about 50%. The large activated sludge ponds and anaerobic digestion units are eliminated. Oxygen uptake efficiency can be 90% or greater in the new system compared with the 10% level achieved in present-day sewage treatment works. A pilot unit has been running continuously treating whole raw sewage from the sewage works at Billingham, Great Britain. (Orr-FIRL)
W75-10975

**ANAEROBIC ACIDOGENESIS OF WASTEWATER SLUDGE,**
Institute of Gas Technology, Chicago, Ill.
S. Ghosh, J. R. Conrad, and D. L. Klass.
Journal Water Pollution Control Federation, Vol 47, No 1, p 30-45, January, 1975. 7 fig, 7 tab, 16 ref.

Descriptors: *Waste water treatment, *Methane, *Sewage treatment, Anaerobic conditions, *Anaerobic digestion, Anaerobic bacteria, Digestion, *Sludge treatment.
Identifiers: *Anaerobic acidogenesis.

The anaerobic digestion process is popular in the waste treatment field because of the following reasons: its capability of stabilizing large volumes of dilute organic slurries at low cost; its low biomass production; the high kill rate of pathogenic organisms; its capability of producing solid residue suitable for use as soil conditioners; and, its ability to convert the organic carbon in the feeds to a product gas stream high in methane that can be substituted for natural gas. This study was designed to determine the feasibility of maintaining dominant cultures of acidogenic organisms with waste water sludge feeds by kinetic control, compile information on the biokinetic characteristics of acidogenic organisms; and, to develop guidelines and criteria for operating acid-phase digestion with waste water sludge feeds. A general discussion on the theory and operating principles of the two-phase digestion process is presented with special emphasis on the acidogenic phase of the total process. Results of the study showed that stable, steady-state operation of the two-phase process is possible with waste water sludge for extended time period. The two-phase digestion process may be operated at one-half of the detention time of a high-rate digester and still exhibit higher rates of solids stabilization and methane production. The suggested reason for this high achievement is that phase operation allows the two groups of digester organisms to attain their full metabolic potential and thereby effect substantial improvement in overall digestion efficiency. (Orr-FIRL)
W75-10976

**$3-MILLION AND TWO-AND-A-HALF YEARS TO SOLVE CAMPBELL RIVER'S SEWAGE PROBLEMS,**
G. Beardsley
Water and Pollution Control, Vol 113, No 4, p 57-59, April, 1975.

Descriptors: *Sewage treatment, *Waste wat treatment, Storm runoff, Sewerage, Pipeline Pumps, Interceptor sewers, Planning, *Canad *Treatment facilities.
Identifiers: *Campbell River(BC)

The Campbell River District, British Columbi has designed a secondary sewage treatment to the needs of its population of 11,000. The area h been subjected to intrusion of storm water into t sanitary system. A new collection system a treatment plant were planned and funded fro various federal and provincial sources. The enti project was carried out between February 19 and May 1974. A 14,000 foot long trunk pressu line was constructed so as to serve the area n tially by gravity. An eighteen-inch diameter Sch pipe was chosen for the pressure main. Fo pumping stations were installed along the highwa Flygt pumps were used throughout the syste The installation of collector sewers was co plicated by the problem of terrain, necessitati grading the trunks continuously because of t shoreline is very close and seepage from the s was a danger. The plant was designed a screened so as to be aesthetically compatible w its residential surroundings. Public relations e forts were also made and the reaction to the n system was favorable. The plant capacity is c rently enough to serve a population of 15,000, w anticipated modular additions for a population 30,000. (Prague-FIRL)
W75-10977

**ALGAE REMOVAL USING DISSOLVED A FLOTATION,**
Ellsworth Engineering and Associates, Ida Falls, Idaho.
W. F. R. Bare, N. B. Jones, and E. J. Middlebrooks.
Journal Water Pollution Control Federation, V 47, No 1, p 153-159, January, 1975. 18 fig, 3 tab, ref.

Descriptors: *Waste water treatment, Alg Suspended solids, *Flotation, Flocculation, Pi plants, Laboratory tests.
Identifiers: *Algal removal, *Dissolved air flo tion, Ferric sulfate, Alum.

The study described was conducted to evalu the effectiveness and economic of dissolved flotation as a method of removing algae fr waste water stabilization pond effluents. operating parameters studied included algae c centration, coagulant dosage, and percent recycle. Some of the conclusions made, based bench-scale and pilot plant tests, are as follo direct pressurization did not provide g suspended solids removal in raw, naturally floc lated, or chemically flocculated algal sampl pressurized recycle greatly improved the remo efficiencies in naturally and chemically floc lated samples; 85 mg/liter of ferric sulfate w required to flocculate an algal suspension of ab 100 mg/liter to obtain solids removal greater t 90% in the batch tests; 75 mg/liter of alum w required to flocculate an algal suspension of ab 100 mg/liter to obtain solids removal greater t 90% in batch tests; 175 mg/liter of alum w needed to flocculate an algal suspension of ab 125 mg/liter to obtain 90% solids removal in p plant tests; and, the difference in chem requirements between pilot plant and bench-s tests was thought to be caused by a higher conc tration of algae in pilot plant tests, a major ference in the algal species being removed, and dynamic nature of the pilot plant tests as c pared with the static, ideal conditions of ben scale tests. The total annual cost of operating flotation system was estimated to range fr $39,000/year for a one mgd plant to $457,300/y for a 20 mgd plant. (Orr-FIRL)
W75-10978

OCHEMICAL TREATMENT OF WASTE-R-SEAWATER MIXTURE BY ELEC-'SIS,
Island Univ., Kingston. Dept. of Civil and mental Engineering.
Poon, and T. G. Brueckner.
Water Pollution Control Federation, Vol 1, p 66-78, January, 1975. 6 fig, 4 tab, 23

tors: *Waste water treatment, olysis, *Nutrient removal, *Sea water, Ac-carbon, Anodes, Cathodes, Electrochemis-sphorus, Nitrogen, Desalination.
ers: *Physico-chemical treatment.

was performed to determine the feasibility mple and reliable waste water treatment using electrolysis of waste water and sea-The process is intended for the removal of hosphorus and nitrogen, and also for disin-The electrolysis cell employed contains anodes on the bottom of the cell with an ode placed above them. Seawater is used nolyte and waste water as the catholyte. trolytic cell, operated as a batch unit, was o be capable of producing an effluent of quality than a secondary effluent. Both tes and nitrogen may be effectively l to meet the most stringent effluent stan-owever, some nitrogen content is inevita-e final effluent. Therefore, the batch elec-process can be considered extremely ef-when control of phosphates is absolutely , but control of nitrogen is less critical. g of the effluent from batch electrolysis t with activated carbon adsorption an essentially pollutant-free discharge. h operation necessitates the use of small t units. A bank of electrolytic cells can be handle moderate to high waste water his may be higher in terms of the capital will add to the flexibility of the plant in operation and expansion plans. The treat-quires no specialized operator training, chemicals, produces a relatively small of sludge, and is unaffected by low tem-s. (Orr-FIRL)
79

BLE PROVISION IN CURRENT S FOR FUTURE DEVELOPMENT IN ON TO RECLAMATION OF EF-
Inst. for Water Research, Pretoria (South
nard.
llution Control, Vol 74, No 2, p 177-180, g, 4 ref.

ors: *Waste water treatment, *Nutrient *Design, Biological treatment, Denitrifi-ewage treatment, Aeration, Dissolved ox-tivated sludge, Nutrient removal.
rs: Phosphorus removal, Nitrogen

tions to the activated sludge process for val of nitrogen and phosphorus neces-anges in the design and application of equipment. The removal of phosphates age by precipitation without chemical ad-s been observed in plug-flow plants. In fine bubble aeration in the last compart-a minimum DO content of 3-4 mg/liter quor are recommended. When ferrous used to precipitate phosphates (200 errous sulfate), the oxygen requirements o 7.5 oxygen/liter of feed. The modifica-e activated sludge process for the total f nitrogen involves recycling of nitrate-d liquor to a compartment at the head of on basin. The first and third basins are d but stirred to keep the solids in suspen-DO in the second basin should be kept one and 2 mg/liter. Therefore, the aera-is basin should be of such a size and so located in the basin that they can be switched in or out according to the oxygen requirements. Whether to use surface aerators or bubble aerators depends upon several factors. Surface aerators are generally more economical than bubble aerators when only oxygen transfer efficiency is considered. The cooling effect of the various aerators needs to be considered when nitrification and denitrification are desired since reaction rates decline with decreasing temperatures. Automatic control of DO is recommended since this results in a power cost savings that can offset in two years the cost of the equipment for DO control. (Orr-FIRL)
W75-10980

**ICI'S DEEP SHAFT 'HALVES SLUDGE VOLUME',**
B. Appleton.
New Civil Engineer, April, 1975. 3 fig.

Descriptors: *Waste water treatment, *Sewage treatment, Biological treatment, Equipment, Industrial wastes, Sludge, Treatment facilities.
Identifiers: *Deep shaft process, Sludge production volume.

ICI's Agricultural Division has developed a new treatment process for raw sewage of industrial effluent. The effluent circulates around a 150 m deep shaft and emerges requiring only final settlement and sludge dewatering. The claims for the deep shaft process include: only 50% of the sludge volume generated by a conventional works; low capital cost; low operating cost; a highly efficient oxygen transfer system makes the process ideal for roughing treatment of high strength liquors; and, absence of odor. The process relies on a colony of bacteria in the circulating liquor to purify the effluent. The effluent circulates vertically in the shaft, completing about 20 circuits in the 2 hour retention time. The air used for biological oxidation also provides the driving force for liquid circulation. The process involves: feeding incoming sewage into a vertical carbon steel tube extending to the bottom of the shaft; recycled sludge from the subsequent sludge-separation stage is added to maintain the bacteria colony; air is injected into the inner tube to provide the necessary oxygen; spent air is vented to the atmosphere at the head of the shaft; and, a conventional overflow weir outlet carries the purified effluent to the sludge separation stage. Deep narrow shafts are preferred for weak liquors requiring high quality treatment, while roughing treatment of high strength industrial waste is most economically provided in shallower broader shafts. One hundred and fifty meters has been chosen as the optimum depth for domestic sewage treatment, the shaft diameter being fixed by the design retention time of 2 hours. (Orr-FIRL)
W75-10981

**MEMBRANE DESALTING GETS BIG PUSH,**
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 3A.
W75-10982

**WATER POLLUTION PROBLEMS IN SALISBURY, RHODESIA: PRESENT AND FUTURE,**
For primary bibliographic entry see Field 5G.
W75-10983

**NITROGEN REMOVAL IN A PILOT PLANT,**
Vattenbyggnadsbyran Ltd., Stockholm (Sweden).
B. Ericsson.
Journal Water Pollution Control Federation, Vol 47, No 4, p 727-740, April, 1975. 9 fig, 2 tab, 18 ref.

Descriptors: *Nitrification, *Denitrification, *Waste water treatment, Pilot plants, Filters, Tanks, Sludge, Costs, Nitrogen, Nutrient removal, Phosphorus.
Identifiers: Phosphorus removal, Sweden.

Nitrogen removal is used as an alternative to phosphorus removal in limiting algal growth. While the method chosen depends on the type of water and dissolved nitrogen compounds, concentrations, and associated costs, the most promising method in Sweden is biological nitrification-denitrification. Results from a pilot plant operation demonstrated that biological nitrification in a tank system is best accomplished by a double sludge system for combined and separate carbon degradation and nitrification. Critical rate of nitrification at 95% yield was found to be about 3.0 and 2.2 NH3-N/hr/g vss at 18 C and 12 C, respectively. The BOD:NH3-N ratio after pre-sedimentation influences the oxygen requirement, the sludge yield and the acid produced; pH is also very important. The rate of denitrification in the anaerobic filter with plastic media at about 95% yield during the first period at 18 C was about 9 g NO3(-)-N/hr, with a 1.8 hour detention time. The choice between a tank reactor and an anaerobic filter for denitrification depends upon costs and upon operational safety. While the anaerobic filter proved to be safer during the operational trial, it was more expensive. It was recommended that further experimentation be conducted to improve the sludge settleability in the tank reactor system and the system be compared with flotation. (Prague-FIRL)
W75-10984

**INDUSTRY AND COMMUNITY IN COOPERATION,**
K-Konsult, Lund (Sweden).
L. Nilsson.
Journal Water Pollution Control Federation, Vol 47, No 4, p 760-763, April, 1975. 4 fig.

Descriptors: *Waste water treatment, Municipal wastes, Biochemical oxygen demand, Biological treatment, Alum, Economics, *Treatment facilities, Industrial wastes.
Identifiers: Sweden, *Combined treatment.

A successful combined municipal/industrial waste water treatment facility is described. The plant was designed for the township of Kagerod, Sweden and a milk products industry. The township's population, under 2000, produces about 270 lb of biochemical oxygen demand per day. Industrial waste water is expected to average 1000 lb BOD per day, corresponding to 7500 person equivalents. Average daily flow for the new treatment plant will accomodate 4950 cu ft/hr, 1030 cu ft/hr of this from the milkfood plant. The facility uses biological treatment with the activated sludge method and chemical post precipitation treatment with alum. Sludge is dried with industrial smoke and a Nateko dryer. Operation results since 1972 have been very efficient; water emitted from the plant showed a remainder of 22 mg BOD/gal, 27 mg nitrogen/gal, and 0.9 mg phosphorus/gal, or a reduction of 99, 89, and 99%, respectively. The dryer is successful in sulfur reduction as well. The dryer makes it possible to use heating oils with a high sulfur content and still emit less sulfur, thus decreasing costs of heating oil The results of this system are a economical advantage for both industry and the municipality and a cleaner living environment. (Prague-FIRL)
W75-10985

**WASTEWATER TREATMENT PLANT ODORS: A CONTINUING ENIGMA,**
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
R. D. Neufeld.
Public Works, Vol 106, No 3, p 83-84, 106, 107, March, 1975. 1 tab, 22 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Odors, *Municipal wastes, Treatment facilities, Absorption, Adsorption, Organic compounds, Pollution abatement, Pennsylvania.
Identifiers: Allegheny County(Penn).

One major problem in the operation of both domestic and industrial waste water treatment plants is the control of odors. The Allegheny County Sanitary Authority (ALCOSAN) has built a treatment network for coping with this problem. Because of the complexity of odorants from various sources, six general classifications of techniques for abatement of odorous air have been defined. These are: combustion; adsorption; absorption; vapor mixing; source reduction; and dilution. Source reduction is a difficult defense against odors, and dilution of odors by discharge through tall stacks into the atmosphere is an alternative which has been discouraged. Combustion for complete destruction of organics requires high temperatures for a sufficient time period. Adsorption with activated carbon requires a system design which accounts for the variety of potential odorants, and determines the offending chemical which is most poorly retained on the carbon. Absorption or scrubbing is suitable only when odorous vapors are soluble, reactive, or emulsifiable in water. Also, organic compounds which comprise most of the odor producing substances in waste are insoluble without the addition of oxidants. Vapor mixing with odor masking or odor modification is controversial as it is not always successful and it does not reduce the atmospheric burden of organic gases but rather increases it. ALCOSAN is presently most concerned with fecal odor from sewage sludge process; gases from filters will be ducted into existing incinerators, other control will require chemical oxidation. (Prague-FIRL)
W75-10986

**WATER CONSERVATION IN SWEDEN: III. CURRENT TRENDS,**
Ministry of Agriculture, Stockholm (Sweden).
For primary bibliographic entry see Field 5G.
W75-10987

**CARBON REGENERATION BY WET AIR OXIDATION,**
Zimpro, Inc., Rothschild, Wis.
W. B. Gitchel, J. A. Meidl, and W. Burant, Jr.
Chemical Engineering Progress, Vol 71, No 5, p 90-91, May, 1975. 1 fig, 1 tab, 12 ref.

Descriptors: *Waste water treatment, *Activated carbon, Adsorption, Tertiary treatment, Laboratory tests, Sewage treatment, Physical properties, Water quality, *Oxidation.
Identifiers: *Wet air oxidation, Carbon regeneration.

The results of physical and chemical tests and full-scale plant tests on the water quality produced by wet air oxidation regenerated activated carbon are summarized. The quality of the water produced by the regenerated carbon was found to be equal to that obtained by using virgin carbon. Results indicate that wet air oxidation causes some reduction in surface in pores under 10 angstroms radius with no change in surface in all other pores. Absorption isotherms show that most Cl-C4 compounds are readily adsorbed even by virgin carbon with a full complement of surface in the smallest pores. These small carbon compounds are readily removed by biological treatment, suggesting therefore that the surface in 10 angstrom or smaller pores is not essential in waste water treatment. The chemical and physical tests show that wet air oxidation does restore all the adsorbate relative efficiencies (R.E.) and pore structure of the parent carbon to a very high degree with the exception of the mentioned small pores. It is concluded that spent carbons may be fully regenerated by wet air oxidation in terms of the application of these carbons. (Orr-FIRL)
W75-10988

**LAMELLA SEDIMENTATION: A COMPACT SEPARATION TECHNIQUE,**
Svenska Traforskningsinstitutet for Industriforskning, Stockholm (Sweden). Engineering Dept.
B. Forsell, and B. Hedstroem.
Journal Water Pollution Control Federation, Vol 47, No 4, p 834-842, April, 1975. 12 fig, 3 ref.

Descriptors: *Waste water treatment, Sedimentation, *Settling basins, *Separation techniques, Equipment, Sludge treatment.
Identifiers: *Lamella separators, *Lamella sedimentation.

Lamella sedimentation has the advantages of reducing the demand for large building areas and/or volumes and also of low operating and overall costs. Modern lamella sedimentation techniques have profited from advances in fluid dynamics research and materials technology. A general description of lamella sedimentation is given with reference to the topics of surface effectiveness and compactness, sludge density, sludge volume and resistance to shear forces, flow variations, fluid mechanics, special problems of lamella sedimentation, and the mechanical construction and layout of a lamella sedimentation plant. The area that is theoretically available for separation in a lamella apparatus is equal to the sum of the projections on the horizontal plane of the separation plates. In a continuously working separator, a large enough inclination angle must be chosen so that the sludge separating on the plates may be continuously and efficiently removed. Flow pattern can be either cocurrent or counter current; the choice depends on the fraction of the sludge volume which is light, network forming, low yield stress and which is heavy, finely dispersed, high yield stress. A lamella sedimentation plant consists of a particular number of separating plates working in parallel, large plants may contain several thousand. Smaller plants, less than 250 sq m, may be designed as package plants. In larger plants, the lamella device is usually one step in a process line in which all units are contained in a common concrete building block. (Orr-FIRL)
W75-10989

**LIQUID CO2 PROTECTS OUR WATER'S QUALITY,**
Kansas City Water Dept., Mo.
For primary bibliographic entry see Field 5F.
W75-10990

**VIRUS REMOVAL AND INACTIVATION DURING WATER TREATMENT,**
Maine Univ., Orono. Dept. of Civil Engineering.
O. J. Sproul.
Journal of the New England Water Works Association, Vol 89, No 1, p 6-15, March 1975. 5 tab, 12 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Viruses, Coagulation, Sedimentation, Filtration, Disinfection, Chlorine, Ozone, Recreation, Environmental effects.
Identifiers: *Viral removal, Virus inactivation.

The increased use of water for recreational purposes has made it necessary to decrease the viruses in water after treatment. Coagulation and sedimentation, rapid sand filtration and disinfection in a series are used by a complete water treatment plant. Removal of poliovirus can be as high as 99.9% when magnesium is precipitated from the water. Coagulation has also resulted in a high virus removal rate. Filtration through sand can remove viruses completely from treated waste water effluent provided the distance is long enough. Chlorine used properly is an effective viricide. Ozone is also an effective disinfectant. In the future research and development to minimize effects on the environment from viruses through treatment plants would be useful. Standards for treating potable and waste water should also be developed. (Dean-FIRL)
W75-10991

**ACTIVATED CARBON IN THE WATE TREATMENT PLANT,**
Massachusetts Dept. of Public Health, Lawrenc Lawrence Experiment Station.
A. E. Sylvia.
Journal of the New England Water Works A sociation, Vol 98, No 1, p 29-35, March 1975.

Descriptors: *Activated carbon, *Treatment fac ties, *Waste water treatment, *Water quality st dards, Public health, Legislation, Industr wastes, Surface runoff, Odor, Taste, Potat water, Microorganisms, *Pollutant identificatio Identifiers: Carbon chloroform extract, Rap Fluorescence Technique.

Coal is the source of granular activated carb commonly used by water treatment plants. Pub health officials are concerned not only by the od and taste problems but also by the chemicals fr industrial plant effluents and natural surface r noff entering the public water supply. Activat carbon beds and columns will adsorb the che cals most concerning the public health officials potential health hazards. The Environmental P tection Agency has been trying to pass a bill t would extend their authority beyond bacteriolo cal quality of water supplies to include physic chemical, and biological standards. Passage of t legislation would mean that a number of water d tricts would have to use additional treatment meet the standards. Carbon Chloroform Extr (C.C.E.) is high on the EPA list. Work is being c tinued on the development of a rapid fluorescen technique. The method has undergone extens testing and seems to be valid for measurement microorganisms in potable water when compa to the CCE method. (Dean-FIRL)
W75-10992

**HIGH COSTS MODIFY SEWAGE PLANT E PANSION.**
Engineering News-Record, Vol 194, No 15, p 82, April 10, 1975. 3 fig.

Descriptors: *Waste water treatm *Construction costs, *Treatment facilities, F rates, Costs, Potomac River, Biochemical oxy demand, Nitrogen, Phosphorus compou Estuaries, Cyanophyta, Fishkill, Sludge dispo Tertiary treatment.
Identifiers: Washington, DC, Blue Plains Sew Treatment Plant(DC).

Rising construction and energy costs have forc slowdown in the plans to expand and upgrade installing an advanced waste treatment system would remove nitrogen and phosphorus Washington, D.C.'s Blue Plains sewage treatm plant. The present facility is a modified activa sludge plant handling an average flow of 250 with a peak of 300 mgd with a secondary treatm process removing 70% BOD and suspended so The upgraded plant would handle 309 mgd wi peak of 650 mgd and the new modified aera plant will remove 95.5% BOD, 98% phosph and nitrogen and 90% ammonia. Because of Plains' proximity to the Potomac tidal estuary removal of both nitrogen and phosphate was lieved necessary to end growth of blue-green a which has on occasion matted and caused fishk If phosphorus removal could slow the gro construction costs would be lower. Sl disposal presents another problem. Incineratio the sludge according to present plans w require 50 million kwh of electricity and 13.7 lion gallons of fuel oil in 1978. Presently the sl is being disposed of by burying and surface disposal. Another solution is selling compo sludge for fertilizer providing the odor pro can be overcome. (Dean-FIRL)
W75-10993

**MINITEST METHOD FOR MONITORING FLUENT QUALITY,**
Uppsala Univ. (Sweden). Algal Assay Lab.
E. Elfving, A. Forsberg, and C. Forsberg.

Water Pollution Control Federation, Vol
, p 720-726, April 1975. 3 fig, 2 tab, 18 ref.

tors: *Waste water treatment, Data collec-
Chemical oxygen demand, Water quality,
ts, Nitrification, Biological treatment, Ac-
sludge, Analytical techniques, Treatment
s, *Pollutant identification.

g-run efficiency of six different treatment
described with the use of data obtained by
ous sampling from July 1973 to July 1974.
clude the effects of treatment disturbing
such as technical errors, incoming oil, or
ompounds. Processes demonstrated are
al treatment with activated sludge, and
al treatment in combination with five dif-
ypes of phosphorus removal systems. In-
n was given on PO4-P, total P, NH4-N,
NO3-N, AGP, and COD. The analysis of
s from chemical treatment plants showed
h presimultaneous and postprecipitation
maximum phosphorus reduction, weekly
values of about 0.2 mg/liter. The treatment
y was reduced by disturbances and by
l errors. The nitrification processes
a comparatively high correlation with tem-
. Some negative AGP values were found.
COD values were between 30 and 40
(Prague-FIRL)
94

LL TECHNOLOGY,
nental Protection Service, Ottawa
. Environmental Emergency Branch.
ary bibliographic entry see Field 5G.
01

ELECTION,
ed Engineering Services Ltd., Vancouver
Columbia).
ary bibliographic entry see Field 8C.
02

M SULFATE SOLUBILITY IN
SH WATER CONCENTRATES AND
ATIONS TO REVERSE OSMOSIS
SES: POLYPHOSPHATE ADDITIVES,
e National Lab., Tenn.
tts, P. M. Lantz, and W. L. Marshall.
ion, Vol 15, No 2, p 177-192, 1974. 7 fig, 2
f.

rs: *Desalination, Reverse osmosis,
use, Potable water, Filtration, Chemical
ion, Desalination plants, *Waste water
.
s: *Calcium sulphate, Hyperfiltration,
phate additives.

urally occurring brackish waters contain
s that may foul reverse osmosis mem-
uch as magnesium, calcium, and sulfate
small amounts of hydroxide ion. The ex-
hich saline water can be concentrated
erfiltration or by the reverse osmosis
o recover pure water is dependent upon
tion precipitation of these substances.
ility at 25C of CaSO4 . 2H2O (gypsum)
stigated for three brackish waters at
smosis plants in Gillette, Wyoming, and
South Dakota, and from the Wellton-
post-irrigation canal in Arizona. It was
at sodium hexametaphosphate, when
small amounts, produces an apparent in-
the saturation concentration of CaSO4.
ns for maximum water recoveries and
ips to the reverse osmosis process were
(Prague-FIRL)
4

NE WATER LEGISLATION ACCOM-
BY MILLSTONE OF BUREAUCRATIC
E,
Roads Sanitary District, Norfolk, Va.

For primary bibliographic entry see Field 5G.
W75-11007

**HOW TO ESTIMATE AND ESCALATE COSTS OF WASTEWATER EQUIPMENT,**
ICARUS Corp., Silver Spring, Md.
H. G. Blecker, H. S. Epstein, and T. M. Nichols.
Chemical Engineering, Vol 81, No 22, p 115-121, October, 1974. 13 fig, 2 tab.

Descriptors: *Waste water treatment, *Costs, *Equipment, Computer programs, Engineering, Design, Installation, Water works, Alternative costs, Capital costs, Construction costs, Installation costs, Initial costs, Real costs, *Treatment facilities.

Charts and tables of cost data are presented to aid in the preparation of conceptual or rough estimates of the cost of facilities for treating waste water, or comparing alternative processing schemes. A technique for escalating the estimate to a future time is also described. The cost data were generated as a computer-aided design and estimating system which determines equipment costs in the same way as an equipment vendor and assembles the complete installed costs the same way a contractor does at the definitive stage. Graphs are included giving the purchased-equipment costs (or field-erected cost), equipment-setting manhours, installed-equipment cost, total field-labor manhours, and the labor-to-material ratio. An example of how to determine the escalation of cost is given. To determine the total installed cost for the equipment item in a South Philadelphia treatment plant in the 2nd quarter 1976, the estimated purchased-equipment cost for the 2nd quarter 1975, the material cost (less equipment) for 2nd quarter 1975 and the field-labor cost for 2nd quarter 1976 must all be calculated. The graphs cover such equipment as storage vessels, vertical pressure vessels, field labor for vertical pressure vessels, general-service centrifugal pumps, reinforced concrete aeration basins, motor-driven reciprocating pumps, motor-driven rotary blowers, variable speed motors and rectangular excavations. (Orr-FIRL)
W75-11014

**HOW SILICA AFFECTS IRON REMOVAL FROM GROUNDWATER,**
Yule, Jordan and Associates, Camp Hill, Pa. Environmental Engineering Div.
For primary bibliographic entry see Field 5F.
W75-11016

**YWA PLAN FOR CLEANER RIVERS,**
B. Appleton.
New Civil Engineer, p 21-22, January 23, 1975.

Descriptors: *Water pollution control, Rivers, *Waste water treatment, Water pollution sources, *Storm runoff, *Sewage treatment, Sewerage, *Overflow, Planning, Industrial wastes.
Identifiers: Yorkshire River Authority(Gt Brit).

The Yorkshire Water Authority, Great Britain, has developed plans for water pollution control of its two major rivers. Sources of pollution are both industrial and municipal. One problem is overflow from sewers during storms. Where the capacity of a sewer has been reduced to below twice dry weather flow, serious surcharging occurs during storms, causing pressure buildup so that manhole covers are blown off and sewage flows out of these openings. Infiltration from surrounding groundwater adds to normal surface runoff and thus further reduces the amount of foul sewage retained in the sewer. When the Rother river level rises, discharges from sewage overflows is shut off and sewage flows into the river as the storm abates and river flow drops. Plans include building of new interceptor sewers to pick up sewage from existing and new branch sewers and to carry up to 50 cu m/sec to a low level pumping station. Another development is a trunk sewer to relieve parts of the city. Besides sewerage problems, the area rivers are polluted from mine drainage. Treatment requires aeration for complete oxidation followed by settlement of the ochre. Other plans include an investigation of the possibility of mixing industrial effluents with domestic sewage for treatment at the local sewage plant. (Prague-FIRL)
W75-11017

**COST SHARING TO HELP CLEAN OUR WATERWAYS.**
For primary bibliographic entry see Field 5G.
W75-11023

**NITROGEN REMOVAL IN THE OPERATION OF THE MILILANI SEWAGE TREATMENT PLANT,**
Hawaii Univ., Honolulu. Water Resources Research Center.
G. L. Dugan, R. H. F. Young, and R. T. Tsutsui.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 718, $3.75 in paper copy, $2.25 in microfiche. Technical Memorandum No 44, September 1974. 20 p, 5 fig, 6 tab, 7 ref. OWRT A-047-HI(1). 14-31-0001-4011.

Descriptors: Nitrogen, *Activated sludge, *Anaerobic digestion, *Sewage treatment, Effluents, Eutrophication, Sludge treatment, Sedimentation, *Waste water treatment, Nutrient removal, *Hawaii, Settling basins, Aeration.
Identifiers: *Rapid Bloc process, *Nitrogen removal rates.

The effluent of the Mililani Sewage Treatment Plant (STP), Oahu, Hawaii, from January 1972 to January 1973 contained only approximately 30% of the total nitrogen that was originally in its raw sewage. During the period that high nitrogen removal rates were observed, raw sewage flowed directly to the 'Rapid Bloc' activated sludge unit. Sludge stabilization was by aerobic digestion. During the fall of 1973, a primary sedimentation tank and an anaerobic digester (which replaced the aerobic digester) were added to the components of the STP. A study was initiated for a one-year period, 1 July 1973 to 30 June 1974, in an attempt to determine the mechanism for nitrogen removal for both before (Phase I) and after (Phase II) modifications to the STP. The waste water flow during Phase I, July to August 1973, averaged 0.65 mgd with an overall total nitrogen removal of about 54%. The major nitrogen loss in the effluent speculated to be by means of gaseous ammonia to the atmosphere, apparently occurred in the aeration unit, settling tank, and aerobic digester. During Phase II studies, January through June 1974, the mean monthly flow increased by approximately 30% and the mean total nitrogen loss decreased to 29%, a range that is typical for conventional secondary activated sludge operations. In both Phases I and II, ammonia nitrogen was the predominant form showing major losses.
W75-11041

**PROCESS FOR TREATING SEWAGE SLUDGE,**
American Cyanamid Co., Stamford, Conn. (assignee)
H. P. Panzer, and K. W. Dixon.
U.S. Patent No 3,894,948, 7 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 1008, July 15, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Sludge treatment, Dewatering, Chemical reactions, Polymers, Waste disposal.
Identifiers: *Chemical treatment.

In the disposal of sludge formed in processing of sewage, it is beneficial to concentrate or thicken the sludges as much as possible to facilitate disposal. A method of treatment is provided which comprises adding to the sludge an effective

amount of a water-dispersible polyquaternary polymer consisting essentially of the reaction product of a lower dialkylamine, a polyfunctional amine, and a difunctional epoxy compound selected from the group consisting of epihalohydrins, diepoxides, precursors of epihalohydrins and diepoxides which under alkaline conditions are readily converted into the corresponding epoxy compounds and mixtures thereof. (Sinha-OEIS)
W75-11064

**PROCESS FOR TREATING INDUSTRIAL WASTES,**
American Cyanamid Co., Stamford, Conn. (assignee)
H. P. Panzer, and K. W. Dixon.
U.S. Patent No 3,894,946, 8 p, 8 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 1007-1008, July 15, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, Water quality control, *Flocculation, Chemical reactions, *Polymers.
Identifiers: *Chemical treatment.

A process of flocculating industrial wastes is described in which the wastes are treated with an effective amount of a polyquaternary polymer obtained from reaction of a major portion of secondary amine, a minor portion of polyfunctional amine and an epoxy type reactant whereby the polyquaternary polymer obtained has a solution viscosity at 25 C of at least 100 centistokes as a 37%, by weight, aqueous solution, based on the cationic portion of the polyquaternary compounds. (See also W75-11067) (Sinha-OEIS)
W75-11066

**PROCESS FOR TREATING INDUSTRIAL WASTES,**
American Cyanamid Co., Stamford, Conn. (assignee)
H. P. Panzer, and K. W. Dixon.
U.S. Patent No 3,894,947, 5 p, 1 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 1008, July 15, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, Water quality control, *Flocculation, Chemical reactions, Polymers.
Identifiers: *Chemical treatment.

Flocculatable industrial wastes are treated with effective amounts of polyquaternary polymers obtained by reaction of a difunctional epoxy type reactant with a secondary amine to a solution viscosity above a minimum value. This process has a widely diversified range of utility. The high efficiency of the process not only enables greater solids removal to be effected but allows desirable removal to be achieved at lower flocculant usages than is conventionally required. (See also W75-11066) (Sinha-OEIS)
W75-11067

**ELECTROLYTIC SEA WATER PROCESS,**
Diamond Shamrock Corp., Cleveland, Ohio. (assignee)
For primary bibliographic entry see Field 3A.
W75-11068

**AEROBIC LAGOON WASTE TREATMENT SYSTEM AND METHOD,**
Kimberly-Clark Corp., Neenah, Wis. (assignee)
A. R. Le Compte, Jr., and D. W. Appel.
U.S. Patent No 3,893,924, 5 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 660, July 8, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water quality control, Water pollution treatment, *Aerobic treatment, Aeration, Water circulation, Lagoons, *Sewage lagoons, Aerated lagoons, Jets.

A highly efficient system and method for effectively treating liquids containing waste materials are disclosed. By the selection and placement of specific types of aerators it is possible to operate an aerobic lagoon at a fraction of the power requirements heretofore thought necessary. The system includes the use of jets placed within the liquid and directed so as to form primary circulation cells having an average velocity of at least about 0.3 foot per second and secondary circulation within the cells sufficient to substantially prevent solids which have been subjected to primary separation from settling out. The flow within the cell is designed to be complementary to adjacent cells and create a serpentine path from inflow to outflow of the lagoon. A quiescent zone may be provided within the lagoon for sludge settling, or a separate polishing pond may be utilized. (Sinha-OEIS)
W75-11069

**MOBILE UNIT FOR TREATING LIQUID WASTE,**
Chemfix, Inc., Pittsburgh, Pa. (assignee)
D. J. Opacic, A. L. Lengyel, E. A. Zawadzki, and F. H. Jackson.
U.S. Patent No. 3,893,656, 4 p, 13 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 576, July 8, 1975.

Descriptors: *Patents, *Waste water treatment, Industrial waste, *Waste disposal, Water pollution control, Water quality control, Equipment, Liquid wastes.
Identifiers: Setting agents, Mobile equipment.

A mobile unit for treating liquid waste to render it non-polluting and fit for ultimate disposal includes a mixing hopper having an inlet for receiving liquid waste, and an outlet for connection to a conduit extending to the disposal area. The unit also includes a bin for a powdered setting agent for a liquid alkali metal silicate. The bin has an outlet at its bottom and a porous floor spaced above its bottom. Compressed air is delivered to the space beneath the floor to form a fluidized bed of setting agent above the floor. The setting agent is delivered to the mixing hopper in which it is mixed with the liquid waste. After the mixture leaves the hopper, liquid alkali metal silicate from a tank in the mobile unit is delivered to the mixture. The treated waste will set after it has reached the disposal area. (Sinha-OEIS)
W75-11073

**LOW TEMPERATURE WATER PURIFICATION SYSTEM,**
Pollution Control, Inc., South Barre, Vt. (assignee)
For primary bibliographic entry see Field 5F.
W75-11074

**WASTEWATER TREATMENT PLANT,**
Autotrol Corp., Milwaukee, Wis. (assignee)
W. N. Torpey.
U.S. Patent No. 3,894,953, 5 p, 5 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 1010-1011, July 15, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Organic wastes, Water pollution control, *Septic tanks, Separation techniques, Anaerobic digestion, Biological treatment, Hydrogen sulfide, *Treatment facilities.

A modified septic tank with troughs arranged to be fed in parallel controls the detention time of wastewater passing through the troughs to the range of from 2 to 4 hours thereby minimizing the addition of gasses to the effluent wastewater, particularly hydrogen sulphide that is evolved in the lower portion of the tank in connection with the digestion of settled organic solids. The substantial reduction of hydrogen sulphide in the effluent wastewater from the septic tank makes available a maximum amount of surface for the growth and maintenance of organisms oxidizing carbonaceous and nitrogenous pollutants on the downstream rotating contactors. A biological treatment unit such as those employing rotating contactors can be provided to treat the effluent from the septic tank. (Sinha-OEIS)
W75-11076

**FLOCCULATION DEVICE FOR WASTE FLUID TREATMENT,**
Wheelabrator-Frye Inc., New York. (assignee)
C. K. Walther, K. Beckschafer, and K. E. Temme.
U.S. Patent No. 3,893,921, 3 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 659, July 8, 1975.

Descriptors: *Patents, *Waste water treatment, *Water purification, Water pollution treatment, *Coagulation, *Flocculation, Equipment.
Identifiers: Vibration.

An apparatus for coagulating and flocculating waste fluid includes a tank attached to a vibrating treatment device from which the waste fluid is discharged. A variable rate pump or other means injects a flocculating agent into the tank, where it is effectively mixed with the waste fluid due to the vibration of the treatment device. The waste fluid containing the flocculated material in suspension is then discharged from the tank for subsequent separation, as by filtration, centrifuge or the like. The apparatus employs a siphon-like arrangement to obtain greater efficiency under a continuous flow mode of operation. (Sinha-OEIS)
W75-11077

**TOTAL WASTE RECYCLE SYSTEM FOR WATER PURIFICATION PLANT USING ALUM AS PRIMARY COAGULANT,**
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
L. K. Wang, and J. Y. Yang.
Resource Recovery and Conservation, Vol 1, No 1, p 67-84, May 1975; 4 fig, 10 tab, 34 ref. WA88-188, WA86-361.

Descriptors: *Waste water treatment, *Water treatment, Water quality, *Sludge treatment, *Recycling, *Coagulation.
Identifiers: Acid treatment, Alkaline treatment, Alum sludge, Zero waste discharge, Resource recovery, *Waste recycling, Filter backwash water, Alum recycle.

A systems study to investigate the feasibility of total recycle of wastes generated from water purification plants has been conducted. Wastewater and alum sludge used in were collected from a water plant employing water treatment process including aeration, chemical addition, mixing, flocculation and sedimentation followed by filtration, pH adjustment, fluoridation and chlorination. Wastewater and sludge are generated mainly from the sedimentation basin and the filter backwash. The waste recycle system studied consisted of (a) treating the filter backwash water in a sludge separator, (b) dividing the combined sludge into two fractions for alum solubilization respectively in an acid treatment unit and an alkaline treatment unit, (c) screening the inert silt for ultimate disposal, and (d) returning the solubilize alum from the acid and alkaline treatment units in proper proportions for reuse as flocculation agent. The proposed recycle process was designed to provide a cost effective system for achieving 'zero' waste discharge from a water purification plant. Inasmuch as the inert silt collected during water treatment is derived from raw water supply, an elimination of added chemical discharges to

egarded as satisfying the desired 'zero' arge objectives. Although detailed process n parameters necessary to achieve the above l goal have not been established, experimen- sults tend to suggest that practical designs on the proposed recycle system are feasible. 11094

EFFECTS OF FREE AMMONIA AND NITROUS ACID ON THE NITRIFICA- PROCESS,
ll Univ., Ithaca, N.Y.
Anthonisen.
ble from University Microfilms, Inc., Ann Mich, 48106. Order No 74-24,253. PhD , 1974, 323 p.

ptors: *Ammonia, *Nitrification, Municipal , *Waste water treatment, Nitrites, s, Pilot plants, Microorganisms, Bacteria, Denitrification, Inhibition.
iers: Un-iodized ammonia, Un-iodized Nitrobacter, Nitrosomonas, *Nitrous acid.

ch has been conducted on the accumula- f nitrite as observed in soil, natural waters ste treatment systems which receive indus- gricultural, and municipal wastes. The esis postulated was that un-ionized am- FA) and unionized nitrite (FNA) are inhibi- nitrifying organisms and their effects cause to accumulate and persist. Both laboratory t plant tests were completed to investigate tion rates for the organisms Nitrosomonas robacter. Results indicated that FA inhibi- Nitrobacter occurred at concentrations ower than those required to inhibit nonas. Nitrites thus accumulated without ent oxidation to nitrate. In liquid waste accumulation of nitrite was shown to be related to concentrations of FA and FNA pendent of pH, ammonia and nitrite con- ns. FA inhibits Nitrosomonas nitrifica- 10.0 to 150.0 mg/liter; FA inhibits ter at 0.1 to 1.0 mg/liter; and FNA inhibits nonas and Nitrobacter nitrification at 0.22 /liter concentration. It appears possible to ne nitrification patterns that occur during lation of ammonia using operational es that consider the inhibitory effects of NA. (Prague-FIRL)
01

ES OF BIODEGRADABILITY AND TORY ORGANICS IN WASTE- : (ANALYSIS, INTERPRETATION, PPLICATION OF MEASUREMENT QUES),
ut Univ., Storrs.

from University Microfilms, Inc., Ann ich, 48106. Order No 75-10,627. PhD 75, 125 p.

s: *Measurement, *Oxidation, , Carbon, Nitrification, dation, *Analytical techniques, Mu- stes, Industrial wastes, *Waste water *Pollutant identification, *Refractivity. Refractory Index(RI), Ultimate Ox- nd(UOD).

te Oxygen Demand (UOD) method for the total amount of oxidizable material drogen, oxygen, carbon, and nitrogen, was developed. A working parameter ated to approach the derived evaluation tput responses of available analyzers. l Warburg Respirometer is used to he biodegradable portions of the total resent, with a correction term for inconsistencies. The ratio of degrada- to the total oxidizable material is the Index (RI). The formula is RI = te)/UOD. According to this index, dable materials such as domestic raw sewage or glucose have RI values of 0.97 and 0.93, indicating 93-97% degradation, while industrial dye wastes or benzene have RI values of 0.56 and 0.23. Specific organic compounds were classified in terms of bio-persistence, using the RI values. Other uses of these values are suggested, such as the evaluation of acceptability of industrial waste discharge to municipal biological treatment facilities or the use as a preliminary treatment parameter. (Prague-FIRL)
W75-11103

WATER TREATMENT BY OZONE, (IN JAPANESE),
K. Oda.
Seikatsu Eisei, (J. of Urban Living and Health Assoc), Vol 18, No 6, p 168, 1974. 13 fig, 20 ref.

Descriptors: *Waste water treatment, *Reviews, *Water treatment, *Ozone, Oxidation, Detergents, Organic compounds, Color, Odors.
Identifiers: Reaction time, Decolorization, Deodorization.

The use of ozone for water treatment is reviewed. The greatest advantage of ozone usage is that it does not give any reaction residue. Ozone is one of the strogest oxidizing agents, therefore it decomposes most compounds in a relatively short reaction time. Ozone can be used for decolorization, deodorization, sterilization, and decomposition of organic compounds as well as of inorganic compounds such as cyanides. The sterilization effect of ozone is 15 to 30 times stronger than that of chloride gas or hypochlorous acid. Most decomposition of unsaturated organic compounds by ozone is believed to proceed by ozonolysis followed by aldehyde formation and stable organic acid formation. Ozone is also useful in treating synthetic detergents such as alkyl benzene sulfonate for which biological treatment is very difficult. If ozone alone is used to treat water, a large amount of ozone consumption is needed and the process is less economical. Therefore, ozone treatment is recommended for use with other water treatment methods such as activated carbon and floatation techniques. (Katayama-FIRL)
W75-11107

ACTIVATED CARBON ADSORPTION TECHNIQUE FOR THIRD STAGE SEWAGE WATER TREATMENT, (IN JAPANESE),
T. Kasakura.
Kankyo Sozo, (Environment Creation), Vol 5, No 1, p 72, January, 1975. 10 fig, 3 tab, 7 ref.

Descriptors: *Waste water treatment, *Activated carbon, *Sewage treatment, Tertiary treatment, Pilot plants, Filtration, Precipitation(Chemical), Adsorption, Turbidity, Phosphorous.
Identifiers: Aluminum sulfate, Adsorption towers.

A pilot plant to test the activated carbon adsorption technique for the third stage treatment of sewage water was constructed and operates at Nagoya city. The third stage water treatment plant consists of precipitation, filtration, and adsorption processes. After second stage treatment by an activated sludge method, sewage water is mixed with aluminum sulfate to precipitate most of the phosphorous compounds. The precipitates are filtered out at the rate of 350 m/d before entering an adsorption tower filled with 320 kg of activated carbon, with average particle sized of 0.90 mm. An average 72% of the total phosphorous in the second stage water was removed by the precipitation treatment, and 99% was further removed by the activated carbon treatment. The turbidity of the second stage water was improved an average 79% and 97% by aluminum sulfate precipitation and activated carbon treatments, respectively. The COD values in the precipitation and adsorption processes were 19.5 ppm and 1.8 ppm, respectively, and the corresponding TOD values were 38.9 ppm and 18.8 ppm. Several adsorption towers were installed in parallel and sewage water flowed through at the rate of 300 m/d. The life of activated carbon was between 800 to 1200 hr dependent on temperature which affected the efficiency of activated sludge treatment. The regeneration of deactivated carbon was seen to be achieved by heating at 800 C for 90 min. (Katayama-FIRL)
W75-11108

ON-SITE HYPOCHLORITE GENERATION,
Salford Univ. (England).
A. Kuhn.
Processing, Vol 21, No 3, p 6-7, 1975. 4 fig.

Descriptors: *Waste water treatment, *Sodium compounds, *Sewage treatment, *Municipal wastes, Electrolysis, Chemical industry, Industrial wastes, Equipment, Oxidation, Odors, Chemical oxygen demand.
Identifiers: On-site generation, Sodium hypochlorite, Great Britain, *Hypochlorite cells.

It has been shown that on-site generated sodium hypochlorite has several uses. The application for which this process has the greatest potential is in the treatment of municipal sewage. A sucessful demonstration of the process at Guernsey, Great Britain, involved pure seawater electrolysis followed by its passage to a separate stirred reactor tank where it was contacted with sewage. In the United States, Several installations using on-site hypochlorite generation are in operation. In Clark County, Nevada, only the supernatant liquid from the primary digester, rather than a full effluent stream, was electrolytically treated. Liquor was passed through the acutal electrolysis cell using electrodes of Pb02; benefits were attributed to direct oxidation of dissolved or suspended matter at the electrode surface. Vigorous evolution of gases achieved flotational effect. The froth that formed carried with it a high proportion of solids, leaving the liquor lower in COD. Modern commercially available hypochlorite cells are described; all were of the florce-flow, narrow gap design. The treatment processes detailed are also useful in oxidizing and disinfecting within the chemical industry, in heat exchanger fouling control, in deodorizing for tobacco plants, and in sterilizing of food processing equipment. (Prague-FIRL)
W75-11109

OPTIMUM VALUES FOR OPERATIONAL VARIABLES IN TURBIDITY REMOVAL,
Mosul Univ. (Iraq).
M. A. Al-Layla, and E. J. Middlebrooks.
Water and Sewage Works, Vol 121, No 8, p 66-69, August, 1974. 9 fig, 3 tab, 8 ref.

Descriptors: *Flocculation, *Water treatment, *Turbidity, *Alum, *Mathematical models, Operations, Treatment facilities, *Waste water treatment.
Identifiers: Alum dosage, *Turbidity removal.

A study was designed to define the effect of the main variables that can influence the efficiency of present flocculation basins in water treatment plants, thereby contributing to improving the design of flocculation basins. Variables were paddle speed, time, and alum dosage. The other objectives were to determine the interactions between time of flocculation and alum dosage, flocculation time and paddle speed, and paddle speed and alum dosage, flocculation time, and paddle speed. Methods included analysis of variance, linear, logarithmic, and multivariable mathematical models. It was concluded that the most significant idenpendent variable was paddle speed followed by flocculation time and alum dosage; dosage was 25 mg/liter for the study conditions; optimum paddle speed ranged between 40 and 50 rpm; and optimum flocculation time was about 30 minutes. Certain equipment and methods were shown to be important in removal of turbidity from water treatment plants. These were variable speed flocculator paddles, multiple flocculation basins that can be used in series or parallel operation, and the use of

jar tests to determine the optimum alum dosage continuously during the operation of water treatment plants. (Prague-FIRL)
W75-11110

**A SOLUTION TO PUMP STOPPAGES,**
Irvine Ranch Water District, Calif.
For primary bibliographic entry see Field 8C.
W75-11111

**A PLANNING OF CATCHMENT SEWERAGE FOR OYODO RIVER (IN JAPANESE),**
M. Ishiguro, and Y. Watanabe.
Miyazaki Daigaku Kogakuru Kenkyu Hokoku, (Research Report of Miyazaki Univ., Dept. of Engineering), No. 20, p 35-45, August 1974. 5 fig, 12 tab, 20 ref.

Descriptors: *Sewerage, *Planning, *Waste water treatment, *Water quality control, Construction costs, Rivers, Water pollution, Treatment facilities, Biochemical oxygen demand, Waste treatment, Activated sludge.
Identifiers: *Oyodo River(Japan), Catchments.

A plan of catchment sewerage for protecting water quality of the Oyodo River in Japan is discussed. Present and future water quality were analyzed according to observed data. The river catchment area was divided into three blocks and the water pollution loads in each block were estimated. Within each area, construction-maintenance costs and treatment efficiencies of various sewer transport-treatment systems were compared. It was concluded that construction of high degree treatment plants with an activated sludge process for 95% BOD removal should be implemented in all three blocks. However, a treatment plant of 95% BOD removal is very difficult using present techniques. Thus, it was advised to use other treatment processes simultaneously. These included irrigation treatment, oxidation ponding, lagooning, and a rotating biological contactor process, in addition to a plant of 88% BOD removal with an activated sludge process. (Prague-FIRL)
W75-11113

**ADVANCED WASTEWATER TREATMENT (IN JAPANESE),**
M. Shimodo, and Y. Okada.
Onoda Kenkyu Hokoku, (Research Reports of Onoda Cement Co.), No. 26, p 92-98, 1974. 11 fig, 9 ref.

Descriptors: *Waste water treatment, *Tertiary treatment, Nitrogen, Phosphorus, Lime, Precipitation(Chemical), Calcium carbonate, Calcium hydroxide, Inorganic compounds.

Advanced waste water treatment technology is utilized to remove pollutants which are not adequately removed by conventional secondary treatment processes. Such pollutants include soluble inorganic compounds (phosphorus, nitrogen) which may support algal growth in receiving water. Lime precipitation is the most useful technology for removal of phosphorus compounds from waste water. The chemical reactions of lime precipitation involve the condensed phosphate being readily hydrolyzed in the presence of Ca2+ and OH-. Calcium hydroxide then reacts with orthophosphate to precipitate calcium hydroxyapatite. As pH increases above 10.0, the precipitation of calcium hydroxyapatite increases, so that phosphate removal is improved with increasing pH. Also, calcium-hydroxide reacts with the bicarbonate alkalinity of waste water to form calcium carbonate and calcium hydroxide is regenerated. (Prague-FIRL)
W75-11114

**HUNTINGDON RESEARCH CENTRE PASVEER OXIDATION PLANT--SIX YEARS ON,**
Huntingdon Research Centre (England). Dept. of Building and Maintenance.
B. J. Spring, and E. R. E. Briscoe.
Public Health Engineer, Vol 14, p 35-39, March 1975. 4 tab.

Descriptors: *Waste water treatment, *Design criteria, *Activated sludge, *Oxygenation, Biochemical oxygen demand, Oxygen requirements, Oxidation lagoons, *Treatment facilities.
Identifiers: Oxidation channels.

The operation of the waste water treatment plant (Pasveer Oxidation Plant) at the Huntingdon Research Centre is described for the years following its installment in 1966. The capacity of the system to absorb heavy temporary overloading was established but the increased loading and greater sludge production increased the time required to clear the draw-off system and also increased the time required to draw-off the total volume, thus reducing the time available for oxygenation. The reduction of oxygenation time made additional oxidation capacity necessary. To meet the oxygen input requirement, a Flygt Pump, type CG 3605, was installed in May, 1971. In October, 1972, a new oxidation channel began operation. Several charts are included which show the average daily flow based on a 7-day week, the average daily flow based on a 5-day week, and the peak daily flow for every month in the years 1967 through 1973. The results of studies performed throughout 1968-1971 are presented in chart form. These include: BOD loading in terms of kg/d and percent of design limit; BOD in the raw waste, channel discharge, and final effluent; suspended solids in the raw waste, channel discharge, and BOD reduction overall in the channel discharge and final effluent. It is apparent from the records of the plant that there is no 'typical day' and that the volumes and characteristics of the waste vary considerably and do not follow any consistent pattern. The plant has had no odor problem of any kind and a recreational area is being planned for its surrounding land. (Orr-FIRL)
W75-11115

**INVESTIGATIONS ON THE LONG TERM BIOCHEMICAL OXIDATION OF SEWAGE,**
T. Stones.
Water Pollution Control, Vol 74, No 2, p 231-233, 1975. 2 fig, 1 tab, 16 ref.

Descriptors: *Sewage treatment, *Waste water treatment, *Biochemical oxygen demand, *Biodegradation, Nitrification, Nitrogen compounds, Organic compounds, *Oxidation.
Identifiers: *Biochemical oxidation.

The biochemical oxidation of sewage occurs in two broadly distinct stages, the first of which is attributed to the oxidation of the carbonaceous compounds present in the sewage, and the second to the oxidation of the nitrogenous matter present. However, the dichromate value of sewage which closely approximates the total carbonaceous oxygen demand greatly exceeds the first-stage BOD thus indicating that only part of the carbonaceous material is oxidized in the first step. Experiments performed determined that the remainder is inert to biochemical oxidation and is not oxidized along with the nitrogenous matter during the second stage. It was found that a second stage of biochemical oxidation of sewage is due to the fact that an induction period of about eighteen days (for the proliferation of the nitrifying organisms initially present) is necessary before nitrification can begin. This lag period is coincidental with the time required for the carbonaceous oxidation rather than caused by an inhibiting effect of carbonaceous matter on the nitrifying organisms as had been previously thought to be the reason for the lag time. (Orr-FIRL)
W75-11116

**TREATMENT METHODS OF GROUNDWATER CONTAINING A LARGE QUANTITY OF HUMIC ACID (AUFBEREITUNGSVERSUCHE AN EINEM STARK HUMINSTOFF-BELASTETEN TIEFENGRUNDWASSER),**
T. Harpe, and D. Eichelsdoerfer
Vom Wasser, Vol 42, p 207-220, 1974. 7 fig, 3 tab, 10 ref.

Descriptors: *Humic acids, *Groundwater, *Waste water treatment. Water treatment, Organic compounds, *Filtration. Pilot plants, Aeration.
Identifiers: *Germany(Hamburg-Curslack).

Treatment of water containing humic acids must consider special problems. Humic acids were identified in order to study their reactivity under different treatment methods. Experiments on deep groundwater with a high content of humic acid from Hamburg-Curslack, Germany, are reported. Colloidal brown humic acids were identified. The colloidal form was highly unstable against air oxygen. Thus, experiments were conducted to eliminate the organic matter by filtration on a pilot plant scale. In a closed system, raw water was filtered after aeration, using different filter materials. Without additional flocculants, humic acids can be removed to 3% of their original content. (Prague-FIRL)
W75-11117

**OXIDATION OF ORGANIC COMPOUNDS IN WATER (OXIDATION ORGANISCHER VERBINDUNGEN IN WASSER),**
C. Bannert, and P. Speiser.
Vom Wasser, Vol 42, p 221-239, 1974. 3 fig, 12 tab, 14 ref.

Descriptors: *Oxidation, *Waste treatment, *Organic compounds, *Waste water treatment, Gas chromatography, Pollutant identification.
Identifiers: *Hydrogen peroxide.

The oxidative treatment of polluted water containing organic impurities is becoming increasingly important. The oxidative degradation of all organic material to carbon dioxide was studied by treating pure organic compounds (serving as models for common impurities) with hydrogen peroxide. The organic compounds were treated in aqueous solution for 15 minutes at 150, 225, and 300C with hydrogen peroxide in the presence of catalysts. The optimum oxidation was found to occur in the 5 pH range and at 225C. Temperature increase to 300C as well as greater than stoichiometric additions of hydrogen peroxide were found to achieve no better oxidation effects. The concentration of the organic pollutants had no influence on the oxidation effect in the range investigated. The organic residuals were measured by gas chromatography as total organic carbon. (Orr-FIRL)
W75-11118

**NITROGENOUS CHANGES DURING THE SETTLEMENT OF SEWAGE,**
T. Stones.
Water Pollution Control, Vol 74, No 2, p 234-
1975. 1 tab, 3 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Nitrogen, Organic compounds, Ammonia, Settling basins, Treatment facilities.
Identifiers: Organic nitrogen.

It is known that there is a reduction in organic nitrogen during settlement of sewage. Two theories to account for this phenomena are that the reduction is due to biological activity, independent of settlement, or that reduction is due to conversion of part of the organic nitrogen to ammonia. In a test, the amounts of ammoniacal and organic nitrogen present were determined for samples of sterilized and unsterilized sewage, both fresh and when 18 hours old. On the average organic nitrogen was reduced by 48.8% during settlement for 18 hours. However, 32.5% of this was independent of settlement, implying that only was actually due to deposition. An increase

in the amount of ammoniacal nitrogen
t was clearly due to the decomposition of
nous organic matter. The resulting reduc-
the total amount of nitrogen effected by set-
was only about 8%. As there was no
in nitrogenous constituents of sterilized
s, the effects of biological activity are con-
In routine analysis of sewage in a facility,
are 24 hour composites compounded
from individual samples, with varying
of conversion of organic nitrogen to am-
having occurred. Thus, although an in-
in ammonia concentration is noted in
settlement, exact changes taking place in
ous constituents of sewage during passage
sedimentation tanks is not usually mea-
Prague-FIRL)
.20

ION DEVICES: THE MANUFAC-
S VIEWPOINT,
Greig.
ollution Control, Vol 74, No 2, p 191-192,
ef.

ors: Equipment, *Aeration, *Waste water
t, *Sewage treatment, Sludge, Design
Tanks, Construction costs, Sludge
Economics, Treatment facilities, Africa.
rs: *South Africa, Extended aeration,
tanks.

l specifications for sewage treatment
utilizing aeration are discussed, in par-
ose used in South Africa. The current
sed is extended aeration. The system in-
ly one basic process line with long reten-
aeration tanks, and limited experience is
for operation of facilities. Also, ex-
ration offers economic advantages over
nal plants in construction costs.
with extended aeration include sludge
ent with poor settling characteristics due
ication and a predominance of filamen-
isms. Also, the sludges produced by this
re voluminous, and difficult to con-
nd dry. Since 1966, however, aeration
the predominant process for activated
atment. Facilities are being designed for
n and biological denitrification within
plant. The relationship between equip-
tank design is critical because different
ave bery different operational charac-
Oxygenation efficiency of an aerator is
lated to volume of the aeration tank.
he most important criterion and most
rers prefer shallow (up to 3 m) tanks to
he use of baffles, bottom mixing tur-
draught tubes. It was concluded that
nk design should be decided by the
equipment supplier in order that the
le geometry be chosen for a particular
ign. (Prague-FIRL)

D WASTE WATER PURIFICATION
PHYSICAL-CHEMICAL TREAT-
(VEREINFACHTE ABWASSER-
G DURCH PHYSIKALISCH
IE BEHANDLUNG),
ch.
schaft, Vol 65, No 5, p 125-129, May
ref.

*Waste water treatment, *Sewage
Flotation, Flocculation, Adsorption,
hemical precipitation.
*Physico-chemical treatment.

mical treatment of sewage is
as characterized by flocculation,
, absorption, and flotation. Chemicals
uccessively and have a high reaction
h colloids by opposite charging. They
high adsorptive capacity for the ox-
ng dissolved organic matter found in
sewage. Flotation is a result of oxidation with air in the presence of chemicals acting as catalysts. The subsequent result is an improvement of drainage ability of silicate sludge. (Nave-FIRL)
W75-11122

**CHEMICAL-BIOLOGICAL TREATMENT WITH BIOLOGICAL FILTERS,**
Salisbury City Engineer's Dept. (Rhodesia).
A. B. Neeley.
Water Pollution Control, Vol 74, No 2, p 160-165, 1975. 2 ref.

Descriptors: *Biological treatment, *Waste water treatment, *Lime, Pilot plants, Capital costs, Filters, Phosphates, Denitrification, Operation, Sludge treatment, Treatment facilities, Africa.
Identifiers: Phosphate removal, Recarbonation, *Rhodesia.

Pilot scale experiments with lime addition at the primary stage of a conventional works is discussed. The objective of the study was to find a process which could initially be used on a seasonal basis, requires little capital expenditure, and can be used with existing treatment facilities. A pilot facility was tested at Salisbury, Rhodesia, after laboratory study. Lime precipitation with recarbonation enabled the filter to work well. Costs for lime storage, dosing, and pH control were low; major capital expenditure would be necessary only if denitrification, suspended solids removal and sludge recalcining were needed. It was concluded that conventional biological filter plants could be converted for phosphate removal at low cost, without excessive revenue expenditure. Under certain circumstances, it might be economic to use lime to reduce overload on a works rather than to extend it. If phosphate removal was needed on an overloaded works, the process would be very economical. Effluents from this system would be well suited to treatment by denitrification. Because necessary installation would not interfere with normal operation, the system is applicable for seasonal use in conjunction with a farm. (Prague-FIRL)
W75-11123

**AERATION BY MEANS OF BLAST NOZZLE--A POSSIBILITY FOR THE AERATION OF BIOLOGICAL WASTE WATER TREATMENT PLANTS (DIE STRAHLDUESENBEGASUNG--EINE MOEGLICHKEIT ZUR BELUEFTUNG BIOLOGISCHER KLAERANLAGEN),**
H-H. Daucher, P. Kroetzsch, K. H. Popp, and R. Stickel.
VDI-Berichte, No 218, p 239-249, 1974.

Descriptors: *Waste water treatment, *Aerators, *Activated sludge, Oxygen, Municipal wastes, Industrial wastes, Aeration, Equipment, Biological treatment, Treatment facilities.

A blast nozzle aerator and its use for the aeration of activated sludge in biological waste water treatment plants is described. Blast nozzles are placed horizontally near the bottom of the aeration tank. These blow air, oxygen-enriched air, or oxygen into the water, while performing a rotary motion due to the tangential arrangement of the nozzles. The rotary motion provides for necessary circulation of the water. At an immersion depth of 1.6 m, the oxygen input ranges from 1.5 to 2.5 kg of dissolved oxygen per kWh, while nozzles with 4 m immersion reach oxygen inputs over 4 kg/kWh. The blast nozzles are equally suitable for the aeration of municipal and industrial waste water. (Takacs-FIRL)
W75-11124

**LIMITATIONS OF USING A SIMULATION MODEL OF THE SOIL UNDER IRRIGATED CULTIVATION TO SIMULATE THE FUNCTIONING OF THE SOIL AS A PURIFYING SYSTEM (LIMITES D'UTILISATION D'UN MODELE DE COMPORTEMENT DU SOL SOUS CULTURE IRRIGUEE POUR SIMULER LE FONCTIONNMENT DU SOL COMME SYSTEME EPURATEUR),**
Institut National de la Recherche Agronomique, Versailles (France). Soils Lab.
For primary bibliographic entry see Field 5B.
W75-11125

**THE USE OF SOIL AS A PURIFYING SYSTEM (L'UTILISATION DU SOL COMME SYSTEME EPURATEUR),**
Institut National de la Recherche Agronomique, Dijon (France). Laboratoire de Microbiologie des Sols.
G. Catroux, J-C. Germon, and P. Graffin.
Annales Agronomiques, Vol 25, No 2/3, p 179-193, 1974. 1 fig, 3 tab, 36 ref.

Descriptors: *Waste treatment, *Soil, *Organic matter, *Purification, Aeration, Waste disposal, Filtration, Soil mechanics.
Identifiers: Soil mechanics.

Filtration, retention and transmission of water, and aeration and retention of dissolved matter are discussed. The different functions of the soil system in purification are given, stressing the action of microflora and exportation by plants. Means of control in purification by soil are analyzed. Data are compared concerning the purification of waste water by soil and agronomic data on the evolution of organic matter. It was concluded that soil should be capable of purifying about 1,200 kg DCO per hectare per day. Details of the practical uses of soil as a purification system and the disposal of waste water are mentioned. (Prague-FIRL)
W75-11126

**THE ECONOMY OF VARIOUS METHODS FOR DEWATERING SLUDGE FROM BIOLOGICAL PURIFICATION (UEBER DIE WIRTSCHAFTLICHKEIT VERSCHIEDENER VERFAHREN ZUR ENTWAESSERUNG VON BIOLOGISCHEM KLAERSCHLAMM),**
Uhde (Friedrich) G.m.b.H., Dortmund (West Germany).
J. Lohmann.
Chemie-Ingenieur-Technik, Vol 46, No 20, p 852-856, 1974. 9 fig, 2 ref.

Descriptors: *Sludge treatment, *Dewatering, *Operating costs, *Capital costs, Centrifugation, Filters, *Waste water treatment, Filtration, Biological treatment.
Identifiers: Vacuum filters, Band press.

Sludge from biological purification can be dewatered in several steps and by equipment with varying costs and operating properties. On the basis of experimental results, capital costs, and operating costs, the influence of flocculant consumption on the dewatering costs is examined for the vacuum filter, the band press, and the centrifuge. If costs for the various dewatering apparatuses are calculated to include subsequent incineration, they will depend upon whether organic or inorganic flocculants or filtering agents are used for conditioning. For example, if use of an organic flocculant in a centrifuge is followed by a fluidized bed furnace, the costs for the mechanical dewatering stage increase, due to rising flocculant consumption. The decrease of the incineration costs slows down with increasing flocculant consumption. A low cost minimum is obtained at a specific flocculant consumption of 2.9 g/kg dry substance. For the vacuum filter and the filter press no cost minimums exist. The lowest costs are obtained when the minimum filtering agent is required to remove the cake from the filter cloth or the filter press is added. (Nave-FIRL)
W75-11127

**DESIGN CONSIDERATIONS--WATER AND EFFLUENT DISPOSAL,**
W. E. Brand.
Institute of Food Science and Technology, Vol 7, No 2, p 130-137, June 1974.

Descriptors: *Effluents, *Sewers, *Water pollution, *Sludge disposal, Industrial wastes, Rivers, Water quality, Management, Waste water treatment, Activated sludge, Domestic sewage.
Identifiers: Sewerage Bill of 1968(Scotland).

A Sewerage Bill was introduced into Parliament in 1968, with Part II of the bill concerning trade effluent in accordance with the recommendations of the Hill Watson Committee. According to this act, the local authority is compelled to 'provide public sewers to effectively drain their area domestic sewage, surface water and trade effluent and also provide sewage treatment works to effectively deal with the contents of the sewers'. The local authority has jurisdiction over conditions relating to the sewers into which trade effluent may be discharged; the nature and composition of all trade effluent, maximum quantity and hourly rate, the prohibition of any constituent of any trade effluent which may be detrimental to the operation of the sewers, and the provision of inspection chambers. In regard to water quality control, bacteriological quality, suspended matter, organic matter, dissolved gases and dissolved solids are the salient headings. Effluent standards are dependent upon the place of the trade effluent discharge. Standards applied to effluents being discharged into rivers are much more strict than the normal limit of less than 20 ppm BOD and 30 ppm suspended solids. More stringent pH and temperature limits are also enforced. Regulations of discharge to tidal waters would be less strict than discharge to a river. (Leibowitz-FIRL)
W75-11128

**DRUG RESISTANT COLIFORMS CALL FOR RE-EVALUATION OF WATER QUALITY STANDARDS,**
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5B.
W75-11130

**WATER QUALITY CONTROL IN SEWAGE WATER TREATMENT, (IN JAPANESE),**
E. Fujimoto, N. Sato, and T. Sekine.
Meiden Jiho (Meiden Riview), Vol 5, No 118, p 40-48, 1974.

Descriptors: *Water pollution control, *Waste water treatment, *Sewage treatment, Aeration, Instrumentation, *Model studies, Equations, Biochemical oxygen demand, Water quality control.

To control the operation of sewage treatment plants, mathematical equations are proposed for individual treatment units, such as the sand-precipitation pond, aeration tank, sterilization pond, sludge concentration bath, and sludge feedback system. The model equations reflect the water qualities at each individual unit as well as quantitative conditions appearing at each unit. The equations are to be used by computers to predict better quality, rather than quantity, control in sewage plants. For example, the equation to control air amounts supplied to aeration tanks is expressed as the function of amount of sewage water, oxygen mobility (which is a function of temperature), oxygen dissolution efficiency, BOD value, MLSS value in aeration tank, and aeration tank capacity. Therefore, to regulate the air amount in the aeration tanks, the measurements of amount of BOD, MLSS values, and dissolved oxygen are all necessary. The use of model equations for computer quality control will be applicable to sewage plants with future developments in sensoring instrumentation. (Katayama-FIRL)
W75-11133

**TENSIDS (SYNDETS) AND THE WATER POLLUTION PROBLEM, (GESUND-HEITLICHE ASPEKTE DES TENSID-GEBRAUCHS),**
Bundesgesundheitsamt, Berlin (West Germany). Institut fuer Wasser-, Bodenund Lafthygiene.
I. J. Janicke.
Fortschritte der Medizin, Vol 93, No 8, p 377-378, March, 1975. 4 ref.

Descriptors: *Waste water treatment, *Surfactants, *Detergents, Domestic wastes, Sewage treatment, Toxicity, Legislation, Foreign research, Environmental effects, Biological treatment, Anaerobic digestion, Water pollution control.
Identifiers: Tensids(Syndets), Germany.

Surface active agents in sewage originating mostly from household detergents are an important factor in the determination of environmental influences on man, with special reference to the water supply. The current German legislation on detergents considers the problems in a comprehensive sense including the overall toxicity via and in the water system. The recent literature on toxicological values for warm-blooded animals and aquatic organisms such as sewage degrading bacteria and the influence of chemical structure is discussed. The toxicity of surfactants to a biological sewage treatment system including the effects on anaerobic digestion is considered to be of special importance. Successful control of environmental pollution caused by surfactants in the water can be achieved by the use of adequate sewage treatment. (Orr-FIRL)
W75-11134

**INTERACTIONS OF HEAVY METALS IN THE ACTIVATED SLUDGE PROCESS,**
Illinois Inst. of Tech., Chicago.
M. H. Cheng.
Available from University Microfilms, Inc., Ann Arbor, Michigan, 48106, Order No 74-16992. PhD Thesis, 1973, 221 p.

Descriptors: *Activated sludge, *Heavy metals, *Waste water treatment, *Toxicity, Biological treatment, Sludge, Waste treatment, *Chemical reactions, Ions.
Identifiers: Freundlich equation, Langmuir Isotherm, Metal ions.

Although many reports on the toxic effects of heavy metals on biological wastes treatment processes have appeared in the literature, little is known about the physical-chemical interactions within the process between the sludge mass and dissolved metal ions. The kinetics of heavy metals uptake by activated sludge, the ability of the sludge to concentrate metal ions from waste water and the affinity of the sludge mass for metal ions were investigated. Metal uptake by the sludge was dependent upon such factors as pH and the concentrations of sludge, soluble supernatant organics, and metal ions present in the system. Binding capacity appeared to increase with increasing pH, and higher initial concentration of either metal ions or MLSS also augmented the uptake efficiency. If the proper conditions are present the sludge can concentrate heavy metals up to 2 percent or more (by weight) of the sludge mass, even at low initial soluble metal levels. Good correlation was found between the metal uptake by activated sludge and the expression of Freundlich or Langmuir Isotherm. At high initial metal concentrations, the metal ions precipitate and are entrapped within the biological floc of the activated sludge system. At lower metal concentrations, the metals are taken up by the biomass through other mechanisms, such as physical adsorption, complexation and diffusion. (Orr-FIRL)
W75-11173

**TREATMENT PLANT MONITORING PROGRAMS: A PRELIMINARY ANALYSIS,**
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
P. M. Berthouex, and W. G. Hunter
Journal Water Pollution Control Federation, Vo 47, No 8, p 2143-2156, August 1975. 9 fig, 3 tab, 1 equ, 11 ref.

Descriptors: *Monitoring, *Water pollution con trol, *Waste water treatment, Costs, Treatmen facilities, Decision making, Operations research Sampling, Standards, Effluents, Behavior, Probe bility, Data collections, Optimization, Economics Equations, Statistical models, Systems analysis Design, Protection.
Identifiers: Control theory, Control charts, Sen sitivity, Autocorrelation, Cost minimization.

Statistical monitoring should be used more exte sively in pollution control. Monitoring is prerequisite for control; it is needed to discov how much control is required or how effective a plied controls have been. The design of an effe tive monitoring system requires balancing the pr tection purchased against the cost. An approach this problem is outlined using a simple cont chart to determine protection afforded. A simp system behavior/cost model is developed that cludes a penalty for polluting as the incentive purchase protection. Specifically, a compron between daily treatment plant monitoring and monitoring is explored. The economic sensitiv of the simple cost function derived from basic c trol theory is examined to ascertain how m sampling gives a good balance between efflu monitoring cost and assurance of being in co pliance with an effluent standard. The statis used indicate a near optimal sampling interval or 4 days; this gives a reasonable compron which provides protection but will not overbur a small operation financially. This analysis p vides a framework that small plants (where o the cost-benefit relationship is unclear) and reg tory agencies may use to consider rationally motivation for and implementation of enforcem programs. (Bell-Cornell)
W75-11176

**DISTRIBUTION-SYSTEM OPERATION AN YSIS MODEL,**
Omaha Metropolitan Utilities District, Nebr. vices Dept.
J. L. Gerlt, and G. F. Haddix.
Journal of the American Water Works Ass tion, Vol 67, No 7, p 381-384, July 1975. 5 fig,

Descriptors: *Water distribution(App *Operations, *Management, Projects, straints, Equations, Optimization, Simu analysis, Computer programs, *Water treat Operating costs, Pumping, Storage, Pres Water demand, Networks, Energy, Mathem models, Systems analysis, Model st *Distribution systems, *Nebraska.
Identifiers: *Omaha(Neb), *Systems opera analysis model, *Mixed integer program Hardy Cross method, Cost minimiz MAGEN computer language, Power, Ele costs, Nodes.

In 1970, Omaha, Nebraska recognized the n more efficient methods to operate and exp water treatment and distribution system. A of a comprehensive master plan, a systems tional analysis model (SOAM) of the di treatment, pumping, and storage facilitie developed. This article presents a highly d tive account of the model and its procedura cation to the Omaha system. SOAM, desi be used in conjunction with an advanced terized Hardy Cross-type flow simulation employs mixed-integer optimization tec and is utilized to derive least-cost combine ment plant, pump-station, and storage-o strategies. A simplified network for the municipal water system (MUD) is develo is suited to analysis using the Hardy Cr gram. Considered in detail are the defini tions and constraints for the system. Descr the network nodes, problem parameters,

les, system defining equations, energy and
r equations, cost equations, and other con-
s. The minimization problem is solved using
e-module process: (1) an equation-constraint
ation program using the MAGEN matrix
ation language solves the (2) minimization
m for several water-use-demand profiles,
) a well-designed, easily read report of the
l module is derived. It is concluded that the
t's operating policies are nearly optimal for
rent distribution system. (Bell-Cornell)
1180

ATION OF WATER QUALITY
GEMENT POLICIES,
a State Water Control Board, Richmond.
mary bibliographic entry see Field 5G.
181

AS TRICKLING-FILTER DEWATERING
M FOR PULP AND PAPER MILL
E,
Inst. of Tech., Atlanta. Dept. of Chemical
ring.
ghtsey.
le from the National Technical Informa-
rvice, Springfield, Va. 22161, as PB-244
75 in paper copy, $2.25 in microfiche.
Environmental Resources Center, Atlan-
rt No ERC-0975, July 1975. 21 p, 6 fig, 5
ref, append. OWRT A-059-GA(1) 14-31-
.

ors: *Waste water treatment, *Sludge
*Trickling filters, *Pulp wastes,
, Filtration, *Dewatering, *Sludge treat-
dustrial wastes, Chemical oxygen de-
iochemical oxygen demand, Soil treat-

s: *Sludge drying, Bark utilization, Pine

ter treatment methods are of considera-
tance to the pulp and paper industry to
rescribed environmental standards at a
e cost. Pine bark, an abundant manufac-
idue, is examined for its effectiveness
st as a trickling filter medium and then as
endment. Three trickling filter models
nined for their ability to remove BOD,
ium, settleable matter, and color from a
udge stream from a clarifier. Conduc-
pH observations were recorded. Results
at pine bark as a filter medium is very
n removing settleable matter from a pri-
ge and BOD from the liquid fraction.
le matter is converted to a dewatered
he filter face and BOD removal in the
to 95 percent. Blinding of the filter can
lem if the dewatered sludge is not
removed. Experimental observations
he BOD and COD removal efficiencies
her change significantly after the liquid
through approximately three feet of the
m. The results suggest the optimum
oading rate for maximizing BOD and
val and minimizing filter size is larger
ximum 4.59 gals. Ft-2day-1 rate tested
y. Maximum BOD and COD removal
d 42 percent, respectively, for the
ng rate. The nitrogen content of the
edium significantly increases after ap-
two months use as a filter medium.
y indicates that bark, after use as a
er medium, would have far greater
il conditioner than raw bark.

IN VEGETATION AND SURFACE
ERTIES FOLLOWING IRRIGATION
ANDS WITH MUNICIPAL WASTE-
ate Univ., East Lansing. Dept. of
bibliographic entry see Field 5B.

**TIME-VARIANT CHARACTERISTICS OF SELECTED WASTEWATER TREATMENT PLANTS OF NEVADA,**
Nevada Univ., Reno. Desert Research Inst.
V. L. Gupta.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 822, $3.75 in paper copy, $2.25 in microfiche. Center for Water Resources Research, Reno, Project Report No 36, August 1975. 38 p, 14 fig, 6 tab, 11 ref. OWRT A-049-NEV(2), 14-31-0001-3838.

Descriptors: *Waste water treatment, Water quality control, *Treatment facilities, *Statistical methods, *Temporal distribution, *Distribution patterns, Probability.
Identifiers: Spectral analysis.

Six wastewater treatment plants in Nevada were analyzed for resultant effects on receiving water body quality caused by temporal variability of sewage effluent quality. The variation of the peak hourly flows caused by population was examined with efforts to develop an empirical equation usable for future planning of sewage collection works. The probability distributions of a variety of variables such as hourly influent flow, daily flow, influent and effluent biochemical oxygen demand and suspended solids, and in some instances, phosphate concentrations, were investigated. Results showed the significance of expressing treatment effectiveness in terms of statistical parameters rather than average values only. The study also revealed periodicities exist in a multitude of variables associated with the municipal wastewater treatment facilities. Engineering and scientific principles rather than purely empirical considerations should govern the design and operation of plant facilities. (Fallon-Nevada)
W75-11245

**STATUS OF WASTE HEAT UTILIZATION AND DUAL-PURPOSE PLANT PROJECTS,**
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 3E.
W75-11251

**WASTE WATER SURVEY, ST. REGIS PAPER COMPANY, CANTONMENT, FLORIDA.**
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-228 275, $4.25 in paper copy, $2.25 in microfiche. August 1972. 52 p, 4 fig, 4 ref, 14 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, *Evaluation, Water pollution sources, Wastes, Industrial wastes, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Lignins, Color, *Florida, Ammonia, Phosphorus compounds, Nutrients, Settling basins, Aerated lagoons, Sewage treatment, Nutrient removal, Water pollution treatment, Water pollution control, Waste water(Pollution).
Identifiers: Total organic carbon, Kraft mills, Phosphoric acid, Perdido Bay(Fla), Elevenmile Creek(Fla), Bleached paper, Kraft paper, Perdido Bay Federal-State Enforcement Conference.

An evaluation is presented of waste treatment at St. Regis Paper Company's integrated kraft pulp and paper mill located at Cantonment, Florida. Reported results are from a 1972 study which was requested by the conferees at the Perdido Bay Federal-State Enforcement Conference Progress Meeting held in Gulf Breeze, Florida, during January, 1972. The field study was designed to determine the waste removal effectiveness of the mill's waste treatment facilities and to characterize the wastes discharged. Daily production during the survey averaged 830 tons of kraft pulp (543 tons of unbleached and 287 tons of bleached) and 785 tons of bleached and unbleached paper. Approximately 29 million gal/day of liquid wastes generated at the mill are discharged into Perdido Bay via Elevenmile Creek. The treatment facilities include a primary settling basin, nutrient feed system (anhydrous ammonia and phosphoric acid), three aeration ponds, and a final settling pond. Riffle terraces are located before and after the final pond. Waste loads and concentrations before and after treatment and percent reductions are as follows: BOD, 45,000 lb/day (210 mg/liter) and 4,050 lb/day (17 mg/liter), 91%; total organic carbon, 57,500 lb/day (264 mg/liter) and 29,300 lb/day (122 mg/liter), 49%; COD, 175,000 lb/day (814 mg/liter) and 83,400 lb/day (352 mg/liter), 52%; lignin-like compounds, 19,600 lb/day (91 mg/liter) and 17,300 lb/day (73 mg/liter), 12%; and color (Pt-Co units), 1,290 mg/liter and 1,100 mg/liter, 15%. About 90% of the total suspended solids load (49,200 lb/day) and total volatile suspended solids (30,000 lb/day) are removed in the treatment system. All of the N and P added by the nutrient feed system was not assimilated. (Witt-IPC)
W75-11314

**VACUUM DISTILLATION/VAPOR FILTRATION WATER RECOVERY,**
General American Transportation Corp., Niles, Ill.
R. J. Honegger, R. B. Neveril, and G. A. Remus.
Available from the National Technical Information Service, Springfield, Va 22161 as NASA-CR-120303, $3.75 in paper copy, $2.25 in microfiche. Summary Report for Phase III. April 1974. 40 p, 14 fig, 2 tab. Project No 1528. NAS 8-27467.

Descriptors: *Distillation, *Urine, *Water reuse, Potable water, Wastes, *Waste water treatment, Condensation, Water vapor, Gravity, Testing, Liquid wastes, Liquids, Equipment, *Filtration, Domestic wastes.
Identifiers: Human wastes, *Vacuum systems, Space technology.

Research activities preparatory to conducting low-gravity tests of a vacuum distillation/vapor filtration (VD/VF) system for recovering water from urine and humidity condensate are described. The VD/VF system comprises an evaporator, catalytic oxidation unit, and condenser, as well as auxilliary heat exchangers, valves, pumps, and controls. The evaporator boils urine and condensate into raw vapor, the catalytic oxidation unit removes organic contaminants and bacteria from the vapor, and the condenser condenses the vapor into potable water. A schematic flow diagram of the VD/VF system is given. Preparations for low-gravity testing described include analysis of liquid motion inside the evaporator during parabolic flights; installation of a transparent top on the evaporator and liquid deflectors within the evaporator; design of supports for VD/VF system components; design of a cooling unit; modification of various components, including sludge removal pump, drive motor and speed reducer for evaporator impeller, and oil-less vacuum pump; and frame fabrication and system assembly. The present status of low-gravity test preparations is assessed. (Witt-IPC)
W75-11315

**CONSIDERATIONS FOR PREPARATION OF OPERATION AND MAINTENANCE MANUALS,**
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
R. L. Green, G. L. Page, Jr., and W. M. Johnson.
Available Supt. of Doc., GPO, Washington, D.C. $2.85. EPA Report 430/9-74-001, 1973. 239 p, 21 fig, 80 ref, 2 tab. 68-01-0341.

Descriptors: *Treatment facilities, *Operation and maintenance, *Publications, Cities, *Waste water treatment, Maintenance, Equipment, Operations, Permits, Water quality standards, Sludge treatment, Personnel, Laboratory tests, Logging(Recording), Safety, Utilities, Electrical equipment, Pumping plants, Pipelines.
Identifiers: Emergency operation.

The preparation of municipal waste water treatment plant operation and maintenance manuals is discussed. The type of information to be included in each of the recommended chapters is described. The latter include: an introduction; discharge permits and water quality standards; description, operation, and control of waste water treatment facilities; description, operation, and control of sludge handling facilities; personnel requirements; laboratory testing; records; maintenance; emergency operating and response program; safety; utilities; and electrical system. Suggested manual outlines have been prepared for treatment plants and for pumping stations and pipelines. (Witt-IPC)
W75-11317

**UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 1). IN-PROCESS MODIFICATIONS AND PRETREATMENT,**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
A. J. Steffen.
EPA Technology Transfer Seminar Publication, No. 1, Oct. 1973. 90 p, 23 fig, 9 tab, 18 ref, 2 append.

Descriptors: *Food processing industry, *Waste water treatment, *Industrial wastes, Pollution abatement, Water pollution treatment, Waste treatment, Treatment facilities, Odor.
Identifiers: *Meat packing industry.

This text, designed for owners, managers, superintendents, and operators of meat packing plants, deals with in-plant modifications for pollution abatement, including odor control, and pretreatment of waste waters prior to discharge to municipal sewage lines. Case histories are given. (See also W75-11321 and W75-11322) (Brown-IPC)
W75-11320

**UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 2). WASTE TREATMENT,**
Bell, Galyardt and Wells, Omaha, Nebr.
W. J. Wells, Jr., P. B. Wells, C. A. Haas, S. L. Hergert, and S. J. Brown.
EPA Technology Transfer Seminar Publication, No. 2, Oct. 1973. 64 p, 35 fig, 7 tab.

Descriptors: *Waste water treatment, *Food processing industry, Treatment facilities, Planning, Waste treatment, Pollution abatement, Water pollution treatment, *Industrial wastes, Water pollution sources.
Identifiers: *Meat packing industry.

The 7 chapters of this text deal with the need for wastewater treatment, the role of microorganisms, waste loads from meat packing factories, planning and design procedures for treatment facilities, treatment methods (anaerobic, aerobic lagoon, activated sludge, trickling filter, rotating biological disk, and irrigation), and maintenance and operation of waste treatment plants. Case histories and a survey of existing treatment facilities in the meat-processing industry are also given. (See also W75-11320 and W75-11322) (Brown-IPC)
W75-11321

**UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 3). CHOOSING THE OPTIMUM FINANCIAL STRATEGY,**
Commins (J. A.) and Associates, Inc., Fort Washington, Pa.
U. M. Patankar, and C. R. Marshall.
EPA Technology Transfer Seminar Publication, No. 3, Oct. 1973. 38 p, 10 fig, 6 tab.

Descriptors: *Food processing industry, *Waste water treatment, *Economics, Costs, *Financing, *Optimization, Pollution abatement, Water pollution treatment, Waste treatment, *Industrial wastes, Treatment facilities, Operation and maintenance, Capital cost, Depreciation, Decision making.
Identifiers: *Meat packing industry.

Detail topics discussed in the 7 chapters of this text include depreciation, financing strategies for pollution-control investments, state financing and tax incentives, and financial decisionmaking theory for municipal vs. private facilities. An illustration of optimizing financial strategy for pollution control is included. (See also W75-11320 and W75-11321) (Brown-IPC)
W75-11322

**POLLUTION ABATEMENT IN A BREWING FACILITY.**
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
EPA Technology Transfer Capsule Report No. 6, (1974). 17 p, 8 fig, 6 tab.

Descriptors: *Waste water treatment, *Treatment facilities, Biochemical oxygen demand, Suspended solids, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control, Capital costs, Operating costs, Costs, Water conservation, Byproducts, Sludge, *Colorado, Sewage treatment, Neutralization, Waste treatment, Activated sludge, Biological treatment, Food processing industry.
Identifiers: *Brewing industry, Hatfield process.

The brewing process and waste water treatment at Adolph Coors Company (Golden, Colorado) are described. Wastes generated from the combined brewing and malting operations amount to 3.3 million gal/day at a BOD level of 825 mg/liter. This is less than one-half the waste load produced by average breweries without malting facilities. The waste treatment facility provides primary treatment through neutralization and solids removal, and secondary treatment through a high-rate activated sludge system using a modification of the Hatfield process. Suspended solids are reduced by 90%, from 280 mg/liter to 29 mg/liter, and BOD is reduced by 96% to 34 mg/liter. Coors has realized sizable savings in the capital and operating costs for its waste treatment facility by reducing the raw wastes from the brewing plant through a program of water conservation, in-plant waste reduction, and recovery of waste materials as by-products. Preliminary feeding tests have shown that the dried sludge can be used as a high protein animal feed supplement. (Witt-IPC)
W75-11323

**UPGRADING METAL-FINISHING FACILITIES TO REDUCE POLLUTION. (PART 1). IN-PROCESS POLLUTION ABATEMENT,**
Oxy Metal Finishing Corp., Madison Heights, Mich.
A. E. Olsen, and E. N. Hanf.
EPA Technology Transfer Seminar Publication, No. 1, July 1973. 69 p, 32 fig, 4 tab, 14 ref, 2 append.

Descriptors: *Metals, *Chemical wastes, *Waste water treatment, *Water pollution treatment, *Pollution abatement, Water pollution sources, Corrosion control, Equipment, *Industrial wastes, Effluents, Ventilation, Air pollution.
Identifiers: *Metal finishing wastes.

The 3 chapters of this text deal with water and air pollution control measures and devices, as well as with corrosion protection of floors and equipment in various types of metal-finishing plants. Case histories and examples are included. (See also W75-11325) (Brown-IPC)
W75-11324

**UPGRADING METAL-FINISHING FACILITIES TO REDUCE POLLUTION. (PART 2). WASTE TREATMENT,**
Lancy Labs., Inc., Zelienople, Pa.
L. E. Lancy, and R. L. Rice.
EPA Technology Transfer Seminar Publication No. 2, July 1973. 47 p, 24 fig, 2 tab, 40 ref.

Descriptors: *Metals, *Waste water treatment *Pollution abatement, *Chemical wastes, *Wate pollution treatment, Water pollution sources Economics, Sludge disposal, Sludge treatment Dewatering, Separation techniques, Ion exchange Reverse osmosis, Evaporation, Industrial wastes
Identifiers: Chemical recovery, *Metal finishing wastes.

Metal-finishing processes requiring pollution control are discussed, along with commonly use waste-treatment systems (batch, continuous, an integrated). The regeneration of process solution and metal recovery (by evaporation, ion exchange, and reverse osmosis) are dealt with i detail, including economic considerations. Th final chapter considers solid-liquid separation solids concentration, and sludge handling an disposal. (See also W75-11324) (Brown-IPC)
W75-11325

**UPGRADING TEXTILE OPERATIONS T REDUCE POLLUTION. (PART 1). IN-PLAN CONTROL OF POLLUTION.**
Institute of Textile Technology, Charlottesvill Virginia.
EPA Technology Transfer Seminar Publicatio EPA-625/3-74-004, No. 1, Oct. 1974. 118 p, 14 f 50 tab, 28 ref, 2 append.

Descriptors: *Pollution abatement, *Waste wa treatment, *Textiles, Chemical wastes, Air pol tion, Water pollution sources, Industrial wa Monitoring, Data collections, Water reuse, F control, Water supply, Foaming.
Identifiers: *Textile industry wastes.

Current practices in the technology of waste wa management (waste survey, major sources of p lution, and flow reduction) are discussed, al with air pollution abatement (emissions surv particulate control, and solvent recovery) in textile industry. Some of the details dealt with clude pretreatment of textile wastes prior discharge, case histories of flow reduction water reuse, substitution of processes and ma als and their effects on pollution abatement, the reduction of wastewater foaming. (See W75-11327) (Brown-IPC)
W75-11326

**UPGRADING TEXTILE OPERATIONS REDUCE POLLUTION. (PART 2). WA WATER TREATMENT SYSTEMS.**
Metcalf and Eddy, Inc., Boston, Mass.
EPA Technology Transfer Seminar Publica EPA-625/3-74-004, No. 2, Oct. 1974. 45 p, 1 16 tab, 4 ref.

Descriptors: *Textiles, *Waste water treat *Chemical wastes, Pollution abatement, pollution treatment, Activated carbon, Biol treatment.
Identifiers: *Textile industry wastes.

The 5 chapters of this text discuss the need f tile industry wastewater treatment, source strengths of these wastewaters, biological ment methods, and granular activated treatment. Case histories are also cited. (Se W75-11326) (Brown-IPC)
W75-11327

**UPGRADING POULTRY-PROCESSING F TIES TO REDUCE POLLUTION. (PART PROCESS POLLUTION ABATEMENT,**
Environmental Engineering, Inc., Gainesvil R. H. Jones, J. D. Crane, T. A. Bursztynsky A. Macon.
EPA Technology Transfer Seminar Publ No. 1, July 1973. 28 p, 1 fig, 5 tab, 6 ref.

riptors: *Food processing industry, *Poultry, ste water(Pollution), *Water manage- (Applied), Industrial water, Equipment, Pol- abatement, Waste water treatment, Water y, Industrial wastes.
ifiers: *Poultry processing wastes.

upply and management of poultry-processing is discussed, including a case history and cal recommendations for waste water con- nd equipment changes. (See also W75-11329 75-11330) (Brown-IPC)
1328

ADING POULTRY-PROCESSING FACILI- TO REDUCE POLLUTION. (PART 2). REATMENT OF POULTRY-PROCESSING ES,
onmental Protection Agency, Washington, echnology Transfer Staff.
teffen.
Technology Transfer Seminar Publication, July 1973. 54 p, 22 fig, 3 tab, 13 ref.

ptors: *Poultry, *Food processing industry, water treatment, *Industrial wastes, Pollu- abatement, Regulation, Legislation, nics, Costs.
ers: *Poultry processing wastes.

hapters of this discussion examine condi- or the pretreatment of poultry-processing ater prior to discharge into a municipal system (e.g., for legal reasons and/or to ize on final treatment costs), as well as the pretreatment to be selected (none, secon- reening, solids separation, and/or biologi- hemical treatment) and factors to be con- in the decision. (See also W75-11328 and 30) (Brown-IPC)
29

DING POULTRY-PROCESSING FACILI- O REDUCE POLLUTION. (PART 3). TREATMENT.
ssociates, Inc., Detroit, Mich.
chnology Transfer Seminar Publication, ly 1973. 48 p, 24 fig, 5 tab.

ors: *Treatment facilities, *Food g industry, *Poultry, Waste water treat- ater pollution treatment, Pollution con- er pollution sources, Costs.
s: *Poultry processing wastes.

nd planning for waste water treatment in rocessing plants, the operation of treat- ems, and a case history are discussed, in- site selection, waste water surveys, election, design criteria, expansion provi- stem costs, operating difficulties, and modifications. (See also W75-11328 and 9) (Brown-IPC)
0

T CHARACTERISTICS AND TREAT- OF MECHANICAL PULPING EF-
,
rch, Vancouver(British Columbia).
ard, and C. C. Walden.
al Mechanical Pulping Conference, San June 16-20, 1975, (Preprinted s, TAPPI, Atlanta, Ga.), p 197-201. 1 tab.

s: *Pulp wastes, *Biochemical oxygen Toxicity, *Fish, Rainbow trout, Indus- s, Wastes, Water pollution sources, ution effects, Water pollution, Aerobic Activated sludge, Waste water treat- culation, Waste treatment, Water pollu- , Lagoons, Economics.
*Mechanical pulping, *Total organic

This study assessed the 5-day BOD, total organic carbon, and toxicity to fish of mechanical pulping effluents where the effluent is not contaminated by barking wastes or brightening aids. The raw effluent was toxic to rainbow trout with the median tolerance limit, 96 hr-LC(50), normally between 4-10% (volume/volume) and the median survival time in 65% concentration frequently as low as 20 minutes. The BOD ranged from 300 to 1400 mg/liter and the total organic carbon was about 400 mg/liter. Aerobic microbiological fermentation either in activated systems or in 5-day lagoon systems reduced the BOD by as much as 97% and total organic carbon correspondingly. All systems effectively detoxified the waste unless activity was limited by temperature, as in the case of a system operated at 1 C. Flocculation was not effective. The economics of treatment are discussed briefly as are the interrelationships of effluent characteristics. The only useful relationship was between 5-day BOD and total organic carbon. (See also W75-11332) (Witt-IPC)
W75-11331

**MILL EXPERIENCE IN THE TREATMENT OF MECHANICAL PULPING EFFLUENT,**
B.C. Research, Vancouver (British Columbia).
T. E. Howard, R. G. Leslie, and N. E. Ward.
International Mechanical Pulping Conference, San Francisco, June 16-20, 1975 (Preprinted Proceedings, TAPPI, Atlanta, Ga.), p 202. 1 fig, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Aerobic treatment, *Biological treatment, Lagoons, Oxidation ponds, Biochemical oxygen demand, Toxicity, Winter, Seasonal, Heating, Natural gas, Temperature control, Industrial wastes, Wastes, Water pollution sources, Water pollution treatment, Water pollution control, Foreign countries, Canada.
Identifiers: *Mechanical pulping, Finlay Forest Industries Ltd.(Canada).

Refiner-groundwood pulping effluent at Finlay Forest Industries Ltd. (Mackenzie, British Columbia) is treated by an aerobic microbiological system (consisting of a primary lagoon, 3-day aerated stabilization basin, and final aeration lagoon) to reduce BOD and remove toxicity. Detoxification of the effluent during winter months (November-February) has been improved by installing submerged natural gas heaters ahead of the 3-day lagoon to maintain the temperature of the effluent around 18 C. (See also W75-11331) (Witt-IPC)
W75-11332

**PAPERMAKING COMPLEX AT DUNAUJ-VAROS (HUNGARY) -- PRESERVING THE DANUBE (AU COMPLEXE PAPETIER DE DU-NAUJVAROS -- PRESERVER LE DANUBE),**
Kipinvest, Budapest (Hungary).
P. Gati, and C. Maric.
Papier, Carbon et Cellulose, Vol 24, No 5, p 42-47, May, 1975. 1 fig, 4 illus, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, Industrial wastes, Wastes, Water pollution sources, Biological treatment, Water purification, Sludge treatment, Dewatering, Filtration, Aeration, Water pollution treatment, Water pollution control, Europe, Pulp and paper industry.
Identifiers: *Hungary, Corn stalks, Kraft mills, Groundwood mills, Writing papers, Printing papers.

The pulp and paper complex at Dunaujvaros includes a 22,000 ton/year kraft pulp mill processing corn stalks, a 15,000 ton/year groundwood mill, and a 70,000 ton/year writing and printing paper mill. Plans call for the installation of a semichemical pulp mill, a linerboard and corrugating medium machine, and a box plant in 1976. Internal measures for reducing pollution at the complex are outlined, including the planned chemical cross-recovery system. A description is presented of the effluent treatment system being developed, which includes physical-chemical clarification plus biological purification (activated sludge aeration plus secondary clarification). Sludge thickening and filtration procedures are also mentioned. (Speckhard-IPC)
W75-11333

**SOLUTE-SOLUTE INTERACTIONS IN ULTRAFILTRATION TREATMENT OF PAPER MILL WASTES,**
North Carolina State Univ., Raleigh. Dept. of Chemical Engineering.
H. B. Hopfenberg, V. T. Stannett, and M. W. Bailey.
American Institute of Chemical Engineers, Symposium Series, Vol 70, No 139, p 1-10, 1974. 14 fig, 22 ref, 1 tab.

Descriptors: *Waste water treatment, *Reverse osmosis, *Inorganic compounds, Industrial wastes, Wastes, Water pollution sources, Membrane processes, Separation techniques, Waste treatment, Membranes, Water pollution treatment, Water pollution control, Electrolytes, Gels, Permselective membranes.
Identifiers: *White water, *Starch, Cellulose acetate membrane.

The effect of interactions between starch and various inorganic salts on flux-limiting phenomena in the ultrafiltration of salt-starch-water solutions was studied. These ternary solutions were formulated to model a paper mill white water and contained a commercial papermaker's oxidized starch and one of several salts (sodium chloride, sodium sulfate, magnesium chloride, magnesium sulfate, aluminum chloride, or aluminum sulfate). The test loop employed an Eastman Chemicals KP-90 asymmetric cellulose acetate membrane. The results showed a reduction in product flux of up to 70% from the pure water flux when a starch-salt solution was treated, indicating that process equipment may be undersized by a factor of 4 if these flux-limiting interactions between solutes are ignored. In an aqueous solution of oxidized starch, the starch chain is in an expanded configuration, due to repulsion of like charges from the ionized COOH groups along the chain. By adding an electrolyte, the charges on the chain are shielded by the counterions, allowing the polymer chain to coil more densely. The shielded starch molecules form less viscous solution and, ultimately, a denser gel than they would without shielding. Gel formation on the membrane surface caused by the preferential accumulation of starch at the solution-membrane interface adds an additional resistance to water transport through the membrane. The interaction between starch and salt is a consequence of the charge on the polymer, and the resistance to water transport was shown to increase with increasing concentration of starch and/or salt and with decreasing charge frequency on the starch molecule. (Witt-IPC)
W75-11334

**EVALUATION OF THE ADSORPTIVE PROPERTIES OF FLY ASH WITH REFERENCE TO A PULP AND PAPER MILL WASTE EFFLUENT,**
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
R. C. Whittemore.
U.S. Bureau of Mines, Information Circular IC 8640, p 296-317, 1974. 50 ref, 14 tab.

Descriptors: *Fly ash, *Bleaching wastes, *Color, *Waste water treatment, Biochemical oxygen demand, Chemical oxygen demand, Wood wastes, Bark, Water pollution sources, Wastes, *Industrial wastes, Water pollution treatment, Water pollution control, Lime, *Waste treatment.

The adsorptive properties of fly ash from boilers that burned wood wastes and bark along with auxiliary fuels (oil and gas), from a coal-burning boiler, and from coal- and bark-fired boilers were studied. The results showed that the fly ash in general did not have conventional adsorptive properties comparable to a commerical-grade activated carbon. Softwood-bark-derived fly ash adsorbed iodine and phenol better than the hardwood-bark-derived fly ash. The study also indicated that the ability of a fly ash to be used effectively in the treatment of a particular pulp and paper mill waste was proportional to its lime (CaO) content. Hardwood bark fly ash had a high lime content and was most effective in removing caustic bleaching effluent color, COD, and 5-day BOD. (Witt-IPC)
W75-11335

**SOME OBSERVATIONS CONCERNING PREPARATION AND STORAGE OF STREAM SAMPLES FOR DISSOLVED INORGANIC PHOSPHATE ANALYSIS,**
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W75-11336

**WORKSHOP ON COMPUTER-AIDED DESIGN AND SIMULATION OF WASTE TREATMENT SYSTEMS.**
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
Department of the Environment, Report No (Training Manual) EPS 6-WP-74-1, January, 1974, 454 p.

Descriptors: *Waste water treatment, *Treatment facilities, *Design, *Model studies, *Computer models, Computer programs, Mathematical models, Sanitary engineering, Sewage treatment, Water pollution treatment, Water pollution control, Waste treatment.

This volume contains the notes from a workshop conducted for Environmental Canada by B and P Silveston, Engineers (Kitchener, Ontario) in January, 1974, on the application of computers in waste treatment plant design and planning studies. The individual chapters cover the objectives and organization of the workshop, usefulness of computers in process design and simulation, process systems analysis, the SEPSIM (Short Executive Program for SIMulation) software, model development, and mathematical models for a wide variety of waste treatment processes. An appendix describes the applications and operation of the SEPSIM program. (Witt-IPC)
W75-11338

**MEASURES IN THE SULFITE PULP INDUSTRY FOR DECREASING WASTE WATER LOAD (MASSNAHMEN DER SULFITZELLSTOFF-INDUSTRIE ZUR MINDERUNG DER ABWASSERBELASTUNG),**
Chemiefaser Lenzing A.G. (Austria).
R. Hornke, and H. Danninger.
Das Papier, Vol 29, No 6, p 241-245, June, 1975. 5 fig, 3 ref, 1 tab.

Descriptors: *Pulp and paper industry, *Waste water treatment, *Water pollution, Sulfite liquors, Bleaching wastes, Industrial wastes, Wastes, Water pollution sources, Neutralization, Biological treatment, Biochemical oxygen demand, Water pollution control, Water pollution treatment.
Identifiers: Chemiefaser Lenzing AG.(Austria), Austria, Evaporator condensates, Sulfite mills.

Following a short review of the origins of waste water loads during the operation of a sulfite pulp mill, measures being taken or planned at the mill of Chemiefaser Lenzing AG. (Austria) are described. A differentiation is made between measures for digester discharge, condensates from spent liquor evaporation, and bleach plant effluents. The target is a spent liquor retention of 99.3%, neutralization of evaporator condensates, and treatment of the bleaching waste water in a biological or other decomposition stage, with the desired result of a total discharge of only 6 tons or 5-day BOD per day. (Speckhard-IPC)
W75-11339

**EFFECT OF LIME TREATMENT ON MOLECULAR WEIGHT DISTRIBUTION OF COLOR BODIES FROM KRAFT LINERBOARD DECKER EFFLUENTS,**
Institute of Paper Chemistry, Appleton, Wis.
H. S. Dugal, J. W. Swanson, E. E. Dickey, and M. A. Buchanan.
Tappi, Vol 58, No 7, p 132-135, July, 1975. 4 fig, 12 ref, 4 tab.

Descriptors: *Pulp wastes, *Lime, *Color, *Waste water treatment, Industrial wastes, Wastes, Water pollution sources, Water pollution treatment, Waste treatment, Effluents, Solubility, Pulp and paper industry, Freeze drying.
Identifiers: *Molecular weight, Decker effluents, Kraft linerboard, Total organic carbon, Sugars, Board mills.

Concentrated aqueous solutions of freeze-dried solids from kraft linerboard decker effluents (before and after lime treatment) were acidified to give acid-insoluble and acid-soluble fractions in experiments designed to allow the isolation and characterization of the colored components of dilute kraft waste liquors. About 63% color was obtained as an acid-insoluble fraction when the effluent not treated with lime was acidified, and only 26% when lime-treated effluent was acidified. Lime treatment removed approximately 86% of the color, 57% of the total organic carbon, and 17% of the reducing sugars from the decker effluent. Apparent weight-average molecular weights of the acid-insoluble color bodies before lime treatment varied from less than 400 to 30,000 and after lime treatment from less than 400 to 5,000. Acid-soluble color bodies, before and after lime treatment, ranged from less than 400 to 5,000. Color bodies having a weight-average molecular weight of less than 400 were not removed by lime treatment, and those above 5,000 were completely removed. Color bodies in the intermediate range (weight-average molecular weight 400-5,000) were apparently partially removed. (Sykes-IPC)
W75-11345

**BIODEGRADATION OF COMPONENTS OF PULP WASTE EFFLUENTS BY BACTERIA. (I). DEGRADATION OF KRAFT LIGNIN (IN JAPANESE),**
Nagoya Univ. (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5B.
W75-11346

**TREATING EFFLUENTS FROM A SULPHITE PULP MILL BY FLOTATION,**
Ahlstrom (A.) Osakeyhtio, Varkaus (Finland). Paper and Pulp Div.
G. Norrman, and B. Myreen.
Paperi ja Puu, Vol 57, Special issue No 4a, p 177-179, 181-182, April, 1975. 5 fig, 6 ref, 1 tab.

Descriptors: *Sulfite liquors, *Flocculation, *Waste water treatment, *Flotation, Industrial wastes, Wastes, Water pollution sources, Waste treatment, Water purification, Water pollution, Water pollution control, Efficiencies, Effluents, Regression analysis, Europe, Pulp and paper industry.
Identifiers: Sodium aluminate, Polyacrylamide, Polyamide-amine, Sulfite pulp mills, Finland.

Effluents from a Finnish calcium-base sulfite mill were subjected to purification by chemical flotation. The effects of different flocculants (sodium aluminate, polyacrylamide, polyamide-amine) and other variables (water pH, air content, surface loading, retention tank pressure, coagulant dosage) on the efficiency of the flotation plant were analyzed by regression techniques. Type of flocculant was found to have the greatest effect. Best results under the particular operating conditions of this installation were obtained with polyacrylamide. Sodium aluminate was better than no flocculant, but was sensitive to pH variations and required a high retention tank pressure. The polyamide-amine used was not particularly effective. (Brown-IPC)
W75-11347

**STUDY OF ELECTROCHEMICAL TREATMENT METHOD FOR REMOVING COLOIDAL PARTICLES FROM PULP AND PAPER INDUSTRY EFFLUENTS (TUTKIMUS SELLUTEOLLISUUDEN JATEVESIEN KOLOIDAALISTEN AINESTEN POISTOMAHDOLISUUDESTA SAHKOKEMIALLIESTI),**
Helsinki University of Technology, Otaniemi (Finland). Dept. of Metallurgy.
P. J. Tunturi.
Paperi ja Puu, Vol 57, Special Issue No 4a, p 23238, 241-244, April, 1975. 6 fig, 11 ref, 5 tab. English summary.

Descriptors: *Waste water treatment, *Electrochemistry, *Colloids, Industrial wastes, Pulp and paper industry, Wastes, Water pollution sources, Waste treatment, *Flocculation, Water purification, Suspended solids, Neutralization, Stabilization, Electric fields, Anodes, Corrosion control, Corrosion, Steel, Effluents, Water pollution control, Water pollution, Water pollution treatment, Foreign research, Europe, Chemical wastes.
Identifiers: *Finland.

Effluents of forest, chemical, and metal-working industries often contain colloidal particles difficult or impossible to remove by normal treatments. In a 1970 study of cathodic protection of steel against corrosion by pulp mill waste waters, sudden clarification with flock formation was noticed in dark waste waters containing much suspended solids. Charge neutralization and stabilization of colloids by the strong electric field was suspected, but the phenomenon was nonreproducible. Studies resumed in 1974 at the Metallurgy Department of Helsinki's Technological University indicated that the electric field along could not stabilize the colloids, but that conditions suitable for neutralizing the colloids could be achieved by simultaneous anodic dissolution of Al or Fe flock. (Brown-IPC)
W75-11348

**POSSIBILITIES OF REUTILIZATION OF KAOLIN FROM BIOLOGICAL WASTE WATER SLUDGES (MOEGLICHKEITEN DER WIEDERVERWERTUNG VON KAOLIN AUS BIOLOGISCHEN ABWASSERCHLAEMMEN),**
Papierfabrik Biberist (Switzerland).
J. C. Ulrich.
Das Papier, Vol 29, No 6, p 245-247, June, 19 fig, English summary.

Descriptors: *Sludge treatment, *Incinera *Industrial wastes, Wastes, Sludge disposal, sion, Pulp and paper industry, Water poll sources, Sludge, Clays, *Waste treat Recycling, *Water reuse.
Identifiers: *Kaolin, Chemical recovery, P fabrik Biberist(Switzerland), Switzerland, lite.

The reuse of kaolin from biological waste sludges could be of interest in the case of burning. Because the biological sludge of P fabrik Biberist (Switzerland) contains 6 kaolin, the possibilities of kaolin recover being investigated. During incineration, the version of kaolin into mullite must be prev because mullite has an abrasive effect. This decisive for the choice of a suitable incinerat vestigations are in full progress; final resu not yet available. (Speckhard-IPC)

1349

## Ultimate Disposal Of Wastes

OIS LANDFILL LAW MAY EFFECT BY STATES.
mary bibliographic entry see Field 5B.
1011

OBSERVATIONS ON BEHAVIOR OF TREATED SEWAGE DISPOSED IN THE
Univ., Tokyo (Japan). Dept. of Fisheries.
nary bibliographic entry see Field 5B.
020

SS FOR TREATING SEWAGE SLUDGE,
an Cyanamid Co., Stamford, Conn.
e)
nary bibliographic entry see Field 5D.
064

E UNIT FOR TREATING LIQUID
,
, Inc., Pittsburgh, Pa. (assignee)
ary bibliographic entry see Field 5D.
073

EMS OF LIQUID WASTE DISPOSAL,
uth Wales Univ., Kensington (Australia).
Civil Engineering.
ary bibliographic entry see Field 5G.
12

E OF SOIL AS A PURIFYING SYSTEM
ISATION DU SOL COMME SYSTEME
EUR),
National de la Recherche Agronomique,
rance). Laboratoire de Microbiologie des
ry bibliographic entry see Field 5D.
26

CONSIDERATIONS--WATER AND EF-
DISPOSAL,
ry bibliographic entry see Field 5D.
8

OF THE OPTIMAL OUTFALL
FOR A STREAM RECEIVING THER-
ORGANIC WASTE DISCHARGES,
ate Univ., Manhattan. Inst. for Systems
d Optimization.
y bibliographic entry see Field 5B.
7

TRICKLING-FILTER DEWATERING
FOR PULP AND PAPER MILL
st. of Tech., Atlanta. Dept. of Chemical
g.
y bibliographic entry see Field 5D.

ASTES, ANIMAL REFUSE, AND OR-
ESIDUES DISPOSAL, AND THE
OF GROUND WATER,
nst., Ala. School of Applied Sciences.
y bibliographic entry see Field 5B.

TIES OF REUTILIZATION OF
ROM BIOLOGICAL WASTE WATER
(MOEGLICHKEITEN DER
ERWERTUNG VON KAOLIN AUS
CHEN ABWASSERCHLAEMMEN),
Biberist (Switzerland).

For primary bibliographic entry see Field 5D.
W75-11349

## 5F. Water Treatment and Quality Alteration

**THE RESPONSIBILITY OF U.S. WATER SUPPLIERS,**
Senate, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10856

**ORGANIC COLOR IN GROUNDWATER OF MISSISSIPPI,**
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
M. T. Bond, and J. E. Bowie.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 507, $4.25 in paper copy, $2.25 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Completion Report, July 1975. 56 p, 12 fig, 4 tab, 16 ref, 7 append. OWRT A-084-MISS(1).

Descriptors: *Color, Water quality, Groundwater, Water supply, *Mississippi, Water wells, Polyelectrolytes, Waste treatment, *Water treatment, Hydrogen ion concentration.
Identifiers: Organic color.

The objectives were to identify the substances in groundwater that produce organic color and to evaluate techniques to remove the color from water supplies. Eight wells having very little or no iron content were selected as sampling sites for preliminary characterization studies. Organic colors ranged from 15 units to 140 units. All samples had a pH between 8.3 and 8.7. An analysis of the color material in the water strongly indicated that it was a tannin and lignin like substance. A near linear correlation exists between tannin and lignin concentrations and color units in water. Organic color could be removed from groundwaters most effectively by adjusting the pH downward and adding alum and a polyelectrolyte at a proper dosage. Alum requirements were 60-70 mg/l for all waters at a pH of approximately 6. The polyelectrolyte requirements varied with the intensity of color. Activated carbon is not an effective method to remove organic color greater than 40, and possibly much lower, from groundwater. It may be effective to remove residual color after chemical physical treatment.
W75-10907

**DISINFECTING WASTEWATER WITH CHLORINATION/DECHLORINATION PART 1,**
For primary bibliographic entry see Field 5D.
W75-10963

**DISINFECTING WASTEWATER WITH CHLORINATION/DECHLORINATION PART 2,**
For primary bibliographic entry see Field 5D.
W75-10964

**LIQUID CO2 PROTECTS OUR WATER'S QUALITY,**
Kansas City Water Dept., Mo.
D. R. Boyd.
The American City, Vol 90, No 1, p 57-58, March, 1975. 2 fig.

Descriptors: *Water quality, *Carbon dioxide, *Water purification, Costs, Lime, Flow rates, *Water treatment, Missouri, Waste water treatment.
Identifiers: *Recarbonization, Kansas City(Mo).

The Kansas City, Missouri, Water Department utilizes recarbonization as an essential step in their water purification method. This step is used to neutralize and stablize the water after it has been softened with lime. In the past the Kansas City plant produced their own carbon dioxide with on-site generators. They are now using commercial carbon dioxide. The advantages of using liquid carbon dioxide are cost, superior purity and quality of gas, no contamination of the water, shorter filter runs, and prevention of carbon monoxide formation. The Kansas City plant processes an average of 105 mgd with a high of 178 mdg and low of 85 mgd using an average of 339 pounds of carbon dioxide vapor per million gallons of water for recarbonization. The liquid carbon dioxide is stored in 4 fiberglass insulated refrigerated low-pressure tanks with a 24-ton capacity each. In the recarbonization basins the water passes in an undulating motion over and under a series of transverse verticle baffles. The excess alkalinity of the water is neutralized to a pH of 9.7 by the carbon dioxide. (Dean-FIRL)
W75-10990

**A WATERBORNE GASTROENTERITIS EPIDEMIC IN PICO RIVERS, CALIFORNIA,**
Los Angeles County Health Services Dept., Calif. Immunization Project.
L. E. Mahoney, C. T. H. Friedmann, R. A. Murray, E. L. Schulenburg, and G. A. Heidbreder.
American Journal of Public Health, Vol 64, No 10, p 963-968, October 1974. 3 fig, 4 tab, 10 ref.

Descriptors: *Public health, *Epidemics, *Chlorination, *Water supply, Reservoirs. Coliforms, *California, Water treatment, Water pollution effects.
Identifiers: *Sewage poisoning, Fecal coliform, Gastroenteritis, Pico Rivera(Calif).

An outbreak of acute nonspecific gastroenteritis occurred between July 29 and August 7, 1971 when about 11,000 residents of Pico Rivera, California, became ill. Symptoms included diarrhea, stomach cramps, nausea, vomiting, fever, and menatochezia. These symptoms are compatible with the syndrome of sewage poisoning. Sanitary and epidemiology investigations determined that the source of the illnesses was water from a reservoir serving part of the town. Chlorination at the reservoir was interrupted for about a week starting July 29, 1974 due to an unattended chlorinator that was out of chlorine. The area served by the reservoir showed heavy fecal coliform contamination in water samples taken. The contamination was further localized to a portion of the water line. Although the common feeling is that waterborne gastroenteritis outbreaks in the United States are things of the past, current statistics suggest that common source outbreaks of waterborne disease may continue to occur with some frequency. (Orr-FIRL)
W75-11005

**INDUCED INFILTRATION SUPPLY SYSTEM AMONG BIGGEST.**
Water and Pollution Control, Vol 112, No 9, p 33, 38-39, September 1974. 2 fig.

Descriptors: *Water supply, *Aquifers, *Infiltration, Water resources, Pumps, Costs, *Canada, Water treatment, Facilities, Construction.
Identifiers: *Fehlmann collector, *Induced infiltration.

An induced infiltration supply system including pump house for a water supply system has recently been installed for the City of Prince George, British Columbia. The system cost around $1.2 million which was a 44% saving over the estimated cost of a river intake and treatment plant. In addition to the capital cost saving, there will be annual operating cost savings in the form of chemical treatment, operation and maintenance costs associated with surface water treatment plants. The completed project includes a Fehlmann collector, one of the highest capacity ground water collectors in the world. An investigation was done to

determine the best method of supplying water which included drilling and logging test wells, constructing temporary pumped wells, and aquifer testing an extensive glacial outwash area along the Nechako River. The Fehlmann collector is guaranteed to produce a minimum of 10 mgd up to a maximum of 15 mgd. The collector consists of a 16 ft inside diameter caisson of reinforced 4000 psi high early strength concrete with 1.5 ft thick walls and a bottom of 6 ft thick reinforced concrete. Other specifications and details of construction and operation are given. (Orr-FIRL)
W75-11010

**BIOLOGICAL CONTROL: ISOLATION AND BACTERIAL OXIDATION OF THE TASTE-AND-ODOR COMPOUND GEOSMIN,**
Detroit Univ., Mich. Dept. of Biology.
L. V. Narayan, and W. J. Nunez.
Journal of the American Water Works Association, Vol 66, No 9, p 532-536, September, 1974. 6 fig, 2 tab, 13 ref.

Descriptors: *Biodegradation, *Odor-producing algae, *Odor, *Bacteria, Taste, Water quality, Biological treatment, *Biocontrol, Microbial degradation, Oxidation, Microorganisms, Isolation, Water supply.
Identifiers: Bacillus sp, *Geosmin, Anabaena circinalis.

A variety of microorganisms have been cited as the causes of naturally occurring tastes and odors in water supplies. The two most important of these microbial odor causing compounds are mucidione and geosmin. The isolation of geosmin from Anabaena circinalis, determination of the threshold odor level, enrichment culturing of microorganisms, cell cultivation and collection, and oxidative degradation were studied. Geosmin was found to be the primary odor component in Anabaena circinalis. The distillation and extraction of the entire algal culture of Anabaena circinalis, cells and medium, yielded more geosmin than distilling the algal cells along. The geosmin in the medium was probably the result of a release of metabolites during physiological transitions of the algal culture. Manometric oxidation studies were found to be useful for scanning microorganisms as agents for controlling taste and odor compounds in water. Sarcina sp., Micrococcus sp., Mima sp., Escherichia coli, Alcaligenes viscolactis, and Bacillus sp. were all examined in regard to their ability to degrade geosmin. Bacillus sp. appeared to be the best bacterial organisms for biological control of odor causing metabolites. Bacillus cereus strain 10876 has previously been reported as the best strain of bacteria for the degradation of geosmin. However, Bacillus subtilis strains and Bacillus cereus strain ATCC 9139 proved to be as effective as Bacillus cereus strain 10876 in degrading geosmin. (Orr-FIRL)
W75-11013

**CITY/TOWNSHIP JOINT VENTURE--A NEW WATER PLANT,**
East Lansing-Meridian Water and Sewer Authority, East Lansing, Mich.
W. K. Kyes.
Water and Sewage Works, Vol 232, No 8, p 88-91, August, 1974. 3 fig.

Descriptors: *Water treatment, *Water supply, *Domestic water, Water softening, Hardness(Water), Water purification, Water wells, Filters, Treatment facilities, *Michigan.
Identifiers: East Lansing(Mich), Meridian Township(Mich).

The East Lansing-Meridian Water and Sewer Authority was formed in 1969 to provide a sufficient quantity of fully treated water to the City of East Lansing and adjoining Meridian Township. A water treatment plant was put in operation in 1973 which provides 15 mgd of water containing 85 mg/liter or less of hardness and no iron. The plant incorporates an in-house lime handling system to transfer the pebble lime from large storage bins to day bins positioned over the lime feeders. Pretreatment is provided in two primary clarifiers and two secondary clarifiers. Mixing, flocculation and sedimentation are performed in one tank. Wood plank deck and laminate wood beams were chosen to cover the pretreatment tanks because of the lower capital cost than that of a concrete roof and the lack of future maintenance requirements. A concrete roof would have cost more and required periodic painting. After pre-treatment, the water is applied to dual media (sand covered by anthracite) gravity sand filters for removal of chemical floc. Lime soda softening of the water results in two waste by-products: the backwash water is stored in an earthen pond and recycled to the inlet of the plant; the line sludge is stored a lagoon system where the solids settle out and the clear supernatant left is collected and pumped back to the plant. The plant functions with semi-automatic controls. Sixteen new wells, more than 9 miles of pipe to transport the water to the plant and 2 miles of distribution mains were developed in conjunction with the water treatment plant. (Orr-FIRL)
W75-11015

**HOW SILICA AFFECTS IRON REMOVAL FROM GROUNDWATER,**
Yule, Jordan and Associates, Camp Hill, Pa. Environmental Engineering Div.
L. R. Robinson, Jr.
Water and Sewage Works, Vol 122, No 3, p 74-77, March, 1975. 9 tab, 18 ref.

Descriptors: *Groundwater, *Water treatment, Iron, *Oxidation, *Silica, Hydrogen ion concentration, Alkalinity, Pilot plants, Laboratory tests, *Waste water treatment.
Identifiers: *Iron removal.

Interference with iron oxidation and removal is frequently attributed to low pH and low alkalinity concentrations. It has also been indicated that high concentrations of silica can catalyze ferrous iron oxidation and retard hydrolysis of ferric iron and thus hinder sedimentation and filtration. The results of both jar tests and pilot plant studies indicate that silica interference with iron removal is apparently the reaction of silica in alkalinity determinations to indicate sufficiently high bicarbonate alkalinity to insure rapid ferrous iron oxidation. When lime or soda ash were added, satisfactory iron oxidation and removal was achieved. These results confirm the hypothesis that a bicarbonate alkalinity of at least 100 mg/liter as CaCO3 is necessary to obtain immediate oxidation and subsequent removal or iron from groundwater. Tests were performed on several groundwater supplies in East Pakistan where poor iron removal was obtained even though alkalinities were found to be in excess of 100 mg/liter. Silica was observed in significant concentration in several of the waters studied. Where treatability was unsatisfactory, the addition of lime or soda ash was successful in causing the oxidation of the iron. The addition of silica in the form of sodium metasilicate had no effect on the treatability of the water. (Orr-FIRL)
W75-11016

**PREVENTING BACKFLOW IN PIPING CROSS CONNECTIONS,**
Watts Regulator Co., Lawrence, Mass.
For primary bibliographic entry see Field 5B.
W75-11018

**CORROSION BY DOMESTIC WATERS,**
Illinois State Water Survey, Urbana.
T. E. Larson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 723, $4.25 in paper copy, $2.25 in microfiche. Bulletin 59, 1975. 48 p, 32 fig, 2 tab, 38 ref, 3 append.

Descriptors: *Corrosion, *Corrosion control, *Domestic water, Pitting(Corrosion), Pumps, Water wells, Materials, Laboratory tests, Water quality, Water chemistry, Metals, Flow rates, Pipes, Distribution systems, *Water treatment, Chemical reactions, Scaling, Dissolved oxygen, Hydrogen ion concentration, Laminar flow, Turbulent flow.
Identifiers: Tuberculation, Cold water, Hot water, Carrying capacity loss, Calcium carbonate saturation index.

Essential data on corrosion by domestic waters gathered by the Illinois State Water Survey in isolated or programmed studies, and from experience at state institutions since 1950, were summarized. Domestic water was defined as any water provided for human consumption and allied uses, in contrast to sea water, brines, or conventional sewage effluents. Corrosion was defined as the destruction of a metal usually by chemical or electrochemical reaction with its environment. A brief review of basic fundamentals of corrosion was presented as background for the summaries of corrosion data. Also included were some of the general and specific recommendations concerning inhibitors and construction materials that were developed through laboratory and field evaluations for use by architects, engineers, and institutional maintenance personnel. Research needs were indicated. Appendixes contain: (1) a discussion of corrosion in water wells and pumps; (2) a description of the dynamic nature of distribution systems and the problems that can exist; and (3) documentation of actual changes in water quality resulting from microbiological growths to the point of removal of all oxygen, and then further change under anaerobic conditions in a 6500-foot isolated water line at the end of the system. (Humphrey-ISWS)
W75-11062

**SYSTEM FOR SOFTENING AND DEALKALIZING WATER BY ELECTRODIALYSIS,**
Vast (J.) Associates, Inc., New York. (assignee)
A. R. Tejeda.
U.S. Patent No 3,893,901, 12 p, 8 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 653, July 8, 1975.

Descriptors: *Patents, *Water treatment, *Water quality control, *Water softening, *Alkali water, *Electrodialysis, Electrodes, Permselective membranes, Anion exchange, Cation exchange, Separation techniques.
Identifiers: *Dealkalization.

The object is to provide an electrodialytic system which by suitable adjustment of the types of exchange material and permselective membrane employed is capable of either softening or dealkalizing water at a low power consumption and high efficiency. For softening, the water is passed through a cation exchange material placed between a pair of cation permselective membranes. For dealkalizing, the water is passed through an anion exchange material placed between a pair of anion permselective membranes. The ion exchange permselective membranes are like types having ion exchange material of the same type located between them form a chamber in an electrodialytic cell with electrodes at opposite ends of the cell to which a source of direct current is applied. (Sinha-OEIS)
W75-11065

**PROCESS FOR RAW WATER CLARIFICATION,**
American Cyanamid Co., Stamford, Conn. (assignee)
H. P. Panzer, and K. W. Dixon.
U.S. Patent No. 3,894,945, 7 p, 8 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 1007, July 15, 1975.

ptors: *Patents, Water quality control, pollution control, *Water purification, ded solids, Turbidity, Natural streams, cal reactions, Water supply, Polymers, Or- ompounds, *Water treatment. ers: *Clarification, *Chemical treatment.

ess is described for clarifying raw water or water. The water is treated with an effec- ount of a water-dispersible polyquaternary r consisting essentially of the reaction of a lower dialkylamine, a polyfunctional and a difunctional epoxy compound from the group consisting of ydrins, diepoxides, precursors of ydrins and diepoxides which under al- conditions are readily converted into the onding epoxy compounds and mixtures. DEIS) 072

EMPERATURE WATER PURIFICATION
1,
Control, Inc., South Barre, Vt.
e)
miston.
ent No. 3,893,894, 9 p, 2 fig, 12 ref; Offi- ette of the United States Patent Office, No 2, p 651, July 8, 1975.

ors: *Patents, *Water purification, reatment, *Water quality control, Separa- hniques, Centrifugation, Evaporation, on, Temperature, Equipment, Heat

s: Vacuum evaporation, Vacuum distilla- temperature.

nperature purification system is provided particularly adapted for use to mechani- ify in a continuous operation solutions g solids and dissolved substances. The on system includes a solution supply nd a centrifugal vacuum evaporator to solution to be purified is fed from the upply. Drive means are operatively con- the evaporator for subjecting the solu- n the evaporator to centrifugal accelera- by causing the solids in the solution to be outwardly of the axis of rotation of the nd the liquid of the solution is displaced oward the axis of rotation. Outlet means ied in the evaporator for discharging the e liquid as it is being displaced inwardly eously subjected to vacuum distillation vapor. This vapor in turn is condensed ntially pure liquid. A heat pump is pro- the system between the centrifugal aporator and the condenser means. The operates to transfer the heat of conden- rbed by the condenser back to the cen- cuum evaporator to supply heat to the the evaporator to replace the heat loss d is transformed to vapor. The system eans for providing heat energy in the ing introduced to the vacuum evapora- de a minimum temperature in the body tion within the evaporator and to com- heat losses within the system. (Sinha-

ASTE RECYCLE SYSTEM FOR URIFICATION PLANT USING ALUM RY COAGULANT,
Polytechnic Inst., Troy, N.Y. Dept. of Engineering; and Rensselaer Inst., Troy, N.Y. Dept. of Environ- neering.
bibliographic entry see Field 5D.

TREATMENT BY OZONE, (IN
bibliographic entry see Field 5D.

**OPTIMUM VALUES FOR OPERATIONAL VARIABLES IN TURBIDITY REMOVAL,**
Mosul Univ. (Iraq).
For primary bibliographic entry see Field 5D.
W75-11110

**WATER TREATMENT FOR PUBLIC SUPPLY,**
M. A. Hilson.
Chemistry and Industry, Vol 1, p 21-25, January 4, 1975. 1 tab, 2 ref.

Descriptors: *Water treatment, *Potable water, *Water quality control, Water distribution(Applied), Flocculation, Coagulation, Filtration, Sedimentation.

Various Acts of Parliament have put the burden on the supplier of supplying water that 'is free from visible suspended matter, color, odor and taste, and from all objectionable bacteria indicative of the presence of disease producing organisms and contains no dissolved matter of mineral or organic origin which in quality or quantity would render it dangerous to health, and will not dissolve substances from the distribution system which are injurious to health.' Water treatment to obtain such a water falls into 3 stages: bacteriological sterilization; chemical purification to remove objectionable matter; and, quality adjustment to ensure that the water does not pick up any harmful substances during distribution. The processes available to achieve the various stages are presented with emphasis on the processes used by the Fylde Water Board, Great Britain. Chlorine, chlorine dioxide, ozone, or ultraviolet radiation may be used for the sterilization of water. Chemical clarification consists of two stages: flocculation and separation of the solid material formed from the bulk of the water. The first step is achieved by the addition of a controlled dose of a coagulant. The floc formed during coagulation can be made tougher and denser by the addition of polymeric compounds. The removal of the solids from the water can be carried out either in a single stage process by direct filtration or by a two stage process of sedimentation followed by filtration. Water softening can be accomplished by precipitation or by ion exchange. Final quality adjustment is the adjustment of the pH value to a level at which the water will not corrode the pipelines or deposit calcium carbonate in the system. (Orr-FIRL)
W75-11119

**CAN A COMPUTER REALLY OPERATE A WATER-FILTRATION PLANT,**
Kennedy Engineers, Inc., Tacoma, Wash.
J. Watkins, Jr.
Journal of the American Water Works Association, Vol 67, No 7, p 351-352, July 1975.

Descriptors: *Water treatment, *Filtration, *Treatment facilities, *Operations, *Control, *Computers, Water quality, Flow, Measurement, Monitoring, Simulation analysis, Computer programs, Hydraulics, Industries, Mathematical models, Systems analysis, Chemicals, Evaluation.
Identifiers: Process control, Real-time, Prediction.

In view of today's technology, the ability of the computer to independently perform process control functions on a real-time basis in the operation of a filtration plant is evaluated. To control any function, one must predict the response of the function. Given are the specifications for a mathematical system model to predict, monitor, and control the variables of the process. The Santa Clara District's Rinconada treatment plant is utilized to illustrate a typical filtration plant using a full treatment process (chemicals, coagulation, sedimentation, filtration, and chlorination). In such a plant, control of two processes is necessary: the hydraulic flow of water through the plant and the treatment process itself. The first can be readily calculated and simulated. Two problems, however, make it extremely difficult to develop mathematical control models for the treatment process: (1) water treatment is still partially an art and not completely a science; and (2) There is a lack of good primary instrumentation to measure and control process variables so as to perform control functions on a real-time basis. In conclusion, further development of mathematical equations of the chemical and physical process, process techniques, and equipment and instrumentation are needed before the computer can independently exercise these control functions. Those functions which a computer can perform beneficially in a treatment plant operation, based on Santa Clara experience, are given, and recommendations are made that include enlisting aid of a control systems engineer and selecting an appropriate computer. (Bell-Cornell)
W75-11184

**AQUATIC PLANT CONTROL USING HERBICIDES IN A LARGE POTABLE WATER SUPPLY,**
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.
For primary bibliographic entry see Field 5G.
W75-11201

**ALGAE IN BALTIMORE'S RESERVOIRS,**
Baltimore City Dept. of Public Works, Md. Water Supply Treatment and Pumping Div.
For primary bibliographic entry see Field 5C.
W75-11221

**ELECTROLYTIC CONTROL OF ALGAE,**
Calcutta Metropolitan Development Authority (India).
S. K. Paul, K. V. Chari, and B. Bhattacharyya.
Journal of the American Water Works Association, Vol 67, No 3, p 140-141, 1975. 8 fig, 1 tab.

Descriptors: *Algal control, *Chlorophyta, *Electrolysis, *Water treatment, Electrodes, Settling velocity, Electric currents, Water pollution control.

Algae in water fed to water treatment plants and recirculated effluent from stabilization ponds can be controlled by electrolytic treatment. Experiments were conducted on cultures of planktonic algae (Chlorophyta). Individual organisms were mounted on microscope slides, the current passed momentarily, and the treated cells examined to determine damage and if they were dead. Stained dead organisms did not plasmolyze. Also algae-laden water was passed through a gap between two steel electrodes to avoid toxic effects of copper ions in solution. Maximum voltage was 200 volts, water temperature 26-42C, and the minimum gap between the electrodes was selected to avoid clogging by filamentous organisms. When treated water samples were exposed to diffuse sunlight, photosynthesis was weak or absent, and the green color bleached slowly. Dead algae settled quickly and regrowth did not occur. The lethal action of the electric current may be the result of electrical stress on the organisms, which depends on the potential difference across the cells, maintained by the voltage gradient between electrodes; and diffusion of cellular anions and cations. Both effects are instantaneous and independent of rate of flow between electrodes and concentration of organisms. Current density and voltage are important factors. (Buchanan-Davidson--Wisconsin)
W75-11228

**ALGAE CONTROL IN NORTHWEST RESERVOIRS,**
Seattle Dept. of Water, Wash.
For primary bibliographic entry see Field 5G.
W75-11231

## 5G. Water Quality Control

**THE RESPONSIBILITY OF U.S. WATER SUPPLIERS,**
Senate, Washington, D.C.
E. M. Kennedy.
American Water Works Association Journal, Vol 66, No 10, p 559-562, October 1974.

Descriptors: *Water supply development, *Water quality control, *Water quality standards, Water resources development, Political aspects, Social aspects, Social values, Water pollution, Community development, Governmental interrelations, Legal aspects, Planning, Water reuse, Water demand.
Identifiers: *Water Resources Development Act, *Safe Drinking Water Act.

The problem of providing an adequate supply of water while maintaining and improving the quality of water is discussed. The problem is exacerbated by the increasing demand for water and the public's conception of water as a free and inexhaustible resource. The rising level of pollution in water and the growth of population and industry add new threats to the quality of clean drinking water. The key to the solution is a national water policy implemented under the auspices of federal, state and local governments. The solution will have to be multifold and should include a national commitment to assure an adequate supply of water as is in the Water Resources Development Act. A commitment to end massive pollution and a commitment to support a national policy of conservation are recommended also. (Altuve-Florida)
W75-10856

**FACING THE REAL COST OF CLEAN WATER,**
Environmental Protection Agency, Washington, D.C.
R. E. Train.
American Water Works Association Journal, Vol 66, No 10, p 562-565, October 1974.

Descriptors: *Legislation, *Water costs, *Legal aspects, *Potable water, Water quality, Public health, Water purification, Cost sharing, Governmental interrelations, Federal government, Chlorine, Water quality standards, Water policy, Water treatment, Government finance, Grants, Government supports, Water values, Research and development.
Identifiers: *Safe Drinking Water Act, Public notification, Legislative history.

The need for federal standards is emphasized, since many of the water systems in this country do not adequately protect their patrons. This is particularly true of the smaller systems which all will have difficulties in meeting water standards. Although there is no drinking water crisis today, there are symptoms of neglect. The passage of the Safe Drinking Water Bill would reduce this neglect because it would require the establishment of national drinking water standards or regulations and would provide federal financial support for the program. The Act is correct in allowing for primarily local or state enforcement and for federal enforcement only if the local government fails to do so. The portion of the Act which calls for public notification concerning environmental matters is significant because a well-informed public is necessary for the maintenance and improvement of quality water systems. (Altuve-Florida)
W75-10857

**THE IMPACT OF THE SAFE DRINKING WATER ACT ON UTILITIES,**
Boston Metropolitan District Committee, Mass.
J. W. Sears.
American Water Works Association Journal, Vol 66, No 10, p 573-574, October 1974.

Descriptors: *Utilities, *Water quality control, *Water quality standards, *Potable water, *Environmental sanitation, Cost-benefit analysis, Consitiutional law, Administration, Penalties(Legal), Legal aspects, Administrative decisions, Discount rates, Pricing, Water rates, Value, Federal government.
Identifiers: *Safe Drinking Water Act, Liability(Legal aspects).

The Safe Drinking Water Act is a progressive and reasonable piece of social legislation but there are several potentially troublesome aspects of the act. These include the potential cost for compliance, especially the cost to small systems. The application provisions fail to adequately define what systems are controlled by the act and as a result many systems may not be affected by the act although they are the types of systems that the statutory draftsmen of the act probably envisioned. The possibility of erroneously imposed criminal and civil penalties on administrators who are actually not in a position of control is discussed. Water supply administrators should attempt to create a constituency of citizens who understand and follow their efforts. Pricing rates should be reevaluated and nationwide quantity discounts should be eliminated. (Altuve-Florida)
W75-10859

**MAN'S INFLUENCE ON THE HYDROLOGICAL CYCLE: A DRAFT REPORT OF THE UNESCO/FAO WORKING GROUP ON THE INTERNATIONAL HYDROLOGICAL DECADE.**
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
For primary bibliographic entry see Field 2A.
W75-10863

**AN ANALYSIS OF THE MOTOR-ROW CONVERSION ISSUE OF COLORADO RIVER FLOAT TRIPS,**
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 6B.
W75-10867

**OCCURRENCE OF 2, 4, 5-T AND PICLORAM IN SURFACE RUNOFF WATER IN THE BLACKLANDS OF TEXAS,**
Agricultural Research Service, College Station, Tex.
For primary bibliographic entry see Field 5B.
W75-10895

**CONCURRENT NITRIFICATION-DENITRIFICATION AT THE SEDIMENT-WATER INTERFACE AS A MECHANISM FOR NITROGEN LOSSES FROM LAKES,**
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W75-10902

**INFORMATION AS A REGULATORY TOOL IN WATER QUALITY CONTROL,**
Wisconsin Univ., Madison. Land Tenure Center; and Wisconsin Univ., Madison. Dept. of Agricultural Journalism.
H. H. Felstehausen.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 502, $3.75 in paper copy, $2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS-WRC 75-06, June 1975. 29 p, 4 fig, 16 ref. OWRT A-055-WIS(1). 14-31-0001-4050.

Descriptors: *Information exchange, *Water law, *Statutes, *Legislation, Legal aspects, *Water permits, Data processing, Documentation, *Wisconsin, Water quality control, Water quality standards, *Federal Water Pollution Control Act.

The Federal Water Pollution Control Amendments of 1972 (Public Law 92-500) were analyzed to test the assumption that a resource well described and well monitored will be well managed. A model was designed of resource legislation which focused attention on: (1) who is being addressed by the law, (2) what actions are to be taken under the law, and (3) what are the defined relationships between actors and objects of action. A content analysis was performed on the 80 sections of the law. In addition, the Wisconsin Pollutant Discharge Permit System was examined. The 1972 Water Pollution Control Act was found primarily to establish an information, monitoring and standards program creating a large data system about water resources and water quality. Of the 80 sections in the law, 75 of them pertained primarily to how the law is to be administered, enforced and reported, not how the water is to be used. This analysis was performed in the context of previous criticism that the regulatory/enforcement procedure will not solve water pollution problems. The study found that an elaborate information system is resulting from the regulatory/enforcement model, but based on the criticism of the model, the vast information system is not to be expected to significantly affect effluent discharges. Several changes are suggested which emphasize technical assistance to the user and information feedback to the pollution dischargers as ways to improve and modify the legislation.
W75-10903

**WATER POLLUTION PROBLEMS IN SALISBURY, RHODESIA: PRESENT AND FUTURE,**
C. G. Wells.
Water Pollution Control, Vol 74, No 2, p 120-12 1975. 1 ref.

Descriptors: *Waste water treatment, *Sewa treatment, *Water pollution control, Sewerag Biological treatment, Land management, Irrig tion, Water supply, Rivers, Lakes, Treatme facilities, Africa.
Identifiers: *Rhodesia, Chemical treatment, La application.

Overall water pollution problems in Salisbu Rhodesia, are presented, as well as proposals the future. Between 1950 and 1973, there has b a large increase in population, water consumpti and sewage flow, which has strained both financ and natural resources. The region is on watershed within the catchment area of its wa supply, consisting of the Hunyani River and th tributaries and Lake McIlwaine. It was determi that treated sewage effluents are the major ca of pollution. The regional Council decided that municipality should be responsible for collecti treatment, and disposal of all Salisbury sewage; treatment will be concentrated at works with the largest gravity drainage, clos agricultural land; outfall sewers will be structed draining to the new treatment facili schemes for irrigation of land with sewage fluents will be developed; and contin hydrobiological research will be conducted well as studies on chemical treatment of sewag combination of biological and chemical treat and irrigation were formulated such that: d the dry season, all flow will be treated biologic with effluent being applied to land; and, durin wet season, flow will be treated biologically the amount to be irrigated or stored. with e flows to be treated chemically as raw sewage, treated effluents being discharged to the (Prague-FIRL)
W75-10983

**WATER CONSERVATION IN SWEDEN: CURRENT TRENDS,**
Ministry of Agriculture, Stockholm (Sweden).
S. Lundkvist.
Journal Water Pollution Control Federation 47, No 4, p 673-674, April, 1975.

ptors: *Waste water treatment, *Waste
al, *Water quality, *Oil pollution, *Water
vation, Governments, *Permits, Water pol-
control, Potable water, Aquatic life, Oil
Lakes, Municipal water, Industrial wastes.
iers: *Sweden.

vedish government passed the Environmen-
tection Act in 1969, requiring that dischar-
municipal waste water as well as industrial
ts have a permit. Government subsidies of
vater treatment plants seven years ago have
arge-scale construction and increased effi-
The problems of water management are
ng water conditions, stopping further pol-
and repairing present damages. Because 80
of Swedish Water consumption is industri-
een 1970 and 1974, 275 million dollars were
l in industrial pollution control, 102.5 mil-
this as government subsidies. A dramatic
e in pollution discharge has resulted; for
, BOD has decreased by 520 tons per day.
DDT and PCB has also been regulated and
l. Oil pollution has been a major water
ation problem. The Swedish Coast Guard,
gisters about 250 oil spills per year, has in-
its harbor facilities for handling oily
and has developed special vessels and
to deal with the problem. Mercury
es, which had made fish unfit for human
otion, have been reduced since 1967 from
tons per year to present levels of 800 kg
. Other marine research has been con-
n water exchange and material balance on
vers, and groundwater. Lake restoration
in several areas have used mechanical
of vegetation and sediments, chemical
t with flocculants to reduce organic
and nutrients, oxygenation of bottom
and biological methods. Continued en-
ntal protection of Sweden's coastal waters
provided by agreements with neighboring
, on its western coastlines and on the Bal-
ue-FIRL)
37

CHIAL MODEL FOR WATER-
SYSTEM CONTROL,
ge Univ. (England). Dept. of Engineering.
ry bibliographic entry see Field 4A.
96

ND RESPONSIBILITIES OF THE EN-
ENTAL PROTECTION SERVICE
),
ental Protection Service, Ottawa

ry bibliographic entry see Field 6G.
0

L TECHNOLOGY,
ental Protection Service, Ottawa
Environmental Emergency Branch.

dings of the Annual Conference of the
lumbia Water and Waste Association,
1974, Vancouver, British Columbia, p
fig, 2 tab.

s: *Water pollution control, *Oil spills,
ental control, Environmental engineer-
ers, Oil pollution, Oil wastes, Technolo-
la.

onmental Emergency Branch of En-
Canada was formed to cope with en-
l emergencies. To deal effectively with
ntal emergencies, the following items
considered: analysis of the threat;
ss; and, evaluation of the risk. The
paredness is dependent on: the contin-
which assigns the responsibilities and
necessary to reduce the damages due to
cy; the training of the personnel; and,
ility of proper equipment, techniques
and materials. Most of the materials, techniques and equipment currently used are unsatisfactory in terms of their application, labor requirements, sophistication, and/or effectiveness. Research and development requirements in the following areas are representative of the lack of scientific knowledge: diking of storage facilities; detection of spills; containment of spills; recovery of oil and other hazardous materials; and, cleaning and restoration of beaches contaminated with oil. The examples given deal with oil spills but are applicable for other types of environmentally hazardous materials. Guidelines are given for assessing every project for the evaluation and development of new technology. (Orr-FIRL)
W75-11001

**WATER RESOURCES,**
British Columbia Water Resources Service, Vancouver.
B. E. Marr.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, Vancouver, British Columbia, p 1-10.

Descriptors: *Planning, *Administration, *Water pollution control, Waste water treatment, Legislation, Water resources, *Canada.
Identifiers: *British Columbia.

The functions and responsibilities of the British Columbia Water Resources Service include water licensing, water investigations (engineering and planning), pollution control, and environmental matters. The pollution control and environmental activities of the Water Resources Service are discussed. A series of public inquiries into each of the major categories of waste discharge in B. C. were held beginning in 1970. Three levels of objectives have been established for most classes of discharge. These objectives will be upgraded or amended to incorporate and reflect changes in technology, economic conditions, and public attitudes. B. C. has developed a discharge permit system. The last five years have seen a good inventory of discharges compiled, objectives set for most types of discharges, and identification of environmental, technical, and administrative problems. A need exists for flexibility in planning--regional, site, resource development, and waste management planning. The structure within the Water Resources Service is being integrated and decentralized. Investigations are being performed to increase the department's expertise in environmental sciences. Waste treatment plant operator training programs are being initiated. (Orr-FIRL)
W75-11003

**MILESTONE WATER LEGISLATION ACCOMPANIED BY MILLSTONE OF BUREAUCRATIC RED TAPE,**
Hampton Roads Sanitary District, Norfolk, Va.
W. A. Cox.
Professional Engineer, Vol 44, No 10, p 21-23, October 1974.

Descriptors: *Water quality, Planning, *Legislation, *Federal jurisdiction, Effluents, Water pollution control, Treatment facilities, Regulations, Waste water treatment, Participating funds, Costs.
Identifiers: *Public law 92-500.

Since the passing of Public Law 92-500, water quality planning has been improved. However, the processes and steps required to activate a new major waste treatment facility are time-consuming and costly. Uniform effluent limitations to meet 1977 and 1983 treatment method deadlines impose a great deal of pressure on municipalities, especially on their consulting engineers. Applications for funding are processed slowly at the Federal level; Congress has also impounded many of the existing funds. It was recommended that modifications be made either in the law or in the implementation of regulations to ease some of the burden. These include: modification of the time frame constraints; release of impounded funds to stimulate new jobs and manufacturing; reduction of the Federal percentage of participation in funding water pollution control projects; streamlining of the fund distribution process; and, the reinstatement of provisions for reimbursement to municipalities. In addition, it was suggested that more responsibility be delegated to the states, that fund allocation to the states be resumed on a population basis, and that the requirements for user charges be amended to allow localities and regional agencies to employ the types of financial procedures used under state laws and municipal ordinances. Finally, one should establish a continuing review of required treatment standards so that they remain flexible to consider demands of the nation's critical energy supply, operating and capital costs, and effects of treatment on receiving waters. (Prague-FIRL)
W75-11007

**COST EVALUATION OF WATERCOURSE MANAGEMENT IN ESSEX,**
Cambridge Univ. (England). Dept. of Applied Biology.
M. P. Brooker, and J. H. Baird.
Surveyor Public Authority Technology, No. 4288, p 34-37, August 16, 1974. 2 fig, 2 tab, 2 ref.

Descriptors: *Watercourses(Legal aspects), *Drainage systems, *Herbicides, Environmental effects, *Costs, Odor, Taste, Potable water, Water supply, Public health, Agriculture, Chem control.

In England Wales about 3 million acres of agricultural land are entirely dependent on drainage systems of dykes and larger channels and an additional 2 million acres on wet ditches. The maintenance of good drainage by keeping the watercourses free of vegetation is of national importance. In the past, clearing of the channels has been by 'brushing' or cutting and subsequently removing vegetation from the channel by hand. However, chemical control such as the use of herbicides is becoming a more desired solution to this problem. Detailed records have been kept which allow a direct comparison of the unit costs of chemical applications and conventional hand clearance; the unit cost per annum of herbicide treatment is about 50-75% of the conventional hand clearance, raking and disposal. Other factors than cost are involved in the choice of whether to use chemical control. The most important are the implications of using water containing herbicides for potable and agricultural purposes and the ecological effects of their use. The dosages used in chemical control are unlikely to produce acute toxic effects in man or livestock. One problem involved with using herbicide containing water for public water supply is the presence of tastes and odors. If recommendations for use are followed correctly, herbicides such as 2,4-D and dalapon are unlikely to affect crops irrigated with treated drainage water. The ecological effects on birds by destroying their nesting places and the change in the benthic invertebrates which may in turn cause in fish populations and the effects of chronic doses of herbicides on human and farmstock populations must be evaluated before widespread use of chemical control for watercourse management can be instituted. (Orr-FIRL)
W75-11008

**FRESHWATER ECOSYSTEM RESEARCH IN WATER QUALITY MANAGEMENT,**
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
For primary bibliographic entry see Field 6G.
W75-11012

**YWA PLAN FOR CLEANER RIVERS,**
For primary bibliographic entry see Field 5D.
W75-11017

**COST SHARING TO HELP CLEAN OUR WATERWAYS.**
Dimensions NBS, Vol 58, No 12, p 267-269, December, 1974.

Descriptors: *Costs, *Federal Water Pollution Control Act, *Economics, *Cost sharing, Waste water treatment, Federal government, Municipal water, Industrial water, Treatment facilities.
Identifiers: National Bureau of Standards, Construction Grant Program.

The National Bureau of Standards (NBS) was asked to evaluate the Construction Grant Program by the Environmental Protection Agency, a federal cost-sharing program as defined after the Federal Water Pollution Control Act Amendments of 1972. It was decided by two NBS economists that the cost-sharing is not as efficient or as equitable as it could be. Because the Construction Grant Program provides different levels of Federal funding for different techniques and costs, municipalities may be encouraged to build oversized or inappropriate facilities. The Federal Government subsidizes 75% of the capital costs and cost of land that is needed for the treatment process but does not cover operation or maintenance. Any technology which requires a large operation and maintenance rather than capital costs expenditure will receive little Federal assistance. Distribution of benefits is discussed. Without effective regional cost-sharing management, it may be difficult to apportion costs appropriately between the regional and the federal sectors. Current user fees imposed on industry, households, and businesses for sewage removal and treatment contribute to inefficiency in the selection of techniques and the size of newly developed facilities. The existing program also results in a larger Federal subsidy to industrialized communities than to residential communities. It was suggested, that with optimal cost-sharing, municipalities should choose a scale of abatement that is locally and nationally efficient, and then pay a cost share equal to their marginal benefits. (Prague-FIRL)
W75-11023

**USE OF STEELON-NET VEILS FOR PROTECTION OF THE HYDRO-ENGINEERING WORKS AGAINST DREISSENA POLYMORPHIA PALL,**
Wyzsza Szkola Rolnicza, Szczecin (Poland). Dept. of Hydrozoology.
L. Szlauer.
Polskie Archiwum Hydrobiologii, Vol 21, No 3-4, p 391-400, 1974. 1 fig, 3 tab, 7 ref.

Descriptors: *Mussels, *Mollusks, *Design, Construction, Engineering structures, *Nets, Environmental effects, Thermal pollution.
Identifiers: *Steelon-Net veils, Hydro-Engineering installations, *Dreissena polymorpha.

Serviceability of the veils used for safeguarding hydro-engineering installations against Dreissena polymorpha invastion has been studied. Mass settling down of young individuals of this mussel species has been observed on the veil hung in the headrace channel furnishing water to the hydro-engineering installation. The veil of 26 m2/in surface was able to withhold 5 million young mussels. The large-scale of the settling of D. polymorpha on the veil allows for the possibility that a range of veils could protect the hydro-engineering installations effectively against the harmful mussels. (Katz)
W75-11033

**PRELIMINARY INVESTIGATIONS INTO COPPER CYCLING IN INDIAN LAKE, MASSACHUSETTS: A LAKE TREATED ANNUALLY WITH COPPER SULFATE,**
Massachusetts Univ., Amherst. Water Resources Research Center
For primary bibliographic entry see Field 5B.
W75-11039

**LEGAL AND INSTITUTIONAL PROBLEMS IN THE MANAGEMENT OF SALINITY,**
Washington Univ., Seattle. School of Law.
R. W. Johnson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 730, $3.75 in paper copy, $2.25 in microfiche. Completion Report, June 20, 1975. 35 p. OWRT A-076-WASH(1).

Descriptors: *Colorado River basin, Legal aspects, *Institutional constraints, Salinity, Irrigation, Coordination, Management, Water law, Water rights, *Optimum development plans, Federal-State water rights conflicts.
Identifiers: *Salinity control.

This study examines the Colorado River basin salinity management program. The optimal solution will generally be found by considering the problem on a basinwide basis. In most cases the optimal solution is one that would result in the least total cost per unit for the largest salinity reduction. This optimal solution requires extensive voluntary cooperation among all water users; it has proven quite effective in the Colorado River basin. The recommendations for a comprehensive basinwide or regional management entity to plan and implement a salinity control program for the Colorado Basin have, to date, produced a voluntary, cooperative interstate discussion group, the 'Colorado River Basin Salinity Control Forum.' To date all irrigation efficiency and water use management programs have been voluntary and are based on education and persuation rather than on legal regulation. Most water managers and other experts in the Colorado Basin believe the voluntary program will, in the long run, be more effective.
W75-11047

**PROCESS STUDIES AND MODELING OF SELF-CLEANING CAPACITY OF MOUNTAIN CREEKS FOR RECREATION PLANNING AND MANAGEMENT,**
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W75-11055

**CORROSION BY DOMESTIC WATERS,**
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5F.
W75-11062

**OIL SEPARATOR WITH COALESCING MEDIA,**
Amoco Production Co., Tulsa, Okla. (assignee)
L. W. Jones.
U.S. Patent No. 3,893,925, 4 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 660-661, July 8, 1975.

Descriptors: *Patents, *Water pollution treatment, *Water quality control, *Separation techniques, *Oil pollution, Oily water, Sulfur, Coalescence, Pollution abatement, Oil wastes.

A system is described for removing dispersed oil from water by contacting the oily water with sulfur to cause the oil to coalesce or agglomerate. A bed of granular sulfur is provided in a vertical tank through which oily water flows downward. An inverted cone shaped member supports the sulfur. This cone shaped member is perforated to permit the passage of fluid but is also provided with protected channels extending from the base of the cone to an oil gathering chamber at its apex. Oil free water is drawn off at the bottom of the vessel. The oil accumulates in the protected channels and being lighter than water rises to the peak or apex of the cone and is drawn off. The water being heavier than the oil has no tendency to rise but falls downwardly to the bottom of the vessel where it is removed. Both coalescence of the oil droplets and separation of the oil from the water is thus accomplished in a single vessel. (Sinha-OEIS)
W75-11071

**COMPARISON OF UREDO EICHHORNIAE, THE WATERHYACINTH RUST, AND UROMYCES PONTEDERIAE,**
Florida Univ., Gainesville. Dept. of Plant Pathology.
R. Charudattan, and K. E. Conway.
Mycologia, Vol 67, No 3, p 653-657, May-June 1975 9 fig, 1 tab, 8 ref. OWRT A-027-FLA(6), 14-31-0001-5009.

Descriptors: *Plant pathology, Aquatic plants, *Aquatic weed control, *Biocontrol, *Florida, *Water hyacinth, *Rusts, *Plant diseases, Water pollution control.
Identifiers: Uredo eichorniae, Uromyces pontederiae, Pickerelweed rust.

The waterhyacinth, Eichhornia crassipes (Mart.) Solms (Pontederiaceae), is a troublesome aquatic weed in the tropics and subtropics. In Florida, Several control methods have been tried against it including control with plant pathogens. Among potentially useful pathogens is Uredo eichhorniae Fragoso and Ciferri which may be specific to waterhyacinth. This rust has not been recorded since its original description in 1927, but as a result of surveys in the past 4 yr it was found in the Entre Rios province of Argentina. There have been doubts concerning the propriety of the generic name of this rust. The similarity of Uredo eighhorniae to Uromyces pontederiae Gerard on the related genus Pontederia (pickerelweed) has been suggested. Uromyces pontederiae has been reported from Urguay in its uredial stage on Eichhornia azurea (Swarts) Kunth, the anchored waterhyacinth. It is uncertain if teliospores are produced on this plant. In surveys in Argentina, the Dominican Republic, Puerto Rico, Uruguay and Venezuela, no rust was seen on E. azurea. The occurrence of Uredo eichhorniae on E. crassipes in Argentina is reconfirmed, and it is compared with Uromyces pontederiae from localities in Argentina, Uruguay and Florida. The pickerelweed rust was collected from Pontederia cordata L. and P. lanceolata Nutt. Some consider the two as extreme types of P. cordata. (Morgan-Florida)
W75-11092

**GUIDELINES FOR REVEGETATION AND STABILIZATION OF SURFACE MINED AREAS IN THE WESTERN STATES,**
Colorado State Univ., Fort Collins. Dept. of Range Science.
For primary bibliographic entry see Field 4D.
W75-11100

**A MATHEMATICAL MODEL FOR OPTIMAL WASTE LOAD ALLOCATIONS,**
Oklahoma Univ., Norman.
M. S. Masqati.
Available from University Microfilms, Inc., Ann Arbor Mich, 48106. Order No 74-11,251. PhD thesis, 1974, 189 p.

Descriptors: *Water quality, *Water pollution control, *Mathematical models, River basin development, Streams, Waste water treatment, Planning, Administration, Regional analysis, *Comprehensive planning, Model studies, Oklahoma.
Identifiers: *Waste load allocations, *Verdigris River basin(Okla).

The first and most important step in regional water quality management is river basin planning. One of the most effective methods of water pollution control is treatment of wastes before discharge. Although planners have other alternatives, this method is easily implemented and convenient to administer. In order to maintain a required level of quality in stream waters, waste load alloc

de to individual waste dischargers on the
f the assimilative capacities of the streams
river basin. Stream waters have been
d in the past by large complex simulation
requiring a large amount of input data.
lanners need is a model that is regional in
can work with inadequate data, and
a minimum of man and computer time.
model has been developed and is used to
the quality of stream water in the Ver-
iver basin. A linear programming model
n developed to make the optimal waste
cation, thereby minimizing the total cost
treatment to a region. (Dean-FIRL)
02

**EMS OF LIQUID WASTE DISPOSAL,**
uth Wales Univ., Kensington (Australia).
Civil Engineering.
uild.
itution of Engineers, Australia, Civil En-
Transactions, Vol CE16, No. 1, p 71-74,
ef.

ors: *Liquid wastes, *Water quality con-
stralia, Effluents, Water pollution con-
chemical oxygen demand, Turbidity,
cation, Fishkill, Toxicity, Reviews.

and discussion of the current problems in
ste pollution are given. An increasing
oted in Australia for controlling effluent
s, due to industrial expansion as well as
nd density of human populations. The
ollution described include: oxygen con-
pacity or BOD, which results in fish kills
ation; suspended solids, which produce
and reduce penetration of light;
c organisms from enteric human wastes
ay spread infections; nutrients which
trophication and upset the ecological
n waters; toxic materials, especially
ritants such as detergents, which are
fatal to fish; dissolved salts, from water
omestic purposes or irrigation; and car-
mutagens, and teratogens, which may
term effects. In addition, the aesthetic
stream may be destroyed by foam or
d discoloration from dyes or floating
lead to undesired odors and tastes. Ef-
harges from both domestic sewage and
lustrial wastes are discussed. Solutions
ous problems of liquid wastes in Aus-
be found in engineering ability to apply
to these environmental problems, in
oncern and public pressure, and in
of funds for pollution control facilities.
RL)

**SISTANT COLIFORMS CALL FOR
ATION OF WATER QUALITY
DS,**
st. for Water Research, Pretoria (South

bibliographic entry see Field 5B.

**OK AT POLLUTION PREVENTION
ND RIVERS,**
ter Authority, London (England).

, p 2-4, April, 1975.

*Water quality control, *Pollution
*Water supply development, Adminis-
nicals, Water pollution sources, Pesti-
ic wastes.

hown in recent years that current pol-
l practices will not be adequate for
rotection of public supplies drawn
l rivers. This reason has prompted the
er Authority to institute a program for
nt and control of the extent and na-

ture of continuous contamination of lowland water sources with persistent chemicals. Some of the considerations which have led to this conclusion and new approach include: a recent 3 year dry period which resulted in very high increases in the concentration of residual pollutants, especially nitrates, in river water; the discovery of benthal biomethylation of mercury and bioconcentration and biotranslocation of chemical residues; and, the finding of the transfer of minute herbicide residues from rivers into public water supplies. Basically, the new pollution control approach would put the current system into new overall arrangements to determine, in detail and with all possible accuracy, what chemical contaminants are, or may be, passed into lowland water supply rivers, whether these are likely to present any health hazard in public supplies abstracted from the rivers, and to seek removal or reduction to acceptable levels of all contaminants which are, or are likely to be, dangerous. The new approach can be described as 'catchment quality control'. (Orr-FIRL)
W75-11132

**HYDROLOGIC INVESTIGATION AND DESIGN OF URBAN STORMWATER DRAINAGE SYSTEMS,**
Snowy Mountains Engineering Corp., Canberra (Australia).
For primary bibliographic entry see Field 4A.
W75-11141

**CONDENSATION IN JETS, INDUSTRIAL PLUMES AND COOLING TOWER PLUMES,**
Waterloo Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 2B.
W75-11166

**TREATMENT PLANT MONITORING PROGRAMS: A PRELIMINARY ANALYSIS,**
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W75-11176

**THE LOUISIANA ENVIRONMENTAL MANAGEMENT SYSTEM AND ITS UTILITY IN WATER RESOURCE PLANNING,**
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
C. A. Whitehurst, E. J. Dantin, and D. Harang.
Water Resources Bulletin, Vol 11, No 4, p 734-750, August 1975. 9 fig, 3 tab, 3 ref.

Descriptors: *Water resources development, *Water management(Applied), *Alternative planning, *Multiple-purpose projects, *Decision making, *Data processing, Information retrieval, Computers, Simulation analysis, Assessment, Regional analysis, Mathematical models, Systems analysis, Natural resources, Environment, Ecology, Water quality, *Louisiana, Environmental effects, Water pollution control.
Identifiers: Central processing units, Input-output matrices, Environmental impact.

The Louisiana Environmental Management System (LEMS) is a data processing program developed to aid the Louisiana Joint Legislative Committee on Environmental Quality in decisions leading to resources legislation. Serving as a central data collection and retrieval point for various agencies, the LEMS will maintain assembled information on the location of monitoring stations and coordinate the files of user agencies with data on: land use, air and water quality; meteorological, climatological, and hydrological phenomena; vegetation; fish and wildlife conservation; population; and economics. This data is geographically stored in relation to the state plane coordinate system. For decision making, all pertinent hydrologic, topographic, engineering, cadastral, and other information from separate sources can be automatically mapped as a combined overlay to one of three chosen scales. Land-use patterns are the input data for interative analyses of present conditions and simulated future human activities for assessing the environmental impact of proposed multiple-purpose water resource developments. The assessment methodology requires two complementary functions. The first, general data assessment, determines pertinent data and their parameters, programs the data as input-output matrices, and uses the matrices with algorithms to analyze conditions at a particular site. The second, simulation modeling, provides real and predicted data to assess specific problem areas; hydrodynamic and diffusion simulation programs are included. To demonstrate LEMS, an environmental assessment study in the Tenasas River basin (Louisiana) is considered in terms of its multiple-purpose features. Finally, objectives of the Lower Mississippi River Basin Water Quality Management Plan are considered. (Bell-Cornell)
W75-11177

**STRATEGIC APPROACH TO ESTUARINE ENVIRONMENTAL MANAGEMENT,**
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-11179

**SIMULATION OF WATER QUALITY MANAGEMENT POLICIES,**
Virginia State Water Control Board, Richmond.
J. W. Hyden, J. A. Chisman, and H. H. Macaulay.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 101, No EE4, Paper No 11524, p 623-641, August 1975. 5 fig, 4 tab, 4 equ, 12 ref.

Descriptors: *Water quality control, *Management, *Environmental engineering, *Simulation analysis, Standards, Effluents, River basins, Optimization, Water policy, Economic efficiency, Costs, Waste water treatment, Dissolved oxygen, Systems analysis, Mathematical models, Equations.
Identifiers: *Effluent fees, Feedback, Cost minimization.

A series of water users are located along a river which is the sole source of water intake and the only place in which to discharge wastewater. For a given set of conditions, a management policy such as effluent standard or charge can be set which reflects the basin-wide economic optimum. As these conditions change with time, however, a previously established policy may give rise to a misallocation of allowable waste discharge levels, resulting in a current actual treatment cost greater than that determined to be optimal under the new conditions. Using the prototype computer simulation program written for this study, the actual and optimal solutions are compared. Simulation runs involving three dynamic conditions--user growth, new users, and variable stream-flow--have been made. Misallocations are noted in actual performance relative to optimal solutions. Under an effluent charge policy, resulting treatment cost surpluses and deficits are partially offset by charge deficits and surpluses, respectively. Under a standards policy, there are no charges to offset misallocations. The general simulation program developed for the study has the following capabilities: (1) development of continuous polynomical cost functions based on actual cost data; (2) determination of the optimal solution using the procedure of the Wilde-Beightler algorithm for a nonlinear objective function subject to linear constraints; and (3) comparison of the optimal solution to the actual response, by user acting under a previously established quality management policy. (Bell-Cornell)
W75-11181

**OPERATION CLEAN SWEEP,**
Army Engineer District, Jacksonville, Fla.
C. F. Zeiger, J. T. McGehee, and J. F. Willis.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 5-13, August 1974. 11 fig.

Descriptors: *Water hyacinth, *Aquatic weed control, *Herbicides, 2-4-D, Environmental effects, Spraying, *Florida, Costs, Water pollution control.
Identifiers: St. Johns River(Fla), Lake George(Fla).

An effort was made to catch and spray the water hyacinths in the St. Johns River from Palatka to Jacksonville, Florida in their early growth stage, since they had been damaged by frost, and to bring the number of plants to manageable proportions before the heavy summar growing season. The long range objective was to reduce the water hyacinth problem to a routine maintenance proportion. A residual shoreline fringe had been left in 1971, but during the mild winter of 1972 the plants flourished. Spraying controlled the Lake George area but large free-floating mats had moved downstream, shifting with the wind, blocking navigation, damaging crab traps, endangering piers, and reducing the amount of dissolved oxygen in the water by the heavy concentrations of the floating plants. During the spring of 1973, the control program had reduced the water hyacinth problem to a routine maintenance situation which required only one airboat to cover the area. The intensified control operation required 50 days to spray 3026 acres with 2,4-D amine at an estimated cost of $37,000 or $12.23 per acre. Despite the concentrated spraying there was a heavy population of young bass, possibly due to the cool weather and the vegetation. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11192

**FIELD TESTS OF SLOW-RELEASE HERBICIDES,**
Army Engineer District, New Orleans, La.
W. E. Thompson.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 15-20, August 1974. 6 fig.

Descriptors: *Aquatic weed control, *2-4-D, *Herbicides, *Application methods, *Louisiana, Rubber, Floating plants, Water hyacinth, Submerged plants, Rates of application, Water pollution control.
Identifiers: Slow-release formulations, Water milfoil, New Orleans(La).

Slow-release formulations of the butoxyethanol ester of 2,4-dichlorophenoxyacetic acid (2,4-D) dissolved in natural rubber were developed to treat aquatic vegetation only in specific zones, such as at the water surface or rooted plants at or near the mud-line, eliminating the need for total water column treatment and reducing the amount of chemical applied, frequency of application, and total cost. Three tests were made in the New Orleans area. In a field test of a rubber-herbicide combination with a specific gravity greater than one, surface air bubbles prevented the particles from sinking rapidly enough, causing part of the root to be undertreated and the rest overtreated. This herbicide was not very effective against Brazilian elodia, hornwart or fanwart and even an effective herbicide would not have reached toxic concentrations under the test conditions. Rubber-herbicide suspender strips satisfactorily controlled water hyacinths. Plant bending occurred for a longer time than with foliar treatment but the plants were eliminated in about seven months, and the ditch remained clear of hyacinths. Rubber-herbicide sinkers applied to Eurasian water milfoil sank when broadcast but were light enough to remain on the plant leaves. Discoloration of the plants was observed in two weeks and vegetation was eliminated in four months. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11193

**AQUATIC PLANT CONTROL ON LAKE CORPUS CHRISTI,**
Army Engineer District, Galveston, Tex.
C. J. Novosad.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 21-23, August 1974.

Descriptors: *Aquatic weed control, *Herbicides, *Water hyacinth, Alligator weed, *Texas, Application methods, Rates of application, Spraying, Costs, Floating plants, Operating costs, Maintenance costs, Annual benefits, Cost-benefit ratio, *2-4-D.
Identifiers: *Lake Corpus Christi(Tex), 2-4-D BEE.

Since control of water hyacinths in Lake Corpus Christi, Texas was begun in March 1970, about 17,000 acres have been treated. Most spraying operations were from small boats using 2,4-D butoxyethanol ester at a rate of 2 to 4 lbs/acre active acid equivalent. Aerial spraying was also used with increased dosages. Some areas could not be reached by boats or aircraft thus it was necessary to spray using long hoses from boats or land-based trucks. At the date of the report the lake was essentially free of hyacinth infestations and required only a small amount of maintenance spraying to control seedlings. The estimated total first cost for the plant control and eradication program was $724,700 with an estimated annual charge of $24,550 based on 3-1/4% interest rate for amortization and a project life of 100 years. The annual charges totaled $29,050 which included $4,500 for operation and maintenance. The annual benefits for eradication of water hyacinth and alligator weed in ten work areas (Nueces, Guadalupe, Sabine, Trinity, Neches, San Jacinto, and Rio Grande River Basins; Cypress Creek Basin; and north and south coastal areas) were estimated at $194,040. The benefit-cost ratio was 6.7. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11194

**AQUATIC PLANT RESEARCH AND CONTROL IN FLORIDA,**
Florida Dept. of Natural Resources, Tallahassee.
For primary bibliographic entry see Field 4A.
W75-11195

**CRITERIA FOR HERBICIDE EVALUATION,**
Environmental Protection Agency, Washington, D.C. Office of Pesticide Programs.
T. D. Burkhalter.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 29-31, August 1974.

Descriptors: *Aquatic weed control, *Specifications, *Regulation, *Legislation, Standards, Herbicides, Pesticides, Water quality standards.
Identifiers: *Pesticide registration.

The Criteria and Evaluation Division of the Pesticide Program of the Environmental Protection Agency is responsible for the development of guidelines for the registration of pesticides. The authority for the regulation of pesticides is found in the Federal Insecticide, Fungicide, and Rodenticide Act, which specifies the administering agency and delegates to that agency the authority to establish regulations to accomplish its provisions. Regulations generally deal with one provision of an Act, presenting policies and procedures necessary to effectively administer that provision. To clarify the requirements of the Act and the penalties for not adhering to them, Congress required that guidelines be published, specifying the kinds of information required to support the registration of a pesticide. Guidelines were prepared to interpret the Act, to detail requirements and suggestions, interrelate information, and answer questions. The guidelines include an appendix of conversion tables and required and suggested methods and procedures. Data will be presented in sections indicating various disciplines in three categories: required, suggested, and tentative. To deal with special problems involved with aquatic pesticide use, Budget Issue Papers are prepared to delineate the problems and recognize the needs for acceptable vocabulary, definitions, testing and evaluation methods. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11196

**REGISTRATION OF HERBICIDES FO AQUATIC USE,**
Environmental Protection Agency, Washington D.C. Office of Pesticide Programs.
R. J. Hummel, and J. C. Cummings.
In: Proceedings, Research Planning Conferen on Integrated Systems of Aquatic Plant Contr October 29-30, 1973, Army Engineer Waterwa Experiment Station, Vicksburg, Mississippi, p 36, August 1974.

Descriptors: *Pesticide residues, *Toxicity, Sta dards, *Herbicides, Aquatic weed control, Lo environment, Lentic environment, Estuari Safety, Regulation, Potable water, 2-4-D, Cro 2-4-5-T, *Water quality standards.
Identifiers: *Herbicide registration.

Toxicology data, including 90-day feeding for t species of mammals, and residue data for irriga crops, meat, poultry, milk, eggs, fish, shellfi and potable water are required for registration each aquatic herbicide. Separate protocols probably be necessary for still waters, flow waters, and tidal estuaries because of diverg environmental conditions. If herbicide resid are expected, toxicology data must be furnishe support safety of the residues. Residue clearа for USDA registration can be obtained requesting the USDA to register it as a nonf use or petition for an FDA regulation settir tolerance or exemption from requirement tolerance. A nonfood use involves applica remote from food crops where there is no reas ble expectancy of residues; this may include s aquatic uses. If used for irrigation, residue must support the use; water should be monit downstream and if residues are indicated, analysis should be made to determine res tolerances. A March 1968 Public Health Se bulletin updated drinking water standards t clude 2,4-D, 2,4,5-T, and 2,4,5,-TP and prese guidelines for water control authorities. Le tive jurisdiction for pesticide tolerance in po water was unresolved. (See also W75-0 (Buchanan-Davidson--Wisconsin)
W75-11197

**DISSIPATION OF RESIDUES OF PHEN HERBICIDES APPLIED FOR WATER MIL CONTROL IN LARGE RESERVOIRS,**
Tennessee Valley Authority, Muscle Shoals,
For primary bibliographic entry see Field 5B.
W75-11198

**CHEMICAL CONTROL OF EGERIA DENS**
Agricultural Research Service, Fort Laude Fla.
R. D. Blackburn.
In: Proceedings, Research Planning Conf on Integrated Systems of Aquatic Plant C October 29-30, 1973, Army Engineer Wat

eriment Station, Vicksburg, Mississippi, p 43-August 1974. 3 tab, 11 ref.

criptors: *Submerged plants, *Herbicides, uatic weed control, *Chemcontrol, Diquat, 2-chlobenil, Copper, Application methods, Tox-, Fish, Rates of application, Taxonomy.
tifiers: *Egeria densa, Brazilian elodea, En-all.

taxonomic features of Egeria densa are ribed. The effects of several commonly used icides on Egeria were studied. In the laborato-ndothall (amine salt) was more effective than ssium and dihydroxy aluminum salts. Addi-of copper to endothall increased the effective-of both herbicides. Diquat alone or with a er amine complex was very effective. Water erature during application may be important. at gave good control in growth pools. Addi-of endothall or copper to diquat had no ad-ge. Endothall (amine salt) was effective on a but toxic to fish. Endothall (potassium and troxy aluminum salts) were safe for fish but ot control Egeria. Copper plus endothall in-ed the effectiveness of both. Copper partially olled Egeria, was toxic to fish, and regrowth apid. In field trials, diquat partially controlled a; the diquat-copper complex gave excellent ol; but potassium endothall plus diquat did ncrease activity. Endothall (amine salt) was ost effective and endothall (TD-1874) more ive than the aluminum and potassium salts. ndothall controlled-release formulation was effective on Egeria and less toxic to fish than r formulations. Dichlobenil did not control a but delayed regrowth when applied after . (See also W75-08289) (Buchanan-David-Visconsin)
1199

**) TESTING OF AQUATIC HERBICIDES CONTROL OF EGERIA DENSA,**
rsity of Southwestern Louisiana, Lafayette. of Plant Industry.
arry.
oceedings, Research Planning Conference egrated Systems of Aquatic Plant Control, er 29-30, 1973, Army Engineer Waterways iment Station, Vicksburg, Mississippi, p 53-gust 1974. 4 tab.

ptors: *Aquatic weed control, *Herbicides, ratory tests, *On-site investigations, , Rates of application, Water temperature.
iers: Egeria densa, Brazilian elodea, Black -a), Lake Martin(La), K-lox, Fenac, 3M E, TD-1874, TD-1929, SD-16389, Com-K, Triazine, Florida elodea, Hydrilla ver-.

esting of promising herbicides during previ-sts was conducted in Lake Martin near tte, Louisiana. In one test diquat and diquat tank mix including copper hydroxide olamine complex (K-lox) were most active control of Egeria densa, followed by en-derivatives TD-1874 and TD-1929. K-lox ss protection than when mixed with diquat. gave poor results which were inconsistent or pool and field studies. The 3M System E ation was of no practical value for Egeria . In another test an experimental copper x formulation containing 8% copper ound K) was cost effective against Egeria, d by diquat + K-lox, diquat + compound x, and diquat. Effective control of Egeria tests could thus be achieved with at least erbicides. SD-16389, an experimental , received the lowest rating, which was in-nt with pool studies, perhaps due to dilu-tors. Further testing of SD-16389 will be ed under field conditions to determine if e rates and/or application techniques may loped to provide the control shown in pool new invasion of Hydrilla verticillata in a was discovered on July 1973 in Spanish Lake near New Iberia. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11200

**AQUATIC PLANT CONTROL USING HERBICIDES IN A LARGE POTABLE WATER SUPPLY,**
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.
C. B. Schreck, C. R. Berry, R. J. Strange, S. L. Van Horn, and R. V. Corning.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 61-70, August 1974. 5 fig.

Descriptors: *Impoundments, *Potable water, *Aquatic weed control, *Herbicides, Diquat, *Virginia, Comparative productivity, Fish, Rates of application, Dispersion, Application methods, Pesticide residues, Bottom sediments, Reservoirs, Oxygen.
Identifiers: *Chickahominy Reservoir(Va), *Walker's Dam Impoundment(Va), Newport News(Va), Coontail, Duckweed, Egeria densa, Brazilian elodea, Potassium endothall, Lyngbya, Ceratophyllum.

In July 1973, flowing water and still water quadrants of Chickahominy Reservoir (Walker's Dam Impoundment) in Virginia, a potable water supply for Newport News, were treated with diquat dibromide and potassium endothall to control Brazilian elodea (Egeria densa). The effects on biological, chemical, and physical parameters of the ecosystem; extent of weed eradication; and herbicide physical and biological behavior were investigated. Rhodamine B indicated limited water movement. Nitrates, nitrites, pH, total phosphates, orthophosphates, calcium, magnesium, hardness and alkalinity did not change, but oxygen concentration increased steadily in weeded areas. Light extinction decreased. Phytoplankton primary productivity was immediately depressed, then increased steadily. Fish were not killed or eliminated. Closing the reservoir to human consumptive uses for 14 days was enough for the chemicals to dissipate. Herbicide concentrations and chemical oxygen demands in Egeria, coontail, duckweed, algae, bluegills, golden shiners, bass, and hydrosoils were being determined and dynamics of uptake and decline in water, plants, and sediment simulated. Visual observations and aerial photographs were made of plant dieoff. Duckweed surface elimination was an index of Egeria eradication. Egeria and coontail declined but algae increased following treatment. The treatment was successful and acute detrimental environmental impacts were not evident. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11201

**BIOLOGICAL CONTROL OF ALLIGATOR WEED, 1959-1972,**
Agricultural Research Service, Beltsville, Md.
J. R. Coulson.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 71-74, August 1974.

Descriptors: *Aquatic weed control, *Biocontrol, *Alligatorweed, Insects, *South Carolina, Overwintering sites, Reservoirs, Plant populations, Succession.
Identifiers: *Agasicles hygrophila, Columbia(SC), Jim Woodruff Reservoir(SC), Eurasian water milfoil, Giant cutgrass, Hydrilla, Limnophylla.

The biological control of alligatorweed by Agasicles hygrophila was evaluated. Agasicles can overwinter as far north as Columbia, South Carolina and seems to be capable of reducing alligatorweed to a lesser economic or noxious role in the environment. There are insecticides which can control but not eradicate Agasicles; however this will probably never be necessary as its populations will probably vary with the food supply. At the Jim Woodruff Reservoir treatment of alligator weed caused water hyacinths, Eurasian water milfoil, Hydrilla, Limnophylla, catails, and giant cutgrass to increase. Thus a modification in the aquatic ecosystem tended toward increased diversity in the plant community but little improvement in the balance between producer and consumer organisms because of the pest potential of the invading plant species. In an ecosystem with several introduced weeds competing for space but without a complex of natural enemies, control efforts toward one species, if successful, can mean expansion of one or more of the others. A total pest management program for aquatic weeds is needed. Resources currently available for biological control of weeds limit this approach. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11202

**BIOLOGICAL CONTROL OF EURASIAN WATER MILFOIL,**
Agricultural Research Service, Gainesville, Fla. Biological Control Lab.
For primary bibliographic entry see Field 4A.
W75-11203

**INTEGRATED CONTROLS ON NOXIOUS AQUATIC PLANTS,**
Texas Parks and Wildlife Dept., San Antonio. Statewide Noxious Vegetation Control Program.
L. V. Guerra.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 85-87, August 1974.

Descriptors: *Integrated control methods, *Aquatic weed control, Biocontrol, Insects, Alligatorweed, Overwintering sites, Water hyacinth, 2-4-D, Floating plants, Submerged plants, Chemcontrol, Copper sulfate, Mechanical control, *Texas, Harvesting, Succession, Chara, Application methods, Rates of application.
Identifiers: Eurasian water milfoil, Coontail, Egeria, Elodea, Flea beetles, Water hyacinth weevils, Cabomba, Water lilies, Bladderwort, 2-4-D BEE, Aqua Kleen 20.

The program of integrated control of noxious aquatic plants in Texas involves chemical and biological methods. Mechanical methods proved to be expensive; use of the fiber, protein, and residue as chicken feed was unfeasible; plants grew back in 43 days, and harvested plants were replaced by hardier, more chemically resistant plants. Flea beetles have been used on alligatorweed and water hyacinth weevils on water hyacinths. Establishment of permanent brood stock colonies of these insects near Brownsville and possibly San Marcos are planned. Dramatic results have been obtained with chemicals in Caddo Lake in northeast Texas where the main boat roads were blocked by white and yellow water lilies, milfoil, bladderwort, coontail, cabomba, and elodea. Granulated 2,4-dichlorophenoxy acetic acid butoxyethanol ester (2,4-D BEE) was effective against broad leaf plants, but egeria, chara, and cabomba had a natural partial resistance. Treatment of these plants under phytotoxic stress with copper sulfate gave excellent results. A second application of 2,4-D BEE was necessary in areas subject to flooding, high turbidity, and a flushing effect from high currents; the gradual decomposition of the plants and nutrient release improved fishing. Five watersheds are now under a minimal maintenance program, and work is progressing on others. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11204

**UNISEX STUDIES ON THE WHITE AMUR,**
Bureau of Sport Fisheries and Wildlife, Stuttgart, Ark. Fish Farming Experiment Station.
For primary bibliographic entry see Field 5C.
W75-11205

**UTILIZATION OF PHYTOPATHOGENS AS BIOCONTROLS FOR AQUATIC WEEDS,**
Florida Univ., Gainesville. Dept. of Plant Pathology.
T. E. Freeman, F. W. Zettler, and R. Charudattan.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 97-102, August 1974. 12 ref.

Descriptors: *Biocontrol, *Aquatic weed control, *Plant diseases, Water hyacinth, Alligatorweed, Southeast United States, Florida, Blights, Rots, Spots, Hosts, Plant pathology, Viruses, Subtropic.
Identifiers: *Rhizoctonia solani, *Sepholosporium zonatum, Eurasian water milfoil, Hydrilla, Phthium, Sclerotium, Penicillium.

The progress of research at the University of Florida in the study of plant diseases for the biological control of noxious aquatic plants, especially water hyacinth, Hydrilla, alligatorweed, and Eurasian water milfoil is described. Because many of these plants are not native to the United States, disease surveys were made in much of southeastern United States, the Caribbean Islands, South and Central America, and India. Several diseases have been found to affect water hyacinth. Of the leafspots, Cephalosporium zonatum has the highest potential. Indian workers believed Alternaria eichhorniae had potential, but Florida isolates were not aggressive pathogens; Indian isolates are being studied. Three general blights have also been studied; Rhizoctonia solani is especially promising despite its wide host range. A severe root and crown rot was discovered which may be caused by a complex of organisms. The five diseases against Hydrilla were the first ever recorded, and their potential is being assessed. A stunt disease of alligatorweed caused by a virus that may belong to the beet-yellows group has been found, but transmission of the causal agent has been difficult. Certain isolates of R. solani will also affect Hydrilla and alligatorweed. No disease for Eurasian water milfoil has yet been isolated. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11206

**TRANSPLANTING SEA GRASS IN MISSISSIPPI SOUND,**
Gulf Coast Research Lab., Ocean Springs, Miss.
For primary bibliographic entry see Field 4A.
W75-11207

**CO2 LASER EFFECTS ON WATER HYACINTH,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. G. Collins.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 111-118, August 1974. 7 fig.

Descriptors: *Aquatic weed control, *Irradiation, *Water hyacinth, Radiation, *Louisiana, Water pollution control.
Identifiers: *Laser, *Carbon dioxide laser, Bayou Gauche(La), Lake Concordia(La).

The objective in Bayou Gauche near New Orleans was to determine how the laser system would function in an outdoor environment. There was damage from the irradiation, but no strong correlation between degree of damage and irradiation level. In Lake Concordia, Louisiana, the objective was to establish the effects of carbon dioxide laser radiation on water hyacinths. Biomass decreased with increased irradiation but little additional damage occurred above a level of 30-40 joules/sq cm. Irradiation may have a prolonged effect since the biomass decreased progressively as a function of time following irradiation. During the first two weeks after irradiation there was no effect on propagation rates, but then there was a decrease in propagation rates with an increase in irradiation and time. There was no evidence of actual plant kill. Coverage of plot areas appeared to decrease with an increase in irradiation and time following irradiation. A cost-effectiveness evaluation of the laser as a control device is needed. Tests should be conducted at the beginning and during the height of the growing season on plants with a wider size range using radiation levels below 30 joules/sq cm. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11209

**OPERATIONS PLATFORMS,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W75-11210

**HERBICIDE CHEMICALS AND THEIR EFFECT ON THE AQUATIC ENVIRONMENT,**
Bureau of Sport Fisheries and Wildlife, Washington, D.C. Div. of Fishery Research.
For primary bibliographic entry see Field 5C.
W75-11211

**REGISTRATION OF AQUATIC HERBICIDES,**
Office of the Chief of Engineers (Army), Washington, D.C.
For primary bibliographic entry see Field 4A.
W75-11212

**DISSIPATION OF RESIDUES OF PHENOXY HERBICIDES APPLIED TO THE WATERSHED,**
Oregon State Univ., Corvallis. School of Forestry.
For primary bibliographic entry see Field 5B.
W75-11213

**DISSIPATION OF PHENOXY HERBICIDES APPLIED TO RIPARIAN VEGETATION,**
Pennsylvania State Univ., University Park. School of Forestry.
For primary bibliographic entry see Field 5B.
W75-11214

**WATER HYACINTH RESEARCH IN PUERTO RICO,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. N. Rushing.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p F3-F24, August 1974. 3 fig, 7 tab.

Descriptors: *Water hyacinth, *Puerto Rice, *Aquatic weed control, *Biocontrol, Growth rates, Snails, Productivity, Biomass, Research and development.
Identifiers: *Brazilian snails, Pomacea australis, Water lettuce.

Water hyacinths are the most troublesome aquatic weed in Puerto Rico. Hyacinth reproduction rate at three different natural sites varied from 0.9 to 8.6 plants per day (48.3 to 587.4 g/day) but the rate of production of daughter plants at all three sites rose to a maximum during a 15 to 40 day period then declined. Sometime within that period, plant material covered the water surface, suggesting that crowding inhibited production of daughter plants. Only water pH varied between plots. Disturbing the plants had some effect on prod tivity, but the extent was not determined. laboratory tests, productivity of plants from three areas varied in tap water, but was the s when fertilized. When hyacinth and Brazi snails (Pomacea australis) were placed in t together, the mass of hyacinths decreased w the mass and number of snails increased. altho their individual weights remained approxima the same. Snails consumed water lettuce fa than hyacinths. When both were present, s consumed the lettuce first, then rapidly consu the hyacinths. The snails eat a variety of g plant material, thus are not specific to hyacin The snails offer a promising potential for w hyacinth control. (See also W75-09 (Buchanan-Davidson--Wisconsin)
W75-11215

**WATER LEVEL MANIPULATION: A T FOR AQUATIC WEED CONTROL,**
Louisiana Wild Life and Fisheries Commis Tioga. Aquatic Weed Research.
For primary bibliographic entry see Field 4A.
W75-11216

**THE AQUATIC WEED PROBLEM. 1. IDEN CATION,**
Victoria State Coll., Carlton (Australia). De Plant Physiology.
For primary bibliographic entry see Field 2I.
W75-11220

**ELECTROLYTIC CONTROL OF ALGAE,**
Calcutta Metropolitan Development Aut (India).
For primary bibliographic entry see Field 5F.
W75-11228

**ALGAE CONTROL IN NORTHWEST R VOIRS,**
Seattle Dept. of Water, Wash.
J. E. Courchene, and J. D. Chapman.
Journal of the American Water Works A tion, Vol 6, No 3, p 127-130, 1975. 3 fig, 3 ref

Descriptors: *Algal control, *Pacific Nor US, *Reservoirs, Application methods, Ra application, Water storage, Potable water cides, Copper sulfate, Chlorine, Chlori Safety factors, Hazards, Fish.
Identifiers: Storage reservoirs, Distribution voirs, Light exclusion.

Several methods of nuisance algae con Pacific Northwest water supply reservo described. Knowledge of the proper algi use, when, how much, and how to apply it, the water to be treated is essential. Copper was found to be the most satisfactory a Factors influencing the amount of copper to be used, susceptibility of organisms, and of its usage are discussed. Chlorine may be conjunction with copper sulfate. The ra methods of application are determined b voir size, available equipment, and cost. Ra solution and uniform application are e Workers should avoid accidental ingestio halation. New reservoirs should be cle vegetation and organic matter to e nutrients for algal growth. Preferably dist reservoirs should be covered to exclude su prevent proliferation of algae. Use of gas c tion is cheaper than copper sulf hypochlorites. With a continuous program pling, identification, and treatment, water should remain clean and palatable. (Bu Davidson-Wisconsin)
W75-11231

ITUTIONAL ARRANGEMENTS FOR UCING CONFLICT OVER WATER QUALI- N INTERNATIONAL RIVERS,
na Univ., Tucson. Inst. of Government rch.
rimary bibliographic entry see Field 6E.
11242

ISLATIONS ON ENVIRONMENTAL LITY, NO. 33.
Publications Research Service, Arlington,

t JPRS 62033, May 20, 1974. 36 p.

iptors: *Foreign countries, *Pollution abate- *Pollutants, *Water pollution control, pollution sources, Environmental effects, e water, Water supply development, n waters, Insecticides, Mexico, DDT, In- l wastes, Air pollution, Water treatment, ling.
iers: *Brazil, *USSR, *West Germany, coalco River(Mexico), Caspian Sea, Vazu- River(USSR), Moscow(USSR), Volga USSR), Ural River(USSR).

ations of newspaper articles and press com- y on environmental pollution and its ef- nd pollution control technology, organiza- nd programs are presented. The 13 articles ews briefs included originate from Brazil, , the USSR, and West Germany during the from October 1973 - May 1974. Topics in- oncern over the harmful effects of DDT in various industries accused of polluting the coalco River, Mexico; praise of the Volk- de Mexico for its efforts in the field of en- ental pollution control; a plan to control the tion of the Caspian Sea; intentions to tap zuza River in order to increase drinking upplies for Moscow; and the elimination by industrial pollution of the Volga and Ural by Soviet technology. Other articles from SR discuss principles of classifying docu- on nature conservation and natural es; the improvement of the Krasnovodsk nery waste treatment facilities and of the ndicators at the Kalinin aeration station; blishment of a commission on the protec- nature; and air and water purification for the steel industry. The West German ummarizes a series of tests of ideas for ng environmental pollution. (Becker- in)
46

NOMIC ANALYSIS OF THE POLLU- ROBLEMS IN THE COLORADO RIVER THE UPPER MAIN STEM SUB-BASIN,
Univ., Boulder.
we, J. F. Kreider, and B. Udis.
from the National Technical Informa- ice, Springfield, Va. 22161, as COM-74- 3.50 in paper copy, $2.25 in microfiche. No EDA-OER-74-308, October 1972. 238 38 tab, 60 ref, 2 append. OER-351-G-71-

rs: *Industrial production, mental effects, *Colorado River Basin, l development, *Input-output analysis, er models, Salinity, Air pollution, River olorado, Colorado River, Rocky Moun- on, Computer programs, Planning, Oil ecreation, Industries, Agriculture, Water Utah, Mining, Livestock, Human popu- mployment, Lumbering, Powerplants, ns, Hydrologic aspects, Groundwater, pply.
: FORTRAN models, Upper-Colorado basins, Eastern Rocky Mountains.

planners to test some environmental im- of alternative growth patterns for the ain Stem sub-basin of the Colorado et of models relating economic activities to air and water demand and quality are developed. This interim report describes a model which has three components: (1) an input-output model of the sub-basin economy, (2) an air diffusion model projecting the airborne distribution of residuals over the region, and (3) a hydrologic-salinity model to trace the monthly surface and groundwater flows and salt flows through the system. Included in the analysis are the agriculture, forestry, mining, energy, manufacturing, tertiary industries, and contract construction aspects of the economy. FORTRAN computer programs for hydro-salinity, residuals generation and pollutant dispersion aid in modeling the relationships between economic activities and environmental implications. The hydro-salinity model has an economic buffer which computes water withdrawal demands, consumptive uses and waste loads, and inputs these data into the combined hydro-salinity model. The Air Pollution Generation and Dispersion Model (APGDM) program computes air-borne residuals generation rates and ground-level pollutant patterns, corresponding to the level of economic activity determined by field surveys or by projections of the input-output model. Use conflicts can be identified through such sets of models. (See also W75-07377) (Becker-Wisconsin)
W75-11247

**ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: MEAT PACKING INDUSTRY,**
Development Planning and Research Associates, Inc., Manhattan, Kans.
R. E. Seltzer, and J. K. Allwood.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-235 303, $6.25 in paper copy, $2.25 in microfiche. Report No EPA-230/2-74-017, May 1974. 164 p, 13 fig, 49 tab. 68-01-1533.

Descriptors: *Food processing industry, *Effluents, *Economic impact, *Water pollution control, *Pollution abatement, Pricing, Waste water treatment, Costs, Foreign trade, Social impact, Investment, Water quality standards, Profit, Employment, Facilities, Industrial wastes.
Identifiers: *Meat packing industry, *Effluent guidelines.

The economic impact of effluent guidelines is assessed for meat packing houses and for slaughterhouses according to size and characteristics. The meat packing and slaughtering industry is characterized by high dollar sales volume and low sales dollar earnings--the after tax earnings in 1972 were 0.8% on sales. Increased costs associated with the implementation of effluent guidelines must be (1) absorbed by meat packers, (2) passed forward to consumers as higher meat prices, (3) passed backwards to suppliers as lower prices for livestock, or (4) some combination of these options; margins in the industry are narrow, so presumably cost increases associated with effluent controls will be passed on primarily as higher retail meat prices. The economic impact analysis, utilizing data developed on industry segments, financial profiles, price effects, and pollution abatement technology and costs, includes effects on pricing, financing, production, employment, community and foreign trade. Plants discharging into municipal sewers will be unaffected by these guidelines. For all other plants, price increases required to meet 1983 standards would be 0.3-0.4% for large, 0.4-0.7% for medium and 1.1-1.25% for small. Plant closures would be greatest among small plants and would affect slaughter-only plants more than meat packers. (Becker-Wisconsin)
W75-11249

**ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES. FERROALLOYS INDUSTRY.**
Kearney (A. T.) and Co., Inc., Chicago, Ill.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-234 045, $5.25 in paper copy, $2.25 in microfiche. Report No EPA-230/2-74-009, June 1974. 131 p, 6 fig, 48 tab. 68-01-1545.

Descriptors: *Air pollution, *Effluents, *Water pollution control, *Economic impact, *Iron alloys, *Pollution abatement, *Industrial wastes, Water quality standards, Steel, Waste water treatment, Investment, Operating costs, Social impact, Pricing, Facilities, Foreign trade, Costs, Cooling towers, Profit.
Identifiers: *Ferroalloys industry, *Effluent guidelines.

Based on the analyzed data and interviews with ferroalloy manufacturers, it is believed that the proposed water pollution control standards (1983 standards--Best Practicable Technology) will have no significant effect on production levels or plant closings in the ferroalloy industry. The analysis of the manufacturing of the four major ferroalloys--ferromanganese, ferrosilicon, ferrochromium, and silico-manganese--includes nine companies, operating 22 plants. To assess the impact of proposed effluent guidelines the following measures were made: (1) the financial impact on the industry as a whole according to several indices, (2) the same analyses on groups of companies, and (3) the impact on prices of ferroalloys based on the maintenance of the industry's historical average level of profitability before taxes. It was found that 14 of the 22 plants already have in operation the equipment necessary to meet 1977 standards and will require only a small investment to meet 1983 standards. For the eight plants needing additional water pollution abatement equipment, a price increase of 1.0-1.3% for 1977 standards and 2.2-2.4% for 1983 standards is necessary to maintain the industry current return on total assets. Other considerations in the future of the ferroalloys industry include air pollution control costs and foreign competition. (Becker-Wisconsin)
W75-11250

**THE WATER INDUSTRY IN TRANSITION,**
National Water Council, London (England).
For primary bibliographic entry see Field 3E.
W75-11252

**THE ECONOMIC IMPACT OF POLLUTION ABATEMENT: THE CASE OF WATER POLLUTION BY DEGRADABLE ORGANIC MATTER,**
Centraal Planbureau, The Hague (Netherlands).
H. den Hartog.
Occasional Papers No 1, 1973. 71 p, 7 tab, 3 append.

Descriptors: *Economic impact, *Pollution abatement, *Organic matter, *Eutrophication, *Input-output analysis, Decomposing organic matter, Water pollution control, Legislation, Europe, Mathematical models, Financing, Gross National Product, Employment, Pollution taxes(Charges), Water quality, Foreign trade.
Identifiers: *Netherlands.

A measurement of the economic consequences of the abatement of water pollution, specifically by degradable organic matter, using direct and indirect policy instruments and a closed input-output model is presented. The input-output model takes into account five sectors of the economy: environmental, which is of primary interest here; agricultural; industrial; construction; and service; but does not include branches of a sector, and therefore can give only global information on an entire sector. The starting point of the model is that environmental policies will create certain activities which are primarily directed at preventing or reducing pollution. The quality standard and the time period for achieving the standard, two important parameters in the model, affect the nature of the expenditure effects and the price effects. In accordance with The Netherlands 1971 Act on Pollution of Surface Waters, the 'polluter pays' principle is assumed. Also discussed are degradable organic pollution and its alleviation by the

methods suggested by results from the model. The limited availability of adequate statistical data on the national level, and the segmentation of the larger topic of water pollution control into the specific area of water pollution by degradable organic matter leave the results of the model study clouded. (Becker-Wisconsin)
W75-11254

PITLESS ADAPTERS: EMPHASIS ON SANITATION,
Environmental Protection Agency, Washington, D.C. Div. of Water Supply.
For primary bibliographic entry see Field 8C.
W75-11258

CONOCO TECHNOLOGY CURBS PRODUCTION POLLUTION,
Continental Oil Co., Houston, Tex.
C. L. Million.
Petroleum Engineer, Vol 45, No 9, p 42-46, August, 1973. 3 fig, 3 tab.

Descriptors: *Pollution abatement, Technology, Design, Methodology, Oil industry, Oil pollution, Industrial production, Water pollution, Air pollution, Pollutant identification, Water pollution control.

Potential pollution causes can be controlled by properly applied technology, though in some cases the technology has not yet become inexpensive enough to be practically applied. Some new technology is needed to meet air emission standards. A technique of evaluating pollution risk of the major subsystems of an overall production system is presented. Specific suggestions and examples of this applied technology are given. (Bradbeer-NWWA)
W75-11267

WORKSHOP ON COMPUTER-AIDED DESIGN AND SIMULATION OF WASTE TREATMENT SYSTEMS.
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5D.
W75-11338

B(RITISH) C(OLUMBIA) PRESSES FOR FOREST INDUSTRIES CLEAN-UP.
Water and Pollution Control, Vol 113, No 6, p 21-22, June, 1975. 3 illus.

Descriptors: *Water pollution control, *Pulp and paper industry, *Canada, Foreign countries, Legislation, Pollution abatement, Costs, Wastes water(Pollution), Water pollution sources, Industrial wastes, Wastes, Water pollution, Wood wastes, Sulfite liquors.
Identifiers: *British Columbia, Forest industries, Sulfite mills, Floating debris.

Millions of dollars are being spent by British Columbia's forest industry to meet the provincial government's policies on water pollution. The pollution regulations are aimed at controlling waste water discharges and containing floating debris (logging residues and logs) in the waterways. Hardest hit has been the province's pulp and paper industry. The sulfite mills, built at the turn of the century when environmental considerations were not an issue, bear the heaviest costs. Pollution control programs for British Columbia's two sulfite mills, Candian Cellulose Co. (Prince Rupert) and Rayonier Canada Ltd. (Port Alice), are estimated at $95 million. The introduction of pollution abatement equipment at these mills will reduce foaming in the receiving waters, reduce fiber losses, and lower the concentration of pollutants in the waste discharges. Current legislation controlling water pollution is already under review by the provincial government. (Witt-IPC)
W75-11350

# 6. WATER RESOURCES PLANNING

## 6A. Techniques Of Planning

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOL. II, ASPECTS OF COMPUTATION,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 2L.
W75-10900

RELATIVE IMPORTANCE OF DECISION VARIABLES IN FLOOD FREQUENCY ANALYSIS,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 4A.
W75-10929

PRESCRIPTIVE ECONOMIC MODELS FOR NONSTRUCTURAL FLOOD CONTROL,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 6F.
W75-11060

A MATHEMATICAL MODEL FOR OPTIMAL WASTE LOAD ALLOCATIONS,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 5G.
W75-11102

COMPUTER SYSTEMS AND WATER RESOURCES,
Polytechnic Institute of New York, Brooklyn; and Illinois Univ., Chicago.
G. Bugliarello, and F. J. Gunther.
Developments in Water Science 1. Elsevier Scientific Publishing Company, Amsterdam, The Netherlands, 1974. 202 p, 38 fig, 16 tab, 210 ref, 9 append. $17.30.

Descriptors: *Water resources, *Technology, *Computers, Methodology, Decision making, Management, Systems analysis, Mathematical models, Groundwater, Surface waters, Water utilization, Optimization, Simulation analysis, Forecasting, Planning, Design, Data processing, Computer programs, *Reviews, *Bibliographies.
Identifiers: Process control, Hardware, Software, *Data acquisition.

The advent of the computer has provided water resources technology with a powerfully efficient tool for the design, planning, management, and operation of water systems. Presented is a state-of-the-art overview of some of the principal considerations in the use of computer systems for water resource practitioners and decision makers. Important trends and issues having impact upon water resources technology are discussed under the general terms of hardware, software, and methodology; focused upon are major areas of computer application in water resources, including data acquisition and management, process control, and system analysis and design. These computer tasks are examined in the contexts of surface water, ground water, and water utilization systems. The methods of dynamic programming, Monte Carlo, Simulation analysis, optimal control theory, relaxation, finite difference, and finite element are considered in the use of computers for surface and ground water systems. The overall issue is whether there should be national possibly international strategies governing the use of computers in water resources. It is recommended that guidelines or agreements be derived in order to establish a comprehensive computer strategy for water resources. Existing and potential principal elements of a structure of the interface between computer systems and water resources technology are considered, i.e., data banks for storage, management and dissemination of information, and a set of problem-oriented computer languages. (Bell-Cornell)
W75-11174

IMPROVED DESIGN OF DISTRIBUTION NETWORKS BY MINIMUM ROUTE,
Nihon Suido Consultants Co., Tokyo (Japan).
For primary bibliographic entry see Field 4A.
W75-11175

TREATMENT PLANT MONITORING PROGRAMS: A PRELIMINARY ANALYSIS,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W75-11176

THE LOUISIANA ENVIRONMENTAL MANAGEMENT SYSTEM AND ITS UTILITY IN WATER RESOURCE PLANNING,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 5G.
W75-11177

STRATEGIC APPROACH TO ESTUARINE ENVIRONMENTAL MANAGEMENT,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-11179

DISTRIBUTION-SYSTEM OPERATION ANALYSIS MODEL,
Omaha Metropolitan Utilities District, Nebr. Services Dept.
For primary bibliographic entry see Field 5D.
W75-11180

SIMULATION OF WATER QUALITY MANAGEMENT POLICIES,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 5G.
W75-11181

COMPUTER ANALYSIS OF WATER DISTRIBUTION SYSTEMS,
Springfield Dept. of Water, Light and Power.
For primary bibliographic entry see Field 4A.
W75-11182

ADVANCED TECHNIQUES IN THE MATHEMATICAL MODELING OF WATER-DISTRIBUTION SYSTEMS,
Beck (R. W.) and Associates, Seattle, Wash.
For primary bibliographic entry see Field 4A.
W75-11183

MACROSCOPIC DISTRIBUTION-SYSTEM MODELING,
General Electric Co., Philadelphia, Pa. Re- and Environmental Systems Div.
For primary bibliographic entry see Field 4A.
W75-11185

AN ECONOMIC ANALYSIS OF THE WATER QUALITY ALLOCATION PROBLEMS IN THE COLORADO RIVER BASIN: THE UPPER MAIN STEM SUB-BASIN,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 5G.
W75-11247

## Evaluation Process

...RIANCE ANALYSIS OF RESERVOIR ...LOPMENT EFFECTS ON PROPERTY ...ASE,
...cky Water Resources Inst., Lexington.
...Vaughan, Jr.
...ble from the National Technical Informa...ervice, Springfield, Va. 22161, as PB-244 ...6.25 in paper copy, $2.25 in microfiche. ...ch Report No 4, 1967. 144 p, 4 fig, 58 tab, 63 ...VRT A-006-KY, 14-01-0001-1085.

...ptors: Reservoirs, *Tax rates, Taxes, Flood ...*Kentucky, *Property values, Reservoir ...ction, Benefits, Costs, Evaluation, ...nics, *Statistical studies.
...ers: *Covariance analysis, Lake Cumber...ent).

...udy tests the hypothesis that a reservoir ...Cumberland) has affected the property tax ...the three counties in which it is located so ...crease at a more rapid rate than that in two ...roups of counties in the same area. One of ...other groups consisted of counties in the ...lain, downstream from the dam, the other ...nsists of counties adjacent to the first two ...The study also seeks to evaluate the ...to the property tax base in the flood-plain ...The study uses the analysis of covari...del to test the hypothesis. Use of the anal... covariance model separates the rate of ...in property tax base in the affected area ...two other areas. The primary source of ...samples of rural and urban real estate ...ions. Secondary data sources include as...alue of real property and estimated market ...real property. The statistical analysis ...the property tax base to be increasing ...idly in the counties containing the reser...n in the other groups of counties. The ...increase in urban property sale values was ...a town in the flood plain. These statistical ...uggest that the initial loss in the tax base ...y land removed from the tax rolls was ...d in time through more rapid expansion in ...ase. (Huffsey-Kentucky)
...51

...IMPACTS OF WATER RESOURCES ...PMENTS AND THEIR IMPLICATION ...BAN AND RURAL DEVELOPMENT: A ...UDIT ANALYSIS OF THE WEBER ...ROJECT IN UTAH,
...te Univ., Logan. Inst. for Social Science ...on Natural Resources.
...drews, G. E. Madsen, and G. J. Legaz.
...from the National Technical Informa...ice, Springfield, Va. 22161, as PB-244 ...0 in paper copy $2.25 in microfiche. ...Monograph No 4, December 1974 178 p, ...fig, 59 ref, append. OWRT C-2192(No

...rs: *Social impact, Social change, Irriga...creation, Flood control, Reservoirs, ...Post-impoundment, Attitudes, *Social ...ocial adjustment, *Urban sociology, ...Municipal water, Industrial water, Water ...Water utilization, *Weber Basin Pro..., *Post audit analysis.

...dit methodology, utilizing both primary ...dary data sources, was applied to the ...sin Project in Utah to identify original ...e project, changes in goals and selected ...acts of the project. The major com...ere: municipal and industrial, irrigation, ...flood control, and power. The impor...es occurred between the authorizing act ...ater planning documents and post-con...se which were related to changing social ...and priorities. Present social impacts ...dentified. Important impacts of Weber ...: feelings of security associated with the assured, dependable supply, ability to provide for increased population, provide for late crops and gardens and recreational use. Among the negative impacts were hardness of the water, chlorine taste, and operation and maintenance costs. There was evidence that recreational impacts of the project were underestimated. Up to 1973, flood control benefits were estimated at $1,230,000 using a Corps of Engineers method. There was also a low degree of anxiety concerning future flooding by the public. However, certain irrigation officials identified flood control problems associated with the project. Power usage by the project generally has been lower than predicted but sales of excess power have been greater than predicted.
W75-10854

**HUMAN OBSTACLES TO THE CONTROL OF THE HYDROLOGICAL CYCLE FOR THE BENEFIT OF MAN,**
Technion - Israel Inst. of Tech. Haifa (Israel). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W75-10866

**AN ANALYSIS OF THE MOTOR-ROW CONVERSION ISSUE OF COLORADO RIVER FLOAT TRIPS,**
Arizona Univ., Tucson. Dept. of Watershed Management.
D. K. Larson.
Arizona University, Tucson, Department of Watershed Management, MS Thesis, 1974. 171 p, 19 fig, 36 tab, 4 append, 33 ref.

Descriptors: *Environmental effects, *Colorado River, *Boating, *Balance of nature, *Watershed management, Recreation, Water utilization, Rivers, River regulation, National parks, National recreation areas, Water pollution control
Identifiers: Motor-row issue.

River float trips on the Colorado River through Marble and Grand Canyons dramatically increased within the last ten years, so much so that the National Park Service has decided to reduce the number of river trip participants and require all motorized trips to convert to oar-powered trips by 1977 to reduce the impact on the ecological system. These policies have become major management concerns identified as the motor-row issue which consists of four divisions; limitation of use, perception of wilderness, user agreement with conversion, and user preference for type of trip. Data were collected with self-administrated questionnaires distributed at one pre-trip and four post-trip sites. Results indicated that there was not a definitive positon of the user population regarding conversion, users are divided in their agreement with conversion policies and preference for type of trip. These results will yield definitive conclusions regarding conversion when the National Park Service defines the desired populations of participations through management goals and objectives. (McLachlan-Arizona)
W75-10867

**THE AWARENESS OF THE RELEVANT WATER RESOURCES LITERATURE BY THE PERSONNEL OF THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES,**
Wisconsin Univ., Madison. Library School.
For primary bibliographic entry see Field 10C.
W75-10899

**A CASE STUDY OF SOME ECONOMIC ASPECTS OF THE NATIONAL FLOOD INSURANCE PROGRAM,**
Mississippi State Univ., Mississippi State. Div. of Business Research.
For primary bibliographic entry see Field 6F.
W75-10906

**FLOODPLAIN LAND-USE MANAGEMENT: AN APPLICATION OF OPERATIONS RESEARCH METHODOLOGY,**
Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 6F.
W75-11037

**THE ECONOMICS OF FLOOD INSURANCE: AN ANALYSIS OF THE NATIONAL FLOOD INSURANCE PROGRAM,**
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 6F.
W75-11038

**WATER APPLICATION PRACTICES AND LANDSCAPE ATTRIBUTES ASSOCIATED WITH RESIDENTIAL WATER CONSUMPTION,**
New Mexico State Univ., University Park. Dept. of Horticulture.
For primary bibliographic entry see Field 3D.
W75-11059

**A MATHEMATICAL MODEL FOR OPTIMAL WASTE LOAD ALLOCATIONS,**
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 5G.
W75-11102

**THE LOUISIANA ENVIRONMENTAL MANAGEMENT SYSTEM AND ITS UTILITY IN WATER RESOURCE PLANNING,**
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 5G.
W75-11177

**SIMULATION OF WATER QUALITY MANAGEMENT POLICIES,**
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 5G.
W75-11181

**AN ECONOMIC ANALYSIS OF THE POLLUTION PROBLEMS IN THE COLORADO RIVER BASIN: THE UPPER MAIN STEM SUB-BASIN,**
Colorado Univ., Boulder.
For primary bibliographic entry see Field 5G.
W75-11247

**ECONOMICS OF GREAT LAKES SHIPPING IN AN EXTENDED SEASON,**
Michigan Univ., Ann Arbor. Dept. of Naval Architecture and Marine Engineering.
For primary bibliographic entry see Field 6C.
W75-11248

**ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: MEAT PACKING INDUSTRY,**
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W75-11249

**ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES. FERROALLOYS INDUSTRY.**
Kearney (A. T.) and Co., Inc., Chicago, Ill.
For primary bibliographic entry see Field 5G.
W75-11250

**NON-RENEWABLE, NON-ENERGY RESOURCES,**
Leicester Univ (England). Public Sector Economics Research Centre.
D. Pearce.
Environmental Economics Study Group Series 13, (1975). 5 p, 62 ref.

Descriptors: *Bibliographies, *Withdrawal, *Resource allocation, *Natural resources, *Mining, Economic impact, Economic life, Taxes, Metals, Forests, Dependable supply, Conservation, Recycling.
Identifiers: *Minerals, Resource depletion, Raw materials.

This bibliography, prepared by the Environmental Economics Study Group of Leicester University, England, contains 62 references. Included among the reference titles are the topics of optimal growth under depletion conditions, the economics of scarcity and growth, resource conservation, mineral reserves and resources, recent theory of exhaustible resources, extractive resources and taxation, intergenerational equity and exhaustible resources, and the life cycle of non-ferrous minerals. The period of 1931-1975 is included within the references. (Becker-Wisconsin)
W75-11253

**THE ECONOMIC IMPACT OF POLLUTION ABATEMENT: THE CASE OF WATER POLLUTION BY DEGRADABLE ORGANIC MATTER,**
Centraal Planbureau, The Hague (Netherlands).
For primary bibliographic entry see Field 5G.
W75-11254

## 6C. Cost Allocation, Cost Sharing, Pricing/Repayment

**COVARIANCE ANALYSIS OF RESERVOIR DEVELOPMENT EFFECTS ON PROPERTY TAX BASE,**
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 6B.
W75-10851

**SUCCESSFUL IRRIGATION: PREPARATION, REALIZATION, EXPLORITATION, (SAVOIR IRRIGUER: PREPARATION, REALISATION, EXPLOITATION),**
California Univ., Davis. Dept. of Irrigation.
For primary bibliographic entry see Field 3F.
W75-10874

**HIGH COSTS MODIFY SEWAGE PLANT EXPANSION.**
For primary bibliographic entry see Field 5D.
W75-10993

**COST EVALUATION OF WATERCOURSE MANAGEMENT IN ESSEX,**
Cambridge Univ. (England). Dept. of Applied Biology.
For primary bibliographic entry see Field 5G.
W75-11008

**HOW TO ESTIMATE AND ESCALATE COSTS OF WASTEWATER EQUIPMENT,**
ICARUS Corp., Silver Spring, Md.
For primary bibliographic entry see Field 5D.
W75-11014

**COST SHARING TO HELP CLEAN OUR WATERWAYS.**
For primary bibliographic entry see Field 5G.
W75-11023

**THE ECONOMY OF VARIOUS METHODS FOR DEWATERING SLUDGE FROM BIOLOGICAL PURIFICATION (UEBER DIE WIRTSCHAFTLICHKEIT VERSCHIEDENER VERFAHREN ZUR ENTWAESSERUNG VON BIOLOGISCHEM KLAERSCHLAMM),**
Uhde (Friedrich) G.m.b.H., Dortmund (West Germany)
For primary bibliographic entry see Field 5D.
W75-11127

**AN IMPLICIT APPROACH TO PRICING AGRICULTURAL WATER TRANSFERS TO URBAN USES,**
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W75-11178

**ECONOMICS OF GREAT LAKES SHIPPING IN AN EXTENDED SEASON,**
Michigan Univ., Ann Arbor. Dept. of Naval Architecture and Marine Engineering.
H. Nowacki, H. Benford, and A. Atkins.
Available from the National Technical Information Service, Springfield, Va. 22161, as COM-73-10930, $4.75 in paper copy, $2.25 in microfiche. Report No 139, January 1973. (Marine Administration RD-900-73039) 93 p, 14 fig, 10 tab, 14 ref, append. MA 1-35487.

Descriptors: *Winter, *Great Lakes, *Ships, *Transportation, *Cost-benefit analysis, Computer programs, Economic impact, Iced lakes, Inland waterways, Estimating, Design, Optimization, Operations, Benefits.
Identifiers: *Shipowners, *Bulk carriers, Ship designs, Winter navigation, Shipping fleets, Investory costs.

The capabilities of a computer program developed to project economic benefits to shipowners from extensions of the operating season are presented. The program inputs data concerning trade routes between most ports on the Great Lakes, ship types, ice types, winter severity, and ship characteristics, with the restrictions that (1) the cargo is iron ore pellets, (2) the ships are U.S. built and operated, with only a moderate degree of automation, and (3) the hulls are largely of mild steel. Outputted by the analysis are: cost of service per ton of cargo, required freight rate, net present value, yield, and capital recovery factor. The computer program is being developed to answer the questions of how best to modify and enhance ships for winter navigation, and how late in the season to continue operations. A description of the computer program and summarized results of several parametric studies using the program are included. Optimization on an individual fleet basis, with the assignment of a different length of operating season to each ship on the basis of efficiency, is considered. Also important in estimating total economic benefits is reduced inventory costs. Conclusions as a result of program output are made concerning extended season shipping on the Great Lakes. (Becker-Wisconsin)
W75-11248

**ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: MEAT PACKING INDUSTRY,**
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W75-11249

**ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES. FERROALLOYS INDUSTRY.**
Kearney (A. T.) and Co., Inc., Chicago, Ill.
For primary bibliographic entry see Field 5G.
W75-11250

**THE ECONOMIC IMPACT OF POLLUTION ABATEMENT: THE CASE OF WATER POLLUTION BY DEGRADABLE ORGANIC MATTER,**
Centraal Planbureau, The Hague (Netherlands).
For primary bibliographic entry see Field 5G.
W75-11254

**WILL SUBMERSIBLES MAKE JET PUMPS OBSOLETE.**
For primary bibliographic entry see Field 8C.
W75-11263

**UNCONVENTIONAL AIR DRILLING REDUC WELL COSTS.**
For primary bibliographic entry see Field 8C
W75-11270

**DRILLING RATE AFFECTS COSTS MO THAN BIT LIFE,**
Sandia Labs., Albuquerque, N. Mex.
For primary bibliographic entry see Field 8C.
W75-11279

**HOW DOWNHOLE TEMPERATURES, PR SURES AFFECT DRILLING; PART NEEDLESS SPENDING OF DRILLING AND PLORATION MONEY CAN BE PREDICT AND PREVENTED,**
Continental Oil Co., Houston, Tex. Produc Engineering Services.
For primary bibliographic entry see Field 8G.
W75-11298

**SOME OBSERVATIONS ON RAINFALL WESTERN NEW SOUTH WALES,**
New South Wales Univ., Kensington (Austr School of Wool and Pastoral Sciences.
For primary bibliographic entry see Field 2B.
W75-11304

**UPGRADING MEAT PACKING FACILITIE REDUCE POLLUTION. (PART 3). CHOO THE OPTIMUM FINANCIAL STRATEGY,**
Commins (J. A.) and Associates, Inc., Washington, Pa.
For primary bibliographic entry see Field 5D.
W75-11322

**POLLUTION ABATEMENT IN A BREW FACILITY.**
Environmental Protection Agency, Washi D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 5D.
W75-11323

**UPGRADING POULTRY-PROCESSING FA TIES TO REDUCE POLLUTION. (PAR PRETREATMENT OF POULTRY-PROCES WASTES,**
Environmental Protection Agency, Washi D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 5D.
W75-11329

## 6D. Water Demand

**SOCIAL IMPACTS OF WATER RESOU DEVELOPMENTS AND THEIR IMPLIC FOR URBAN AND RURAL DEVELOPME POST AUDIT ANALYSIS OF THE V BASIN PROJECT IN UTAH,**
Utah State Univ., Logan. Inst. for Social Research on Natural Resources.
For primary bibliographic entry see Field 6
W75-10854

**THE IMPACT OF THE SAFE DRI WATER ACT ON UTILITIES,**
Boston Metropolitan District Committee, M
For primary bibliographic entry see Field 5
W75-10859

**WATER CONSUMPTION AND WATE NOVER OF SHEEP GRAZING SE PASTURE COMMUNITIES IN NEW WALES,**
Commonwealth Scientific and Industrial R Organization, Deniliquin (Australia). Lab.
For primary bibliographic entry see Field
W75-10888

AMFLOW IN THE NEW YORK PART OF SUSQUEHANNA RIVER BASIN,
gical Survey, Albany, N.Y.
imary bibliographic entry see Field 2E.
0931

OVED DESIGN AND OPERATING ERIA FOR RURAL WATER DISTRICTS,
oma State Univ., Stillwater. Dept. of ltural Engineering.
arton.
ble from the National Technical Informa- ervice, Springfield, Va. 22161, as PB-244 4.75 in paper copy, $2.25 in microfiche. etion Report, June 1975. 67 p, 27 fig, 4 tab, 3 append. OWRT B-028-OKLA(2).

otors: *Design criteria, Operations, *Water s, *Water demand, *Oklahoma, Optimum ment plans, Data collections, Water uses, utilization, Water supply, Pumping, Dairy y, Industrial water.
ers: *Rural water district, Payne Coun- ).

re obtained on Rural Water District No. 3, County, Oklahoma. There was a signifi- ifferent pattern of usage for three classes mers. The average monthly usage per tap rom 8768 to 19183 gallons for dairies, 4357 gallons for Class A taps, and 2537 to 4160 for Class B taps. The average monthly r person ranged from 1424 to 2821 gallons s A taps and from 989 to 1664 gallons for taps. Optimal design values for daily de- re in the range of: 350 gallons per tap; 200 per Class B tap; 350 gallons per Class A gallons per Dairy tap; 12 gallons per dairy ed; 100 gallons per person; 90 gallons per Class B tap; and 150 gallons per person, tap. Optimal design values for peak de- nged from: 1.0 to 1.5 gallons per minute 1.3 to 1.8 gallons per minute per Class A o 0.9 gallons per minute per Class B tap; gallons per minute per person; 0.5 to 0.7 er minute per person, Class A tap; and 0.3 lons per minute per person, Class B tap. al period off-peak pumping time is from 7 a.m., a period of 9 hours.
6

APPLICATION PRACTICES AND APE ATTRIBUTES ASSOCIATED SIDENTIAL WATER CONSUMPTION,
ico State Univ., University Park. Dept. lture.
y bibliographic entry see Field 3D.
9

DATION AND REHABILITATION OF N POUDRE VALLEY,
State Univ., Fort Collins. Dept. of al Engineering.
y bibliographic entry see Field 4A.

## ter Law and Institutions

PONSIBILITY OF U.S. WATER SUP-
shington, D.C.
y bibliographic entry see Field 5G.

HE REAL COST OF CLEAN WATER,
ntal Protection Agency, Washington,
bibliographic entry see Field 5G.

THE IMPACT OF THE SAFE DRINKING WATER ACT ON UTILITIES,
Boston Metropolitan District Committee, Mass.
For primary bibliographic entry see Field 5G.
W75-10859

INTERNATIONAL DEVELOPMENT STRATEGIES FOR THE SAHEL.
For primary bibliographic entry see Field 4A.
W75-10861

HUMAN OBSTACLES TO THE CONTROL OF THE HYDROLOGICAL CYCLE FOR THE BENEFIT OF MAN,
Technion - Israel Inst. of Tech. Haifa (Israel). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W75-10866

IMPACT OF ENERGY DEVELOPMENT ON THE LAW OF THE COLORADO RIVER,
California Univ., Los Angeles. School of Law.
For primary bibliographic entry see Field 4C.
W75-10869

INTERBASIN WATER TRANSFERS: A CASE STUDY IN MEXICO,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 4A.
W75-10879

THE LAW OF WATER ALLOCATION IN KENTUCKY,
Kentucky Water Resources Inst., Lexington.
R. C. Ausness, and B. H. Flynn.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-244 534, $4.25 in paper copy, $2.25 in microfiche. Research Report No. 86, July 1975. 81 p. OWRT A-060-KY(1). 14-31-0001-5017.

Descriptors: Legal aspects, Legislation, Water law, Water policy, Water Resources Development, *Kentucky, *Water allocation(Policy), *Water distribution(Applied), Consumptive use, *Administration, Navigation, Disposal.

This study discusses navigability concepts, consumptive rights to surface and ground waters, the disposal of diffused surface waters and the administration of Kentucky's statutory water allocation system. Federal regulatory powers are based on navigability as is state ownership of submerged lands. Kentucky uses the ebb-and-flow test of navigability to determine title to submerged lands but uses a navigability-in-fact test to determine the scope of state regulatory authority. Consumptive uses of water in Kentucky are governed by the riparian land-owner to use as much water as he needs as long as his use does not interfere with the legitimate uses of other riparians. Underground streams are subject to the same consumptive use rules, but an overlying landowner can use as much percolating ground water as he needs even though other users are harmed. Kentucky follows the civil law rule with respect to the disposal of diffused surface water, but recent cases seem to have applied the more modern reasonable use rule. In addition to these common-law rules, the Department for Natural Resources and Environmental Protection, under the provisions of KRS Chapter 151, administers a permit system under which both riparian and nonriparian users are allowed to make beneficial uses of water. (Huffsey-Kentucky)
W75-10898

INFORMATION AS A REGULATORY TOOL IN WATER QUALITY CONTROL,
Wisconsin Univ., Madison. Land Tenure Center; and Wisconsin Univ., Madison. Dept. of Agricultural Journalism.
For primary bibliographic entry see Field 5G.
W75-10903

WATER POLLUTION PROBLEMS IN SALISBURY, RHODESIA: PRESENT AND FUTURE,
For primary bibliographic entry see Field 5G.
W75-10983

WATER CONSERVATION IN SWEDEN: III. CURRENT TRENDS,
Ministry of Agriculture, Stockholm (Sweden).
For primary bibliographic entry see Field 5G.
W75-10987

ROLE AND RESPONSIBILITIES OF THE ENVIRONMENTAL PROTECTION SERVICE (CANADA),
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 6G.
W75-11000

WATER RESOURCES,
British Columbia Water Resources Service, Vancouver.
For primary bibliographic entry see Field 5G.
W75-11003

MILESTONE WATER LEGISLATION ACCOMPANIED BY MILLSTONE OF BUREAUCRATIC RED TAPE,
Hampton Roads Sanitary District, Norfolk, Va.
For primary bibliographic entry see Field 5G.
W75-11007

INDUCED INFILTRATION SUPPLY SYSTEM AMONG BIGGEST.
For primary bibliographic entry see Field 5F.
W75-11010

LEGAL AND INSTITUTIONAL PROBLEMS IN THE MANAGEMENT OF SALINITY,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 5G.
W75-11047

INSTITUTIONAL ARRANGEMENTS FOR REDUCING CONFLICT OVER WATER QUALITY IN INTERNATIONAL RIVERS,
Arizona Univ., Tucson. Inst. of Government Research.
J. R. Wagner.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 821, $3.75 in paper copy, $2.25 in microfiche. Completion Report, August 1975. 48 p, 36 ref, 3 append. OWRT A-057-ARIZ(1), 14-31-0001-4003.

Descriptors: *International Joint Commission, *International Bound and Water Comm, *Water policy, *Political aspects, Administrative agencies, Organizations, Legislation, *Institutional constraints, Quality control, International water, *Water quality, United States, Canada, Mexico, Colorado River, Columbia River, Salinity.
Identifiers: International rivers, Downstream benefits.

Institutional arrangements coping with the problem of water quality in international rivers were examined. Findings are restricted to the evidence available and are tentative only. Both the International Boundary and Water Commission (United States-Mexico) and the International Joint Commission (United States-Canada) are adequately meeting technical problems of quality control in their respective jurisdictions. Political aspects of water policy, however, caused delays in solving the salinity problem on the Colorado River and the downstream benefits issue on the Columbia River. These problems were beyond the jurisdiction of the IBWC and the IJC and necessitated action at higher, policy-making, levels of government.
W75-11242

TRANSLATIONS ON ENVIRONMENTAL QUALITY, NO. 33.
Joint Publications Research Service, Arlington, Va.
For primary bibliographic entry see Field 5G.
W75-11246

THE WATER INDUSTRY IN TRANSITION,
National Water Council, London (England).
For primary bibliographic entry see Field 3E.
W75-11252

B(RITISH) C(OLUMBIA) PRESSES FOR FOREST INDUSTRIES CLEAN-UP.
For primary bibliographic entry see Field 5G.
W75-11350

## 6F. Nonstructural Alternatives

A CASE STUDY OF SOME ECONOMIC ASPECTS OF THE NATIONAL FLOOD INSURANCE PROGRAM,
Mississippi State Univ., Mississippi State. Div. of Business Research.
L. R. Cheatham.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 506, $4.25 in paper copy, $2.25 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Completion Report, July 1975. 56 p, 6 fig, 16 tab, 14 ref. OWRT A-087-MISS(1).

Descriptors: *Flood Plain Insurance, Economics, *Mississippi, *Investment, *Property values, Government supports, Government finance.
Identifiers: Columbus(Miss).

The objective was to determine the impact of federally subsidized flood insurance on urban flood plain development in Columbus, Mississippi. The scope of study was limited to determining the effect on business investment and property values. Evidence indicates that the availability of federally subsidized flood insurance has had little effect on the initial location decisions of either business or non-business properties in Columbus, Mississippi. However, mass flood plain encroachment has occurred since 1968, and there is some evidence that the availability of low-cost insurance may be responsible for businesses and residents remaining on the lands. Data indicate that higher premium rates, which would exist if actuarial rates were charged, would result in a major reduction in the number of policies in force. It appears in the Columbus case that federal disaster aid is more responsible for the current level of commercial investment than subsidized flood insurance.
W75-10906

FLOODPLAIN LAND-USE MANAGEMENT: AN APPLICATION OF OPERATIONS RESEARCH METHODOLOGY,
Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.
J. F. Smiarowski, C. Willis, and J. H. Foster.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 729, $4.25 in paper copy, $2.25 in microfiche. Massachusetts Water Resources Research Center, Amherst, Publication No 45, January 1975. Special Report, 44 p, 18 tab, 44 ref, 2 append. OWRT B-028-MASS(5) and B-043-MASS(3). 14-31-0001-5081.

Descriptors: Flood plains, Management, *Decision making, *Flood plain zoning, *Connecticut, *Mathematical models, *Land use, Model studies, Benefits, Costs, Economics, *Operations research.
Identifiers: *Economic analysis, Farmington(Conn).

Three models are presented from an investigation of the economic potential of land-use management or zoning for a floodplain in Farmington, Connecticut. The analysis demonstrates the potential usefulness of operations research methods to flood zone decision-makers, and it provides a set of (conditional) normative decisions which may be of value to the community under investiation. A review was conducted of the literature concerning applications of quantitative methods of problems of floodplain land-use. The mathematical programming methodology is developed, as is the treatment of the empirical results of the application. A general discussion on the distribution (incidence) of benefits and costs of floodplain land-use management among the various sectors of the society is also presented. The use of mathematical programming can aid land-use decisions by identifying economically optimum land-use patterns. The framework of the three models is flexible enough to include aspects of flood proofing and landfill. The material developed will be used along with that developed in similar studies of other flood water management alternatives to determine an optimum flood management system for the Connecticut River basin.
W75-11037

THE ECONOMICS OF FLOOD INSURANCE: AN ANALYSIS OF THE NATIONAL FLOOD INSURANCE PROGRAM,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
G. A. Vaut.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 715, $4.75 in paper copy, $2.25 in microfiche. Massachusetts Water Resources Research Center, Amherst, Publication No 46, July 1974. 72 p, 11 tab, 136 ref, Special Report. OWRT B-028-MASS(4) and OWRT B-043-MASS(2).

Descriptors: *Flood plain insurance, Economics, *Risks, *Welfare(Economics), Water policy, Management, Evaluation.
Identifiers: *National Flood Insurance Program.

The purpose was to provide information relevant to the role of flood insurance as a floodplain management/flood loss reduction measure. The first section of the report summarizes the history of the formulation of the current national flood insurance program and its major provisions. The second section assesses the implications for flood insurance of two areas of economic theory: individual behavior under uncertainty and welfare economics. The principle of the existence of a certainty equivalent and risk premium has been established in theory. The existence of a residual degree of risk aversion in some individuals has already been demonstrated to support an economically efficient flood insurance arrangement. Some important policy implications are implied by the lexicographic model developed for this study. A change in status for flood insurance, from an endogenous alternative to an exogenous institutional given, must be recognized by flood plain policy makers.
W75-11038

PRESCRIPTIVE ECONOMIC MODELS FOR NONSTRUCTURAL FLOOD CONTROL,
Cornell Univ., Ithaca, N.Y.
W. F. Bialas.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 720, $7.00 in paper copy, $2.25 in microfiche. Technical Report No 97, Cornell University Water Resources and Marine Sciences Center, Ithaca, New York June 1975. 184 p, 21 fig, 2 tab, 68 ref, 4 append. OWRT C-5240(No 4230)(2).

Descriptors: *Flood plains, *Flood plain zoning, *Land use, *Non-structural alternatives, *Linear programming, Alternative planning, Optimization, Economic efficiency, Probability, Equations, Mathematical models, System analysis.

A linear programming model is developed to sel optimal floodplain management plans which reduce damage due to inundation and be econo cally and environmentally sound. The techniqu intended for relatively inexpensive screening floodplain management alternatives before ca ing out a plan-by-plan search with more deta and expensive methods of analysis. Viewing floodplain as a land use allocation problem in th dimensions, this formulation permits a direct sessment of expected flood damage on the basi location and elevation. The model discretizes ti flood losses, topography, and building heig Decision variables include changes in the land allocation in the floodplain; shifts in the acti schema of developed basins can be handled. A the effects of the floodwater displaced by var activities can be explicitly measured and inclu as a component of flood risk. Techniques to count for environmental impact when floo does not occur are also incorportated. The amb concentrations of residuals at each site are ca lated as a function of the degree and type of use activity of all sites. The model defines amount of generated residual to be treated at location to maintain the desired environm quality standards. The standards are themse functions of the land use allocation plan, with plan evaluated on the basis of capital required for land use reallocation, change in rent, and change in residuals treatment cos any. (Bell-Cornell)
W75-11060

## 6G. Ecologic Impact Of Water Development

MAN'S INFLUENCE ON THE HYDROL CAL CYCLE: A DRAFT REPORT OF UNESCO/FAO WORKING GROUP ON TH TERNATIONAL HYDROLOGICAL DECAD
Food and Agriculture Organization of the U Nations, Rome (Italy). Land and Water Dev ment Div.
For primary bibliographic entry see Field 2A
W75-10863

BALANCING THE EFFECTS OF MAN'S TIONS ON THE HYDROLOGICAL CYCLE
Commonwealth Scientific and Industrial Re Organization, Canberra (Australia). Div. of Industry.
For primary bibliographic entry see Field 2A
W75-10865

AN ANALYSIS OF THE MOTOR-ROW VERSION ISSUE OF COLORADO FLOAT TRIPS,
Arizona Univ., Tucson. Dept. of Wat Management.
For primary bibliographic entry see Field 6E
W75-10867

ROLE AND RESPONSIBILITIES OF TH VIRONMENTAL PROTECTION SE (CANADA),
Environmental Protection Service, (Ontario).
L. Edgeworth.
In: Proceedings of the Annual Confere British Columbia Water and Waste Asso April 9-11, 1974, Vancouver, British Colu 59-69.

Descriptors: *Water pollution *Legislation, *Canada, Environmental Administration.

The history and duties of the Environmer tection Service of Canada are discussed. is concerned not only with activities directly tied to environmental protection with the management and improver

nada's renewable resources such as fisheries, estry and wildlife. The Fisheries Act, the nada Water Act, and the Fisheries Act amend- nts are some of the legislation that has defined roles of the federal and local governments and vides for an optimization of benefits through onal resource management. Water pollution trol is based on the use of the best practicable nology, meaning that in most cases it does the in terms of protecting the environment, and meaning that it does not require the impossi- or the economically destructive. The goal of a nced program is being achieved through a em of cooperation. The EPS has set up a spe- Environmental Emergency Branch to improve national ability to deal with environmental ac- nts such as oil spills. This unit is developing ingency plans for all conceivable problems is developing a central operations center. er legislation is directed toward the control of ial types of products which may cause pollu- problems such as gasoline additives and phate containing detergents. Canada is learn- hat energy and the environment are not two rent disciplines but that the preservation of a environment is the result of the knowledga- pplication of energy through the right sources. FIRL)
11000

SPILL TECHNOLOGY,
onmental Protection Service, Ottawa rio). Environmental Emergency Branch.
rimary bibliographic entry see Field 5G.
11001

HWATER ECOSYSTEM RESEARCH IN ER QUALITY MANAGEMENT,
elaer Polytechnic Inst., Troy, N.Y. Fresh Inst.
ris, N. L. Clesceri, and S. I. Auerbach.
onmental Science and Technology, Vol 8, p 706-710, August, 1974. 3 fig, 2 tab, 5 ref.

ptors: *Water quality, Management, es, Freshwater, *Ecosystems, Lakes, oirs, Forests, Deserts, Environmental con- ish, Aquatic life, *United States.

of U.S. scientists from many disciplines ed to study total ecosystems in the U.S. ternational Biological Program was created define the biological basis of productivity man welfare, investigation organic produc- land, in fresh waters, and in seas, poten- and uses of new natural resources, and adaptability to a changing environment. A n goal was the achievement of information uld lead to rational resource management h water ecosystems. The ability of proper ent was founded on a simplified method, predictability of changes in the conditions amics of ecosystems was demonstrated by em modeling. More than 80 lakes were stu- e U.S. was integrated into biomes of living ms, with each community exhibiting its entific similarity. The Tundra Biome con- d on natural and exogenously disturbed ems in the wet Arctic tundra. The Desert nvestigated abiotic and biotic systems and estion-oriented submodels describing a se- relationships allied to organism function the ecosystem. The Coniferous Forest assessed forest and urban land-use in- , energy sources for aquatic food chains, structure and metabolism of communities r nutrient budgets. The Eastern Deciduous Biome concentrated on the IBP goal of osystem understanding and the prediction lts from changes induced by man. itz-FIRL)
12

**GUIDELINES FOR REVEGETATION AND STABILIZATION OF SURFACE MINED AREAS IN THE WESTERN STATES,**
Colorado State Univ., Fort Collins. Dept. of Range Science.
For primary bibliographic entry see Field 4D.
W75-11100

**STRATEGIC APPROACH TO ESTUARINE ENVIRONMENTAL MANAGEMENT,**
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-11179

**MAN'S IMPACT ON A NEWLY FORMED RESERVOIR,**
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-11233

**NON-RENEWABLE, NON-ENERGY RESOURCES,**
Leicester Univ (England). Public Sector Economics Research Centre.
For primary bibliographic entry see Field 6B.
W75-11253

**GUIDELINES FOR THE IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS IN THE CONSTRUCTION AND OPERATION OF A RESERVOIR,**
Illinois Univ., Urbana. Dept. of Forestry.
For primary bibliographic entry see Field 5C.
W75-11316

# 7. RESOURCES DATA

## 7A. Network Design

**INVESTIGATION OF THE OPERATING CHARACTERISTICS OF THE IOWA SEDIMENT CONCENTRATION MEASURING SYSTEM,**
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2J.
W75-11163

**THE MEASUREMENT AND ESTIMATION OF LAKE EVAPORATION FROM FOUR AUSTRALIAN WATER STORAGES,**
Bureau of Meteorology, Melbourne (Australia).
For primary bibliographic entry see Field 2D.
W75-11300

**DIFFICULTIES IN GAUGING SMALL CATCHMENTS - A CASE STUDY,**
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-11306

**AUSTRALIAN ARID ZONE STREANGAUGING,**
New South Wales Dept. of Public Works, Sydney (Australia). Water Supply and Sewerage Branch.
For primary bibliographic entry see Field 2E.
W75-11307

**ASPECTS OF RAINFALL MEASUREMENT IN A NEW ENGLAND LOCATION,**
University of New England, Armidale (Australia). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W75-11309

## 7B. Data Acquisition

**MEASUREMENT OF COBBLE ABRASION IN NATURAL STREAMS,**
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2J.
W75-10881

**A SIMPLE AND INEXPENSIVE TECHNIQUE FOR DETERMINING COLORED LIGHT INTENSITY UNDERWATER,**
Genesee Community Coll., Batavia, N.Y. Mathematics and Science Div.
B. A. Marcus.
Water Resources Research, Vol 11, No 3, p 491-492, June 1975. 4 fig, 5 ref.

Descriptors: *Ligh intensity, *Optical properties, Light, *Instrumentation, *Light penetration, *New York, Color, Opacity, Photometry, Penetration, Turbidity, Secchi disks, Filters, Analytical techniques, Evaluation, Water, Underwater.

A technique for underwater determination of colored light intensity, relative to the surface, was presented. The technique involves using gelatin filters which are less expensive and more easily cut to fit meters than glass. (Henley-ISWS)
W75-10919

**DETERMINATION OF REGIONAL HYDRAULIC CONDUCTIVITY THROUGH USE OF C-14 DATING OF GROUNDWATER,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-10930

**EVAPOTRANSPIRATION OF FOUR FOREST TYPES MEASURED WITH THE EDDY CORRELATION TECHNIQUE,**
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 2D.
W75-11044

**DEVICE FOR AUTOMATIC DETERMINATION OF SUSPENDED SOLIDS CONTENT IN WATER,**
Agency of Industrial Science and Technology, Tokyo (Japan). (assignee)
For primary bibliographic entry see Field 5A.
W75-11063

**MEASURES OF BIODEGRADABILITY AND REFRACTORY ORGANICS IN WASTEWATERS: (ANALYSIS, INTERPRETATION, AND APPLICATION OF MEASUREMENT TECHNIQUES),**
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5D.
W75-11103

**NOTE ON THE MEASUREMENT OF THE RESPONSE OF OCEANOGRAPHIC TEMPERATURE SENSORS,**
National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
W. S. Hurst.
Journal of Geophysical Research, Vol 80, No 18, p 2663-2666, June 20, 1975. 4 fig, 2 tab, 3 ref.

Descriptors: *Temperature, *Thermometers, *Water temperature, *Instrumentation, *Thermal properties, Physical properties, Measurement, Calibrations, Properties, Water properties, Estimating, Evaluation, Testing, Oceanography, Testing procedures, Mathematical studies, Oceans, Numerical analysis, Salinity, Analytical techniques.

Identifiers: *Oceanographic temperature sensors, *Response time, Platinum resistance sensors, Rotating water container method, Photodiode detector system, Wheatstone bridge.

The response time of three different types of oceanographic platinum resistance temperature sensors was measured employing the conventional rotating water container procedure. At low sensor immersion velocieis (less than 100 cm/s) the response was strongly dependent upon the details of the sensor insertion velocity for one sensor design. With carefully defined measurement procedures, reproducible values for the 'time constant' were obtained, but their application in data analysis must be treated with caution. (Henley-ISWS)
W75-11146

**INVESTIGATION OF THE OPERATING CHARACTERISTICS OF THE IOWA SEDIMENT CONCENTRATION MEASURING SYSTEM,**
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2J.
W75-11163

**CHARGED DROPLET COLLISION EFFICIENCY MEASUREMENTS,**
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 2B.
W75-11168

**AQUATIC WEED FIELD TEST PROGRAM USING A CO2 ELECTRIC DISCHARGE CONVECTION LASER,**
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5A.
W75-11208

**APPLICATION OF THE MANOMETRIC TECHNIQUE IN THE STUDY OF SEDIMENT OXYGEN DEPLETION,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-11222

**EXTRACTION AND ANALYTICAL TECHNIQUES FOR PESTICIDES IN SOIL, SEDIMENT, AND WATER,**
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5A.
W75-11236

**THE UTILIZATION OF SUN-GLINT IN A STUDY OF LAKE DYNAMICS,**
Canada Centre for Inland Waters, Burlington(Ontario).
For primary bibliographic entry see Field 5A.
W75-11239

**A PNEUMATIC SYSTEM TO PUMP WATER FROM PIEZOMETERS,**
Department of the Environment, Lethbridge (Alberta). Research Station.
For primary bibliographic entry see Field 8C.
W75-11257

**APPARATUS FOR CONCENTRATION OF VOLATILE ORGANIC POLLUTANTS IN WATER,**
Tekmar Co., Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W75-11342

## 7C. Evaluation, Processing and Publication

**A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOL. II, ASPECTS OF COMPUTATION,**
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 2L.
W75-10900

**TWO-DIMENSIONAL, HYDROSTATIC SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS,**
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W75-10901

**A COMPUTER PROGRAM PACKAGE FOR AQUATIC ECOLOGISTS,**
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 2H.
W75-10908

**COMPUTER ALGORITHMS USEFUL FOR DETERMINING A SUBSURFACE ELECTRICAL PROFILE VIA HIGH FREQUENCY PROBING,**
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 8G.
W75-10910

**AUTOMATED DISTRIBUTION OF GAUGE AND SHIFT CORRECTIONS,**
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
K. W. Stewart.
January 1975. 29 p, 6 fig.

Descriptors: *Data processing, *Computer programs, *Stage-discharge relations, *Data storage and retrieval, Water levels, Discharge(Water), Computers, Automation, Distribution, Information retrieval, Gages.
Identifiers: Gage corrections, Shift corrections.

A set of detailed instructions was provided to explain the use of the GCSC computer program. This program will produce: (1) printouts of an expanded stage-discharge table with figures rounded to the standard rule for significant figures, along with an option to plot the curve; (2) annual page of daily mean gage corrections; and (3) annual page of daily mean shift corrections. These printouts may be used to assist in the quality checking of data from the STREAM and MANUAL computer programs or in the manual computation of daily discharge or water level data. (Scott-ISWS)
W75-10911

**AUTOMATED TIDAL COMPUTATIONS,**
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
K. W. Stewart.
January 1975. 53 p, 16 fig.

Descriptors: *Computer programs, *Data processing, *Tides, Computers, Data storage and retrieval, Gages, Automation, Water levels, Information retrieval.
Identifiers: Hourly.

A set of detailed instructions was provided to automate tidal computations by using a digitizer interfaced with a card punch. Detailed instructions were provided for digitizing water level recorder charts to obtain punched cards containing the X-Y coordinates. With these cards and the card deck defining the gage corrections, the computer program TIDAL (WSC No. J21035) is used to obtain instantaneous hourly water levels on printouts or punched cards. The TIDAL program computes instantaneous gage heights at hourly intervals. ... only output options available in the TIDAL ... gram are listings of hourly and mean gage he... and punched cards in TWL 501 format. ... rectilinear graphical charts can be processe... the TIDAL program (Scott-ISWS)
W75-10912

**FLOW FILE OPERATIONS MANUAL,**
Department of the Environment, O... (Ontario). Water Resources Branch.
K. W. Stewart.
January 1975. 74 p, 1 fig.

Descriptors: *Computer programs, *Data st... and retrieval, *Data processing, *Canada, Co... ters, Data collections, Hydrographs, Inform... retrieval, Streamflow, Discharge(W... Monthly, Average, Annual.
Identifiers: Daily.

A detailed description was given of the F... magnetic tape file of historical daily dischar... well as detailed instructions and an explanat... the computer programs for the storage ... retrieval of these data on the CDC CYBE... computer at the Department of Energy, Min... Resources (EMR), Ottawa (Canada). The F... file now contains some 37,000 station-ye... daily discharges to December 1973 on 15 re... tape (some 133 million characters of da... stored at 800 bpi). Data are stored by Distri... by station number order within each Distri... facilitate the retrieval and publication of m... and annual mean discharges and total acre-... TOTALS file is created from the FLOW fi... contains the monthly totals in cfs-days for ... tions on one reel of tape. Historical ... monthly, and annual streamflow data can b... plied to users on punched cards or magnet... for computer processing. Instructions for p... annual daily discharge hydrographs usi... CYBER 74 computer and CALCOMP plo... EMR were given. (Scott-ISWS)
W75-10913

**DESCRIPTION OF CARD AND TAPE ... MATS FOR SUPPLYING DATA TO USER...**
Department of the Environment, ... (Ontario). Water Resources Branch.
1975. 15 p.

Descriptors: *Canada, *Hydrologic data, ... storage and retrieval, *Data processing, ... flow, *Discharge(Water), Sediments, M... Annual, Average, Suspended solids, Info... retrieval, Hydrometry, Annual peak discha...
Identifiers: Daily.

A description was given of the various c... tape formats in which hydrometric d... Canada can be supplied to users. Streamf... sediment data can be supplied in card... either on punched cards or magnetic tap... discharge data can also be supplied in ... format on magnetic tape. As of 1975, the c... that can be supplied are daily discharges, ... and annual mean discharges, and annual m... instantaneous discharges in cfs for the p... record to December 1973 inclusive; a... suspended sediment concentration in mg... period of record to December 1970 i... Period of record summary listings, indic... months and/or years for which data are a... can also be supplied. The procedure b... users can request data for stations in ea... districts of Canada was indicated. This de... is an updated version of the 1973 edition. ... types of hydrometric data become ava... punched cards or magnetic tape for distri... users, other updated editions will be p... (Scott-ISWS)
W75-10914

TOMATED HOURLY COMPUTATIONS,
partment of the Environment, Ottawa tario). Water Resources Branch.
W. Stewart.
uary 1975. 68 p, 16 fig.

criptors: *Computer programs, *Data cessing, *Streamflow, *Water levels, State-harge relations, Gages, Discharge(Water), a storage and retrieval, Information retrieval, ormation, Computers.
tifiers: *Hourly.

et of detailed instructions was given to auto- e streamflow and water level computations at cted time intervals by using a digitizer inter- d with a card punch. Detailed instructions for izing water level recorder charts were pro- d to obtain punched cards containing the X-Y dinates. With these cards and the card decks ing the stage-discharge relationships and gage shift corrections, the computer program TRLY (WSC No. J21019) is used to obtain in- aneous gage heights and/or discharges. The wing options are available in this program: (1) ing of the expanded stage-discharge table; (2) ing of the instantaneous discharges or instan- us gage heights, or both, on a selected time val of 15 minutes or 1, 2, 3, 4, 6, or 8 hours, or a selected number of days; (3) card output e instantaneous discharges or instantaneous levels, or both; (4) processing of linear, ed-line,' or 'arc-line' charts (both the ed-line' and the 'arc-line' charts have a d gage height axis but the 'curved-line' have a nonlinear vertical scale and the 'arc- charts have a linear vertical scale.); (5) d output of the chart record as digitized; and otted output of the computed instantaneous arges and/or water levels. (Scott-ISWS)
0915

LITY OF WATER IN AQUIFERS OF THE RGOSA DESERT AND VICINITY, DA,
gical Survey, Denver, Colo.
imary bibliographic entry see Field 5B.
0932

ERATURES OF KANSAS STREAMS,
gical Survey, Lawrence, Kans.
imary bibliographic entry see Field 2E.
0933

MINOR AND TRACE ELEMENTS, GAS, SOTOPE COMPOSITIONS OF THE PRIN- HOT SPRINGS OF NEVADA AND ON,
ical Survey, Menlo Park, Calif.
mary bibliographic entry see Field 2K.
0937

ATED AVAILABILITY OF SURFACE GROUND WATER IN THE POJOAQUE DRAINAGE BASIN, SANTA FE COUN- W MEXICO,
ical Survey, Albuquerque, N. Mex.
nary bibliographic entry see Field 4A.
938

LOW CHARACTERISTICS OF TED STREAMS IN NORTHEASTERN NGTON,
cal Survey, Tacoma, Wash.
nary bibliographic entry see Field 2E.
939

D WATER IN THE CORVALLIS-AL- AREA, CENTRAL WILLAMETTE VAL- REGON,
cal Survey, Reston, Va.
nary bibliographic entry see Field 2F.
940

**ESTIMATED MEAN-MONTHLY AND ANNUAL RUNOFF AT SELECTED SITES IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUNTY, NEW MEXICO,**
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2E.
W75-10943

**RECHARGE AREAS OF THE FLORIDAN AQUIFER IN SEMINOLE COUNTY AND VICINITY, FLORIDA,**
Geological Survey, Tallahassee, Fla.
C. H. Tibbals.
Florida Bureau of Geology, Tallahassee, Map Series No. 68, 1975. 1 sheet, 3 fig, 6 ref.

Descriptors: *Groundwater recharge, *Groundwater resources, *Aquifer characteristics, *Florida, Hydrologic data, Maps, Water wells, Withdrawal, Water supply, Rainfall, Hydrology, Hydrogeology, Hydrologic budget.
Identifiers: *Seminole County(Fla), *Floridan aquifer, Recharge areas.

The Floridan aquifer is the most important source of water supply in Seminole County, Florida. Virtually all public and domestic water supplies and most of the water used for irrigation are from wells that tap the Floridan. Hence, delineating the areas that recharge the aquifer is important. This map report shows those areas where the Floridan aquifer is subject to recharge or discharge. Recharge to the Floridan aquifer can occur wherever the water table (or a lake surface) is above the potentiometric surface of the Floridan. However, the rate of recharge is governed by: (1) the thickness and permeability of the intervening confining beds and (2) the degree of hydraulic potential, or head difference, between the water-table aquifer and the Floridan aquifer. (Woodard-USGS)
W75-10944

**WATER RESOURCES OF THE LOWER ST. CROIX RIVER WATERSHED, EAST-CENTRAL MINNESOTA,**
Geological Survey, Reston, Va.
G. F. Lindholm, J. O. Helgesen, W. L. Broussard, and D. F. Farrell.
For sale by USGS, Reston, Va 22092, $2.25 per set. Hydrologic Investigations Atlas HA-490, 1974. 3 sheets, 22 ref.

Descriptors: *Water resources, *Watershed management, *Minnesota, *Hydrologic data, Maps, Hydrographs, Climatic data, Hydrologic budget, Water utilization, Surface waters, Groundwater resources, Water resources development, Watershed management, Aquifer characteristics, Streamflow, Water yield, Water quality, Geology, Bedrock, Glacial drift.
Identifiers: *Lower St. Croix River(Minn).

This 3-sheet atlas describes water resources of the lower St. Croix River watershed, east-central Minnesota. Average annual precipitation in the watershed is about 28 inches. Of that amount, about 22 inches is removed by evaporation and transpiration. The average annual runoff is about 6 inches. Virtually all large water users in the watershed obtain water supplies from bedrock aquifers. Withdrawals in 1967 exceeded 1.2 billion gallons. Groundwater is generally very hard, greater than 180 mg/liter. Water from any of the formations may be high in iron, exceeding the recommended limits of 0.3 mg/liter for drinking water. The lower St. Croix River, its tributaries, and many lakes, provide an abundance of water of good quality which is suitable for most industrial, municipal, and agricultural uses. Flooding is not a major problem in the basin. Most flood damage is confined to the vicinity of Lake St. Croix. Streamflow is sustained during dry periods by the large amount of natural storage, both on the surface and in the ground. (Woodard-USGS)
W75-10945

**WATER RESOURCES OF THE SNAKE RIVER WATERSHED, EAST-CENTRAL MINNESOTA,**
Geological Survey, Reston, Va.
G. F. Lindholm, J. O. Helgesen, W. L. Broussard, and D. W. Ericson.
For sale by USGS, Reston, Va 22092, $2.00 per set. Hydrologic Investigations Atlas HA-488, 1974. 3 sheets, 20 ref.

Descriptors: *Water resources, *Watershed management, *Minnesota, *Hydrologic data, Maps, Hydrographs, Groundwater resources, Aquifer characteristics, Hydrology, Water utilization, Water yield, Water quality, Groundwater recharge, Surface waters, Streamflow, Geology, Glacial drift, Bedrock, Evapotranspiration, Soil moisture, Flood frequency.
Identifiers: *Snake River watershed(Minn).

This 3-sheet atlas describes water resources of the Snake River watershed in east-central Minnesota. All domestic, municipal, and industrial water supplies in the watershed are obtained from groundwater sources. Water use is greatest at Mora where withdrawals doubled from 1964 to 1969. Precipitation, the primary source of recharge to the watershed, averaged about 28.9 inches per year during 1939-68. Evapotranspiration, the main discharge process, is generally greatest in July and August, commonly resulting in moisture deficits for optimum plant growth. The average annual runoff from the Snake River basin is about 8.5 inches. Groundwater is generally very hard (greater than 180 mg/liter) and of the calcium magnesium bicarbonate type. The larger base-flow yields in the basin are from streams draining outwash areas. During base-flow periods, a substantial amount of the flow in the Snake River is from groundwater discharging directly to the main channel. Seventy-five percent of the annual minimum flows in the lower reaches of the Snake River occur late in the winter. (Woodard-USGS)
W75-10946

**WATER RESOURCES OF THE LOWER MINNESOTA RIVER WATERSHED, SOUTH-CENTRAL MINNESOTA,**
Geological Survey, Reston, Va.
H. W. Anderson, Jr., D. F. Farrell, and W. L. Broussard.
For sale by USGS, Denver, Colo 80225, and Reston, Va 22092, $2.25 per set. Hydrologic Investigations Atlas HA-526, 1974. 3 sheets, 9 ref.

Descriptors: *Water resources, *Watershed management, *Minnesota, *Hydrologic data, Maps, Hydrographs, Groundwater resources, Streamflow, Runoff, Water quality, Hydrology, Hydrologic budget, Water utilization, Aquifer characteristics, Water yield, Groundwater recharge, Glacial drift, Evaluation, Geology.
Identifiers: *Lower Minnesota River(Minn).

This 3-sheet atlas describes the water resources in the Lower Minnesota River watershed in south-central Minnesota. The main sources of water are precipitation and flow in the Minnesota River, which enters the watershed from the south. All municipalities use groundwater supplies. Glacial sand and gravel are widely used aquifers in the west. The Dresbach, Jordan, and St. Peter aquifers are the most reliable and widely used in the central and eastern parts. The use of groundwater is about 12,000 million gallons per year. This estimate represents 0.34 inch of water used compared with 28.8 inches of precipitation, 24.3 inches of evapotranspiration, and 4.5 inches of runoff. Considerably more water could be used without seriously depleting the amount of groundwater in storage or affecting the water budget. Dissolved solids, sulfate, and bicarbonate concentrations in water from glacial deposits decrease generally from west to east. Dissolved solids range from 900 mg/liter from areas of gray till to generally less than 400 mg/liter from areas of red till and from outwash deposits. Runoff is greatest in the spring and early summer, after the spring breakup. Ru-

noff may be high locally in the summer after intense storms. (Woodard-USGS)
W75-10947

**WATER RESOURCES OF THE CANNON RIVER WATERSHED, SOUTHEASTERN MINNESOTA,**
Geological Survey, Reston, Va.
H. W. Anderson, Jr., D. F. Farrell, W. L. Broussard, and P. E. Felsheim.
For sale by USGS, Denver, Colo 80225 and Reston, Va 22092, $2.25 per set. Hydrologic Investigations Atlas HA-522, 1974. 3 sheets, 6 ref.

Descriptors: *Water resources, *Watershed management, *Minnesota, *Hydrologic data, Maps, Hydrographs, Surface waters, Streamflow, Runoff, Sediment transport, Water quality, Groundwater resources, Aquifer characteristics, Hydrology, Geology, Water yield, Water utilization, Hydrologic budget, Water supply.
Identifiers: *Cannon River watershed(Minn).

This 3-sheet atlas describes the water resources of the Cannon River watershed in southeastern Minnesota. The 1,462 square miles of land surface in the watershed varies considerably from areas of low hills and plains to areas dominated by streams deeply incised into bedrock. Water entering the watershed as precipitation is approximately equal to surface runoff plus evapotranspiration. No significant areas of groundwater decline are known, indicating that the volume of water in storage is fairly constant. Water use in 1970 for public supply, rural supply, and self supplied (industrial and thermoelectric power), was 6,423 million gallons of groundwater and 26,216 million gallons of surface water. The population that year was 84,000. (Woodard-USGS)
W75-10948

**THE HYDROLOGIC CYCLE--AS APPLICABLE TO THE PACIFIC NORTHWEST,**
Geological Survey, Tacoma, Wash.
D. Molenaar.
Available from Washington State Dept. of Ecology, Tacoma, Wash, $1.00 in paper copy. Washington State Department of Ecology, Olympia, Geohydrologic Monograph 4, 1975. 1 map.

Descriptors: *Maps, *Hydrologic cycle, *Pacific Northwest US, Climatic zones, Precipitation(Atmospheric), Runoff, Surface waters, Groundwater, Hydrology, Evaporation, Evapotranspiration, Transpiration.

This map of the hydrologic cycle representative of conditions in the Pacific Northwest, shows the pattern of water movement as it circulates through the natural system--as precipitation from the atmosphere to the earth, as surface runoff and streamflow to the sea, as percolation into the ground and seepage back to the surface, and as evaporation and transpiration back to the atmosphere. Precipitation as rain and snow is the source of all freshwater. A part of the precipitation runs off rapidly to streams, and a part is evaporated directly back to the atmosphere from the ground and from lakes, streams, and plant surfaces. A part soaks into the soil where some is drawn up by plants and returns to the atmosphere by evapotranspiration through and from the leaves; the remainder percolates downward to a zone of saturation to become groundwater. In turn, most of the groundwater returns to the surface-water system by seepage to springs, lakes, streams, and the sea. The Pacific Northwest is a land of climatic and topographic contrasts that are reflected as extremes in natural hydrologic conditions. Average annual precipitation varies widely, from more than 200 inches at places in the higher mountains to less than 8 inches in the semiarid region east of the Cascade Range. (Woodard-USGS)
W75-10949

**CONTOUR MAP OF THE BEDROCK SURFACE, NEW BRITAIN QUADRANGLE, CONNECTICUT,**
Geological Survey, Hartford, Conn.
E. H. Handman.
Miscellaneous Field Studies Map MF-523 C (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 135), 1975. 1 sheet, 1 map, 4 ref.

Descriptors: *Soils surveys, *Connecticut, *Geologic mapping, *Bedrock, Contours, Geologic investigations, Mapping, Overburden, Soils, Sediments, Rocks.
Identifiers: *Bedrock surface maps, *Britain(Conn), Urban geology.

Contours show the altitude of the bedrock surface in the New Britain quadrangle, Connecticut. The position of the contours is based largely on data from wells, test holes, and published geologic maps supplemented by knowledge of the geologic history of the region. The map shows the configuration of the bedrock surface if all unconsolidated earth materials were removed. (Woodard-USGS)
W75-10950

**MAP SHOWING DEPTH TO BEDROCK, WORTHINGTON QUADRANGLE, MASSACHUSETTS,**
Geological Survey, Boston, Mass.
C. J. Londquist.
Miscellaneous Field Studies Map MF-662 A (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 136), 1975. 1 sheet, 1 map, 2 ref.

Descriptors: *Soils surveys, *Massachusetts, *Geologic mapping, *Bedrock, Geologic investigations, Overburden, Soils, Sediments, Rocks.
Identifiers: *Depth to bedrock, *Worthington(Mass), Urban geology.

This map indicates depth to bedrock below land surface in the Worthington quadrangle, Massachusetts. The locations of bedrock outcrops were obtained by field mapping and from a surficial geology map. Depths to bedrock are inferred from logs of wells and test holes and excavations for utility lines and foundations supplemented by data from a contour map of the bedrock surface. Depths shown are a generalization of localized highly variable conditions and do not include any weathered (decomposed) bedrock. (Woodard-USGS)
W75-10951

**MAP SHOWING DEPTH TO BEDROCK, GREENFIELD QUADRANGLE, MASSACHUSETTS,**
Geological Survey, Boston, Mass.
C. J. Londquist.
Miscellaneous Field Studies Map MF-629 B (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 140), 1975, 1 sheet, 1 map, 10 ref.

Descriptors: *Soil surveys, *Massachusetts, *Geologic mapping, *Bedrock, Geologic investigations, Overburden, Soils, Sediments, Rocks.
Identifiers: *Depth to bedrock, *Greenfield(Mass), Urban geology.

This map indicates depth to bedrock below land surface in the Greenfield quadrangle, Massachusetts. The locations of bedrock outcrops were obtained by field mapping and from a surficial geology map. Depths to bedrock are inferred from logs of wells and test holes and excavations for utility lines and foundations supplemented by data from a contour map of the bedrock surface. Depths shown are a generalization of localized highly variable conditions and do not include any weathered (decomposed) bedrock. (Woodard-USGS)
W75-10952

**MAP SHOWING DEPTH TO BEDRO CHESTER QUADRANGLE, MASSACHUSET**
Geological Survey, Boston, Mass.
C. J. Londquist.
Miscellaneous Field Studies Map MF-66
(Connecticut Valley Urban Area Project Envi mental, Geologic and Hydrologic Studies tribution 141), 1975. 1 sheet, 1 map, 2 ref.

Descriptors: *Soil surveys, *Massachus *Geologic mapping, *Bedrock, Geologic inves tions, Overburden, Soils, Sediments, Rocks.
Identifiers: *Depth to bedrock, *Chester(M Urban geology.

This map indicates depth to bedrock below surface in the Chester quadangle, Massachu The locations of bedrock outcrops were obt by field mapping and from a surficial geology Depths to bedrock are inferred from logs of and test holes and excavations for utility line foundations supplemented by data from a co map of the bedrock surface. Depths shown generalization of localized highly variable c tions and to not include any weat (decomposed) bedrock. (Woodard-USGS)
W75-10953

**MAP SHOWING DEPTH TO BEDR MOUNT CARMEL QUANDRANGLE, CON TICUT,**
Geological Survey, Hartford, Conn.
E. H. Handman, and M. H. Ginsberg.
Miscellaneous Field Studies Map MF-5
(Connecticut Valley Urban Area Project En mental, Geologic and Hydrologic Studies tribution 142), 1975. 1 sheet, 1 map, 5 ref.

Descriptors: *Soils surveys, *Conne *Geologic mapping, *Bedrock, Geologic inv tions, Overburden, Soils, Sediments, Rocks.
Identifiers: *Depth to bedrock, *Mount mel(Conn), Urban geology.

This map indicates depth to bedrock belo surface in the Mount Carmel quadrangle, C ticut. The locations of bedrock outcrops we tained by field mapping and from a surficial gy map. Depths to bedrock are inferred fro of wells and test holes and excavations for lines and foundations supplemented by dat a contour map of the bedrock surface. shown are a generalization of localized high able conditions and do not include any wea (decomposed) bedrock. (Woodard-USGS)
W75-10954

**HIERARCHIAL MODEL FOR W SUPPLY-SYSTEM CONTROL,**
Cambridge Univ. (England). Dept. of Engin
For primary bibliographic entry see Field 4A
W75-10996

**WATER RESOURCE OBSERVATORY MATOLOGICAL DATA, WATER YEAR**
Wyoming Univ., Laramie. Water Re Research Inst.
Available from the National Technical I tion Service, Springfield, Va 22161 as PB- $7.25 in paper copy, $2.25 in microfiche Resources Series No 49, October 1974, OWRT A-999-WYO(21).

Descriptors: *Data processing, *Climati *Temperature, Humidity, *Data coll Precipitation(Atmospheric), Precipitation Measurement.

Temperature and relative humidity data t been reduced from hygrothermograph ch precipitation data from recording and non ing precipitation gages are presented in form. Four readings per day at 0600, 120 and 2400 hours and the maximum and m are presented. The mean, maximum, and m

eratures are also shown graphically. The ced data are transferred to punch cards for putation and tabulating by the University of ming's digital computer.
11035

Y OF CRITERIA AND MODELS BLISHING OPTIMUM LEVEL OF ROGEOLOGIC INFORMATION FOR UNDWATER BASIN MANAGEMENT,
esota Univ., Minneapolis. Dept. of Geology eophysics.
imary bibliographic entry see Field 2F.
1042

MAP OF THE WORLD, 1:5,000,000, ME IV, SOUTH AMERICA.
and Agricultural Organization of the United s, Rome (Italy); and United Nations Educa- Scientific, and Cultural Organization, Paris e).
Unesco, Paris (France), 1971. 193 p, 8 fig, 3 maps, 103 ref, 1 append.

ptors: *Soils, *Maps, *South America, Cli- Vegetation, Geomorphology, Petrology, use, Agriculture, Fertility, Water supply, ge, Mountains, Soil classification, Soil , Soil investigations, Soil properties, Soil s, Soil texture, Soil types, Distribution pat-

nap sheets which make up the Soil Map of America are drawn on topographic base f the 1:5,000,000 series of the American phical Society Soil units divided into tex- d slope classes are marked on the maps by s and colors. Text described the develop- the map project, gave notes on uses of the and details environmental conditions and s in South America. The climate, vegeta- eomorphology, and lithology of South a were described and related to soil pat- description of the soils of the continent ed an extensive table of soil associations, unt of the distribution of the main soils, scussion of land use and soil suitability for ure. It was shown that only 5% of the land r cultivation. Limitations affecting the ural use of soils are low natural fertility, ainage, and large areas of steeplands. The South America covered by productive soil shows potential for increases in agricul- ductions. (Robinson-ISWS)
38

ND WATER RESOURCES SURVEY IN BEL MARRA AREA, THE SUDAN.
d Agriculture Organization of the United Rome (Italy).
ary bibliographic entry see Field 4A.
39

NTRATION AND GENERA OF ALGAE CTED ILLINOIS STREAMS, 1971-1973,
tate Water Survey, Urbana.
ary bibliographic entry see Field 5A.
55

TER SYSTEMS AND WATER CES,
ic Institute of New York, Brooklyn; and niv., Chicago.
ry bibliographic entry see Field 6A.
4

LOUISIANA ENVIRONMENTAL EMENT SYSTEM AND ITS UTILITY IN RESOURCE PLANNING,
State Univ., Baton Rouge. Div. of En- Research.
ry bibliographic entry see Field 5G.
7

**DISTRIBUTION-SYSTEM OPERATION ANALYSIS MODEL,**
Omaha Metropolitan Utilities District, Nebr. Services Dept.
For primary bibliographic entry see Field 5D.
W75-11180

**COMPUTER ANALYSIS OF WATER-DISTRIBUTION SYSTEMS,**
Springfield Dept. of Water, Light and Power, Ill.
For primary bibliographic entry see Field 4A.
W75-11182

**ADVANCED TECHNIQUES IN THE MATHEMATICAL MODELING OF WATER-DISTRIBUTION SYSTEMS,**
Beck (R. W.) and Associates, Seattle, Wash.
For primary bibliographic entry see Field 4A.
W75-11183

**CAN A COMPUTER REALLY OPERATE A WATER-FILTRATION PLANT,**
Kennedy Engineers, Inc., Tacoma, Wash.
For primary bibliographic entry see Field 5F.
W75-11184

**FINITE-ELEMENT METHOD FOR WATER-DISTRIBUTION NETWORKS,**
AC1 Environics, Melbourne (Australia).
For primary bibliographic entry see Field 4A.
W75-11186

**AN ECONOMIC ANALYSIS OF THE POLLUTION PROBLEMS IN THE COLORADO RIVER BASIN: THE UPPER MAIN STEM SUB-BASIN,**
Colorado Univ., Boulder.
For primary bibliographic entry see Field 5G.
W75-11247

**ECONOMICS OF GREAT LAKES SHIPPING IN AN EXTENDED SEASON,**
Michigan Univ., Ann Arbor. Dept. of Naval Architecture and Marine Engineering.
For primary bibliographic entry see Field 6C.
W75-11248

**MAKING LOG ANALYSTS OF GEOLOGISTS.**
Oilweek, Vol 23, No 51, p 27-28, February 5, 1973. 2 fig.

Descriptors: *Analytical techniques, *Data processing, *Exploration, *Mapping, *Logging(Recording), *Resistivity, Porosity, Permeability, Regional analysis, Computer analysis, Data storage and retrieval.
Identifiers: Spontaneous potential.

Applying long-standing techniques used in interpretation of seismic data to well logs could increase the level of information gained. Automatic scanning systems now offer a highly accurate method of transcribing graphically-recorded log data to a digital tape. Once these are in common use data from logs can be used for more than location of stratigraphic traps. Porosity, apparent water, resistivity, lithology, radioactivity, density, velocity, and ratios of these can be easily assembled and used in regional exploration. Two examples are presented from the Anadarko Basin in western Oklahoma, and from the northeastern Williston Basin in southeastern Saskatchawan. (Bradbeer-NWWA)
W75-11288

**MULTILAG MARKOV MODELS FOR EASTERN AUSTRALIAN STREAMS,**
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-11301

**DETECTION OF CHANGE IN SEQUENCES OF HYDROLOGIC DATA,**
Melbourne and Metropolitan Board of Works (Australia).
K. J. Langford, and R. A. Lewis.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 80-84, May 1975. 2 fig, 6 tab, 9 ref.

Descriptors: *Statistical methods, *Analytical techniques, *Hydrologic data, *Time series analysis, Rainfall, Land clearing, Rain gages.
Identifiers: Non-parametric statistics.

The sophistication of techniques used in an analysis should be in keeping with the quality and extent of the data as most hydrologic data are fairly rudimentary, for example rain guage measurements, simple analysis techniques are an appropriate first step. Some uses for non-parametric statistics are discussed, with particular emphasis on the detection of change in time sequences. A decrease of 4% in measured rainfall following clearing around a rain gauge was found to be significant. A control record is essential to detect such a small change. Changes of the order of 20% can be detected from individual records. (CSIRO)
W75-11302

**GENERATION OF ARID ZONE RAINFALL AND RUNOFF,**
University of New England, Armidale (Australia). School of Natural Resources.
For primary bibliographic entry see Field 2A.
W75-11303

**DROUGHTS, DISTRIBUTIONS AND DEPENDENCE: AN ANALYSIS OF SOME SYNTHETIC DATA GENERATION METHODS,**
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-11305

**AUSTRALIAN ARID ZONE STREANGAUGING,**
New South Wales Dept. of Public Works, Sydney (Australia). Water Supply and Sewerage Branch.
For primary bibliographic entry see Field 2E.
W75-11307

**WORKSHOP ON COMPUTER-AIDED DESIGN AND SIMULATION OF WASTE TREATMENT SYSTEMS.**
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5D.
W75-11338

# 8. ENGINEERING WORKS

## 8A. Structures

**INTERBASIN WATER TRANSFERS: A CASE STUDY IN MEXICO,**
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 4A.
W75-10879

**PREVENTING BACKFLOW IN PIPING CROSS CONNECTIONS,**
Watts Regulator Co., Lawrence, Mass.
For primary bibliographic entry see Field 5B.
W75-11018

**CONSOLIDATION AND REHABILITATION OF CANALS IN POUDRE VALLEY,**
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.

W75-11061

**BEACH EROSION CONTROL STRUCTURE,**
S. S. Fair.
U.S. Patent No. 3,894,397, 4 p, 9 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 829, July 15, 1975.

Descriptors: *Patents, *Beach erosion, *Shore protection, Waves(Water), Ocean waves, Coastal structures, Sea walls.
Identifiers: Hollow concrete blocks.

A beach erosion control structure is described as a perforate wall that includes multiple courses of cored concrete blocks laid on their side so that the core holes provide horizontal passageways through the wall for the flow of water and entrained sand in incoming waves. The multiple rows of such blocks are arranged in such manner that the core holes of adjacent rows of blocks are staggered. The blocks can be preassembled by securing individual blocks into like block units, each block unit having three blocks assembled in a longitudinally staggered side-by-side relationship such that the core holes in adjacent blocks are offset. Such a wall may be laid up without the use of mortar. Instead, mechanical fastening, such as crimped straps, may be employed to couple adjacent courses to each other. Some or all of the block openings may be provided with reed or flapper-type valves which are swung open by an incoming wave, and then move to a partially closed position to resist or restrict the flow of water in ebbing waves. (Sinha-OEIS)
W75-11075

**COULD THE SEA BE USED TO STORE WATER FOR SUPPLY.--A POSSIBLE SCHEME,**
For primary bibliographic entry see Field 4A.
W75-11129

**DESIGN OF THE OPTIMAL OUTFALL SYSTEM FOR A STREAM RECEIVING THERMAL AND ORGANIC WASTE DISCHARGES,**
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 5B.
W75-11137

**PREDICTING CAVITATION IN SUDDEN ENLARGEMENTS,**
Colorado State Univ., Fort Collins. Hydro Machinery Lab.
For primary bibliographic entry see Field 8B.
W75-11151

**GUIDELINES FOR THE IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS IN THE CONSTRUCTION AND OPERATION OF A RESERVOIR,**
Illinois Univ., Urbana. Dept. of Forestry.
For primary bibliographic entry see Field 5C.
W75-11316

## 8B. Hydraulics

**WAVE MOTION IN ROCKFILL,**
Concordia Univ., Montreal (Quebec). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W75-10924

**IMPLICIT NUMERICAL MODELING OF UNSTEADY FLOWS,**
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
M. Amein, and H-L. Chu.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY6, Proceedings Paper 11378, p 717-731, June 1975. 9 fig, 3 tab, 16 ref, 2 append. NOAA Contract O-3528.

Descriptors: *Unsteady flow, *Numerical analysis, *Open channel flow, Hydraulics, Flow, Open channels, Mathematical studies, Boundary processes, Boundaries(Surfaces), *Model studies, *Hydraulic models.
Identifiers: Finite difference analysis.

A numerical model based on the equations of unsteady flow in open channels was used to compute unsteady flows in rivers and reservoirs. The cross sections of the waterways ranged from uniform to highly irregular, the type of flow ranged from slowly varied to abrupt changes in discharge, and nearly all combinations of boundary conditions were encountered. The model used an implicit finite difference method. The versatility, accuracy, stability, and efficiency of the method was demonstrated by field measurements. (Jess-ISWS)
W75-10925

**STOCHASTIC ANALYSIS OF PARTICLE MOVEMENT OVER A DUNE BED,**
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 2J.
W75-10942

**HORIZONTAL GROUNDWATER COLLECTORS, HYDRAULICS AND DESIGN,**
International Water Supply Ltd., Montreal (Quebec).
P. O. Bourgeois.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, Vancouver, British Columbia, p 93-106. 5 fig.

Descriptors: *Water supply, *Groundwater resources, *Aquifers, Wells, Hydrology, Recharge, Hydraulic design, Water wells, *Caissons.
Identifiers: *Horizontal groundwater collector.

A horizontal groundwater collector or radial screen well is a large diameter concrete caisson with several screens driven laterally from its lower level outwards through sand and gravel near a stream or lake. It is used to abstract groundwater from an unconsolidated aquifer hydraulically connected to a body of surface water. A summary is presented of hydrodynamic principles which are used to determine yield, design and development of horizontal groundwater collectors. Field testing and analysis of yield includes: test drilling to establish the real extent of the aquifer and its stratigraphic characteristics; pumping tests to establish the characteristics of the aquifer such as transmissibility, permeability, and coefficient of storage which can then be used to determine the contribution of recharge of the adjacent stream; and, collector yield calculations which involve the above information plus the effective radius of the collector which is defined as the equivalent radius of a vertical well which under the same conditions of drawdown would produce an equivalent yield. Caisson design, lateral drain design, and screens selection are also discussed. Additional research is needed to improve on the methods described for obtaining and using the basic information required in determining the hydraulics for arriving at a collector design. (Orr-FIRL)
W75-10998

**HORIZONTAL GROUNDWATER COLLECTORS, 'CANADA'S LARGEST WATER WELL',**
Prince George City Engineer's Office (British Columbia).
C. E. Obst.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, Vancouver, British Columbia, p 107-123. 8 fig.

Descriptors: *Water supply, *Groundwa resources, *Aquifers, Wells, Costs, Hydrolo Infiltration galleries, Water sources, Pota water, Hydrodynamics, *Water wells, *Cana *Caissons.
Identifiers: *Horizontal groundwater collectors

The City of Prince George, British Columbia, situated planning in 1970 for methods to increase their supply of potable water. The choices included: duplication of a successful and inexpensive infiltration gallery; a raw water intake from the Nechako River with a conventional water treatment plant; and, groundwater supply from the Nechako Aquifer. The installation of a single collector well with horizontal well screen was chosen as the most viable alternative. Details of the exploratory investigation (test drilling and pumping) and examination of the preliminary hydrogeology are presented. The results established that a groundwater aquifer existed, that the water quality from test pumping was acceptable, that the recharge capability of the aquifer was good and the grain size analysis of the granular soil appeared to be acceptable for a sand-free well development. The design and construction of the collector is outlined. The total project costs were $1,125,000 or less than ten cents per gallon capacity for the total capital cost of intake, treatment and pumping. It is concluded that the original objective of Prince George of providing a safe, abundant supply of high quality potable water at the possible cost has been achieved through the installation of a horizontal collector well. (Orr-FIRL)
W75-10999

**SOME RESULTS ON MASS TRANSFER PROCESSES IN A DENSITY-STRATIFIED FLOW,**
Mississippi Univ., University. Dept. of Mechanical Engineering.
J. A. Fox, L. A. Roe, and C. V. Alonso.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-692, $3.75 in paper copy, $2.25 in microfiche. Mississippi Water Resources Research Institute Mississippi State, Completion Report, August 19 p, 10 fig, 22 ref. OWRT A-081-MISS(1).

Descriptors: *Flow characteristics, *D stratification, Diffusion, Shear flow, L Reservoirs, *Stratified flow, *Mass tra Saline water, *Mixing, Eddies, Turbu *Turbulent flow.
Identifiers: Richardson number.

A stream of relatively pure water was m flow over a body of heavier, saline wate general aim was to study the mixing betwe two fluids of different density. This proce investigated in two laboratory flumes and t were analyzed with a view toward obtainin titative estimates of mixing. The main con presenting the results is in the relation Richardson number to turbulent mixing a vertical eddy diffusivity coefficient. The ex of a high local Richardson number of a fresh water over a saline solution lower the vicinity of the interface between the two seems to inhibit turbulent mixing. Th Richardson number approaches zero awa the interface on either side of it. Indirect tion of the vertical eddy diffusivity co from experimental data shows a strong with Richardson number between zero and the flows considered, indicating a strong with increasing Richardson number.
W75-11057

**EFFECT OF PRESSURE GRADIENT ON WAVES IN A LABORATORY CHANNEL,**
Connecticut Univ., Storrs. Dept. of C gineering.
J. D. Lin, and H. C. Liang.
In: Proc Second US National Conference Engineering Research, June 23-25, 1975

ıs, Colorado, Colorado State University, 3 p, 7 g, 1 tab, 10 ref. OWRT A-021-CONN(3), 14-01-01-1075.

escriptors: *Wind tides, *Turbulent boundary yers, Laboratory tests, Channels, *Open chan- l flow,
entifiers: *Wind-generated waves, Boundary er pressure gradient, Wind-wave channels, rodynamic roughness, Two phase flow, Boun- ry layer shear.

e results derived from a wind-wave channel dy of the effect of pressure gradient on the aracteristics of wind-generated waves are sented. The results indicate that a mild pressure dient normally existing in a wind tunnel of form cross section with a solid flat bottom is plified when the bottom is replaced by a water face. The pressure gradient also caused an ex- sive 'set-up' of water surface. The favorable gative) pressure gradient renders a positive eamwise shear stress gradient which might be ponsible in part for the larger growth rate of d-waves in addition to the component due to ct energy transfer. (deLara-Connecticut) 5-11093

DROLOGIC INVESTIGATION AND DESIGN URBAN STORMWATER DRAINAGE TEMS,
wy Mountains Engineering Corp., Canberra stralia).
primary bibliographic entry see Field 4A. -11141

LICATION OF ELECTRICAL ANALOGY DRAW FLOW NETS FOR SUDDEN DRAW- VN CONDITIONS IN EARTH DAMS,
versity Coll. of Engineering, Burla (India). . of Civil Engineering.
Joshi, and A. P. Misra.
an Geotechnical Journal, Vol 4, No 4, p 323- October 1974. 7 fig, 6 ref.

riptors: *Earth dams, *Slope stability, *Flow *Phreatic lines, *Boundary processes, log models, Laboratory equipment, odology, Laboratory tests, Analytical niques, Drawdown.
ifiers: *Sudden drawdown, Electrical analo- quipotential lines.

nets are needed to make an accurate analysis e stability of the water retaining face of an dam for sudden drawdown conditions. Flow ter in the body of the dam is in a transient then. The nature and movement of the satu- line with elapsed time has been studied a viscous fluid model. Such studies showed he free saturation line at any instant is a flat ola. Drawing of flow nets for sudden draw- conditions was suggested with the help of ical analogy apparatus. The laboratory ap- s and the procedural steps for drawing flow ere detailed and exemplified. (Singh-ISWS) 1143

CTS OF ENTRANCE LOSS ON HARBOR LLATIONS,
a Univ., Gainesville. Dept. of Coastal and ographic Engineering.
luata, and C. C. Mei.
l of the Waterways, Harbors and Coastal eering Division, American Soceity of Civil eers, Vol 101, No WW2, Proceedings Paper p 161-180, May 1975. 4 fig, 2 tab, 14 ref, 2 d. ONR Contracts NO0014-67-A-0204-0036, 2-338.

ptors: *Waves(Water), *Harbors, *Friction, ratory tests, *Mathematical studies, nance, Velocity, Head loss, Coastal en- ng, Tsunamis, Fluctuations.
iers: Harmonics.

The results of a theoretical study of wave induced response in a rectangular model harbor was reported. It was assumed that friction head loss was present across the harbor entrance. The loss was assumed to be quadratic in local velocity with a constant friction coefficient. Bottom and side-wall dissipation were not considered. It was shown that odd higher harmonics were present. The resonance characteristics of the fundamental harmonic response in the harbor were significantly influenced by the additional damping due to friction, especially for the lowest peaks. While in the perfect fluid theory, these peaks heighten with diminishing entrace width; in the presence of friction, the opposite was true for a sufficiently narrow mouth. (Bhowmik-ISWS)
W75-11147

**TURBULENT STRUCTURE NEAR SMOOTH BOUNDARY,**
Stone and Webster Engineering Corp., Denver, Colo.
P. H. Blinco, and D. B. Simons.
Journal of the Engineering Mechanics Division, Proceedings of American Society of Civil Engineers, Vol 101, No EM3, Paper 11372, p 241-255, June 1975. 11 fig, 16 ref, 2 append.

Descriptors: *Turbulence, *Boundary layers, *Time series analysis, *Flow characteristics, Reynolds number, Laboratory tests, Analysis, Fluid mechanics, Shear stress, Boundaries(Surfaces), Shear, Anemometers.
Identifiers: *Turbulent structure, *Energy spectra, Boundary shear, Hot film anemometers.

Digital time series analysis of constant temperature hot film anemometer signals were analyzed for a Reynolds number range from 18,600 to 136,000. A miniature boundary layer type sensor and a Flush Surface Hot-Film sensor were used in a smooth boundaried tilting flume. Results of the analysis revealed that: (1) the instantaneous boundary shear stress was a low frequency process with most of its spectral energy associated with frequencies below 5 Hz; (2) the spectral distributions were dependent on the bulk flow variables with higher frequency energy content increasing with increasing Reynolds number; (3) decomposition of the instantaneous boundary shear stress into an extreme value counting process was shown to agree with the so-called 'bursting process'; (4) the mean period between shear stress excursions varied with the 3/4 power of the Reynolds number and, when made dimensionless by use of the bulk flow variables, the mean bursting was a constant; and (5) time-space correlation between the longitudinal velocity fluctuations and the boundary shear stress indicated that a large inclined turbulent structure was responsible for the transfer of turbulence into the viscous sublayer. (Adams-ISWS)
W75-11148

**TRANSITION IN OSCILLATORY FLOW OVER RIPPLED BEDS,**
Cambridge Univ., (England). Dept. of Engineering.
J. F. A. Sleath.
The Institution of Civil Engineers Proceedings, Part 2, Research and Theory, Vol 59, p 309-322, June 1975. 7 fig, 1 tab, 13 ref.

Descriptors: *Turbulent flow, *Transition flow, *Laminar flow, Fluid mechanics, Anemometers, Reynolds number, Hydraulics, Hydrodynamics, Beds, Ripple marks, Sand waves, Velocity.
Identifiers: *Oscillatory flow, *Rippled bed, Flow stability, Velocity measurements, Random instability.

Velocity measurements were made in order to investigate the way in which oscillatory flow over rippled beds become turbulent. The tests were carried out with a range of rippled beds oscillated in still air and water and a hot wire anemometer was used to measure the velocity. For a given bed and amplitude of oscillation, it was observed that below a certain critical frequency of oscillation the flow remained laminar. At higher frequencies random instabilities appeared. Depending on the amplitude of oscillation, these instabilities may reach a limiting value as frequency is increased still further, or they may eventually break down into turbulence. A curve was proposed for the conditions under which the random instabilities first appeared. Conclusions were drawn as to the conditions under which flow produced by wave action over a rippled bed is laminar or turbulent. It was suggested that the observed instability is indepenedent of transition caused by grain roughness, which may be calculated separately. (Lee-ISWS)
W75-11149

**THE DESIGN OF STORM WATER DRAINAGE CHANNELS USING MATHEMATICAL MODEL TECHNIQUES,**
Hydraulics Research Station, Wallingford (England).
W. R. White, and R. K. Price.
The Institution of Civil Engineers Proceedings, Part 2, Research and Theory, Vol 59, p 91-102, March 1975. 8 fig, 3 tab, 9 ref, 1 append.

Descriptors: *Storm runoff, *Storm drains, *Urban drainage, *Urban hydrology, *Mathematical models, *Open channel flow, Urban runoff, Open channels, Routing, Unsteady flow, Continuity equations, Momentum equation, Flood routing, Drainage systems, Networks, Hydrographs.
Identifiers: *Colebrook-White transition. *Airport drainage.

The hydraulic aspects of the design of drainage schemes, the main arterial branches of which consist of open channels, were described. The Road Research Laboratory hydrograph technique was applied to the subsidiary pipe network system, but a new mathematical model technique was used for the main drainage channels. The spatially varied unsteady flow conditions within these channels were analyzed using a full solution of the equations governing continuity, momentum, and frictional resistance, the latter being defined in terms of the Colebrook-White transitional law. The new method was used in a feasibility study to determine the optimum drainage system for the proposed Maplin airport-seaport development and results from this investigation illustrated the method. (Terstriep-ISWS)
W75-11150

**PREDICTING CAVITATION IN SUDDEN ENLARGEMENTS,**
Colorado State Univ., Fort Collins. Hydro Machinery Lab.
J. W. Ball, J. P. Tullis, and T. Stripling.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Paper 11442, p 857-870, July 1975. 5 fig, 2 tab, 17 ref, 2 append.

Descriptors: *Cavitation, *Pitting(Corrosion), *Orifices, *Hydraulics, Energy dissipation, Valves, Pressure, Water conveyance, Nozzles, Water levels, Damages, *Design criteria, *Forecasting.
Identifiers: *Scaling effects, *Pressure effects.

In recent years incipient, critical, and choking cavitation levels have been introduced as design criteria for orifices and valves in pipelines. Recent studies have evaluated a fourth level, incipient cavitation damage, for orifices that is applicable to the design of sudden-enlargement energy dissipators. Design data for these four levels were included in the paper. Since cavitation in prototype structures can differ from that predicted by model studies, research was also directed toward evaluation of scale effects. The existence of scale effects due to pressure, size, and geometry for four levels

of cavitation was examined herein, and methods and equations for adjusting reference test data to structures of other sizes operating under different pressure conditions were presented. The location and distribution of cavitation pitting on the pipe wall downstream from the sudden enlargement was identified. The pitting was a function of expansion ratio and cavitation intensity. (Lardner-ISWS)
W75-11151

**CAVITATION CONTROL BY AERATION OF HIGH-VELOCITY JETS,**
Bureau of Reclamation, Denver, Colo. Hydraulics Branch.
G. L. Beichley, and D. L. King.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Paper 11462, p 829-846, July 1975. 10 fig, 1 ref, append.

Descriptors: *Cavitation, *Outlet works, *Flow around objects, *Hydraulic models, *Slide gates, Hydraulic structures, Jets, Discharge(Water), Spillways, Aeration, Erosion.
Identifiers: *Offsets, Palisades Dam, Navajo Dam, Pueblo Dam, Crystal Dam, Teton Dam, Slots, Deflectors.

To prevent cavitation erosion, air may be introduced along the underside and sides of a jet before the jet comes in contact with downstream concrete surfaces. Model studies of chute offsets, air slots, and deflectors were conducted to determine methods to aerate the jet and provide recommendations for altering two existing structures and designing new structures. A single test facility was used to model existing structures at Palisades and Navajo Dams and proposed structures at Pueblo, Crystal, and Teton Dams. Wall air vent slots combined with a floor deflector were developed for use immediately downstream from the gate frames in the two existing structures. Wall and floor air vent offsets away from the flow at the end of the frame were developed for new structures. These investigations, supplemented by general tests, formed the basis for guidelines developed for design of future air-entraining devices to protect flow surfaces from cavitation erosion. The best dimensions and locations for the slots and offsets were discussed, based on models of these specific structures. (Lardner-ISWS)
W75-11152

**DERIVATION OF SURFACE WATER LAG TIME FOR CONVERGING OVERLAND FLOW,**
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W75-11156

**MASS-EMPLACED SAND-FINGERS AT MARAROA CONSTRUCTION SITE, SOUTHERN NEW ZEALAND,**
Otago Univ., Dunedin (New Zealand). Dept. of Geology.
For primary bibliographic entry see Field 2J.
W75-11161

**SIZE-SORTING DURING SUSPENSION TRANSPORTATION--LOGNORMALITY AND OTHER CHARACTERISTICS,**
Indian Statistical Inst., Calcutta. Geological Studies Unit.
For primary bibliographic entry see Field 2J.
W75-11162

**INVESTIGATION OF THE OPERATING CHARACTERISTICS OF THE IOWA SEDIMENT CONCENTRATION MEASURING SYSTEM,**
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2J.
W75-11163

**LABORATORY INVESTIGATION OF ONE-DIMENSIONAL WAVE MOTION IN OPEN CHANNELS,**
Tennessee Univ., Knoxville. Coll. of Engineering.
W. A. Miller, Jr., and B. A. Tschantz
Paper presented at National Water Resources Engineering Meeting, American Society of Civil Engineers, Atlanta, Georgia, January 25, 1972. 40 p, 16 fig, 24 ref. OWRT B-010-TENN(2), B-012-TENN(2), and B-005-TENN(4).

Descriptors: *Waves(Water), *Open channel flow, Hydraulic transients, Unsteady flow, Velocity, Flow, Surges, Bores, Dam failure.

A three-year (1968-71) study is described in which laboratory measurements of some of the characteristics of one-dimensional waves in a channel were compared with values computed from a particular mathematical model and solution procedure. When boundary conditions, initial conditions, and channel geometry are accurately specified as input to the mathematical model, the leap-frog explicit solution scheme provides an accurate representation of the physical situation. The hydrogen bubble technique is a practical and feasible method for determining velocities in unsteady flow. Within the limits of the test data, neither the amplitude of the wave released into the channel nor the initial depth of water in the channel had an appreciable effect on the agreement between computed and measured values. For wave releases into a steady flow, proper specification of initial and boundary conditions for the model becomes more critical, and accurate experimental measurements are more difficult to obtain.
W75-11172

**IMPROVED DESIGN OF DISTRIBUTION NETWORKS BY MINIMUM ROUTE,**
Nihon Suido Consultants Co., Tokyo (Japan).
For primary bibliographic entry see Field 4A.
W75-11175

**FINITE-ELEMENT METHOD FOR WATER-DISTRIBUTION NETWORKS,**
AC1 Environics, Melbourne (Australia).
For primary bibliographic entry see Field 4A.
W75-11186

**APPROXIMATION FOR STEADY INTERFACE BENEATH A WELL PUMPING FRESH WATER OVERLYING SALT WATER,**
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 4B.
W75-11255

**COLORADO CITY SOLVES ITS SAND PUMPING PROBLEMS,**
Wright Water Engineers, Inc., Denver, Colo.
For primary bibliographic entry see Field 8C.
W75-11261

**FORMULATION OF BOUNDARY CONDITIONS AT THE SURFACE OF A POROUS MEDIUM,**
Alberta Univ., Edmonton.
G. Neal, and W. Nader.
Society of Petroleum Engineering Journal, Vol 14, No 5, p 434-436, October, 1974. 1 fig, 2 tab, 11 ref.

Descriptors: *Flow, *Porous media, *Boundaries(Surfaces), Aquifers, Filters, Porosity, Hydraulic conductivity, Flow system, Interfaces, Mathematical models, Darcy's law, Boundary layers, Hydraulics, Flow profiles, Transmissivity.
Identifiers: *Boundary conditions, Tangential velocity, Flow through a porous medium.

The governing flow equations in prediction of fl flow occurring within adjacent regions of por medium and open space are Darcy's Law and Navier-Stokes equation. The boundary conditi usually assumed are that the mass flux norma the surface is continuous, that the pressure is tinuous across the surface, and that the tangen velocity in the free fluid tends to zero at the face. The last assumption is an approximation tested by comparison with two more explici sumptions, confirmation of the approximati the result. (Bradbeer-NWWA)
W75-11269

**THE MECHANICS OF ROCK FAILURE TO WATER JET IMPINGEMENT,**
Bell Telephone Labs., Inc., Whippany, N.J.
For primary bibliographic entry see Field 8E.
W75-11272

**ANALYSIS OF FACTORS INFLUENCING BILITY AND ADSORPTION IN THE FLOW POLYMER SOLUTION THROUGH POR MEDIA,**
Shell Oil Co., Houston, Tex.
G. J. Hirasaki, and G. A. Pope
Society of Petroleum Engineers Journal, Vo No 4, p 337-346, August, 1974. 8 fig, 7 tab, 25

Descriptors: Porous media, *Polymers, *F Secondary recovery(Oil), Fluid mechanics, I tion, Oil wells, Adsorption, Chemistry, Or molecules, Flooding, Oil fields, Oil reser Water wells, Groundwater, Aquifers, Reser Flow augmentation, Permeability, Por Clogging.
Identifiers: Pseudoplastic flow, Viscoelastic Blake-Kozeny mode(Flow).

Displacement of oil by polymer solution characteristics not present in normal water ing. Rheological behavior of the flow cou Newtonian at low flow rates, pseudoplas medium flow rates, and dilatant at high flow The pseudoplastic behavior is modeled wi Blake-Kozeny model. The dilatant behav modeled with the viscoelastic properties polymer solution. Permeability reduction due to an adsorbed layer of polymer mol coils that reduces effective pore size. The r the size of the polymer molecular coil to an tive pore radius of the medium is used to co the permeability reduction factor wit polymer, brine, and rock properties. A mo been developed to represent adsorption as tion of these properties assuming the poly adsorbed as a monolayer of molecular coi have a segment density greater than the me coil in dilute solution. (Bradbeer-NWWA)
W75-11275

**HOW TO SEAL TUBING COLLAR LEAK**
For primary bibliographic entry see Field 8
W75-11287

**HOW DOWNHOLE TEMPERATURES, SURES AFFECT DRILLING; PART FALLS IN OVERPRESSURE PREDICTIO**
Continental Oil Co., Ponca City, Okla. Pro Research Dept.
For primary bibliographic entry see Field 8
W75-11294

**HOW DOWNHOLE TEMPERATURES, SURES AFFECT DRILLING; PART DICTING HYDROCARBON ENVIRON WITH WIRELINE DATA,**
Continental Oil Co., Houston, Tex. Pr Engineering Services.
For primary bibliographic entry see Field
W75-11295

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 6: CORRELATING GEOPRESSURE GRADIENTS WITH HYDROCARBON ACCUMULATIONS,
Continental Oil Co., Houston, Tex. Production Engineering Services.
For primary bibliographic entry see Field 8G.
W75-11296

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 7: THE SHALE RESISTIVITY RATIO - A VALUABLE TOOL FOR MAKING ECONOMIC DRILLING DECISIONS,
Continental Oil Co., Houston, Tex. Production Engineering Services.
For primary bibliographic entry see Field 8G.
W75-11297

## C. Hydraulic Machinery

XPERIMENTAL STUDY OF THE COOLING ATER SYSTEM, SETUBAL POWER PLANT, IO SADO, PORTUGAL,
assachusetts Inst. of Tech., Cambridge. Dept. of vil Engineering.
r primary bibliographic entry see Field 5B.
75-10855

OJUDICATING TENDERS FOR AERATION EVICES: BEST VALUE AND RELIABILITY,
r primary bibliographic entry see Field 5D.
75-10972

MP SELECTION,
sociated Engineering Services Ltd., Vancouver itish Columbia).
Walker.
Proceedings of the Annual Conference of the tish Columbia Water and Waste Association, ril 9-11, 1974, Vancouver, British Columbia, p 56. 7 fig, 5 ref.

criptors: *Pumps, *Waste water treatment, wage treatment, *Equipment, *Costs, erage, Pumping.

e pumping water and waste water adds only to cost and not to the value of a product, it is imtive that the pumping cost should be as low as ible. The four major factors in the cost struc- of pumping are installed cost-amortization, er or fuel costs, supervision and maintenance, the cost of down time and standby equip- In comparison to the overall cost of the enstallation the actual cost of the pumps and rs is a relatively small item. It is better to buy ment which may not be the cheapest but h will cost less in terms of fewer repairs and maintenance. Future expectations of rising costs necessitate that good system design be emented to insure that the best possible use is of the purchased energy. Down time of the m can be minimized with the installation of pumps rather than the conventional two (one running, one down for maintenance, and the unit in standby in case the operating unit Well pumps can either be vertical turbines hmersible pumps. If vertical turbine pumps be used. then a profile should be made of well upon completion. The traditional booster s are horizontal, double suction closed im- centrifugal pumps. The shaft diameter and stance from center to center of the bearing tals are the parameters to consider when ing these pumps. The selection of the ap- ate pumps for sewage transport is also sed, as well as the various makes of com- rs and self cleaning bar screens that have designed to aid in sewage transport. (Orr-
1002

NOZZLE HYDRAULICS IN THE TRICKLE IRRIGATION SYSTEM--RELATION BETWEEN WATER TEMPERATURE AND NOZZLE FLOW RATE (IN JAPANESE),
Tottori Univ. (Japan). Sand Dune Research Inst.
For primary bibliographic entry see Field 3F.
W75-11096

A SOLUTION TO PUMP STOPPAGES,
Irvine Ranch Water District, Calif.
S. Nelson.
Water and Sewage Works, Vol 121, No 9, p 106, September 1974.

Descriptors: *Pumps, *Sludge digestion, Solids, Flow, *Sewage treatment, *Waste water treatment, Treatment facilities, Equipment.
Identifiers: Comminutor/Macerator, Irvine Ranch Water District.

One problem in sludge digestion and treatment is the stoppage of waste pumps. This is caused by large articles such as cans, bottles, rags, and sticks which get pumped along with primary sludge to an aerobic digester, then to drying beds where they cause the pumps to become inoperative. The Irvine Ranch Water District has solved this problem by the use of a new unit called the Disposable Waste Systems Comminutor/Macerator, installed in the influent channel. This six inch model processes solid material prior to any pump action. The unit can run unattended for several months. The Irvine Ranch Water treatment plant has been using this machine for eight months continuously. Primary sludge and skimming pumps that feed the Comminutor/Macerator share a common discharge line; flow can be to both pumps at once or to either individually. Three new Comminutor/Macerators, 40 inch models, will be installed in the system in the near future. (Prague-FIRL)
W75-11111

AERATION DEVICES: THE MANUFACTURER'S VIEWPOINT,
For primary bibliographic entry see Field 5D.
W75-11121

CAVITATION CONTROL BY AERATION OF HIGH-VELOCITY JETS,
Bureau of Reclamation, Denver, Colo. Hydraulics Branch.
For primary bibliographic entry see Field 8B.
W75-11152

CAN A COMPUTER REALLY OPERATE A WATER-FILTRATION PLANT,
Kennedy Engineers, Inc., Tacoma, Wash.
For primary bibliographic entry see Field 5F.
W75-11184

A PNEUMATIC SYSTEM TO PUMP WATER FROM PIEZOMETERS,
Department of the Environment, Lethbridge (Alberta). Research Station.
T. G. Sommerfeldt, and D. E. Campbell.
Ground Water, Vol 13, No 3, p 293, May-June, 1975. 2 fig.

Descriptors: *Pump, *Piezometers, *Water pressure, *Hydraulic equipment, Measurement, Research equipment, On-site equipment, Design.
Identifiers: *Pneumatic pump.

A system to pump water from piezometers is operated by compressed air. It is especially useful where maximum suction lift, 32.5 feet at sea level, is exceeded and the casing is smaller than 3 inches. The pump is described and diagrammed. It has performed satisfactorily without air leakage. (Bradbeer-NWWA)
W75-11257

PITLESS ADAPTERS: EMPHASIS ON SANITATION,
Environmental Protection Agency, Washington, D.C. Div. of Water Supply.
W. J. Witsell.
Water Well Journal, Vol 29, No 4, p 56-58, April, 1975. 1 fig.

Descriptors: *Casings, *Wells, *Well regulations, *Pollution, Frost protection, Corrosion, Quality control, *Environmental sanitation.
Identifiers: *Pitless adapters, *Well pits, Pitless units, Poisonous gases, Well head.

Because of the pollution hazards involved, a well pit to house pumping equipment or to permit accessibility to the top of a water well is not recommended and, in some cases, is prohibited. The two general types of pitless installations are the pitless adapter, which connects the well from below the frost line to the pumping components, and the pitless unit which is an entire unit mounted on the well casing that has been cut off at the required depth. Problems of installation in this type of equipment often arise. Welding below ground is not conducive to good workmanship. Similarly, achieving a watertight joint is difficult. Clamps and gaskets for attachment of adapters and units are often criticized for their structural weakness. Compatibility between metals on the well, the pitless device, and the welding materials is necessary. Finally, provision for settlement of the well head is necessary. Procedures for inspecting and testing the pitless installations are important as they are installed within the zone of greatest corrosion and contamination potential within the upper 10 feet of the well structure. Testing procedures are outlined. (Bradbeer-NWWA)
W75-11258

LONGER LIFE FOR SUBMERSIBLES.
For primary bibliographic entry see Field 8G.
W75-11259

ELECTRICAL TESTS FOR SUBMERSIBLE PUMPS,
For primary bibliographic entry see Field 8G.
W75-11260

COLORADO CITY SOLVES ITS SAND PUMPING PROBLEMS,
Wright Water Engineers, Inc., Denver, Colo.
R. D. Tafelski.
Johnson Drillers Journal, p 1-3, March-April, 1975. 2 fig.

Descriptors: *Groundwater, *Sands, *Pumping, *Quality control, *Well filters, Well casings, Well screens, Gravels, Wells, Water wells, Sand aquifers, Filters, Silting, Sediment control, *Colorado.
Identifiers: *Burlington(Colo), *Sand pumping, *Ogallala aquifer, Pierre shale.

Investigations into the problem of sand pumping wells in Burlington, Colorado were made in 1973. Initial pumping in each well produced sand. Continued pumping reduced the amount of sand. As the problem worsened with time, the decision was made to drill a series of replacement wells. The new wells completely pierced the Ogallala and continued five feet into the Pierre shale. The size of the gravel pack was reduced and polyphosphates were introduced to aid in breaking down any mudcake on the borehole walls. The well was developed with careful backwashing to prevent the disruption of the gravel pack. The resulting wells produced sand-free water. (Bradbeer-NWWA)
W75-11261

WILL SUBMERSIBLES MAKE JET PUMPS OBSOLETE.
Water Well Journal, Vol 29, No 4, p 53-54, April, 1975.

Descriptors: *Pumps, *Cost comparison, *Cost analysis, Jets, Hydraulic equipment, Equipment, Performance, Deep-well pumping.
Identifiers: *Submersible pump, *Injector pump, *Ejector pump, Jet pump, Working head pump.

A comparison of the relative costs, capacities and working depths of the three types of pumps, working head, ejector and submersible, is made. Costs of installation are competitive at settings from 100 to 500 feet. The jet pump, or ejector alone, is cheapest but its cost rises when the cost of extra pipe length is added. The submersible pump is the most costly to manufacture but requires less pipe and cable to operated. The installation, access and repair of the jet pump are simplest of the three; but it has limitations as to the depth of installation. In wells of 4-inch diameter or larger and settings below 80 feet, the submersible pump develops the greatest volume of water per horsepower. The deeper the setting, the greater the capacity and horsepower advantage for the submersible. The deep well working head pump can be used in wells of narrower diameter. For wells of less than 100 feet, the ejector pump is best in price, capacity and installation ease. (Bradbeer-NWWA)
W75-11263

**INSTALLING SUBMERSIBLES.**
Water Well Journal, Vol 29, No 4, p 47-48, April, 1975.

Descriptors: *Pump testing, *Pumps, Planning, Loads(Forces), Well capacity, Aquifer properties, Power lead, Performance, Quality control, Hydraulic systems, Wells, Safe yield, Specific capacity.
Identifiers: *Submersibles, *Downhole pumping.

Proper planning and preparation are very important to the successful installation of a submersible pump and provide the best insurance against lost time on the job of installation. Well capacity should be predetermined to prevent over-pumping. Pre-installation checks of voltage capacity prevents burnouts. Other checks on wire size, length and placement of splices are common sense. A pump should be handled carefully and tested fully placing it downhole. Some tests for shipping damage are suggested. Once the submersible is emplaced careful operation should be the rule to insure maximum lifetime of the pump. (Bradbeer-NWWA)
W75-11264

**UNCONVENTIONAL AIR DRILLING REDUCES WELL COSTS.**
World Oil, Vol 178, No 7, p 91-93, June, 1974. 2 tab, 1 ref.

Descriptors: *Drilling, *Costs, Groundwater, Drilling equipment, Test wells, Borehole, Drilling fluid.
Identifiers: *Air drilling, Drilling techniques.

Data including penetration rates, number of bits per hole and a description of the cored formation as well as the drill bit types and sizes, pressures used and weight of the bits are tabulated and evaluated for two recent exploratory drilling programs by Shell Oil Company that involved air drilling. The costs reported illustrate the economic advantages of air drilling. (Bradbeer-NWWA)
W75-11270

**DRILLING RATE AFFECTS COSTS MORE THAN BIT LIFE,**
Sandia Labs., Albuquerque, N. Mex.
R. J. Lawrence.
Oil and Gas Journal, Vol 73, No 22, p 130-132, June 2, 1975. 3 fig, 4 ref.

Descriptors: *Drilling equipment, *Cost analysis, Economics, Evaluation, Equipment, Cost-benefit analysis, Wells, Efficiencies, Groundwater, Oil.
Identifiers: *Drilling rate, *Drill bit design, Cost reduction.

To simplify the economic evaluation of drilling costs it can be assumed that logging, casing, and completion costs are essentially fixed and independent of both drilling rate and drill bit life, the two areas open to improvement. Rotating and tripping costs are thus the only factors considered. Drilling rate is more significant than improved bit life from an economic point of view. Two examples to demonstrate this fact are given. (Bradbeer-NWWA)
W75-11279

**'SELF-TAPPING SCREW' BIT WOULD USE LIGHTER WEIGHTS,**
J. L. Kennedy.
Oil and Gas Journal, Vol 72, No 13, p 122-126, April 1, 1974. 11 fig, 1 ref.

Descriptors: *Drilling equipment, *Design criteria, *Penetration, *Weight, Pressure, Wells, Groundwater, Rotary drilling, Water wells.
Identifiers: *Drill bit, *Conical bit, Drilling rate.

A conical bit which uses its cutting to generate thrust forces is the basis of a program to develop a new boring technique. Because of the forces the bit requires only about 10% of the thrust of a conventional bit of similar diameter. The shape of the bit provides more cutting structure and produces a wedge-like effect on the rock. Cleaning should be improved as rock chips would not be caught under the bit. Also, if the side force generated is large enough or if the hole-bottom angle is small enough, the borer can be made self-advancing. Tests indicate the advantages of the conical bit. (Bradbeer-NWWA)
W75-11283

**HOW TO SEAL TUBING COLLAR LEAKS.**
Petroleum Engineer, Vol 45, No 6, p 66, June, 1973. 1 fig.

Descriptors: *Leakage, *Water wells, *Oil wells, *Linings, Technology, *Texas, Pressure Methodology, Seepage.
Identifiers: *Tubing collar, Bee County(Tex).

The technical solution to an actual problem case in Bee County, Texas is discussed. A leak in 2-inch tubing collar at 448 feet with tubing pressure 4150 psi and casing pressure 2000 psi was repaired in 5 hours with a 10-foot long steel liner. (Bradbeer-NWWA)
W75-11287

**WATER SYSTEM ACCESSORIES,**
W. Romano.
Water Well Journal, Vol 29, No 4, p 50-51, April, 1975.

Descriptors: *Water supply development, *Pumps, *Water pressure, *Public utilities, Overflow, Water rates, Water utilization, Water storage.
Identifiers: *Water system accessories, Pressure switch, Relief valve, Pressure tank.

A pump alone cannot provide automatic running water under pressure in all cases. Certain other accessories are needed and the combination of these forms a water system. The motor, the pressure switch, the relief valve, and the pressure tanks are basic components of a water system and provide the regulation of the amount of water pumped. A formula for estimating the pressure tank size necessary is presented, and examples are given. A larger than normal tank can be used to increase the useable volume of water in a slow producing well. An example of this is given. (Bradbeer-NWWA)
W75-11299

## 8D. Soil Mechanics

**WAVE MOTION IN ROCKFILL,**
Concordia Univ., Montreal (Quebec). Dept. Civil Engineering.
M. S. Nasser, and J. A. McCorquodale.
Journal of the Waterways, Harbors and Coas Engineering Division, Proceedings of Americ Society of Civil Engineers, Vol 101, No WW Proceedings Paper 11286, p 145-159, May 1975 fig, 21 ref, 2 append.

Descriptors: *Breakwaters, *Waves(Wate *Coastal engineering, *Dams, *Darcys law, Co puters, *Mathematical models, Rockfill dar Hydraulics, Porous media, Dispersion, Ener Equations.
Identifiers: *Finite differences.

A mathematical model, coupling an external n linear wave and the resulting internal flow i rockfill embankment with an impervious core presented. The method of characteristics al with a finite difference scheme were utilized in numerical solution. The model dealt with the n darcy flow regimes but could be simplified to t Darcy flow. Wave experiments on various rec gular rockfill embankments were described. numerical solutions for typical slow and fast c cases were compared with the corresponding perimental results. The theoretical and experim tal wave transmission curves, reflection co cients, and run-up values were shown to b good agreement. (Bhomik-ISWS)
W75-10924

**APPLICATION OF ELECTRICAL ANALO TO DRAW FLOW NETS FOR SUDDEN DR DOWN CONDITIONS IN EARTH DAMS,**
University Coll. of Engineering, Burla (In Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-11143

**GROUND WATER DEPLETION AND SIDENCE PROBLEMS IN TAIPEI BASIN,**
National Taiwan Univ., Taipei. Hydraulic Lal
For primary bibliographic entry see Field 4B.
W75-11262

## 8E. Rock Mechanics and Geology

**CONTOUR MAP OF THE BEDROCK FACE, NEW BRITAIN QUADRANGLE, NECTICUT,**
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C
W75-10950

**MAP SHOWING DEPTH TO BEDI WORTHINGTON QUADRANGLE, SACHUSETTS,**
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C
W75-10951

**MAP SHOWING DEPTH TO BED GREENFIELD QUADRANGLE, SACHUSETTS,**
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7
W75-10952

**MAP SHOWING DEPTH TO BE CHESTER QUADRANGLE, MASSACHU**
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field
W75-10953

AP SHOWING DEPTH TO BEDROCK, OUNT CARMEL QUANDRANGLE, CONNEC-CUT,
eological Survey, Hartford, Conn.
r primary bibliographic entry see Field 7C.
75-10954

E MECHANICS OF ROCK FAILURE DUE WATER JET IMPINGEMENT,
ll Telephone Labs., Inc., Whippany, N.J.
E. Forman, and G. A. Secor.
ciety of Petroleum Engineers Journal, Vol 14, 1, p 10-18, February, 1974. 10 fig, 2 tab, 17 ref.

scriptors: *Jets, *Hydraulic mining, ilure(Mechanics), Stress, Pressure, Rock chanics, Young's modulus, Poisson ratio, Ten- strength, Porosity, Permeability, Nozzles, w.
ntifiers: *Water jets.

initiation of fracture in a rock mass subjected he impingement of a continuous water jet has n studied. The jet is assumed to place a quasi- c pressure loading on the surface of the rock, ch is treated as a saturated, porous-elastic, opic, and homogeneous half-space. While this sure loading is held constant, the impinging r flows through the rock according to Darcy's and pressurizes the fluid in the pores. The pore sure distribution couples with the stress field lo the surface loading to produce an effective- s field, which can start tensile fracturing tly under the load. At various time intervals initial impingement, the effective-stress field mputed using finite element methods and the ts, together with the Griffith criterion for ten- ailure, produce the loci of the zones of frac- initiation. The behavior of these zones is dis- d as a function of the two jet parameters -- ure and nozzle diameter -- and the five rock erties: Young's modulus, Poisson's ratio, ten- trength, porosity and permeability, and time. rimental verification of the role of pore pres- was made in a laboratory study which is ibed. (Bradbeer-NWWA)
11272

RY OF PLASTICITY OF POROUS MEDIA FLUID FLOW,
Univ., Houston, Tex.
jic, and J. B. Cheatham, Jr.
y of Petroleum Engineers Journal, Vol 14, p 263-270, June, 1974. 16 ref.

iptors: *Plastic deformation, *Mathematical is, *Flow, *Viscosity, *Porosity, *Connate Structural geology, Deep water, Ground- Darcy's law, Mathematical model, Founda- investigation, Dam foundations, Rock nics, Rock properties, Porous media.
iers: *Thrust fault(Geology).

deformation of a porous medium contain- ving fluid is analyzed as a motion of a solid- ixture. The fluid is considered to be New- and the porous material consists of inter- ted pore spaces and of solid particles that form elastically. The effective stress princi- a general form of the yield function -- in- work-hardening characteristics -- and stress-strain relations are applied to e the plastic deformation of the solid. The of governing equations with the number of vns being equal to the number of equations ed. A possible method of solution of a problem is described. Some simplifications the assumptions of quasi-static plastic ation and incipient plastic deformation with lication of Darcy's law for the fluid flow cussed. To illustrate an application of the the problem of incipient plane plastic ation of a Coulomb material is presented. er-NWWA)
276

## 8F. Concrete

**TECHNIQUES FOR LINEAR TIE-BACK CEMENTING,**
MWL Tool and Supply Co., Midland, Tex.
H. E. Lindsey, Jr.
Petroleum Engineer, Vol 45, No 7, p 40-44, July, 1973. 1 fig.

Descriptors: *Linings, *Well casings, *Cements, Circulation, Sealants, Water wells, Oil wells, Deep wells, Groundwater, Leakage.
Identifiers: *Cementing, *Casing, strings, Cement placement.

Tie-back liners or casing strings are cemented to protect other casing in the well against pressure or corrosion, to close a leak, to add to confining strength or to cover worn or damaged casings. A tie-back liner usually extends from the top of a liner back to the surface but may extend only partially up the hole from the production liner. The two methods of cement placement around tie-back strings are by: (1) conventional circulation; and (2) reverse circulation. The equipment is different for each method. Which of these procedures is better is determined by the job requirements. (Bradbeer-NWWA)
W75-11277

**HOW BP ALASKA CEMENTS THROUGH PERMAFROST.**
Petroleum Engineering, Vol 45, No 4, p 38-42, April, 1973. 2 fig.

Descriptors: *Cements, *Mixing, *Permafrost, *Tundra, *Alaska, Oil wells, Technique, Portland cements, Gypsum, Concrete technology.
Identifiers: North Slope(Ala), Prudhoe Bay (Alas).

The approximately 2000 foot thick permafrost of Alaska's North Slope creates a unique problem in drilling methods and cement placement. Gypsum-portland cement blends offer an effective cement mixture of usage through permafrost because of their low heat of hydration, stability in freeze-thaw cycles, and wide range of temperature usage. Surface techniques and mixing equipment are described. The inner string cementing technique is used to cement the open hole. This technique along with precautions due to low temperatures is described. Also, three main types of batch mixing are evaluated for use at low temperatures. (Bradbeer-NWWA)
W75-11278

**HOW TO MAKE SQUEEZE CEMENTING SUCCESSFUL,**
Rike Service, New Orleans, La.
J. L. Rike.
Oil and Gas Journal, Vol 72, No 26, p 58-64, July 1, 1974. 3 fig, 3 tab, 20 ref.

Descriptors: *Wells, *Cements, *Slurries, *Sealants, *Methodology, Concrete additives, Concretes, Water wells, Well casings, Pipes, Groundwater.
Identifiers: *Squeeze cementing.

Squeeze cementing is an operation wherein cement slurry is forced under pressure to a specific point in a well, in order to repair casing or a cement job, or to seal the formation from well fluids. The significance of the volume of cement used, and of the pressure of the operation is delineated and the uses of high and low pressure squeeze are shown. Materials used as extenders, retarders, dispersants and accelerators in the cement slurry are described and their relative values are mentioned. Special problems that might aris during the operation such as lost circulation are recounted and control methods are suggested. (Bradbeer-NWWA)
W75-11286

**CASING-SEAT TESTING - WHY AND HOW.**
P. L. Moore.
Oil and Gas Journal, Vol 21, No 32, p 72-74, August 6, 1973. 5 fig.

Descriptors: *Pressure, *Water wells, *Drilling, *Testing, Frequency, *Methodology, Testing procedure, Concrete testing, Non-destructive testing, Quality control, Measurement, Casing, Well casing.
Identifiers: Leak-off, Casing seat, Fracture gradient.

Pressure testing below the casing seat is generally performed to test the cement job, and to determine the fracture gradient in the first sand below the casing shoe. The general procedure is discussed and some examples are given. Special considerations in running leak-off tests include the pumping rate, the decision to test, the pressure to be used, the frequency of testing and the maximum mud weight. These are discussed. (Bradbeer-NWWA)
W75-11291

**CEMENTING TODAY'S PROBLEM WELLS.**
Drilling, Vol 34, No 5, p 20-21, March, 1973.

Descriptors: *Cements, Technology, *Concrete additives, *Concrete technology, *Water wells, Linings, Pozzolans, Slurries, Concrete mixes, Concrete placing, Drilling, Casings, Deep wells.
Identifiers: *Thixotropic cement, Batch mixing(Cement), Continuous mixing(Cement).

The advantages and disadvantages of batch mixing and continuous mixing cement for use in wells are mentioned. Technological improvements of the continuous mixing process are predicted. The problem of cementing hot drill holes is met with a Class J cement in the form of supplements to certain oil well additives. A spacer, a hydrocarbon-based fluid which is compatible with mud and slurry, is credited with improving mud removal. Thixotropic slurries, gelatinous cements, are developed to support incompetent formations. (Bradbeer-NWWA)
W75-11293

## 8G. Materials

**COMPUTER ALGORITHMS USEFUL FOR DETERMINING A SUBSURFACE ELECTRICAL PROFILE VIA HIGH FREQUENCY PROBING,**
California Univ., Livermore. Lawrence Livermore Lab.
D. L. Lager, and R. J. Lytle.
UCRL-51748, February 13, 1975. 14 p, 23 fig, 13 ref. ERDA Contract W-7405-Eng-48.

Descriptors: *Algorithms, *Electromagnetic waves, *Geophysics, Computers, Mathematical studies, Mathematics, Electrical well logging, Exploration, *Subsurface mapping.
Identifiers: *High-frequency probing, ART algorithm, SIRT algorithm, BPT algorithm, Resolving power, Convergence rate, Tomography.

The data inversion algorithms developed in the last few years by investigators in the field of x-ray tomography for producing 3-D reconstructions of the human head and torso from 2-D projections have been applied to the problem of determining the structure of the ground between a pair of drill holes. The 'projections' were made by probing the ground at high frequencies and recording the magnitude and phase of the received signal for various positions of transmit and receive antennas. The region between the holes was divided into rectangular zones (like a checkerboard) and several algorithms were applied to assign appropriate values of electrical permittivity and skin depth to each zone. The three most successful algorithms to date have been modified versions of the tomographer's ART (algebraic reconstruction technique), SIRT (simultaneous iterative reconstruction technique),

and BPT (back projection technique). Results were presented to show the ability of the algorithms to resolve various-sized simulated anomalies that are analogous to voids and ore bodies. Finally, the results of experimental measurements were presented. (Sanderson-ISWS)
W75-10910

CORROSION BY DOMESTIC WATERS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5F.
W75-11062

LONGER LIFE FOR SUBMERSIBLES.
Water Well Journal, Vol 29, No 4, p 60, April, 1975.

Descriptors: *Corrosion, *Alkaline materials, *Pitting(Corrosion), *Pumps, Hydraulic equipment, Protection, Corrosion control, Chemical degradation, Water softening, Algae, Bacteria, Acidic water, Submerged, Equipment.
Identifiers: *Soda ash, Submersible pump.

Pitting due to organic growth on a pump and corrosion due to acid well water are two important causes of shorter life for pumps. Pitting occurs when bacteria or algae in well water attach themselves to the metal surface. They create minute electrolytic cells and a voltage differential between the metal under the organism and the water surrounding it. This differential is transmitted by metallic ions transferring into solution leaving behind a pit. Chlorination to kill the organisms can solve this problem. Corrosion by acid well water can be detected by sampling the water. Correction of acid water can be accomplished by addition of alkaline substances such as soda ash at the pump. (Bradbeer-NWWA)
W75-11259

ELECTRICAL TESTS FOR SUBMERSIBLE PUMPS,
R. C. Middleton.
Water Well Journal, Vol 29, No 4, p 61-62, April, 1975. 6 fig.

Descriptors: *Testing procedures, *Electrical equipment, *Resistivity, *Electric currents, Electric motors, Pumps, Water wells, Groundwater, Inspection.
Identifiers: *Submersible pump.

Submersible pump motors are designed to operate within a line-voltage variation limit of approximately plus-or-minus 10 percent. Voltage is suitably measured with a small a-c voltmeter at the control box, as for a single-phase motor, or at the magnetic starter as for a three-phase motor. The test method is shown in a diagram. Difficulties in a submersible pumps can also be caused by excessive current drain. To measure current an a-c ammeter is inserted in series with the line. Current should be measured in each of the three motor lines of a three-phase system, then unequal readings indicate trouble. Insulation resistance can be checked with a high range ohmmeter. Readings of less than 5 million ohms for a new installation indicate a leak in the system. (Bradbeer-NWWA)
W75-11260

BASIC CONCEPTS AND PRACTICAL ASPECTS OF CORROSION INVESTIGATION,
Corrosion Control Technologists, Houston, Tex.
M. A. Riordan.
Materials Protection and Performance, Vol 12, No 4, p 55-59, April 1973. 7 fig.

Descriptors: *Corrosion, *Oxidation, *Chemical degradation, Investigations, *On-site investigations, On-site data collection, Pipelines, Foundations, Well casings, Steel pipes, Water wells, Electrical potential.
Identifiers: IR drop measurements, Half cell method.

Four field techniques of corrosion investigation using common electrical measurements have been described and categorized as to application under various field conditions. They include the IR drop measurements, the standard half cell method, soil-to-soil potentials, and pipe-to-soil potentials. The development of a fundamental corrosion circuit reference diagram has been reviewed step by step and its practical significance outlined. (Campbell-NWWA)
W75-11271

THE KINETICS OF CRYSTALLIZATION OF SCALE-FORMING MINERALS,
State Univ. of New York, Buffalo.
G. H. Nancollas, and M. M. Reddy.
Society of Petroleum Engineers Journal, Vol 14, No 2, p 117-126, April, 1974. 8 fig, 1 tab, 32 ref.

Descriptors: *Scaling, *Calcium sulfate, *Calcium carbonate, *Crystal growth, *Growth rates, *Kinetics, Hard water, Activation energy, Electrolytes, Descaling, Groundwater, Wells, Pipes, Phosphates, Water chemistry.
Identifiers: *Calcium sulfate, Scale inhibitors, Second order rate law, Phosphonate.

Reviewed is the kinetics of crystal growth of sparingly soluble minerals such as calcium carbonate, calcium sulfate, and barium sulfate, which frequently cause scaling problems in oil fields. For all three electrolytes, the crystal growth is surface controlled and follows a second-order rate law with an activation energy for the growth process of 10 to 20 kcal mol-1. The growth of calcium sulfate seeded crystal above 100 degrees C demonstrates the importance of characterizing polymorphic transformation processes. Phosphonate scale inhibitors show differing modes of inhibition in systems precipitating CaCO3 and CaSO4. (Bradbeer-NWWA)
W75-11273

DISSOLVED GASES ARE KEY CORROSION CULPRITS,
Petrotech Ltd., London (England).
C. C. Patton.
Oil and Gas Journal, Vol 72, No 29, p 66-69, July 22, 1974. 3 fig, 3 ref.

Descriptors: *Corrosion, *Dissolved oxygen *Electrochemistry, *Hydrogen sulfide, *Carbon dioxide, Flow rate, Aging(Physical), Chemical degradation, Well casings, Well screens, Oxidation, Steel, Chemical reactions, Deterioration.
Identifiers: *Corrosion cell, Dissolved gases.

Corrosion prevention is particularly important as drill pipe becomes scarcer and more precious. Corrosion theory and the susceptibility of steel and other metals to corrosion are discussed. The effects on corrosion rates of dissolved oxygen, carbon dioxide, and hydrogen sulfide are mentioned as well as the effects of physical variables such as fluid velocity and pressure. (Bradbeer-NWWA)
W75-11274

SIMPLE FIELD CHECKS WILL PROVIDE ACCURATE DST DATA,
Halliburton Services, Monahans, Tex.
S. J. Bateman.
World Oil, Vol 178, No 5, p 97-100, April, 1974. 6 fig, 6 ref.

Descriptors: *Pressure, *Testing, *Measurement, *Drilling, Procedure, Deep wells, High pressure, Hydrostatic pressure, On-site investigations, On-site tests.
Identifiers: *Drill stem test data.

Drillstem tests (DST) are an important exploratory tool but, in the past, only 35% of tests run have obtained information adequate for analyses. The importance and methods of testing are stressed and preliminary test chart evaluation procedures are outlined. The accuracy of the DST is limited b[y] data quality that is assured only by careful testin[g] procedure. (Campbell-NWWA)
W75-11281

SPECIAL ANNULUS FLUID EASES CASIN[G] RECOVERY.
World Oil, Vol 178, No 5, p 117, April, 1974. 2 fig

Descriptors: *Drilling equipment, *Well casing *Pipes, *Tubes, *Lubricants, Efficiencies, Wat[er] wells.
Identifiers: *Equipment recovery, *Dry wells, A[n]nulus fluid.

An operator recently recovery 6,100 feet of inte[r]mediate casing from an unsuccessful wildcat we[ll] three weeks after the pipe was set. Recovery w[as] facilitated by a new annulus fluid which lubricat[es] and protects the pipe until it is pulled. (Bradbe[er]-NWWA)
W75-11282

TESTS SHOW POTASSIUM MUD VERSATI[LI]TY,
NL Industries, Inc., Houston, Tex. Baroid Div.
T. C. Mondshine.
Oil and Gas Journal, Vol 72, No 16, p 120-1[24] April 22, 1974. 8 fig, 4 tab, 8 ref.

Descriptors: *Drilling fluids, *Mud, *Potass[ium] compounds, *Feasibility studies, Stability, Sha[le] Stabilization, Salts, Surfactants, Oil wells, W[ater] wells.
Identifiers: *Potassium lignite.

A new potassium-based mud system is prepa[red] with potassium chloride or other potassium c[om]pounds, and contains a potassium lignite de[ri]vative for limiting shale hydration and reducing [fil]tration. A special nonionic surfactant is usec[d] controlling rheology. The system exhibits s[hale] stability, solids tolerance, versatility, and the[rmal] stability. Laboratory and field tests confirm [its] utility. Preparation of the system is recom[mended] step-by-step. (Bradbeer-NWWA)
W75-11284

HOW TO FIND TRANSITION ZONES IN S[OFT] FORMATIONS,
Continental Oil Co., Houston, Tex.
P. E. Pilkington, and W. H. Fertl.
World Oil, Vol 180, No 5, p 98-102, . .pril, 1[975]. fig, 10 ref.

Descriptors: *Drilling, *Pressure, *Measure[ment] High pressure, Safety, Shallow wells, D[rilling] fluid, Weight, Groundwater, Water wells.
Identifiers: *Formation pressure, *Tran[sition] zones of pressure, Soft formations(Geolog[y]), exponent.

Pin-pointing transition zones in soft, shallo[w] formations often in difficult, but when certain [drilling] variables such as overbalance and hydraul[ic] monitored and held constant, d ex[ponent] techniques can be used successfully. The [d] exponent is in widespread use as a formatio[n pressure] sure detection device. The d exponent is d[rilling] problems in its use are discussed and some [effec]tive means of improving utility of d expone[nt] are suggested. (Bradbeer-NWWA)
W75-11285

MAKING LOG ANALYSTS OF GEOLOG[Y]
For primary bibliographic entry see Field 7
W75-11288

CASING-SEAT TESTING - WHY AND H[OW]
For primary bibliographic entry see Field [8]
W75-11291

OW TO CONDUCT CORROSION TESTS,
D. Palmer.
anadian Chemical Processing, Vol 57, No 8, p 52, 4-55, August, 1973. 3 fig.

escriptors: *Corrosion, *Methodology, Corrosion control, *Testing procedures, Evaluaon, Testing, Materials testing, Laboratory tests, uality control, Sampling, On-site tests, Materi-.

entifiers: *Corrosion tests, Corrosion detection.

me degree of control over corrosion test condins must be obtained. In the field, this control y be limited to knowing the operating condins have not changed appreciably, or have anged in a specific way. Complete control over material and operating variables may be obed, but may be impractical. Exposure time of ts, preparation of samples, choice of samples, ice of measuring equipment, and sample size y all affect corrosion results. In tests involving exposure, even the local weather may be a fac- (Bradbeer-NWWA)
5-11292

W DOWNHOLE TEMPERATURES, PRESRES AFFECT DRILLING; PART 4: PITLS IN OVERPRESSURE PREDICTION,
tinental Oil Co., Ponca City, Okla. Production earch Dept.
H. Fertl, and D. J. Timko.
rld Oil, Vol 175, No 4, p 45-49, September, 2. 6 fig.

criptors: *Drilling, *Pressure, *High Pressure, mperature, Evaluation, Salt, Shales, Drawn, Caprock, Geophysics, Oil, Groundwater. tifiers: *Formation pressure, Sloughing, Pres- drawdown, Pressure seals, Pressure bridge.

many factors that affect the use of wireline niques to determine abnormal pressure enments are described. The proper compensa- for these factors and their recognizable acteristics are given to avoid costly misinetations. A comprehensive discussion of how ocks relate to overpressure is included. (See 11295 thru W75-11296) (Bradbeer-NWWA)
11294

DOWNHOLE TEMPERATURES, PRESES AFFECT DRILLING; PART 5: PREING HYDROCARBON ENVIRONMENTS H WIRELINE DATA,
nental Oil Co., Houston, Tex. Production eering Services.
Timko, and W. H. Fertl.
l Oil, Vol 175, No 5, p 73-80, 88, October, 6 fig, 54 ref.

iptors: *Drilling, *Pressure, *Temperature, pressure, *Spatial distribution, Distribution ns, Oil, Gas, Hydrocarbons, Statistical ds, Correlation analysis, Groundwater, Exon, Regional analysis, Oil industry, Deep

iers: Oil exploration.

ds of predicting the presence of hydrocarn a geographical area of investigation are sed. Methods involve comparing log derived ir data to statistical properties of hydrocarvironments. The distribution of terrestrial lay diagenesis, and the sand-shale ratio are d in an attempt to correlate such statistics l and gas occurrence. (See also W75-11294) eer-NWWA)
295

DOWNHOLE TEMPERATURES, PRES- AFFECT DRILLING; PART 6: CORING GEOPRESSURE GRADIENTS HYDROCARBON ACCUMULATIONS,
ntal Oil Co., Houston, Tex. Production ering Services.

D. J. Timko, and W. H. Fertl.
World Oil, Vol 175, No 6, p 79-82, November, 1972. 6 fig, 1 tab, 19 ref.

Descriptors: *Drilling, *Pressure, *Temperature, *Spatial distribution, *Oil, *Gas, *Hydrocarbons, Deep wells, Distribution patterns, Oil industry, Correlation analysis.
Identifiers: *Pressure-depth gradient.

Geopressure gradients are correlated with the spatial and depth distribution of hydrocarbon accumulations. Temperature-pressure-depth relationships and abnormal pressure conditions can be related to gas and oil fields, even size of reservoirs. In addition, some reasons why gas occurrence predominates at deeper depths are suggested. (See also W75-11294) (Bradbeer-NWWA)
W75-11296

**HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 7: THE SHALE RESISTIVITY RATIO - A VALUABLE TOOL FOR MAKING ECONOMIC DRILLING DECISIONS,**
Continental Oil Co., Houston, Tex. Production Engineering Services.
D. J. Timko, and W. H. Fertl.
World Oil, Vol 175, No 7, p 59-63, December, 1972. 6 fig, 6 ref.

Descriptors: *Drilling, *Shale, *Resistivity, *High pressure, *Oil, Gas, Exploration, Geophysics, Oil industry, Oil wells, Deep wells, Statistical analysis, Groundwater.
Identifiers: *Shale resistivity ratio.

The shale resistivity ratio profile for an area such as the Gulf Coast, or similar geologic basins with sand-shale sequences, can save millions of drilling dollars. The profile can indicate whether it is possible for commercial production to exist below the depth to which the well has already been logged, and whether it is economically attrative to continue a borehole below a given depth. Basic guidelines for use of the method and some selected field examples of its application are presented. (See also W75-11294) (Campbell-NWWA)
W75-11297

**HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 8: NEEDLESS SPENDING OF DRILLING AND EXPLORATION MONEY CAN BE PREDICTED-AND PREVENTED,**
Continental Oil Co., Houston, Tex. Production Engineering Services.
D. J. Timko, and W. H. Fertl.
World Oil, Vol 176, No 1, p 45-48, January, 1973. 7 fig.

Descriptors: *Drilling, *Exploration, *Oil, *Gas, *High pressure, Electrical well logging, Well data, Deep wells, Ground water.
Identifiers: *High pressure gradients.

Proper analysis of log-calculated temperatures and pressures can save millions of dollars by preventing unnecessary drilling and setting of additional casing in unfavorable hydrocarbon environments. How to predict whether commercial production can exist below a given depth in a drilling well is described and - as an example of the analysis method - why certain offshore Texas acreage is an extremely poor hydrocarbon prospect is explained. (See also W75-11294) (Campbell-NWWA)
W75-11298

## 8I. Fisheries Engineering

**LIMNOLOGY OF DESERT PONDS,**
Arizona Univ., Tucson. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2H.
W75-10880

**SOME LIMNOLOGICAL CHARACTERISTICS OF ARIVACA LAKE IN SOUTHERN ARIZONA,**
Arizona Univ., Tucson.
For primary bibliographic entry see Field 2H.
W75-10891

**SURVIVAL AND GROWTH RATE OF CHANNEL CATFISH AS A FUNCTION OF DISSOLVED-OXYGEN CONCENTRATION,**
Arkansas Univ., Little Rock. Dept. of Electronics and Instrumentation.
For primary bibliographic entry see Field 5C.
W75-11051

**UNISEX STUDIES ON THE WHITE AMUR,**
Bureau of Sport Fisheries and Wildlife, Stuttgart, Ark. Fish Farming Experiment Station.
For primary bibliographic entry see Field 5C.
W75-11205

**THE EFFECTS OF THE FORMATION OF LAKE KAINJI (NIGERIA) UPON THE INDIGENOUS FISH POPULATION,**
Ife Univ. (Nigeria). Kainji Dam Research Project.
For primary bibliographic entry see Field 5C.
W75-11223

**EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. IV. FEEDING OF INTRODUCED AND AUTOCHTHONOUS NON-PREDATORY FISH,**
Warsaw Univ. (Poland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W75-11234

# 10. SCIENTIFIC AND TECHNICAL INFORMATION

## 10B. Reference and Retrieval

**DEVELOPMENT OF A BIBLIOGRAPHIC INFORMATION SYSTEM FOR WATER YIELD IMPROVEMENT PRACTICES,**
Arizona Univ., Tucson. School of Renewable Natural Resources.
L. M. White, D. B. Thorud, and P. F. Ffolliott.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 696, $3.25 in paper copy, $2.25 in microfiche. Completion Report, August 1975. 6 p, 9 ref. OWRT A-042-ARIZ(9). 14-31-0001-3803.

Descriptors: *Information retrieval, Computers, *Bibliographies, *Water yield improvement, *Watershed management, *Arizona, Southwest U.S., Water yield, Forest management, Land management, Water sources, Vegetation effects, Water quality.
Identifiers: Bibliographic searches, Information systems, Literature searches.

Development of the Watershed Management Information System (WAMIS) began in 1972. WAMIS is designed to serve a variety of users who are interested in water and natural resource research in Arizona. WAMIS is a computerized bibliographic reference retrieval system which provides literature searches for users, in the form of individualized computer printouts of citations and abstracts, based upon a user's special interests. The literature covered in WAMIS includes effects of land management practices and vegetation management on water and other related resources, such as forage production, wildlife habitat, timber production, and recreational use. Research done in Arizona has been emphasized. General procedures used in banking and retrieval are described. Types of search requests have varied, including topics such as wildlife use of ponderosa pine forests, environmental and vegetation effects on evapotranspiration, hydrologic

modeling, Arizona water quality data, the effect of timber cutting practices on runoff, and revegetation of treated pinyon-juniper vegetation.
W75-11050

## 10C. Secondary Publication And Distribution

**THE AWARENESS OF THE RELEVANT WATER RESOURCES LITERATURE BY THE PERSONNEL OF THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES,**
Wisconsin Univ., Madison. Library School.
R. D. Walker, G. J. Zuck, R. E. Durrance, and J. R. Luedtke.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 500, $4.75 in paper copy, $2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS WRC 75-09, August 1975. 81 p, 23 ref, 18 charts, append. OWRT B-083-WIS(2). 14-31-0001-4138.

Descriptors: *Documentation, *Publications, *Information exchange, Technical writing, Wisconsin, Personnel.
Identifiers: *Wisconsin Department of Natural Resources, *Information transfer.

This study is the second part of the first phase of a more comprehensive research study to examine the transfer of information in the area of water resources. It deals with the physical characteristics, the sources of financial support, publishing sources, format, availability, and subject concentration of the literature (publications) designated to be relevant by a sample of water resources personnel employed by the Wisconsin Department of Natural Resources. Journal title dispersion is described for the applicable literature. Awareness or unawareness of the relevant literature is of primary concern as is a determination of the difference between the known and the unknown literature. (See also W75-07996)
W75-10899

**HEAVY METALS AND OTHER TRACE ELEMENTS,**
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W75-10934

**NON-RENEWABLE, NON-ENERGY RESOURCES,**
Leicester Univ (England). Public Sector Economics Research Centre.
For primary bibliographic entry see Field 6B.
W75-11253

**THE TOXICITY OF DRILLING FLUID COMPONENTS TO AQUATIC BIOLOGICAL SYSTEMS, A LITERATURE REVIEW,**
Fisheries and Marine Service, Winnipeg (Manitoba).
For primary bibliographic entry see Field 5C.
W75-11266

## 10D. Specialized Information Center Services

**DEVELOPMENT OF A BIBLIOGRAPHIC INFORMATION SYSTEM FOR WATER YIELD IMPROVEMENT PRACTICES,**
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 10B.
W75-11050

## 10E. Translations

**TRANSLATIONS ON ENVIRONMENTAL QUALITY, NO. 33.**
Joint Publications Research Service, Arlington, Va.
For primary bibliographic entry see Field 05G.
W75-11246

## 10F. Preparation Of Reviews

**HEAVY METALS AND OTHER TRACE ELEMENTS,**
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 05B.
W75-10934

**WATER AND WASTEWATER DISINFECTION WITH OZONE: A CRITICAL REVIEW,**
Cincinnati Univ., Ohio.
For primary bibliographic entry see Field 05D.
W75-10956

**COMPUTER SYSTEMS AND WATER RESOURCES,**
Polytechnic Institute of New York, Brooklyn; and Illinois Univ., Chicago.
For primary bibliographic entry see Field 06A.
W75-11174

**THE TOXICITY OF DRILLING FLUID COMPONENTS TO AQUATIC BIOLOGICAL SYSTEMS, A LITERATURE REVIEW,**
Fisheries and Marine Service, Winnipeg (Manitoba).
For primary bibliographic entry see Field 05C.
W75-11266

**CONSIDERATIONS FOR PREPARATION OF OPERATION AND MAINTENANCE MANUALS,**
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
For primary bibliographic entry see Field 05D.
W75-11317

# SUBJECT INDEX


**2-4-5-T**
Occurrence of 2, 4, 5-T and Picloram in Surface Runoff Water in the Blacklands of Texas,
W75-10895 5B

**2-4-D**
Field Tests of Slow-Release Herbicides,
W75-11193 5G

Aquatic Plant Control on Lake Corpus Christi,
W75-11194 5G

Dissipation of Residues of Phenoxy Herbicides Applied for Water Milfoil Control in Large Reservoirs,
W75-11198 5B

**ABATE**
The Effects of Experimental Blackfly (Diptera: Simuliidae) Larviciding with Abate, Dursban, and Methoxychlor on Stream Invertebrates,
W75-11157 5C

**ABRASION**
Measurement of Cobble Abrasion in Natural Streams,
W75-10881 2J

**ABSCISIC ACID**
The Role of Endogenous Abscisic Acid in the Response of Plants to Stress,
W75-11319 3F

**ABSORPTION**
Absorption and Elimination of Photodieldrin by Daphnia and Goldfish,
W75-11085 5B

**ACTIVATED CARBON**
Carbon Regeneration by Wet Air Oxidation,
W75-10988 5D

Activated Carbon in the Water Treatment Plant,
W75-10992 5D

Activated Carbon Adsorption Technique for Third Stage Sewage Water Treatment, (In Japanese),
W75-11108 5D

**ACTIVATED SLUDGE**
Preserving Activated Sludge,
W75-10962 5D

Settlement and Sludge Return in Activated-Sludge Type Package Plants,
W75-10973 5D

Nitrogen Removal in the Operation of the Mililani Sewage Treatment Plant,
W75-11041 5D

Huntingdon Research Centre Pasveer Oxidation Plant--Six Years On,
W75-11115 5D

Aeration by Means of Blast Nozzle--A Possibility for the Aeration of Biological Waste Water Treatment Plants (Die Strahlduesenbegasung--eine Moeglichkeit zur Belueftung biologischer Klaeranlagen),
W75-11124 5D

Extractions of Heavy Metals in the Activated Sludge Process,
W75-11173 5D

Papermaking Complex at Dunaujvaros (Hungary) -- Preserving the Danube (Au complexe papetier de Dunaujvaros -- preserver le Danube),
W75-11333 5D

**ADAPTATION**
Adaptation of Copepod Populations to Thermal Stress,
W75-11046 5C

**ADMINISTRATION**
The Law of Water Allocation in Kentucky,
W75-10898 6E

Water Resources,
W75-11003 5G

**ADMINISTRATIVE AGENCIES**
The Water Industry in Transition,
W75-11252 3E

**ADMINISTRATIVE DECISIONS**
Human Obstacles to the Control of the Hydrological Cycle for the Benefit of Man,
W75-10866 2A

**AERATION**
Concurrent Nitrification-Denitrification at the Sediment-Water Interface as a Mechanism for Nitrogen Losses from Lakes,
W75-10902 5C

First Stage of the World's Largest Pure Oxygen Sewage Plant to Undergo Test.
W75-10960 5D

Aeration Devices: Basic Theory,
W75-10971 5D

Adjudicating Tenders for Aeration Devices: Best Value and Reliability,
W75-10972 5D

Innovative Process Treats Wastewater,
W75-10975 5D

Aeration Devices: The Manufacturer's Viewpoint,
W75-11121 5D

**AERATION DEVICES**
Adjudicating Tenders for Aeration Devices: Best Value and Reliability,
W75-10972 5D

**AERATORS**
Aeration by Means of Blast Nozzle--A Possibility for the Aeration of Biological Waste Water Treatment Plants (Die Strahlduesenbegasung--eine Moeglichkeit zur Belueftung biologischer Klaeranlagen),
W75-11124 5D

**AERIAL PHOTOGRAPHY**
The Utilization of Sun-Glint in a Study of Lake Dynamics,
W75-11239 5A

**AEROBIC CONDITIONS**
Innovative Process Treats Wastewater,
W75-10975 5D

**AEROBIC TREATMENT**
Aerobic Lagoon Waste Treatment System and Method,
W75-11069 5D

Mill Experience in the Treatment of Mechanical Pulping Effluent,
W75-11332 5D

**AESTHETICS**
Water Application Practices and Landscape Attributes Associated with Residential Water Consumption,
W75-11059 3D

**AESTIVATION**
Seasonal Abundance and Diversity of Benthos in a Southern Illinois, USA Swamp,
W75-11312 2H

**AFRICA**
International Development Strategies for the Sahel.
W75-10861 4A

The Effects of the Formation of Lake Kainji (Nigeria) Upon the Indigenous Fish Population,
W75-11223 5C

**AGASICLES HYGROPHILA**
Biological Control of Alligator Weed, 1959-1972,
W75-11202 5G

**AGRICULTURE**
Estimation of Safe Periods for Crop Planning Under Dryland Agriculture,
W75-10926 3F

An Implicit Approach to Pricing Agricultural Water Transfers to Urban Uses,
W75-11178 4A

**AHOSKIE CREEK (NC)**
Predicting Recessions Through Convolution,
W75-10917 2E

**AIR DRILLING**
Unconventional Air Drilling Reduces Well Costs.
W75-11270 8C

**AIR POLLUTION**
Evidence of Atmospheric Transport of Ozone into Urban Areas,
W75-11169 5A

Economic Analysis of Effluent Guidelines. Ferroalloys Industry.
W75-11250 5G

**ALASKA**
How BP Alaska Cements Through Permafrost.
W75-11278 8F

**ALCOHOLS**
An Investigation of Glycolate Excretion in Two Species of Blue-Green Algae,
W75-11230 5C

**ALGAE**
Nitrogen Removal by Catalyst-Aided Breakpoint Chlorination,
W75-10965 5D

Wastewater Treatment Using Algae and Artemia,
W75-10967 5D

Relations Between Algal Populations and the pH of Their Media,
W75-11028 5C

Biochrome Analysis as a Method for Assessing Phytoplankton Dynamics, Phase II,
W75-11052 5C

Influence of Oil on Nucleic Acids of Algae,
W75-11080 5C

Concentration and Genera of Algae in Selected Illinois Streams, 1971-1973,
W75-11165 5A

Algae in Baltimore's Reservoirs,
W75-11221 5C

**ALGAE**

The Growth of Some Epiphytic Algae in a Lake Receiving Thermal Effluent,
W75-11225 5C

A Contribution to the Biology of Nitella Hookeri A. BR. in the Rotorua Lakes, New Zealand. II. Organic Nutrients and Physical Factors,
W75-11235 5C

**ALGAE COMPOSITION**
Concentration and Genera of Algae in Selected Illinois Streams, 1971-1973,
W75-11165 5A

**ALGAE DENSITY**
Concentration and Genera of Algae in Selected Illinois Streams, 1971-1973,
W75-11165 5A

**ALGAE TYPE**
Concentration and Genera of Algae in Selected Illinois Streams, 1971-1973,
W75-11165 5A

**ALGAL CONTROL**
Electrolytic Control of Algae,
W75-11228 5F

Algae Control in Northwest Reservoirs,
W75-11231 5G

**ALGAL REMOVAL**
Algae Removal Using Dissolved Air Flotation,
W75-10978 5D

**ALGORITHMS**
Computer Algorithms Useful for Determining a Subsurface Electrical Profile Via High Frequency Probing,
W75-10910 8G

**ALKALI SACATON**
Establishing Alkali Sacaton on Harsh Sites in the Southwest,
W75-10882 4A

**ALKALINE MATERIALS**
Longer Life for Submersibles.
W75-11259 8G

**ALKALINE WATER**
System for Softening and Dealkalizing Water by Electrodialysis,
W75-11065 5F

**ALLIGATORWEED**
Biological Control of Alligator Weed, 1959-1972,
W75-11202 5G

**ALLUVIAL AQUIFIERS**
Hydrogeology and Water Resources of Middle Kirkland Creek Basin, Yavapai County, Arizona,
W75-10872 4B

**ALLUVIAL CHANNELS**
Stochastic Analysis of Particle Movement Over a Dune Bed,
W75-10942 2J

**ALTERNATIVE PLANNING**
Improved Design of Distribution Networks by Minimum Route,
W75-11175 4A

The Louisiana Environmental Management System and Its Utility in Water Resource Planning,
W75-11177 5G

**ALUM**
Optimum Values for Operational Variables in Turbidity Removal,
W75-11110 5D

**AMERICAN OYSTER EGGS**
Effects of Ozone-Treated Seawater on the Spawned, Fertilized, Meiotic, and Cleaving Eggs of the Commercial American Oyster,
W75-11256 5C

**AMMONIA**
Nitrogen Removal by Catalyst-Aided Breakpoint Chlorination,
W75-10965 5D

The Effects of Free Ammonia and Free Nitrous Acid on the Nitrification Process,
W75-11101 5D

Ammonia Excretion by Zooplankton and its Significance to Primary Productivity During Summer,
W75-11187 5C

**AMMONIA EXCRETION**
Ammonia Excretion by Zooplankton and its Significance to Primary Productivity During Summer,
W75-11187 5C

**AMMONIUM-NITROGEN**
Concurrent Nitrification-Denitrification at the Sediment-Water Interface as a Mechanism for Nitrogen Losses from Lakes,
W75-10902 5C

**AMOEBAE POPULATION DENSITY**
Pathogenic Free-Living Amoebae in Arkansas Recreational Waters,
W75-11053 5A

**AMPHIPODA**
Factors Influencing Acute Toxicity Estimates of Hydrogen Sulfide to Freshwater Invertebrates,
W75-11027 5C

**ANABAENA**
An Investigation of Glycolate Excretion in Two Species of Blue-Green Algae,
W75-11230 5C

**ANAEROBIC ACIDOGENESIS**
Anaerobic Acidogenesis of Wastewater Sludge,
W75-10976 5D

**ANAEROBIC DIGESTION**
Anaerobic Acidogenesis of Wastewater Sludge,
W75-10976 5D

Nitrogen Removal in the Operation of the Mililani Sewage Treatment Plant,
W75-11041 5D

**ANALOG MODELS**
Application of Electrical Analogy to Draw Flow Nets for Sudden Drawdown Conditions in Earth Dams,
W75-11143 8B

**ANALYTICAL TECHNIQUES**
Advances in the Detection of Water Pollutants,
W75-10995 5A

Measures of Biodegradability and Refractory Organics in Wastewaters: (Analysis, Interpretation, and Application of Measurement Techniques),
W75-11103 5D

Advanced Techniques in the Mathematic Modeling of Water-Distribution Systems.
W75-11183 4

Application of the Manometric Technique the Study of Sediment Oxygen Depletion,
W75-11222

Extraction and Analytical Techniques for Pe cides in Soil, Sediment, and Water,
W75-11236

Making Log Analysts of Geologists
W75-11288

Detection of Change in Sequences Hydrologic Data,
W75-11302

Interference of Mercury(II) in the Colorime Determination of Inorganic Phosphate Water,
W75-11340

Modification of the Iodimetric Titra Method for the Determination of Bromide Its Application to Mixed Domestic-Indus Waste Effluents,
W75-11341

**ANIMAL PHYSIOLOGY**
Mercury Content of Whales, (In Japanese).
W75-11029

The Effects of Oil Dispersants on the Ce Fertilization and Development,
W75-11091

**ANION EXCHANGE**
Chromatographic Determination of Pheno Water,
W75-11344

**ANTITRANSPIRANTS**
Effects of Antitranspirants on Yield of Sorghum Under Limited Irrigation,
W75-10858

**APPLICATION EQUIPMENT**
Operations Platforms,
W75-11210

**APPLICATION METHODS**
Scheduling and Application Rates of Irrig in a Humid Climate,
W75-11048

Nozzle Hydraulics in the Trickle Irri System--Relation Between Water Temper and Nozzle Flow Rate (In Japanese),
W75-11096

Practical Application of Surface Fixed-S for Multi-Purpose Sprinkler Irrigation Us Japanese),
W75-11097

Field Tests of Slow-Release Herbicides,
W75-11193

**AQUATIC ENVIRONMENT**
Some Limnological Characteristics of A Lake in Southern Arizona,
W75-10891

Herbicide Chemicals and Their Effect Aquatic Environment,
W75-11211

**AQUATIC LIFE**
A Computer Program Package for Ecologists,
W75-10908

QUATIC PLANTS
The Aquatic Weed Problem. 1. Identification,
W75-11220 2I

QUATIC WEED CONTROL
Comparison of Uredo Eichhorniae, the Water-hyacinth Rust, and Uromyces Pontederiae,
W75-11092 5G

Operation Clean Sweep,
W75-11192 5G

Field Tests of Slow-Release Herbicides,
W75-11193 5G

Aquatic Plant Control on Lake Corpus Christi,
W75-11194 5G

Aquatic Plant Research and Control in Florida,
W75-11195 4A

Criteria for Herbicide Evaluation,
W75-11196 5G

Dissipation of Residues of Phenoxy Herbicides Applied for Water Milfoil Control in Large Reservoirs,
W75-11198 5B

Chemical Control of Egeria Densa,
W75-11199 5G

Field Testing of Aquatic Herbicides for Control of Egeria Densa,
W75-11200 5G

Aquatic Plant Control Using Herbicides in a Large Potable Water Supply,
W75-11201 5G

Biological Control of Alligator Weed, 1959-72,
W75-11202 5G

Biological Control of Eurasian Water Milfoil,
W75-11203 4A

Integrated Controls on Noxious Aquatic Plants,
W75-11204 5G

Unisex Studies on the White Amur,
W75-11205 5C

Utilization of Phytopathogens as Biocontrols of Aquatic Weeds,
W75-11206 5G

Aquatic Weed Field Test Program Using a CO2 Electric Discharge Convection Laser,
W75-11208 5A

CO2 Laser Effects on Water Hyacinth,
W75-11209 5G

Operations Platforms,
W75-11210 4A

Herbicide Chemicals and Their Effect on the Aquatic Environment,
W75-11211 5C

Registration of Aquatic Herbicides,
W75-11212 4A

Water Hyacinth Research in Puerto Rico,
W75-11215 5G

Water Level Manipulation: A Tool for Aquatic Weed Control,
W75-11216 4A

QUATIC WEEDS
The Aquatic Weed Problem. 1. Identification,
W75-11220 2I

AQUICULTURE
Status of Waste Heat Utilization and Dual-Purpose Plant Projects,
W75-11251 3E

AQUIFER CHARACTERISTICS
Hydrogeology and Water Resources of Middle Kirkland Creek Basin, Yavapai County, Arizona,
W75-10872 4B

Ground Water in the Corvallis-Albany Area, Central Willamette Valley, Oregon,
W75-10940 2F

Recharge Areas of the Floridan Aquifer in Seminole County and Vicinity, Florida,
W75-10944 7C

AQUIFER MANAGEMENT
Management of Retardation of Salt Water Intrusion in Coastal Aquifers,
W75-11058 2F

AQUIFERS
Hydrogeology and Water Resources of Middle Kirkland Creek Basin, Yavapai County, Arizona,
W75-10872 4B

Horizontal Groundwater Collectors, Hydraulics and Design,
W75-10998 8B

Horizontal Groundwater Collectors, 'Canada's Largest Water Well',
W75-10999 8B

Induced Infiltration Supply System Among Biggest.
W75-11010 5F

Deprivation Contribution and Interference Effects of Multiple Wells in a Common Aquifer,
W75-11142 4B

ARID CLIMATES
Phenology of Selected Sonoran Desert Plants at Punta Cirio, Sonora, Mexico.
W75-10862 2I

Shrub Transplanting for Watershed Management and Range Improvement in Iran,
W75-10870 4D

Improving Productivity in Low Rainfall Areas, in India.
W75-11099 3F

ARID LANDS
Barrenness of Desert Pavement in Yuma County, Arizona,
W75-10868 2G

Management of Southwestern Desert Soils,
W75-10877 2G

Soils of the Desert Southwest,
W75-10878 2G

Guidelines for Revegetation and Stabilization of Surface Mined Areas in the Western States,
W75-11100 4D

Generation of Arid Zone Rainfall and Runoff,
W75-11303 2A

Some Observations on Rainfall in Western New South Wales,
W75-11304 2B

Australian Arid Zone Streangauging,
W75-11307 2E

ARIVACA LAKE (ARIZ)
Some Limnological Characteristics of Arivaca Lake in Southern Arizona,
W75-10891 2H

ARIZONA
Differential Release of Water from Arizona Snowpacks,
W75-10860 2C

Barrenness of Desert Pavement in Yuma County, Arizona,
W75-10868 2G

The Influence of Rainfall on the Reproduction of Sonoran Desert Lagomorphs,
W75-10871 4A

Hydrogeology and Water Resources of Middle Kirkland Creek Basin, Yavapai County, Arizona,
W75-10872 4B

Seasonal Variations in the Infiltration Rate of a Whitehouse Soil in Southern Arizona,
W75-10873 2G

Limnology of Desert Ponds,
W75-10880 2H

Measurement of Cobble Abrasion in Natural Streams,
W75-10881 2J

Phytophthora Species in Arizona: Its Occurrence in Recycled Irrigation water,
W75-10883 5A

Factors Affecting Erosion in a Semi-Arid Watershed,
W75-10884 2J

Effects of Pinyon-Juniper Removal on Natural Resource Products and Uses in Arizona,
W75-10886 3B

Some Limnological Characteristics of Arivaca Lake in Southern Arizona,
W75-10891 2H

An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W75-11049 4A

Development of a Bibliographic Information System for Water Yield Improvement Practices,
W75-11050 10B

ARKANSAS
Biochrome Analysis as a Method for Assessing Phytoplankton Dynamics, Phase II,
W75-11052 5C

Pathogenic Free-Living Amoebae in Arkansas Recreational Waters,
W75-11053 5A

Unisex Studies on the White Amur,
W75-11205 5C

ARSENIC COMPOUNDS
The Geochemical Cycle of Arsenic in Lake Washington and its Relation to Other Elements,
W75-10922 5B

ARTEMIA
Wastewater Treatment Using Algae and Artemia,
W75-10967 5D

ARTESIAN AQUIFERS
Management of Retardation of Salt Water Intrusion in Coastal Aquifers,
W75-11058 2F

Ground Water Depletion and Subsidence Problems in Taipei Basin,
W75-11262 4B

ARTIFICIAL LAKES
Some Limnological Characteristics of Arivaca Lake in Southern Arizona,
W75-10891 2H

ARTIFICIAL RECHARGE
Management of Retardation of Salt Water Intrusion in Coastal Aquifers,
W75-11058 2F

ATLANTIC OCEAN
Near-Bottom Chemistry in the Eastern Pacific and North Atlantic Oceans,
W75-10923 2K

AUSTRALIA
The Early Vegetative Growth of Two Annual Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.),
W75-10876 3F

Water Consumption and Water Turnover of Sheep Grazing Semiarid Pasture Communities in New South Wales,
W75-10888 3F

The Influence of Density and Nitrogen on the Outcome of Competition Between Two Annual Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.),
W75-10889 3F

Problems of Liquid Waste Disposal,
W75-11112 5G

Hydrologic Investigation and Design of Urban Stormwater Drainage Systems,
W75-11141 4A

The Measurement and Estimation of Lake Evaporation from Four Australian Water Storages,
W75-11300 2D

Multilag Markov Models for Eastern Australian Streams,
W75-11301 2E

Generation of Arid Zone Rainfall and Runoff,
W75-11303 2A

Some Observations on Rainfall in Western New South Wales,
W75-11304 2B

Droughts, Distributions and Dependence: An Analysis of Some Synthetic Data Generation Methods,
W75-11305 2E

Australian Arid Zone Streangauging,
W75-11307 2E

Variability, Persistence and Yield of Australian Streams,
W75-11308 2E

Aspects of Rainfall Measurement in a New England Location,
W75-11309 2B

AVAILABLE WATER
Available Water-Holding Capacities of Soils in Southern Idaho,
W75-11140 2G

AVAILABLE WATER-HOLDING CAPACITIES
Available Water-Holding Capacities of Soils in Southern Idaho,
W75-11140 2G

AVERAGE FLOW
Estimated Mean-Monthly and Annual Runoff at Selected Sites in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico,
W75-10943 2E

AVRA VALLEY (ARIZ)
The Influence of Rainfall on the Reproduction of Sonoran Desert Lagomorphs,
W75-10871 4A

BACK RIVER (MD)
Behavior of Mn, Fe, Cu, Zn, Cd and Pb Discharged from a Wastewater Treatment Plant into an Estuarine Environment,
W75-11160 5B

BACTERIA
Population Dynamics of Protozoa in Wastewater,
W75-10957 5D

Biological Control: Isolation and Bacterial Oxidation of the Taste-and-Odor Compound Geosmin,
W75-11013 5F

BALANCE OF NATURE
An Analysis of the Motor-Row Conversion Issue of Colorado River Float Trips,
W75-10867 6B

BALTIMORE (MD)
Algae in Baltimore's Reservoirs,
W75-11221 5C

BARIUM SULFATE
Acute Toxicity of Petrochemical Drilling Fluids Components and Wastes to Fish,
W75-11265 5C

BARRIER ISLANDS
Matagorda Island, Texas: The Evolution of a Gulf Coast Barrier Complex,
W75-11144 2L

BASALTS
Hydrogeology and Water Resources of Middle Kirkland Creek Basin, Yavapai County, Arizona,
W75-10872 4B

BASE FLOW
Predicting Recessions Through Convolution,
W75-10917 2E

BASIC DATA COLLECTIONS
Temperatures of Kansas Streams,
W75-10933 2E

The Minor and Trace Elements, Gas, and Isotope Compositions of the Principal Hot Springs of Nevada and Oregon,
W75-10937 2K

BEACH EROSION
Beach Erosion Control Structure,
W75-11075 8A

BEANS
The Role of Endogenous Abscisic Acid in the Response of Plants to Stress,
W75-11319 3F

BED LOAD
Measurement of Cobble Abrasion in Natural Streams,
W75-10881 2J

BEDROCK
Contour Map of the Bedrock Surface, New Britain Quadrangle, Connecticut,
W75-10950 7C

Map Showing Depth to Bedrock, Worthington Quadrangle, Massachusetts,
W75-10951 7C

Map Showing Depth to Bedrock, Greenfield Quadrangle, Massachusetts,
W75-10952 7C

Map Showing Depth to Bedrock, Chester Quadrangle, Massachusetts,
W75-10953 7C

Map Showing Depth to Bedrock, Mount Carmel Quandrangle, Connecticut,
W75-10954 7C

BEDROCK SURFACE MAPS
Contour Map of the Bedrock Surface, New Britain Quadrangle, Connecticut,
W75-10950 7C

BEECH
Vegetation, Soil, and Climate on the Green Mountains of Vermont,
W75-11021

BENTHIC FAUNA
Weyl's Theory of Glaciation Supported by Isotopic Study of Norwegian Core K 11,
W75-11153

Seasonal Abundance and Diversity of Benthic in a Southern Illinois, USA Swamp,
W75-11312

BENTHOS
Species Diversity of Benthic Macroinvertebrates and Limnological Conditions in a Order Mountain Stream,
W75-10918

Seasonal Abundance and Diversity of Benthic in a Southern Illinois, USA Swamp,
W75-11312

BIBLIOGRAPHIES
Development of a Bibliographic Information System for Water Yield Improvement Practices,
W75-11050

Computer Systems and Water Resources,
W75-11174

Extraction and Analytical Techniques for Pesticides in Soil, Sediment, and Water,
W75-11236

Non-Renewable, Non-Energy Resources,
W75-11253

The Toxicity of Drilling Fluid Components to Aquatic Biological Systems, A Literature Review,
W75-11266

BIOACCUMULATION
Mercury Contents in Biologically Prescued Specimens of Menuke (Sebastes Barameke and S. Flammeus),
W75-11078

Uptake of Cadmium, Zinc, Copper, Lead and Chromium in the Pacific Oyster, Crassostrea Gigas, Grown in the Tamar River, Tasmania,
W75-11086 5B

Studies on the Inorganic Components of Marine Animals-III, on the Contents of Cadmium, Zinc, Copper, Lead and Iron in Muscle and Viscera of Marine Animals Captured in the West Sea Area of Kyushu, (In Japanese),
W75-11087 5C

IOASSAY
Toxaphene Effects on Growth and Bone Composition of Fathead Minnows, Pimephales Promelas,
W75-11026 5C

Factors Influencing Acute Toxicity Estimates of Hydrogen Sulfide to Freshwater Invertebrates,
W75-11027 5C

Impact of Thermal Effluent from Steam-Electric Station on a Marshland Nursery Area during the Hot Season,
W75-11032 5C

Standard Curves for Nuvacron, Malathion, Sevin, DDT, and Kelthane Tested Against the Mosquito Culex Pipiens L. and the Microcrustacean Daphnia Magna Straus,
W75-11082 5B

Uptake of Cadmium, Zinc, Copper, Lead and Chromium in the Pacific Oyster, Crassostrea Gigas, Grown in the Tamar River, Tasmania,
W75-11086 5B

iomagnification of Dieldrin Residues by Food hain Transfer from Clams to Blue Crabs nder Controllled Conditions,
75-11135 5C

me Effects of Copper on the Polychaete ıyllodoce Maculata,
75-11136 5C

ssipation of Residues of Phenoxy Herbicides plied for Water Milfoil Control in Large servoirs,
75-11198 5B

CHEMICAL OXIDATION
vestigations on the Long Term Biochemical idation of Sewage,
75-11116 5D

HEMICAL OXYGEN DEMAND
estigations on the Long Term Biochemical idation of Sewage,
5-11116 5D

luent Characteristics and Treatment of chanical Pulping Effluents,
5-11331 5D

HEMISTRY
Investigation of Glycolate Excretion in Two cies of Blue-Green Algae,
5-11230 5C

uence of Oil on Nucleic Acids of Algae,
5-11232 5C

HROME ANALYSIS
hrome Analysis as a Method for Assessing oplankton Dynamics, Phase II,
-11052 5C

BIOCONTROL
Biological Control: Isolation and Bacterial Oxidation of the Taste-and-Odor Compound Geosmin,
W75-11013 5F

Comparison of Uredo Eichhorniae, the Waterhyacinth Rust, and Uromyces Pontederiae,
W75-11092 5G

Biological Control of Alligator Weed, 1959-1972,
W75-11202 5G

Biological Control of Eurasian Water Milfoil,
W75-11203 4A

Utilization of Phytopathogens as Biocontrols for Aquatic Weeds,
W75-11206 5G

Water Hyacinth Research in Puerto Rico,
W75-11215 5G

BIODEGRADATION
Biological Control: Isolation and Bacterial Oxidation of the Taste-and-Odor Compound Geosmin,
W75-11013 5F

Measures of Biodegradability and Refractory Organics in Wastewaters: (Analysis, Interpretation, and Application of Measurement Techniques),
W75-11103 5D

Investigations on the Long Term Biochemical Oxidation of Sewage,
W75-11116 5D

Changes in Vegetation and Surface Soil Properties Following Irrigation of Woodlands with Municipal Wastewater,
W75-11243 5B

Biodegradation of Components of Pulp Waste Effluents by Bacteria. (1). Degradation of Kraft Lignin (In Japanese),
W75-11346 5B

BIOINDICATORS
Epifaunal Invertebrates as Indicators of Water Quality in Southern Lake Pontchartain,
W75-10852 5C

Use of Productivity of Periphyton to Estimate Water Quality,
W75-10936 5B

The Use of Snakes as a Pollution Indicator Species,
W75-11089 5B

BIOLOGICAL COMMUNITIES
The Role of Planktonic Protozoa in the Marine Food Chain. Seasonal Changes, Relative Abundance, and Cell Size Distribution of Tintinnida,
W75-11191 5C

BIOLOGICAL TREATMENT
Population Dynamics of Protozoa in Wastewater,
W75-10957 5D

Temperature Effects on Microbial Growth in CSTR's,
W75-10968 5D

Innovative Process Treats Wastewater,
W75-10975 5D

Chemical-Biological Treatment With Biological Filters,
W75-11123 5D

Mill Experience in the Treatment of Mechanical Pulping Effluent,
W75-11332 5D

BIOMASS
Seasonal Variation in Composition, Plant Biomass, and Net Primary Productivity of a Tropical Grassland at Kurukshetra, India,
W75-11006 2I

Seasonal Abundance of Crustacean Zooplankton and Net Plankton Biomass of Lakes Huron, Erie, and Ontario,
W75-11238 5C

BIOMES
Freshwater Ecosystem Research in Water Quality Management,
W75-11012 6G

BIOSPHERE
Mutagens and Potential Mutagens in the Biosphere: II. Metals--Mercury, Lead, Cadmium and Tin,
W75-11171 5B

BIRDS
Oil Pollution and Seabirds in Denmark 1935-1968,
W75-10893 5C

BLACK HILLS (SD)
Watershed Management in the Black Hills: The Status of Our Knowledge,
W75-11318 4D

BLACKFLY
The Effects of Experimental Blackfly (Diptera: Simuliidae) Larviciding with Abate, Dursban, and Methoxychlor on Stream Invertebrates,
W75-11157 5C

BLEACHING WASTES
Evaluation of the Adsorptive Properties of Fly Ash with Reference to a Pulp and Paper Mill Waste Effluent,
W75-11335 5D

BLUE CRAB
Biomagnification of Dieldrin Residues by Food Chain Transfer from Clams to Blue Crabs Under Controllled Conditions,
W75-11135 5C

BOATING
An Analysis of the Motor-Row Conversion Issue of Colorado River Float Trips,
W75-10867 6B

BOGS
Species Diversity of Benthic Macroin-Vertebrates and Limnological Conditions in a 1st Order Mountain Stream,
W75-10918 2I

BOTTOM SEDIMENTS
Application of the Manometric Technique in the Study of Sediment Oxygen Depletion,
W75-11222 5C

BOUNDARIES (SURFACES)
Formulation of Boundary Conditions at the Surface of a Porous Medium,
W75-11269 8B

BOUNDARY CONDITIONS
Formulation of Boundary Conditions at the Surface of a Porous Medium,
W75-11269 8B

BOUNDARY LAYERS
Turbulent Structure Near Smooth Boundary,
W75-11148 8B

BOUNDARY PROCESSES
Application of Electrical Analogy to Draw Flow Nets for Sudden Drawdown Conditions in Earth Dams,
W75-11143 8B

BRACKISH WATER
A Note on Salinity and Temperature in Some Moroccan Brackish Waters,
W75-10997 2L

BRAZIL
Translations on Environmental Quality, No. 33.
W75-11246 5G

BRAZILIAN SNAILS
Water Hyacinth Research in Puerto Rico,
W75-11215 5G

BREAKPOINT CHLORINATION
Nitrogen Removal by Catalyst-Aided Breakpoint Chlorination,
W75-10965 5D

BREAKWATERS
Wave Motion in Rockfill.
W75-10924 8D

BREWING INDUSTRY
Pollution Abatement in a Brewing Facility.
W75-11323 5D

BRITAIN (CONN)
Contour Map of the Bedrock Surface, New Britain Quadrangle, Connecticut,
W75-10950 7C

BRITISH COLUMBIA
Water Resources,
W75-11003 5G

B(ritish) C(olumbia) Presses for Forest Industries Clean-Up.
W75-11350 5G

BROMIDES
Modification of the Iodimetric Titration Method for the Determination of Bromide and Its Application to Mixed Domestic-Industrial Waste Effluents,
W75-11341 5A

BULK CARRIERS
Economics of Great Lakes Shipping in an Extended Season,
W75-11248 6C

BURLINGTON (COLO)
Colorado City Solves Its Sand Pumping Problems,
W75-11261 8C

BUSYCON CANALICALATUM
Copper Toxicity in Busycon Canaliculatum L.,
W75-11031 5C

CADMIUM
Retention of Cadmium in Mice Studied by Whole Body Autoradiography,
W75-11024 5A

The Accumulation of Cadmium, Copper, Manganese and Zinc by Fucus Vesiculosus in the Bristol Channel,
W75-11083 5B

Uptake of Cadmium, Zinc, Copper, Lead and Chromium in the Pacific Oyster, Crassostrea Gigas, Grown in the Tamar River, Tasmania.
W75-11086 5B

Studies on the Inorganic Components of Marine Animals-III, on the Contents of Cadmium, Zinc, Copper, Lead and Iron in Muscle and Viscera of Marine Animals Captured in the West Sea Area of Kyushu, (In Japanese),
W75-11087 5C

CAISSONS
Horizontal Groundwater Collectors, Hydraulics and Design,
W75-10998 8B

Horizontal Groundwater Collectors, 'Canada's Largest Water Well',
W75-10999 8B

CALCIUM CARBONATE
The Kinetics of Crystallization of Scale-Forming Minerals,
W75-11273 8G

CALCIUM SULFATE
The Kinetics of Crystallization of Scale-Forming Minerals,
W75-11273 8G

The Kinetics of Crystallization of Scale-Forming Minerals,
W75-11273 8G

CALCIUM SULPHATE
Calcium Sulfate Solubility in Brackish Water Concentrates and Applications to Reverse Osmosis Processes: Polyphosphate Additives,
W75-11004 5D

CALIFORNIA
A Waterborne Gastroenteritis Epidemic in Pico Rivers, California,
W75-11005 5F

How Steam is Produced and Handled at the Geyers,
W75-11280 4B

CAMPBELL RIVER (BC)
$3-Million and Two-and-a-Half Years to Solve Campbell River's Sewage Problems,
W75-10977 5D

CANADA
Flow File Operations Manual,
W75-10913 7C

Description of Card and Tape Formats for Supplying Data to Users.
W75-10914 7C

$3-Million and Two-and-a-Half Years to Solve Campbell River's Sewage Problems,
W75-10977 5D

Horizontal Groundwater Collectors, 'Canada's Largest Water Well',
W75-10999 8B

Role and Responsibilities of the Environmental Protection Service (Canada),
W75-11000 6G

Oil Spill Technology,
W75-11001 5G

Water Resources,
W75-11003 5G

Induced Infiltration Supply System Among Biggest.
W75-11010 5F

The Growth of Some Epiphytic Algae in a Lake Receiving Thermal Effluent,
W75-11225 5C

Wind-Snow Relations at Marmot Creek Alberta,
W75-11226 2C

B(ritish) C(olumbia) Presses for Forest Industries Clean-Up.
W75-11350 5G

CANALS
Consolidation and Rehabilitation of Canals in Poudre Valley,
W75-11061 4A

CANNON RIVER WATERSHED (MINN)
Water Resources of the Cannon River Watershed, Southeastern Minnesota,
W75-10948 7C

CAPE ROMANO (FLA)
A Survey of Fishes and Commercial Invertebrates of the Nearshore and Estuarine Zone Between Cape Romano and Cape Sable, Florida,
W75-11189 2

CAPE SABLE (FLA)
A Survey of Fishes and Commercial Invertebrates of the Nearshore and Estuarine Zone Between Cape Romano and Cape Sable, Florida,
W75-11189

CAPITAL COSTS
The Economy of Various Methods for Dewatering Sludge From Biological Purification (Ueber die Wirtschaftlichkeit verschiedener Verfahren zur Entwaesserung von biologischem Klaerschlamm),
W75-11127

CARBON DIOXIDE
Liquid CO2 Protects our Water's Quality,
W75-10990

Dissolved Gases Are Key Corrosion Culprits
W75-11274

CARBON DIOXIDE LASER
CO2 Laser Effects on Water Hyacinth,
W75-11209

CARBON RADIOISOTOPES
Determination of Regional Hydraulic Conductivity Through Use of C-14 Dating of Groundwater,
W75-10930

CARCINOGENS
Stability of Nitrosamines in Samples of Lake Water, Soil, and Sewage,
W75-11019

CARIBBEAN SEA
Near-Bottom Chemistry in the Eastern Pacific and North Atlantic Oceans,
W75-10923

CARTWRIGHT CREEK (TENN)
A Study of Factors Controlling the Chemical Quality of Water in Cartwright Creek Basin, Williamson County, Tennessee,
W75-11164

CASING
Techniques for Linear Tie-Back Cementing
W75-11277

CASINGS
Pitless Adapters: Emphasis on Sanitation.
W75-11258

AVITATION
Predicting Cavitation in Sudden Enlargements,
W75-11151 8B

Cavitation Control by Aeration of High-Velocity Jets,
W75-11152 8B

AYUGA LAKE (NY)
Utilization of Stream-Borne Phosphorus by Cayuga Lake Phytoplankton,
W75-11036 5C

EMENTING
Techniques for Linear Tie-Back Cementing,
W75-11277 8F

EMENTS
Techniques for Linear Tie-Back Cementing,
W75-11277 8F

How BP Alaska Cements Through Permafrost.
W75-11278 8F

How to Make Squeeze Cementing Successful,
W75-11286 8F

Cementing Today's Problem Wells.
W75-11293 8F

NTRIFUGATION
Dewaters Sludge.
W75-10966 5D

ANNEL CATFISH
urvival and Growth Rate of Channel Catfish s a Function of Dissolved-Oxygen Concentra-on,
75-11051 5C

ANNEL EROSION
actors Affecting Erosion in a Semi-Arid atershed,
75-10884 2J

RA
Contribution to the Biology of Nitella ookeri A. BR. in the Rotorua Lakes, New aland. II. Organic Nutrients and Physical ctors,
75-11235 5C

TAUQUA LAKE (NY)
ot:Shoot and Leaf Area Relationships of crophyte Communities in Chautauqua Lake, w York,
5-11009 5C

LATION
elation Study of Copper (II): Fulvic Acid tem,
5-11219 5B

MCONTROL
mical Control of Egeria Densa,
5-11199 5G

MICAL ANALYSIS
Minor and Trace Elements, Gas, and ope Compositions of the Principal Hot ngs of Nevada and Oregon,
5-10937 2K

MICAL DEGRADATION
ic Concepts and Practical Aspects of Corro- Investigation,
-11271 8G

MICAL OXYGEN DEMAND
rmination of Chemical Oxygen Demand, O(Cr), in Waste Waters of Pulp and Paper s (Bestimmung des chemischen Sauerstoff-bedarfes, CSB(Cr), in Restabwaessern von Zellstoff und Papierfabriken).
W75-11337 5A

CHEMICAL REACTIONS
Interactions of Heavy Metals in the Activated Sludge Process,
W75-11173 5D

CHEMICAL TREATMENT
Process for Treating Sewage Sludge,
W75-11064 5D

Process for Treating Industrial Wastes,
W75-11066 5D

Process for Treating Industrial Wastes,
W75-11067 5D

Process for Raw Water Clarification,
W75-11072 5F

CHEMICAL WASTES
Upgrading Metal-Finishing Facilities to Reduce Pollution. (Part 1). In-Process Pollution Abatement,
W75-11324 5D

Upgrading Metal-Finishing Facilities to Reduce Pollution. (Part 2). Waste Treatment,
W75-11325 5D

Upgrading Textile Operations to Reduce Pollution. (Part 2). Wastewater Treatment Systems.
W75-11327 5D

CHEMISTRY
Near-Bottom Chemistry in the Eastern Pacific and North Atlantic Oceans,
W75-10923 2K

CHESTER (MASS)
Map Showing Depth to Bedrock, Chester Quadrangle, Massachusetts,
W75-10953 7C

CHICKAHOMINY RESERVOIR (VA)
Aquatic Plant Control Using Herbicides in a Large Potable Water Supply,
W75-11201 5G

CHLORINATED HYDROCARBON
Toxaphene Effects on Growth and Bone Composition of Fathead Minnows, Pimephales Promelas,
W75-11026 5C

Biomagnification of Dieldrin Residues by Food Chain Transfer from Clams to Blue Crabs Under Controllled Conditions,
W75-11135 5C

CHLORINATED HYDROCARBON PESTICIDES
The Use of Snakes as a Pollution Indicator Species,
W75-11089 5B

Mutagens and Potential Mutagens in the Biosphere: I. DDT and Its Metabolites, Polychlorinated Biphenyls, Chlorodioxins, Polycyclic Aromatic Hydrocarbons, Haloethers,
W75-11170 5B

CHLORINATION
Ozone Treatment Licks Color Problem.
W75-10959 5D

Disinfecting Wastewater with Chlorination/Dechlorination Part 1,
W75-10963 5D

Disinfecting Wastewater with Chlorination/Dechlorination Part 2,
W75-10964 5D

Nitrogen Removal by Catalyst-Aided Breakpoint Chlorination,
W75-10965 5D

Chlorine-Containing Organic Constituents in Chlorinated Effluents,
W75-10970 5D

A Waterborne Gastroenteritis Epidemic in Pico Rivers, California,
W75-11005 5F

CHLORINE
Chlorine-Containing Organic Constituents in Chlorinated Effluents,
W75-10970 5D

CHLOROPHYLL
Biochrome Analysis as a Method for Assessing Phytoplankton Dynamics, Phase II,
W75-11052 5C

CHLOROPHYTA
Influence of Oil on Nucleic Acids of Algae,
W75-11080 5C

Electrolytic Control of Algae,
W75-11228 5F

CHROMIUM
Uptake of Cadmium, Zinc, Copper, Lead and Chromium in the Pacific Oyster, Crassostrea Gigas, Grown in the Tamar River, Tasmania,
W75-11086 5B

CHROMONADAE
The Influence of the Warm Cooling Water from a Fossil Fueled Power Plant on Oceanographic Conditions and Composition of Plankton in Owase Bay I. Water Temperature in Relation to Distribution of Microplankton, (In Japanese).
W75-11030 5C

CITRUS FRUITS
Phytophthora Species in Arizona: Its Occurrence in Recycled Irrigation water,
W75-10883 5A

CLAMS
A Reevaluation of the Combined Effects of Temperature and Salinity on Survival and Growth of Bivalve Larvae Using Response Surface Techniques,
W75-11081 5C

Biomagnification of Dieldrin Residues by Food Chain Transfer from Clams to Blue Crabs Under Controllled Conditions,
W75-11135 5C

CLARIFICATION
Process for Raw Water Clarification,
W75-11072 5F

CLAYS
Ground Water Depletion and Subsidence Problems in Taipei Basin,
W75-11262 4B

CLIMATIC DATA
Water Resource Observatory Climatological Data, Water Year 1973.
W75-11035 7C

CLOUD PHYSICS
Charged Droplet Collision Efficiency Measurements,
W75-11168 2B

COAGULATION
Flocculation Device for Waste Fluid Treatment,
W75-11077 5D

Total Waste Recycle System for Water Purification Plant Using Alum as Primary Coagulant,
W75-11094 5D

COAL MINE WASTES
Acid Strip Mine Lake Recovery,
W75-11224 5C

COASTAL AQUIFERS
Management of Retardation of Salt Water Intrusion in Coastal Aquifers,
W75-11058 2F

COASTAL ENGINEERING
Stabilization and Reconstruction of Texas Coastal Foredunes with Vegetation,
W75-10887 2L

Wave Motion in Rockfill,
W75-10924 8D

COBBLE ABRASION
Measurement of Cobble Abrasion in Natural Streams,
W75-10881 2J

COHO SALMON
Effects of Some Components of Crude Oil on Young Coho Salmon,
W75-11088 5C

COLEBROOK-WHITE TRANSITION.
*AIRPORT DRAINAGE
The Design of Storm Water Drainage Channels Using Mathematical Model Techniques,
W75-11150 8B

COLIFORMS
Disinfecting Wastewater with Chlorination/Dechlorination Part 1,
W75-10963 5D

Drug Resistant Coliforms Call for Re-Evaluation of Water Quality Standards,
W75-11130 5B

COLLISION EFFICIENCIES
Charged Droplet Collision Efficiency Measurements,
W75-11168 2B

COLLOIDS
Study of Electrochemical Treatment Method for Removing Colloidal Particles from Pulp and Paper Industry Effluents (Tutkimus selluteollisuuden jatevesien kolloidaalisten ainesten poistomahdollisuudesta sahkokemialliesti),
W75-11348 5D

COLOR
Organic Color in Groundwater of Mississippi,
W75-10907 5F

Evaluation of the Adsorptive Properties of Fly Ash with Reference to a Pulp and Paper Mill Waste Effluent,
W75-11335 5D

Effect of Lime Treatment on Molecular Weight Distribution of Color Bodies from Kraft Linerboard Decker Effluents,
W75-11345 5D

COLOR REMOVAL
Ozone Treatment Licks Color Problem.
W75-10959 5D

COLORADO
Analysis of Colorado Precipitation,
W75-11040 2B

Consolidation and Rehabilitation of Canals in Poudre Valley,
W75-11061 4A

An Elevational Control of Peak Snowpack Variability,
W75-11155 2C

Colorado City Solves Its Sand Pumping Problems,
W75-11261 8C

Pollution Abatement in a Brewing Facility.
W75-11323 5D

COLORADO RIVER
An Analysis of the Motor-Row Conversion Issue of Colorado River Float Trips,
W75-10867 6B

Impact of Energy Development on the Law of the Colorado River,
W75-10869 4C

Man's Impact on a Newly Formed Reservoir,
W75-11233 5C

COLORADO RIVER BASIN
Legal and Institutional Problems in the Management of Salinity,
W75-11047 5G

An Economic Analysis of the Pollution Problems in the Colorado River Basin: The Upper Main Stem Sub-Basin,
W75-11247 5G

COLORIMETRY
Interference of Mercury(II) in the Colorimetric Determination of Inorganic Phosphate in Water,
W75-11340 5A

Interference of Sulfate Ion on SPADNS (Sodium 2-(Sulfophenylazo)-1,8-Dihydroxynaphthalene-3,6-Disulfonate) Colorimetric Determination of Fluorine in Waste Waters,
W75-11343 5A

COMBINED TREATMENT
Industry and Community in Cooperation,
W75-10985 5D

COMPETITION
The Influence of Rainfall on the Reproduction of Sonoran Desert Lagomorphs,
W75-10871 4A

The Influence of Density and Nitrogen on the Outcome of Competition Between Two Annual Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.),
W75-10889 3F

COMPREHENSIVE PLANNING
A Mathematical Model for Optimal Waste Load Allocations,
W75-11102 5G

Strategic Approach to Estuarine Environmental Management,
W75-11179 2L

COMPUTER MODELS
Two-Dimensional, Hydrostatic Simulation of Thermally-Influenced Hydrodynamic Flows,
W75-10901 2H

Hierarchial Model for Water-Supply-System Control,
W75-10996 4A

An Assessment of Snowpack Depletion Surface Runoff Relationships on Forested Watersheds,
W75-11049 4A

An Economic Analysis of the Pollution Problems in the Colorado River Basin. The Upper Main Stem Sub-Basin,
W75-11247 5C

Workshop on Computer-Aided Design and Simulation of Waste Treatment Systems.
W75-11338 5D

COMPUTER PROGRAMS
Two-Dimensional, Hydrostatic Simulation o Thermally-Influenced Hydrodynamic Flows,
W75-10901 2H

A Computer Program Package for Aquatu Ecologists,
W75-10908 2H

Automated Distribution of Gauge and Shi Corrections,
W75-10911 7

Automated Tidal Computations,
W75-10912 7

Flow File Operations Manual,
W75-10913 7

Automated Hourly Computations,
W75-10915 7

Computer Analysis of Water-Distributi Systems,
W75-11182 4

Advanced Techniques in the Mathemati Modeling of Water-Distribution Systems,
W75-11183

COMPUTERS
Hierarchial Model for Water-Supply-Syst Control,
W75-10996

Computer Systems and Water Resources,
W75-11174

Computer Analysis of Water-Distribut Systems,
W75-11182

Can a Computer Really Operate a Water-Fil tion Plant,
W75-11184

CONCRETE ADDITIVES
Cementing Today's Problem Wells.
W75-11293

CONCRETE TECHNOLOGY
Cementing Today's Problem Wells.
W75-11293

CONDENSATION
Condensation in Jets, Industrial Plumes Cooling Tower Plumes,
W75-11166

CONDUCTIVITY
Specific Conductance Method for in Situ mation of Total Dissolved Solids,
W75-11167

NFERENCES
eview of Conference on Hydrology of Deep edimentary Basins,
75-10935 5B

ICAL BIT
elf-Tapping Screw' Bit Would Use Lighter eights,
75-11283 8C

NATE WATER
eory of Plasticity of Porous Media with id Flow,
5-11276 8E

NECTICUT
ntour Map of the Bedrock Surface, New tain Quadrangle, Connecticut,
5-10950 7C

p Showing Depth to Bedrock, Mount Car- Quandrangle, Connecticut,
5-10954 7C

odplain Land-Use Management: An Appli- on of Operations Research Methodology,
5-11037 6F

TRUCTION COSTS
lerground Wastewater Treatment Plants,
-10974 5D

Costs Modify Sewage Plant Expansion.
-10993 5D

ROL
a Computer Really Operate a Water-Filtra- Plant,
-11184 5F

roscopic Distribution-System Modeling,
-11185 4A

ROL SYSTEMS
rchial Model for Water-Supply-System rol,
10996 4A

OLUTION METHOD
cting Recessions Through Convolution,
10917 2E

NG TOWERS
ensation in Jets, Industrial Plumes and g Tower Plumes,
1166 2B

NG WATER
imental Study of the Cooling Water n, Setubal Power Plant, Rio Sado, Portu-
0855 5B

fluence of the Warm Cooling Water from il Fueled Power Plant on Oceanographic ions and Composition of Plankton in Bay I. Water Temperature in Relation to ution of Microplankton, (In Japanese),
1030 5C

of the Optimal Outfall System for a Receiving Thermal and Organic Waste rges,
137 5B

ed Gas Supersaturation and Dilution in l Plumes from Steam Electric Generat- ions,
159 5B

DS
ion of Copepod Populations to Thermal
046 5C

COPPER
Copper Toxicity in Busycon Canaliculatum L., W75-11031 5C

The Accumulation of Cadmium, Copper, Manganese and Zinc by Fucus Vesiculosus in the Bristol Channel,
W75-11083 5B

Uptake of Cadmium, Zinc, Copper, Lead and Chromium in the Pacific Oyster, Crassostrea Gigas, Grown in the Tamar River, Tasmania,
W75-11086 5B

Studies on the Inorganic Components of Marine Animals-III, on the Contents of Cadmium, Zinc, Copper, Lead and Iron in Muscle and Viscera of Marine Animals Captured in the West Sea Area of Kyushu, (In Japanese),
W75-11087 5C

Some Effects of Copper on the Polychaete Phyllodoce Maculata,
W75-11136 5C

Chelation Study of Copper (II): Fulvic Acid System,
W75-11219 5B

COPPER SULFATE
Preliminary Investigations into Copper Cycling in Indian Lake, Massachusetts: A Lake Treated Annually with Copper Sulfate,
W75-11039 5B

CORAL
A Comparison of Effects of Elevated Temperature Versus Temperature Fluctuations on Reef Corals at Kahe Point, Oahu,
W75-11084 5C

COREXIT 8666
The Effects of Crude Oils and the Dispersant Corexit 8666 on Sea Urchin Gametes and Embryos,
W75-11090 5C

CORROSION
Corrosion by Domestic Waters,
W75-11062 5F

Longer Life for Submersibles.
W75-11259 8G

Basic Concepts and Practical Aspects of Corrosion Investigation,
W75-11271 8G

Dissolved Gases Are Key Corrosion Culprits,
W75-11274 8G

How to Conduct Corrosion Tests,
W75-11292 8G

CORROSION CELL
Dissolved Gases Are Key Corrosion Culprits,
W75-11274 8G

CORROSION CONTROL
Corrosion by Domestic Waters,
W75-11062 5F

How to Conduct Corrosion Tests,
W75-11292 8G

CORROSION TESTS
How to Conduct Corrosion Tests,
W75-11292 8G

CORVALLIS-ALBANY AREA (ORE)
Ground Water in the Corvallis-Albany Area, Central Willamette Valley, Oregon,
W75-10940 2F

COST ANALYSIS
Will Submersibles Make Jet Pumps Obsolete.
W75-11263 8C

Drilling Rate Affects Costs More than Bit Life,
W75-11279 8C

COST-BENEFIT ANALYSIS
Economics of Great Lakes Shipping in an Extended Season,
W75-11248 6C

COST COMPARISON
Will Submersibles Make Jet Pumps Obsolete.
W75-11263 8C

COST SHARING
Cost Sharing to Help Clean Our Waterways.
W75-11023 5G

COSTS
Pump Selection,
W75-11002 8C

Cost Evaluation of Watercourse Management in Essex,
W75-11008 5G

How to Estimate and Escalate Costs of Wastewater Equipment,
W75-11014 5D

Cost Sharing to Help Clean Our Waterways.
W75-11023 5G

Unconventional Air Drilling Reduces Well Costs.
W75-11270 8C

COTTON
Scheduling and Application Rates of Irrigation in a Humid Climate,
W75-11048 3F

COVARIANCE ANALYSIS
Covariance Analysis of Reservoir Development Effects on Property Tax Base,
W75-10851 6B

CRABS
Biomagnification of Dieldrin Residues by Food Chain Transfer from Clams to Blue Crabs Under Controllled Conditions,
W75-11135 5C

CRASSOSTREA GIGAS
Uptake of Cadmium, Zinc, Copper, Lead and Chromium in the Pacific Oyster, Crassostrea Gigas, Grown in the Tamar River, Tasmania,
W75-11086 5B

CROP PRODUCTION
Effects of Irrigation in Rain-Fed Fields on the Growth and Yield of Upland Rice Varieties, (In Korean),
W75-10853 3F

Effects of Antitranspirants on Yield of Grain Sorghum Under Limited Irrigation,
W75-10858 3F

Estimation of Safe Periods for Crop Planning Under Dryland Agriculture,
W75-10926 3F

CRYSTAL GROWTH
The Kinetics of Crystallization of Scale-Forming Minerals,
W75-11273 8G

CULEX PIPIENS
Standard Curves for Nuvacron, Malathion, Sevin, DDT, and Kelthane Tested Against the

**CULEX PIPIENS**

Mosquito Culex Pipiens L. and the Microcrustacean Daphnia Magna Straus,
W75-11082 5B

**CYANOPHYTA**

An Investigation of Glycolate Excretion in Two Species of Blue-Green Algae,
W75-11230 5C

**DAMS**

Wave Motion in Rockfill,
W75-10924 8D

**DAPHNIA**

Absorption and Elimination of Photodieldrin by Daphnia and Goldfish,
W75-11085 5B

**DAPHNIA MAGNA**

Standard Curves for Nuvacron, Malathion, Sevin, DDT, and Kelthane Tested Against the Mosquito Culex Pipiens L. and the Microcrustacean Daphnia Magna Straus,
W75-11082 5B

**DARCYS LAW**

Wave Motion in Rockfill,
W75-10924 8D

**DATA ACQUISITION**

Computer Systems and Water Resources,
W75-11174 6A

**DATA COLLECTIONS**

A Computer Program Package for Aquatic Ecologists,
W75-10908 2H

Water Resource Observatory Climatological Data, Water Year 1973.
W75-11035 7C

The Toxicity of Drilling Fluid Components to Aquatic Biological Systems. A Literature Review,
W75-11266 5C

**DATA PROCESSING**

Automated Distribution of Gauge and Shift Corrections,
W75-10911 7C

Automated Tidal Computations,
W75-10912 7C

Flow File Operations Manual,
W75-10913 7C

Description of Card and Tape Formats for Supplying Data to Users.
W75-10914 7C

Automated Hourly Computations,
W75-10915 7C

Water Resource Observatory Climatological Data, Water Year 1973.
W75-11035 7C

The Louisiana Environmental Management System and Its Utility in Water Resource Planning.
W75-11177 5G

Making Log Analysts of Geologists.
W75-11288 7C

**DATA STORAGE AND RETRIEVAL**

Automated Distribution of Gauge and Shift Corrections,
W75-10911 7C

Flow File Operations Manual,
W75-10913 7C

**DATE STORAGE AND RETRIEVAL**

Description of Card and Tape Formats for Supplying Data to Users.
W75-10914 7C

**DDT**

Effect of DDT and M.S. 222 on Learning a Simple Conditioned Response in Rainbow Trout (Salmo gairdneri),
W75-11025 5C

Standard Curves for Nuvacron, Malathion, Sevin, DDT, and Kelthane Tested Against the Mosquito Culex Pipiens L. and the Microcrustacean Daphnia Magna Straus,
W75-11082 5B

Mutagens and Potential Mutagens in the Biosphere: I. DDT and Its Metabolites, Polychlorinated Biphenyls, Chlorodioxins, Polycyclic Aromatic Hydrocarbons, Haloethers,
W75-11170 5B

**DEALKALIZATION**

System for Softening and Dealkalizing Water by Electrodialysis,
W75-11065 5F

**DECISION MAKING**

Floodplain Land-Use Management: An Application of Operations Research Methodology,
W75-11037 6F

The Louisiana Environmental Management System and Its Utility in Water Resource Planning,
W75-11177 5G

**DECOMPOSING ORGANIC MATTER**

Changes in Vegetation and Surface Soil Properties Following Irrigation of Woodlands with Municipal Wastewater,
W75-11243 5B

**DEEP SEDIMENTARY BASINS**

Review of Conference on Hydrology of Deep Sedimentary Basins,
W75-10935 5B

**DEEP SHAFT PROCESS**

ICI's Deep Shaft 'Halves Sludge Volume',
W75-10981 5D

**DENITRIFICATION**

Concurrent Nitrification-Denitrification at the Sediment-Water Interface as a Mechanism for Nitrogen Losses from Lakes,
W75-10902 5C

Pilot-Plant Study of Denitrification Using a Submerged Sand Filter at Rye Meads Sewage Works,
W75-10955 5D

Nitrogen Removal in a Pilot Plant,
W75-10984 5D

**DENMARK**

Oil Pollution and Seabirds in Denmark 1935-1968,
W75-10893 5C

**DENSITY STRATIFICATION**

Some Results on Mass Transfer Processes in a Density-Stratified Flow,
W75-11057 8B

**DEPLETED AQUIFER**

Deprivation Contribution and Interference Effects of Multiple Wells in a Common Aquifer,
W75-11142 4B

**DEPLETION EFFECTS**

Deprivation Contribution and Interference Effects of Multiple Wells in a Common Aquifer
W75-11142 4B

**DEPTH TO BEDROCK**

Map Showing Depth to Bedrock, Worthington Quadrangle, Massachusetts,
W75-10951 7C

Map Showing Depth to Bedrock, Greenfield Quadrangle, Massachusetts,
W75-10952 7C

Map Showing Depth to Bedrock, Chester Quadrangle, Massachusetts,
W75-10953 7C

Map Showing Depth to Bedrock, Mount Carmel Quandrangle, Connecticut,
W75-10954 7C

**DESALINATION**

Calcium Sulfate Solubility in Brackish Water Concentrates and Applications to Reverse Osmosis Processes: Polyphosphate Additives,
W75-11004 5F

Electrolytic Sea Water Process,
W75-11068 3

**DESERT PAVEMENT**

Barrenness of Desert Pavement in Yuma County, Arizona,
W75-10868 2

**DESERT PLANTS**

Phenology of Selected Sonoran Desert Plants, Punta Cirio, Sonora, Mexico.
W75-10862

Products from Jojoba: A Promising New Crop for Arid Lands.
W75-10890

**DESIGN**

Desirable Provision in Current Designs for future Development in Relation to Reclamation of Effluent,
W75-10980

Use of Steelon-Net Veils for Protection of Hydro-Engineering Works Against Dreissena Polymorphia Pall,
W75-11033

Continuous Automatic Monitoring of Surface Water with Fish,
W75-11079

Improved Design of Distribution Networks for Minimum Route,
W75-11175

Workshop on Computer-Aided Design and Simulation of Waste Treatment Systems.
W75-11338

**DESIGN CRITERIA**

Experimental Study of the Cooling Water System, Setubal Power Plant, Rio Sado, Portugal,
W75-10855

Improved Design and Operating Criteria for Rural Water Districts,
W75-11056

Huntingdon Research Centre Pasveer Oxidation Plant--Six Years On,
W75-11115

Predicting Cavitation in Sudden Enlargements,
W75-11151

elf-Tapping Screw' Bit Would Use Lighter
eights,
75-11283 8C

IGN FLOODS
ood Runoff from Urban Areas,
75-10904 5B

ERGENTS
nsids (Syndets) and the Water Pollution
oblem, (Gesund-Heitliche Aspekte Des Ten-
-Gebrauchs),
75-11134 5D

ROIT (MICH)
st Stage of the World's Largest Pure Oxygen
wage Plant to Undergo Test.
5-10960 5D

ATERING
waters Sludge.
5-10966 5D

Economy of Various Methods for De-
ering Sludge From Biological Purification
ber die Wirtschaftlichkeit verschiedener
fahren zur Entwaesserung von
ogischem Klaerschlamm),
5-11127 5D

as Trickling-Filter Dewatering Medium
Pulp and Paper Mill Sludge,
-11241 5D

OMS
tions Between Algal Populations and the
f Their Media,
-11028 5C

RIN
rption and Elimination of Photodieldrin by
nia and Goldfish,
-11085 5B

agnification of Dieldrin Residues by Food
n Transfer from Clams to Blue Crabs
r Controllled Conditions,
11135 5C

TION
titative Estimation of the Daily Ingestion
hytoplankton by Tilapia Nilotica and
ochromis Nigripinnis in Lake George,
da,
11268 2H

A
ffects of Experimental Blackfly (Diptera:
idae) Larviciding with Abate, Dursban,
ethoxychlor on Stream Invertebrates,
1157 5C

RGE (WATER)
mental Study of the Cooling Water
n, Setubal Power Plant, Rio Sado, Portu-
0855 5B

ption of Card and Tape Formats for Sup-
Data to Users.
0914 7C

CTION
and Wastewater Disinfection with
A Critical Review,
0956 5D

cting Wastewater with Chlorina-
chlorination Part 1,
963 5D

Disinfecting Wastewater with Chlorination/Dechlorination Part 2,
W75-10964 5D

DISPERSION
Hydraulic Modeling of Mixing Phenomena in Stratified Lakes,
W75-11043 2H

Process Studies and Modeling of Self-Cleaning Capacity of Mountain Creeks for Recreation Planning and Management,
W75-11055 5B

DISSOLUTION RATES
A Study of Factors Controlling the Chemical Quality of Water in Cartwright Creek Basin, Williamson County, Tennessee,
W75-11164 2K

DISSOLVED AIR FLOTATION
Algae Removal Using Dissolved Air Flotation,
W75-10978 5D

DISSOLVED OXYGEN
Survival and Growth Rate of Channel Catfish as a Function of Dissolved-Oxygen Concentration,
W75-11051 5C

Process Studies and Modeling of Self-Cleaning Capacity of Mountain Creeks for Recreation Planning and Management,
W75-11055 5B

DISSOLVED OXYGEN *ELECTROCHEMISTRY
Dissolved Gases Are Key Corrosion Culprits,
W75-11274 8G

DISSOLVED SOLIDS
A Study of Factors Controlling the Chemical Quality of Water in Cartwright Creek Basin, Williamson County, Tennessee,
W75-11164 2K

Specific Conductance Method for in Situ Estimation of Total Dissolved Solids,
W75-11167 5A

Dissolved Organic Matter and Lake Metabolism,
W75-11188 5C

DISTILLATION
Vacuum Distillation/Vapor Filtration Water Recovery,
W75-11315 5D

DISTRIBUTION PATTERNS
Time-Variant Characteristics of Selected Wastewater Treatment Plants of Nevada,
W75-11245 5D

DISTRIBUTION SYSTEMS
Practical Application of Surface Fixed-System for Multi-Purpose Sprinkler Irrigation Uses, (In Japanese),
W75-11097 3F

Distribution-System Operation Analysis Model,
W75-11180 5D

Finite-Element Method for Water-Distribution Networks,
W75-11186 4A

DISTRICT OF COLUMBIA
Population Dynamics of Protozoa in Wastewater,
W75-10957 5D

DOCUMENTATION
The Awareness of the Relevant Water Resources Literature by the Personnel of the Wisconsin Department of Natural Resources,
W75-10899 10C

DOMESTIC WATER
City/Township Joint Venture--A New Water Plant,
W75-11015 5F

Corrosion by Domestic Waters,
W75-11062 5F

DOWNHOLE PUMPING
Installing Submersibles.
W75-11264 8C

DRAINAGE SYSTEMS
Cost Evaluation of Watercourse Management in Essex,
W75-11008 5G

DREISSENA POLYMORPHA
Use of Steelon-Net Veils for Protection of the Hydro-Engineering Works Against Dreissena Polymorphia Pall,
W75-11033 5G

DRILL BIT
'Self-Tapping Screw' Bit Would Use Lighter Weights,
W75-11283 8C

DRILL BIT DESIGN
Drilling Rate Affects Costs More than Bit Life,
W75-11279 8C

DRILL STEM TEST DATA
Simple Field Checks Will Provide Accurate DST Data,
W75-11281 8G

DRILLING
Unconventional Air Drilling Reduces Well Costs.
W75-11270 8C

Simple Field Checks Will Provide Accurate DST Data,
W75-11281 8G

How to Find Transition Zones in Soft Formations,
W75-11285 8G

Casing-Seat Testing - Why and How,
W75-11291 8F

How Downhole Temperatures, Pressures Affect Drilling; Part 4: Pitfalls in Overpressure Prediction,
W75-11294 8G

How Downhole Temperatures, Pressures Affect Drilling; Part 5: Predicting Hydrocarbon Environments with Wireline Data,
W75-11295 8G

How Downhole Temperatures, Pressures Affect Drilling; Part 6: Correlating Geopressure Gradients with Hydrocarbon Accumulations,
W75-11296 8G

How Downhole Temperatures, Pressures Affect Drilling; Part 7: The Shale Resistivity Ratio - A Valuable Tool for Making Economic Drilling Decisions,
W75-11297 8G

How Downhole Temperatures, Pressures Affect Drilling; Part 8: Needless Spending of

**DRILLING**

Drilling and Exploration Money Can Be Predicted-And Prevented,
W75-11298 8G

**DRILLING EQUIPMENT**
Drilling Rate Affects Costs More than Bit Life,
W75-11279 8C

Special Annulus Fluid Eases Casing Recovery.
W75-11282 8G

'Self-Tapping Screw' Bit Would Use Lighter Weights,
W75-11283 8C

**DRILLING FLUID**
The Toxicity of Drilling Fluid Components to Aquatic Biological Systems, A Literature Review,
W75-11266 5C

**DRILLING FLUIDS**
Acute Toxicity of Petrochemical Drilling Fluids Components and Wastes to Fish,
W75-11265 5C

Tests Show Potassium Mud Versatility,
W75-11284 8G

**DRILLING RATE**
Drilling Rate Affects Costs More than Bit Life,
W75-11279 8C

**DROPS (FLUIDS)**
Charged Droplet Collision Efficiency Measurements,
W75-11168 2B

**DROUGHTS**
International Development Strategies for the Sahel.
W75-10861 4A

**DRUG RESISTANT BACTERIA**
Drug Resistant Coliforms Call for Re-Evaluation of Water Quality Standards,
W75-11130 5B

**DRY FARMING**
Estimation of Safe Periods for Crop Planning Under Dryland Agriculture,
W75-10926 3F

Improving Productivity in Low Rainfall Areas, in India.
W75-11099 3F

**DRY WELLS**
Special Annulus Fluid Eases Casing Recovery.
W75-11282 8G

**DUAL PURPOSE ENERGY PLANTS**
Status of Waste Heat Utilization and Dual-Purpose Plant Projects,
W75-11251 3E

**DUNES**
Studies on the Relationship Between Dry-Matter Production and the Development of a Pine Forest on Coastal Sand Dunes (1), (In Japanese),
W75-11098 4A

**DURSBAN**
The Effects of Experimental Blackfly (Diptera: Simuliidae) Larviciding with Abate, Dursban, and Methoxychlor on Stream Invertebrates,
W75-11157 5C

**DUWAMISH-GREEN RIVER (WASH)**
Use of Productivity of Periphyton to Estimate Water Quality,
W75-10936 5B

**EARTH DAMS**
Application of Electrical Analogy to Draw Flow Nets for Sudden Drawdown Conditions in Earth Dams,
W75-11143 8B

**ECOLOGY**
Environmental Impact Evaluation in Freshwater Impoundments by Vegetation Analysis of the Terrestrial Ecosystem,
W75-10905 2I

A Computer Program Package for Aquatic Ecologists,
W75-10908 2H

**ECONOMIC ANALYSIS**
Floodplain Land-Use Management: An Application of Operations Research Methodology,
W75-11037 6F

**ECONOMIC IMPACT**
Economic Analysis of Effluent Guidelines: Meat Packing Industry,
W75-11249 5G

Economic Analysis of Effluent Guidelines. Ferroalloys Industry.
W75-11250 5G

The Economic Impact of Pollution Abatement: The Case of Water Pollution by Degradable Organic Matter,
W75-11254 5G

**ECONOMIC PLANTS**
Products from Jojoba: A Promising New Crop for Arid Lands.
W75-10890 3F

**ECONOMICS**
Cost Sharing to Help Clean Our Waterways.
W75-11023 5G

Upgrading Meat Packing Facilities to Reduce Pollution. (Part 3). Choosing the Optimum Financial Strategy,
W75-11322 5D

**ECOSYSTEMS**
Environmental Impact Evaluation in Freshwater Impoundments by Vegetation Analysis of the Terrestrial Ecosystem,
W75-10905 2I

Freshwater Ecosystem Research in Water Quality Management,
W75-11012 6G

**EDDY CORRELATION TECHNIQUE**
Evapotranspiration of Four Forest Types Measured With the Eddy Correlation Technique,
W75-11044 2D

**EFFLUENT FEES**
Simulation of Water Quality Management Policies,
W75-11181 5G

**EFFLUENT GUIDELINES**
Economic Analysis of Effluent Guidelines: Meat Packing Industry,
W75-11249 5G

Economic Analysis of Effluent Guidelines. Ferroalloys Industry.
W75-11250 5G

**EFFLUENTS**
Design Considerations--Water and Effluent Disposal,
W75-11128 5D

Economic Analysis of Effluent Guidelines: Meat Packing Industry.
W75-11249 5G

Economic Analysis of Effluent Guidelines. Ferroalloys Industry.
W75-11250 5

**EGERIA DENSA**
Chemical Control of Egeria Densa,
W75-11199 5

**EJECTOR PUMP**
Will Submersibles Make Jet Pumps Obsolete.
W75-11263

**ELECTRIC CURRENTS**
Electrical Tests for Submersible Pumps,
W75-11260

**ELECTRIC GENERATORS**
A Comparison of Effects of Elevated Temperature Versus Temperature Fluctuations on Re Corals at Kahe Point, Oahu,
W75-11084

**ELECTRIC POWER PRODUCTION**
Impact of Energy Development on the Law the Colorado River,
W75-10869

**ELECTRICAL EQUIPMENT**
Electrical Tests for Submersible Pumps,
W75-11260

**ELECTROCHEMISTRY**
Study of Electrochemical Treatment Meu for Removing Colloidal Particles from Pulp Paper Industry Effluents (Tutkimus sellut lisuuden jatevesien kolloidaalisten aines poistomahdollisuudesta sahkokemialliesti),
W75-11348

**ELECTRODIALYSIS**
System for Softening and Dealkalizing W by Electrodialysis,
W75-11065

**ELECTROLYSIS**
Physiochemical Treatment of Wastewater-water Mixture by Electrolysis,
W75-10979

Electrolytic Sea Water Process,
W75-11068

Electrolytic Control of Algae,
W75-11228

**ELECTROMAGNETIC WAVES**
Computer Algorithms Useful for Determin Subsurface Electrical Profile Via Frequency Probing,
W75-10910

**EMBRYONIC GROWTH STAGE**
The Effects of Crude Oils and the Dispe Corexit 8666 on Sea Urchin Gametes and ryos,
W75-11090

The Effects of Oil Dispersants on the C Fertilization and Development,
W75-11091

**ENDEMIC NEPHROPATHY**
Endemic Nephrophathy and Its Relation Contamination of Well Water by Ph Compounds in Barsa-Arad (Nefropati demica Si Relatia Cu Impurificarea Prin pousi Fenolici in Apele Fintinilor Din C Barsa-Arad),
W75-11105

ERGY
How Steam is Produced and Handled at the Geyers,
W75-11280 4B

ERGY DEVELOPMENT
mpact of Energy Development on the Law of ne Colorado River,
V75-10869 4C

ERGY SPECTRA
urbulent Structure Near Smooth Boundary,
75-11148 8B

GLAND
ne Water Industry in Transition,
75-11252 3E

IRONMENTAL EFFECTS
an's Influence on the Hydrological Cycle: A raft Report of the UNESCO/FAO Working oup on the International Hydrological ecade.
75-10863 2A

e Nature and Components of the Hydrologi- Cycle,
5-10864 2A

Analysis of the Motor-Row Conversion ue of Colorado River Float Trips,
5-10867 6B

vironmental Impact Evaluation in Fresh- er Impoundments by Vegetation Analysis of Terrestrial Ecosystem,
5-10905 2I

ne Observations on Behavior of the Treated vage Disposed in the Sea,
5-11020 5B

tegic Approach to Estuarine Environmental agement,
-11179 2L

Effects of the Formation of Lake Kainji eria) Upon the Indigenous Fish Population,
-11223 5C

Economic Analysis of the Pollution lems in the Colorado River Basin: The er Main Stem Sub-Basin,
-11247 5G

elines for the Identification of Potential ronmental Impacts in the Construction and ation of a Reservoir,
11316 5C

ONMENTAL ENGINEERING
ation of Water Quality Management Poli-
11181 5G

ONMENTAL SANITATION
mpact of the Safe Drinking Water Act on es,
0859 5G

Adapters: Emphasis on Sanitation,
1258 8C

ICS
erborne Gastroenteritis Epidemic in Pico , California,
1005 5F

NAL INVERTEBRATES
nal Invertebrates as Indicators of Water in Southern Lake Pontchartain,
0852 5C

EQUIPMENT
Pump Selection,
W75-11002 8C

How to Estimate and Escalate Costs of Wastewater Equipment,
W75-11014 5D

EQUIPMENT RECOVERY
Special Annulus Fluid Eases Casing Recovery.
W75-11282 8G

EROSION
Factors Affecting Erosion in a Semi-Arid Watershed,
W75-10884 2J

Matagorda Island, Texas: The Evolution of a Gulf Coast Barrier Complex,
W75-11144 2L

Denudation Studies: Can We Assume Stream Steady State,
W75-11154 2J

EROSION CONTROL
Shrub Transplanting for Watershed Management and Range Improvement in Iran,
W75-10870 4D

Stabilization and Reconstruction of Texas Coastal Foredunes with Vegetation,
W75-10887 2L

ESTIMATING
The Measurement and Estimation of Lake Evaporation from Four Australian Water Storages,
W75-11300 2D

ESTIMATING EQUATION
Approximation for Steady Interface Beneath a Well Pumping Fresh Water Overlying Salt Water,
W75-11255 4B

ESTUARIES
A Three-Dimensional Model for Estuaries and Coastal Seas: Vol. II, Aspects of Computation,
W75-10900 2L

Behavior of Mn, Fe, Cu, Zn, Cd and Pb Discharged from a Wastewater Treatment Plant into an Estuarine Environment,
W75-11160 5B

Strategic Approach to Estuarine Environmental Management,
W75-11179 2L

A Survey of Fishes and Commercial Invertebrates of the Nearshore and Estuarine Zone Between Cape Romano and Cape Sable, Florida,
W75-11189 2I

EURASIAN WATER MILFOIL
Biological Control of Eurasian Water Milfoil,
W75-11203 4A

EUROPE
A General Description of the Oligotrophic Lake Paajarvi, Southern Finland, and the Ecological Studies on It,
W75-11229 5C

EURYTEMORA AFFINIS
Adaptation of Copepod Populations to Thermal Stress,
W75-11046 5C

EUTROPHICATION
Wastewater Treatment Using Algae and Artemia,
W75-10967 5D

Preliminary Investigations into Copper Cycling in Indian Lake, Massachusetts: A Lake Treated Annually with Copper Sulfate,
W75-11039 5B

South African Eutrophication Problems: A Perspective,
W75-11131 5C

Dissolved Organic Matter and Lake Metabolism,
W75-11188 5C

Man's Impact on a Newly Formed Reservoir,
W75-11233 5C

The Economic Impact of Pollution Abatement: The Case of Water Pollution by Degradable Organic Matter,
W75-11254 5G

Natural and Fertilizer Nitrogen in Streams and Lakes,
W75-11311 5B

EVALUATION
Waste Water Survey, St. Regis Paper Company, Cantonment, Florida.
W75-11314 5D

EVAPORATION
System for Optimal Pressure Control in a Multi-Stage Evaporation Unit,
W75-11070 3A

The Measurement and Estimation of Lake Evaporation from Four Australian Water Storages,
W75-11300 2D

EVAPORATION CONTROL
Wind Effects on Chemical Films for Evaporation Suppression at Lake Hefner,
W75-10920 3B

EVAPOTRANSPIRATION
Evapotranspiration of Four Forest Types Measured With the Eddy Correlation Technique,
W75-11044 2D

EVAPOTRANSPIRATION CONTROL
An Appraisal of Potential Water Salvage in the Lake McMillen Delta Area, Eddy County, New Mexico,
W75-10941 3B

EVOLUTION
Matagorda Island, Texas: The Evolution of a Gulf Coast Barrier Complex,
W75-11144 2L

EXCRETION
An Investigation of Glycolate Excretion in Two Species of Blue-Green Algae,
W75-11230 5C

EXPLORATION
Making Log Analysts of Geologists.
W75-11288 7C

Subsurface Water -- Tool for Petroleum Exploration,
W75-11289 4B

How Downhole Temperatures, Pressures Affect Drilling; Part 8: Needless Spending of Drilling and Exploration Money Can Be Predicted-And Prevented,
W75-11298 8G

FAILURE (MECHANICS)
The Mechanics of Rock Failure Due to Water Jet Impingement,
W75-11272 8E

FALLOUT
A Field Study of Physico-Chemical States of Artificial Radionuclides in Seawater,
W75-11022 5B

FARM MANAGEMENT
Improving Productivity in Low Rainfall Areas, in India.
W75-11099 3F

FATHEAD MINNOWS
Toxaphene Effects on Growth and Bone Composition of Fathead Minnows, Pimephales Promelas,
W75-11026 5C

FEASIBILITY STUDIES
Tests Show Potassium Mud Versatility,
W75-11284 8G

FEDERAL JURISDICTION
Milestone Water Legislation Accompanied by Millstone of Bureaucratic Red Tape,
W75-11007 5G

FEDERAL WATER POLLUTION CONTROL ACT
Information as a Regulatory Tool in Water Quality Control,
W75-10903 5G

Cost Sharing to Help Clean Our Waterways.
W75-11023 5G

FEHLMANN COLLECTOR
Induced Infiltration Supply System Among Biggest.
W75-11010 5F

FERROALLOYS INDUSTRY
Economic Analysis of Effluent Guidelines. Ferroalloys Industry.
W75-11250 5G

FERTILIZATION
The Effects of Oil Dispersants on the Cell in Fertilization and Development,
W75-11091 5C

Effects of Ozone-Treated Seawater on the Spawned, Fertilized, Meiotic, and Cleaving Eggs of the Commercial American Oyster,
W75-11256 5C

FERTILIZERS
Fertilizer Phosphate in Streams and Lakes,
W75-11310 5B

Natural and Fertilizer Nitrogen in Streams and Lakes,
W75-11311 5B

FILMS
Wind Effects on Chemical Films for Evaporation Suppression at Lake Hefner,
W75-10920 3B

FILTERS
Pilot Plant Study of Denitrification Using a Submerged Sand Filter at Rye Meads Sewage Works,
W75-10955 5D

FILTRATION
Treatment Methods of Groundwater Containing a Large Quantity of Humic Acid (Aufbereitungsversuche an einem stark huminstoffbelasteten Tiefengrundwasser),
W75-11117 5D

Can a Computer Really Operate a Water-Filtration Plant,
W75-11184 5F

Vacuum Distillation/Vapor Filtration Water Recovery,
W75-11315 5D

FINANCING
Upgrading Meat Packing Facilities to Reduce Pollution. (Part 3). Choosing the Optimum Financial Strategy,
W75-11322 5D

FINITE DIFFERENCES
A Three-Dimensional Model for Estuaries and Coastal Seas: Vol. II, Aspects of Computation,
W75-10900 2L

Wave Motion in Rockfill,
W75-10924 8D

FINITE ELEMENT ANALYSIS
Management of Retardation of Salt Water Intrusion in Coastal Aquifers,
W75-11058 2F

Finite-Element Method for Water-Distribution Networks,
W75-11186 4A

FINLAND
Study of Electrochemical Treatment Method for Removing Colloidal Particles from Pulp and Paper Industry Effluents (Tutkimus selluteollisuuden jatevesien kolloidaalisten ainesten poistomahdollisuudesta sahkokemialliesti),
W75-11348 5D

FISH
Studies on Toxicity of Sodium Nifurstyrenate (NFS-NA) in Cultured Yellowtail (In Japanese),
W75-11034 5C

The Toxicity of Drilling Fluid Components to Aquatic Biological Systems, A Literature Review,
W75-11266 5C

Quantitative Estimation of the Daily Ingestion of Phytoplankton by Tilapia Nilotica and Haplochromis Nigripinnis in Lake George, Uganda,
W75-11268 2H

Effluent Characteristics and Treatment of Mechanical Pulping Effluents,
W75-11331 5D

FISH BEHAVIOR
Effect of DDT and M.S. 222 on Learning a Simple Conditioned Response in Rainbow Trout (Salmo gairdneri),
W75-11025 5C

FISH DIETS
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. IV. Feeding of Introduced and Autochthonous Non-Predatory Fish,
W75-11234 5C

FISH DISEASES
Studies on Toxicity of Sodium Nifurstyrenate (NFS-NA) in Cultured Yellowtail (In Japanese),
W75-11034 5C

FISH EGGS
The Effects of Oil Dispersants on the Cell
Fertilization and Development,
W75-11091

Effects of Ozone-Treated Seawater on
Spawned, Fertilized, Meiotic and Cleav
Eggs of the Commercial American Oyster,
W75-11256

FISH MANAGEMENT
Experimentally Increased Fish Stock in
Pond Type Lake Warniak. IV. Feeding of
troduced and Autochthonous Non-Predat
Fish,
W75-11234

FISH PHYSIOLOGY
Effect of DDT and M.S. 222 on Learnin
Simple Conditioned Response in Rainb
Trout (Salmo gairdneri),
W75-11025

Toxaphene Effects on Growth and Bone C
position of Fathead Minnows, Pimeph
Promelas,
W75-11026

Studies on Toxicity of Sodium Nifurstyre
(NFS-NA) in Cultured Yellowtail
Japanese),
W75-11034

The Effects of Oil Dispersants on the C
Fertilization and Development,
W75-11091

FISH POPULATIONS
The Effects of the Formation of Lake K
(Nigeria) Upon the Indigenous Fish Popula
W75-11223

FISH REPRODUCTION
Unisex Studies on the White Amur,
W75-11205

FISH STERILANTS
Unisex Studies on the White Amur,
W75-11205

FISH STOCKING
Experimentally Increased Fish Stock i
Pond Type Lake Warniak. IV. Feeding
troduced and Autochthonous Non-Pre
Fish,
W75-11234

FISHERIES
Limnology of Desert Ponds,
W75-10880

A Survey of Fishes and Commercial
tebrates of the Nearshore and Estuarin
Between Cape Romano and Cape
Florida,
W75-11189

FLOCCULATION
The Mechanism of Flocculation Proce
the Presence of Humic Stubtances,
W75-10958

Process for Treating Industrial Wastes,
W75-11066

Process for Treating Industrial Wastes,
W75-11067

Flocculation Device for Waste Fluid
ment,
W75-11077

ptimum Values for Operational Variables in
rbidity Removal,
75-11110
5D

eating Effluents from a Sulphite Pulp Mill by
otation,
75-11347
5D

udy of Electrochemical Treatment Method
Removing Colloidal Particles from Pulp and
per Industry Effluents (Tutkimus selluteol-
uuden jatevesien kolloidaalisten ainesten
stomahdollisuudesta sahkokemialliesti),
5-11348
5D

**OD FREQUENCY**
ative Importance of Decision Variables in
od Frequency Analysis,
5-10929
4A

**OD PLAIN INSURANCE**
Case Study of Some Economic Aspects of
National Flood Insurance Program,
5-10906
6F

Economics of Flood Insurance: An Analy-
of the National Flood Insurance Program,
5-11038
6F

**D PLAIN ZONING**
odplain Land-Use Management: An Appli-
on of Operations Research Methodology,
-11037
6F

criptive Economic Models for Nonstruc-
Flood Control,
-11060
6F

**D PLAINS**
criptive Economic Models for Nonstruc-
Flood Control,
-11060
6F

**OWATER**
ronmental Impact Evaluation in Fresh-
Impoundments by Vegetation Analysis of
errestrial Ecosystem,
10905
2I

**DA**
arge Areas of the Floridan Aquifer in
ole County and Vicinity, Florida,
10944
7C

arison of Uredo Eichhorniae, the Water-
th Rust, and Uromyces Pontederiae,
1092
5G

rvey of Fishes and Commercial Inver-
es of the Nearshore and Estuarine Zone
en Cape Romano and Cape Sable,
a,
1189
2I

ion Clean Sweep,
1192
5G

c Plant Research and Control in Florida,
1195
4A

Water Survey, St. Regis Paper Com-
Cantonment, Florida.
1314
5D

**AN AQUIFER**
ge Areas of the Floridan Aquifer in
le County and Vicinity, Florida,
944
7C

**ION**
Removal Using Dissolved Air Flotation,
978
5D

Treating Effluents from a Sulphite Pulp Mill by Flotation,
W75-11347
5D

**FLOW**
Formulation of Boundary Conditions at the Surface of a Porous Medium,
W75-11269
8B

Analysis of Factors Influencing Mobility and Adsorption in the Flow of Polymer Solution Through Porous Media,
W75-11275
8B

Theory of Plasticity of Porous Media with Fluid Flow,
W75-11276
8E

**FLOW AROUND OBJECTS**
Cavitation Control by Aeration of High-Velocity Jets,
W75-11152
8B

**FLOW CHARACTERISTICS**
Some Results on Mass Transfer Processes in a Density-Stratified Flow,
W75-11057
8B

Turbulent Structure Near Smooth Boundary,
W75-11148
8B

**FLOW MEASUREMENT**
Difficulties in Gauging Small Catchments - A Case Study,
W75-11306
2E

**FLOW NETS**
Application of Electrical Analogy to Draw Flow Nets for Sudden Drawdown Conditions in Earth Dams,
W75-11143
8B

**FLOW RATES**
Nozzle Hydraulics in the Trickle Irrigation System--Relation Between Water Temperature and Nozzle Flow Rate (In Japanese),
W75-11096
3F

**FLOW-THROUGH SYSTEMS**
Continuous Automatic Monitoring of Surface Water with Fish,
W75-11079
5A

**FLUORIDES**
Interference of Sulfate Ion on SPADNS (Sodium 2-(Sulfophenylazo)-1,8-Dihydroxynaphthalene-3,6-Disulfonate) Colorimetric Determination of Fluorine in Waste Waters,
W75-11343
5A

**FLY ASH**
Evaluation of the Adsorptive Properties of Fly Ash with Reference to a Pulp and Paper Mill Waste Effluent,
W75-11335
5D

**FOOD CHAINS**
Biomagnification of Dieldrin Residues by Food Chain Transfer from Clams to Blue Crabs Under Controllled Conditions,
W75-11135
5C

**FOOD PROCESSING INDUSTRY**
Economic Analysis of Effluent Guidelines: Meat Packing Industry,
W75-11249
5G

Upgrading Meat Packing Facilities to Reduce Pollution. (Part 1). In-Process Modifications and Pretreatment,
W75-11320
5D

Upgrading Meat Packing Facilities to Reduce Pollution. (Part 2). Waste Treatment,
W75-11321
5D

Upgrading Meat Packing Facilities to Reduce Pollution. (Part 3). Choosing the Optimum Financial Strategy,
W75-11322
5D

Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 1). In-Process Pollution Abatement,
W75-11328
5D

Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 2). Pretreatment of Poultry-Processing Wastes,
W75-11329
5D

Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 3). Waste Treatment.
W75-11330
5D

**FORECASTING**
Predicting Cavitation in Sudden Enlargements,
W75-11151
8B

Some Observations on Rainfall in Western New South Wales,
W75-11304
2B

**FOREIGN COUNTRIES**
Translations on Environmental Quality, No. 33.
W75-11246
5G

**FOREST MANAGEMENT GUIDELINES**
An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W75-11049
4A

**FOREST WATERSHEDS**
An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W75-11049
4A

Moisture and Energy Conditions in a Draining Soil Mass,
W75-11054
2G

**FORESTS**
Vegetation, Soil, and Climate on the Green Mountains of Vermont,
W75-11021
2I

Evapotranspiration of Four Forest Types Measured With the Eddy Correlation Technique,
W75-11044
2D

**FORMALDEHYDE**
Preserving Activated Sludge,
W75-10962
5D

**FORMATION PRESSURE**
How to Find Transition Zones in Soft Formations,
W75-11285
8G

How Downhole Temperatures, Pressures Affect Drilling; Part 4: Pitfalls in Overpressure Prediction,
W75-11294
8G

**FRICTION**
Effects of Entrance Loss on Harbor Oscillations,
W75-11147
8B

**FUCUS VESICULOSUS**
The Accumulation of Cadmium, Copper, Manganese and Zinc by Fucus Vesiculosus in the Bristol Channel,
W75-11083
5B

FULVIC ACIDS
Chelation Study of Copper (II): Fulvic Acid System,
W75-11219 5B

FUNGI
Phytophthora Species in Arizona: Its Occurrence in Recycled Irrigation water,
W75-10883 5A

GAGING STATIONS
Difficulties in Gauging Small Catchments - A Case Study,
W75-11306 2E

Aspects of Rainfall Measurement in a New England Location,
W75-11309 2B

GAMETES
The Effects of Crude Oils and the Dispersant Corexit 8666 on Sea Urchin Gametes and Embryos,
W75-11090 5C

The Effects of Oil Dispersants on the Cell in Fertilization and Development,
W75-11091 5C

GAS
How Downhole Temperatures, Pressures Affect Drilling; Part 6: Correlating Geopressure Gradients with Hydrocarbon Accumulations,
W75-11296 8G

How Downhole Temperatures, Pressures Affect Drilling; Part 8: Needless Spending of Drilling and Exploration Money Can Be Predicted-And Prevente
W75-11298 8G

GAS CHROMATOGRAPHY
Chromatographic Determination of Phenols in Water,
W75-11344 5A

GASES
Dissolved Gas Supersaturation and Dilution in Thermal Plumes from Steam Electric Generating Stations,
W75-11159 5B

GASTROPODS
Copper Toxicity in Busycon Canaliculatum L.,
W75-11031 5C

GEOCHEMISTRY
Geochemical Reconaissance of Surficial Materials in the Vicinity of Shawangunk Mountain, New York,
W75-10928 5A

GEOLOGIC MAPPING
Contour Map of the Bedrock Surface, New Britain Quadrangle, Connecticut,
W75-10950 7C

Map Showing Depth to Bedrock, Worthington Quadrangle, Massachusetts,
W75-10951 7C

Map Showing Depth to Bedrock, Greenfield Quadrangle, Massachusetts,
W75-10952 7C

Map Showing Depth to Bedrock, Chester Quadrangle, Massachusetts,
W75-10953 7C

Map Showing Depth to Bedrock, Mount Carmel Quandrangle, Connecticut,
W75-10954 7C

GEOLOGY
Review of Conference on Hydrology of Deep Sedimentary Basins,
W75-10935 5B

Sediment Processes in Great Lakes,
W75-11237 2J

GEOPHYSICS
Computer Algorithms Useful for Determining a Subsurface Electrical Profile Via High Frequency Probing,
W75-10910 8G

GEORGIA
Unisex Studies on the White Amur,
W75-11205 5C

GEOSMIN
Biological Control: Isolation and Bacterial Oxidation of the Taste-and-Odor Compound Geosmin,
W75-11013 5F

GEOTHERMAL ENERGY
How Steam is Produced and Handled at the Geyers,
W75-11280 4B

GEOTHERMAL STUDIES
How Steam is Produced and Handled at the Geyers,
W75-11280 4B

GERMANY (HAMBURG-CURSLACK)
Treatment Methods of Groundwater Containing a Large Quantity of Humic Acid (Aufbereitungsversuche an einem stark huminstoffbelasteten Tiefengrundwasser),
W75-11117 5D

GERMINATION
The Early Vegetative Growth of Two Annual Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.),
W75-10876 3F

Establishing Alkali Sacaton on Harsh Sites in the Southwest,
W75-10882 4A

The Germination and Establishment of Two Annual Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.),
W75-10897 2I

GLACIAL SEDIMENTS
Weyl's Theory of Glaciation Supported by Isotopic Study of Norwegian Core K 11,
W75-11153 2J

GLACIERS
Weyl's Theory of Glaciation Supported by Isotopic Study of Norwegian Core K 11,
W75-11153 2J

GLYCOLIC ACID
An Investigation of Glycolate Excretion in Two Species of Blue-Green Algae,
W75-11230 5C

GOLDFISH
Absorption and Elimination of Photodieldrin by Daphnia and Goldfish,
W75-11085 5B

GOPHER SNAKES
The Use of Snakes as a Pollution Indicator Species,
W75-11089 5B

GRASSES
The Early Vegetative Growth of Two Ann
Pasture Grasses (Hordeum Leporinum L
and Lolium Rigidum Gaud.)
W75-10876

Establishing Alkali Sacaton on Harsh Sites
the Southwest,
W75-10882

Water Consumption and Water Turnover
Sheep Grazing Semiarid Pasture Communi
in New South Wales,
W75-10888

The Influence of Density and Nitrogen on
Outcome of Competition Between Two An
Pasture Grasses (Hordeum Leporinum
and Lolium Rigidum Gaud.),
W75-10889

The Germination and Establishment of
Annual Pasture Grasses (Hordeum Lepori
Link and Lolium Rigidum Gaud.),
W75-10897

Transplanting Sea Grass in Mississippi Sou
W75-11207

GRASSLANDS
Seasonal Variation in Composition,
Biomass, and Net Primary Productivity
Tropical Grassland at Kurukshetra, India,
W75-11006

GRAZING
Salt and Specific Ion Effects on Germinati
Four Grasses,
W75-10894

GREAT LAKES
Primary Production in Lakes Ontario and
A Comparative Study,
W75-11217

Sediment Processes in Great Lakes,
W75-11237

Preliminary Information on the Nature
ganic Matter in the Surface Sediments of
Huron, Erie, and Ontario,
W75-11240

Economics of Great Lakes Shipping in
tended Season,
W75-11248

GREEN MOUNTAINS (VT)
Vegetation, Soil, and Climate on the
Mountains of Vermont,
W75-11021

GREENFIELD (MASS)
Map Showing Depth to Bedrock, Gre
Quadrangle, Massachusetts,
W75-10952

GREENHOUSES
Cultivation of Netted Melon By Use of
Irrigation in a Sand Field Plastic Gree
(In Japanese),
W75-11095

GROUNDWATER
Quality of Water in Aquifers of the A
Desert and Vicinity, Nevada,
W75-10932

How Silica Affects Iron Remov
Groundwater,
W75-11016

of Criteria and Models Establishing Op-
n Level of Hydrogeologic Information for
ndwater Basin Management,
1042
2F

nent Methods of Groundwater Containing
arge Quantity of Humic Acid
ereitungsversuche an einem stark humin-
elasteten Tiefengrundwasser),
1117
5D

ation Contribution and Interference Ef-
f Multiple Wells in a Common Aquifer,
1142
4B

m Mineralization by Ground Water in
ntary Rocks, Japan.
145
2F

Wastes, Animal Refuse, and Organic
es Disposal, and the Quality of Ground
244
5B

lo City Solves Its Sand Pumping
ıs,
261
8C

Water Depletion and Subsidence
s in Taipei Basin,
262
4B

ıce Water -- Tool for Petroleum Ex-
,
89
4B

ical Way to Find Minimum Drainage
a Well,
901
4B

**WATER MINING**
ion Contribution and Interference Ef-
Multiple Wells in a Common Aquifer,
12
4B

**WATER MOVEMENT**
ation of Regional Hydraulic Conduc-
rough Use of C-14 Dating of Ground-
0
2F

**WATER RECHARGE**
Areas of the Floridan Aquifer in
County and Vicinity, Florida,
4
7C

**WATER RESOURCES**
Availability of Surface and Ground
the Pojoaque River Drainage Basin,
County, New Mexico,
4A

Water in the Corvallis-Albany Area,
illamette Valley, Oregon,
2F

Areas of the Floridan Aquifer in
County and Vicinity, Florida,
7C

Groundwater Collectors, Hydraulics
8B

Groundwater Collectors, 'Canada's
ter Well',
8B

**TES**
Effects on Growth and Bone Com-
Fathead Minnows, Pimephales
5C

Survival and Growth Rate of Channel Catfish as a Function of Dissolved-Oxygen Concentration,
W75-11051
5C

Studies on the Relationship Between Dry-Matter Production and the Development of a Pine Forest on Coastal Sand Dunes (1), (In Japanese),
W75-11098
4A

A Contribution to the Biology of Nitella Hookeri A. BR. in the Rotorua Lakes, New Zealand. II. Organic Nutrients and Physical Factors,
W75-11235
5C

The Kinetics of Crystallization of Scale-Forming Minerals,
W75-11273
8G

**GROWTH STAGES**
A Reevaluation of the Combined Effects of Temperature and Salinity on Survival and Growth of Bivalve Larvae Using Response Surface Techniques,
W75-11081
5C

Standard Curves for Nuvacron, Malathion, Sevin, DDT, and Kelthane Tested Against the Mosquito Culex Pipiens L. and the Microcrustacean Daphnia Magna Straus,
W75-11082
5B

The Effects of Crude Oils and the Dispersant Corexit 8666 on Sea Urchin Gametes and Embryos,
W75-11090
5C

**GULF OF MEXICO**
Matagorda Island, Texas: The Evolution of a Gulf Coast Barrier Complex,
W75-11144
2L

**GYNOGENESIS**
Unisex Studies on the White Amur,
W75-11205
5C

**HALOGENATED PESTICIDES**
Toxaphene Effects on Growth and Bone Composition of Fathead Minnows, Pimephales Promelas,
W75-11026
5C

**HAPLOCHROMIS-NIGRIPINNIS**
Quantitative Estimation of the Daily Ingestion of Phytoplankton by Tilapia Nilotica and Haplochromis Nigripinnis in Lake George, Uganda,
W75-11268
2H

**HARBORS**
Effects of Entrance Loss on Harbor Oscillations,
W75-11147
8B

Strategic Approach to Estuarine Environmental Management,
W75-11179
2L

**HAWAII**
Nitrogen Removal in the Operation of the Mililani Sewage Treatment Plant,
W75-11041
5D

**HEAT EXCHANGERS**
System for Optimal Pressure Control in a Multi-Stage Evaporation Unit,
W75-11070
3A

**HEAT TRANSFER**
Status of Waste Heat Utilization and Dual-Purpose Plant Projects,
W75-11251
3E

**HEATED WATER**
Status of Waste Heat Utilization and Dual-Purpose Plant Projects,
W75-11251
3E

**HEATING**
Status of Waste Heat Utilization and Dual-Purpose Plant Projects,
W75-11251
3E

**HEAVY METALS**
Geochemical Reconaissance of Surficial Materials in the Vicinity of Shawangunk Mountain, New York,
W75-10928
5A

Heavy Metals and Other Trace Elements,
W75-10934
5B

Mercury Content of Whales, (In Japanese),
W75-11029
5B

Interactions of Heavy Metals in the Activated Sludge Process,
W75-11173
5D

**HELE-SHAW MODEL**
Approximation for Steady Interface Beneath a Well Pumping Fresh Water Overlying Salt Water,
W75-11255
4B

**HERBICIDE REGISTRATION**
Registration of Herbicides for Aquatic Use,
W75-11197
5G

**HERBICIDES**
Occurrence of 2, 4, 5-T and Picloram in Surface Runoff Water in the Blacklands of Texas,
W75-10895
5B

Cost Evaluation of Watercourse Management in Essex,
W75-11008
5G

Operation Clean Sweep,
W75-11192
5G

Field Tests of Slow-Release Herbicides,
W75-11193
5G

Aquatic Plant Control on Lake Corpus Christi,
W75-11194
5G

Registration of Herbicides for Aquatic Use,
W75-11197
5G

Chemical Control of Egeria Densa,
W75-11199
5G

Field Testing of Aquatic Herbicides for Control of Egeria Densa,
W75-11200
5G

Aquatic Plant Control Using Herbicides in a Large Potable Water Supply,
W75-11201
5G

Herbicide Chemicals and Their Effect on the Aquatic Environment,
W75-11211
5C

Dissipation of Phenoxy Herbicides Applied to Riparian Vegetation,
W75-11214
5B

HERBIVORES
The Influence of Rainfall on the Reproduction of Sonoran Desert Lagomorphs,
W75-10871 4A

HIGH-FREQUENCY PROBING
Computer Algorithms Useful for Determining a Subsurface Electrical Profile Via High Frequency Probing,
W75-10910 8G

HIGH PRESSURE
How Downhole Temperatures, Pressures Affect Drilling; Part 4: Pitfalls in Overpressure Prediction,
W75-11294 8G

How Downhole Temperatures, Pressures Affect Drilling; Part 5: Predicting Hydrocarbon Environments with Wireline Data,
W75-11295 8G

How Downhole Temperatures, Pressures Affect Drilling; Part 7: The Shale Resistivity Ratio - A Valuable Tool for Making Economic Drilling Decisions,
W75-11297 8G

How Downhole Temperatures, Pressures Affect Drilling; Part 8: Needless Spending of Drilling and Exploration Money Can Be Predicted-And Prevented,
W75-11298 8G

HIGH PRESSURE GRADIENTS
How Downhole Temperatures, Pressures Affect Drilling; Part 8: Needless Spending of Drilling and Exploration Money Can Be Predicted-And Prevented,
W75-11298 8G

HILLSIDE DRAINAGE
Moisture and Energy Conditions in a Draining Soil Mass,
W75-11054 2G

HORIZONTAL GROUNDWATER COLLECTOR
Horizontal Groundwater Collectors, Hydraulics and Design,
W75-10998 8B

HORIZONTAL GROUNDWATER COLLECTORS
Horizontal Groundwater Collectors, 'Canada's Largest Water Well',
W75-10999 8B

HOT SPRINGS
The Minor and Trace Elements, Gas, and Isotope Compositions of the Principal Hot Springs of Nevada and Oregon,
W75-10937 2K

HOURLY
Automated Hourly Computations,
W75-10915 7C

HUMIC ACIDS
Treatment Methods of Groundwater Containing a Large Quantity of Humic Acid (Aufbereitungsversuche an einem stark huminstoffbelasteten Tiefengrundwasser),
W75-11117 5D

Chelation Study of Copper (II): Fulvic Acid System,
W75-11219 5B

HUMID CLIMATES
Scheduling and Application Rates of Irrigation in a Humid Climate,
W75-11048 3F

HUMUS
A General Description of the Oligotrophic Lake Paajarvi, Southern Finland, and the Ecological Studies on It,
W75-11229 5C

Preliminary Information on the Nature of Organic Matter in the Surface Sediments of Lakes Huron, Erie, and Ontario,
W75-11240 2J

Changes in Vegetation and Surface Soil Properties Following Irrigation of Woodlands with Municipal Wastewater,
W75-11243 5B

HUNGARY
Papermaking Complex at Dunaujvaros (Hungary) -- Preserving the Danube (Au complexe papetier de Dunaujvaros -- preserver le Danube),
W75-11333 5D

HYDRAULIC CONDUCTIVITY
Determination of Regional Hydraulic Conductivity Through Use of C-14 Dating of Groundwater,
W75-10930 2F

HYDRAULIC EQUIPMENT
Sprinkler Irrigation Practice, (La Pratique De L'Irrigation Par Aspersion),
W75-10875 3F

A Pneumatic System to Pump Water from Piezometers,
W75-11257 8C

HYDRAULIC FORCES METHOD
Management of Retardation of Salt Water Intrusion in Coastal Aquifers,
W75-11058 2F

HYDRAULIC MINING
The Mechanics of Rock Failure Due to Water Jet Impingement,
W75-11272 8E

HYDRAULIC MODELS
Implicit Numerical Modeling of Unsteady Flows,
W75-10925 8B

Hydraulic Modeling of Mixing Phenomena in Stratified Lakes,
W75-11043 2H

Cavitation Control by Aeration of High-Velocity Jets,
W75-11152 8B

HYDRAULICS
Predicting Cavitation in Sudden Enlargements,
W75-11151 8B

HYDROCARBONS
How Downhole Temperatures, Pressures Affect Drilling; Part 6: Correlating Geopressure Gradients with Hydrocarbon Accumulations,
W75-11296 8G

HYDROGEN
Measures of Biodegradability and Refractory Organics in Wastewaters: (Analysis, Interpretation, and Application of Measurement Techniques),
W75-11103 5D

HYDROGEN ION CONCENTRATION
Relations Between Algal Populations and the pH of Their Media,
W75-11028 5C

HYDROGEN PEROXIDE
Oxidation of Organic Compounds in Wat
(Oxidation organischer Verbindungen
Wasser),
W75-11118 5

HYDROGEN SULFIDE
Factors Influencing Acute Toxicity Estimat
of Hydrogen Sulfide to Freshwater Inv
tebrates,
W75-11027

Dissolved Gases Are Key Corrosion Culprits
W75-11274

HYDROGEOLOGY
Hydrogeology and Water Resources of Mid
Kirkland Creek Basin, Yavapai Coun
Arizona,
W75-10872

Ground Water in the Corvallis-Albany Ar
Central Willamette Valley, Oregon,
W75-10940

HYDROGRAPHS
Predicting Recessions Through Convolution,
W75-10917

HYDROLOGIC ASPECTS
Balancing the Effects of Man's Actions on
Hydrological Cycle,
W75-10865

HYDROLOGIC CYCLE
Man's Influence on the Hydrological Cycle
Draft Report of the UNESCO/FAO Wor
Group on the International Hydrolo
Decade.
W75-10863

The Nature and Components of the Hydro
cal Cycle,
W75-10864

Balancing the Effects of Man's Actions o
Hydrological Cycle,
W75-10865

Human Obstacles to the Control of
Hydrological Cycle for the Benefit of Man
W75-10866

The Hydrologic Cycle--As Applicable t
Pacific Northwest,
W75-10949

HYDROLOGIC DATA
Man's Influence on the Hydrological Cyc
Draft Report of the UNESCO/FAO W
Group on the International Hydrol
Decade.
W75-10863

The Nature and Components of the Hydr
cal Cycle,
W75-10864

Description of Card and Tape Formats fo
plying Data to Users.
W75-10914

Streamflow in the New York Part
Susquehanna River Basin,
W75-10931

Estimated Availability of Surface and
Water in the Pojoaque River Drainage
Santa Fe County, New Mexico,
W75-10938

Ground Water in the Corvallis-Albany
Central Willamette Valley, Oregon,
W75-10940

Water Resources of the Lower St. Croix River Watershed, East-Central Minnesota,
W75-10945 7C

Water Resources of the Snake River Watershed, East-Central Minnesota,
W75-10946 7C

Water Resources of the Lower Minnesota River Watershed, South-Central Minnesota,
W75-10947 7C

Water Resources of the Cannon River Watershed, Southeastern Minnesota,
W75-10948 7C

tudy of Criteria and Models Establishing Optimum Level of Hydrogeologic Information for roundwater Basin Management,
775-11042 2F

etection of Change in Sequences of ydrologic Data,
775-11302 7C

**ROLOGIC PROPERTIES**
he Nature and Components of the Hydrologi- l Cycle,
75-10864 2A

**ROLOGY**
eview of Conference on Hydrology of Deep dimentary Basins,
75-10935 5B

**OCHLORITE CELLS**
-Site Hypochlorite Generation,
75-11109 5D

**COVER**
ermal Response of Heated Streams, Solution the Implicit Method,
75-10909 5B

**IO**
ailable Water-Holding Capacities of Soils in uthern Idaho,
5-11140 2G

**NOIS**
ois Landfill Law May Effect Nearby es.
5-11011 5B

centration and Genera of Algae in Selected ois Streams, 1971-1973,
5-11165 5A

sonal Abundance and Diversity of Benthos Southern Illinois, USA Swamp,
-11312 2H

**UNDMENTS**
atic Plant Control Using Herbicides in a e Potable Water Supply,
-11201 5G

**ERATION**
ibilities of Reutilization of Kaolin from ogical Waste Water Sludges eglichkeiten der Wiederverwertung von in aus biologischen Abwasserchlaemmen),
-11349 5D

ct of Soil-Water Relations on the Root sity, Transpiration and Ion Uptake in Rice,
10916 3F

oving Productivity in Low Rainfall Areas, dia.
11099 3F

**INDIA (KURUKSHETRA)**
Seasonal Variation in Composition, Plant Biomass, and Net Primary Productivity of a Tropical Grassland at Kurukshetra, India,
W75-11006 2I

**INDIAN LAKE (MASS)**
Preliminary Investigations into Copper Cycling in Indian Lake, Massachusetts: A Lake Treated Annually with Copper Sulfate,
W75-11039 5B

**INDIAN RESERVATIONS**
Products from Jojoba: A Promising New Crop for Arid Lands.
W75-10890 3F

**INDUCED INFILTRATION**
Seasonal Variations in the Infiltration Rate of a Whitehouse Soil in Southern Arizona,
W75-10873 2G

Induced Infiltration Supply System Among Biggest.
W75-11010 5F

**INDUSTRIAL PRODUCTION**
An Economic Analysis of the Pollution Problems in the Colorado River Basin: The Upper Main Stem Sub-Basin,
W75-11247 5G

**INDUSTRIAL WASTES**
Wastewater Treatment Plant Odors: A Continuing Enigma,
W75-10986 5D

Process for Treating Industrial Wastes,
W75-11066 5D

Process for Treating Industrial Wastes,
W75-11067 5D

Economic Analysis of Effluent Guidelines. Ferroalloys Industry.
W75-11250 5G

Upgrading Meat Packing Facilities to Reduce Pollution. (Part 1). In-Process Modifications and Pretreatment,
W75-11320 5D

Upgrading Meat Packing Facilities to Reduce Pollution. (Part 2). Waste Treatment,
W75-11321 5D

Upgrading Meat Packing Facilities to Reduce Pollution. (Part 3). Choosing the Optimum Financial Strategy,
W75-11322 5D

Upgrading Metal-Finishing Facilities to Reduce Pollution. (Part 1). In-Process Pollution Abatement,
W75-11324 5D

Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 2). Pretreatment of Poultry-Processing Wastes,
W75-11329 5D

Evaluation of the Adsorptive Properties of Fly Ash with Reference to a Pulp and Paper Mill Waste Effluent,
W75-11335 5D

Possibilities of Reutilization of Kaolin from Biological Waste Water Sludges (Moeglichkeiten der Wiederverwertung von Kaolin aus biologischen Abwasserchlaemmen),
W75-11349 5D

**INFILTRATION**
Barrenness of Desert Pavement in Yuma County, Arizona,
W75-10868 2G

Seasonal Variations in the Infiltration Rate of a Whitehouse Soil in Southern Arizona,
W75-10873 2G

Induced Infiltration Supply System Among Biggest.
W75-11010 5F

**INFILTRATION RATES**
Seasonal Variations in the Infiltration Rate of a Whitehouse Soil in Southern Arizona,
W75-10873 2G

**INFORMATION EXCHANGE**
The Awareness of the Relevant Water Resources Literature by the Personnel of the Wisconsin Department of Natural Resources,
W75-10899 10C

Information as a Regulatory Tool in Water Quality Control,
W75-10903 5G

**INFORMATION RETRIEVAL**
Development of a Bibliographic Information System for Water Yield Improvement Practices,
W75-11050 10B

**INFORMATION TRANSFER**
The Awareness of the Relevant Water Resources Literature by the Personnel of the Wisconsin Department of Natural Resources,
W75-10899 10C

**INJECTOR PUMP**
Will Submersibles Make Jet Pumps Obsolete.
W75-11263 8C

**INORGANIC COMPOUNDS**
Near-Bottom Chemistry in the Eastern Pacific and North Atlantic Oceans,
W75-10923 2K

Solute-Solute Interactions in Ultrafiltration Treatment of Paper Mill Wastes,
W75-11334 5D

**INPUT-OUTPUT ANALYSIS**
An Economic Analysis of the Pollution Problems in the Colorado River Basin: The Upper Main Stem Sub-Basin,
W75-11247 5G

The Economic Impact of Pollution Abatement: The Case of Water Pollution by Degradable Organic Matter,
W75-11254 5G

**INSECTICIDES**
Standard Curves for Nuvacron, Malathion, Sevin, DDT, and Kelthane Tested Against the Mosquito Culex Pipiens L. and the Microcrustacean Daphnia Magna Straus,
W75-11082 5B

Absorption and Elimination of Photodieldrin by Daphnia and Goldfish,
W75-11085 5B

The Effects of Experimental Blackfly (Diptera: Simuliidae) Larviciding with Abate, Dursban, and Methoxychlor on Stream Invertebrates,
W75-11157 5C

INSTITUTIONAL CONSTRAINTS
Legal and Institutional Problems in the Management of Salinity,
W75-11047 5G

Institutional Arrangements for Reducing Conflict Over Water Quality in International Rivers,
W75-11242 6E

INSTITUTIONS
Successful Irrigation: Preparation, Realization, Exploritation, (Savoir Irriguer: Preparation, Realisation, Exploitation),
W75-10874 3F

INSTRUMENTATION
A Simple and Inexpensive Technique for Determining Colored Light Intensity Underwater,
W75-10919 7B

Note on the Measurement of the Response of Oceanographic Temperature Sensors,
W75-11146 7B

Investigation of the Operating Characteristics of the Iowa Sediment Concentration Measuring System,
W75-11163 2J

Apparatus for Concentration of Volatile Organic Pollutants in Water,
W75-11342 5A

INTEGRATED CONTROL METHODS
Integrated Controls on Noxious Aquatic Plants,
W75-11204 5G

INTER-BASIN TRANSFERS
Interbasin Water Transfers: A Case Study in Mexico,
W75-10879 4A

INTERCEPTION
Approximate Annual Water Budgets of Two Chained Pinyon-Juniper Sites,
W75-10896 4A

INTERFERENCE EFFECTS
Deprivation Contribution and Interference Effects of Multiple Wells in a Common Aquifer,
W75-11142 4B

INTERNATIONAL BOUND AND WATER COMM
Institutional Arrangements for Reducing Conflict Over Water Quality in International Rivers,
W75-11242 6E

INTERNATIONAL JOINT COMMISSION
Institutional Arrangements for Reducing Conflict Over Water Quality in International Rivers,
W75-11242 6E

INVERTEBRATES
Epifaunal Invertebrates as Indicators of Water Quality in Southern Lake Pontchartain,
W75-10852 5C

Species Diversity of Benthic Macroin-Vertebrates and Limnological Conditions in a 1st Order Mountain Stream,
W75-10918 2I

Factors Influencing Acute Toxicity Estimates of Hydrogen Sulfide to Freshwater Invertebrates,
W75-11027 5C

INVESTMENT
A Case Study of Some Economic Aspects of the National Flood Insurance Program,
W75-10906 6F

IRAN
Shrub Transplanting for Watershed Management and Range Improvement in Iran,
W75-10870 4D

IRON
Studies on the Inorganic Components of Marine Animals-III, on the Contents of Cadmium, Zinc, Copper, Lead and Iron in Muscle and Viscera of Marine Animals Captured in the West Sea Area of Kyushu, (In Japanese),
W75-11087 5C

IRON ALLOYS
Economic Analysis of Effluent Guidelines. Ferroalloys Industry.
W75-11250 5G

IRON REMOVAL
How Silica Affects Iron Removal from Groundwater,
W75-11016 5F

IRRADIATION
Aquatic Weed Field Test Program Using a CO2 Electric Discharge Convection Laser,
W75-11208 5A

CO2 Laser Effects on Water Hyacinth,
W75-11209 5G

IRRIGATION
Effects of Irrigation in Rain-Fed Fields on the Growth and Yield of Upland Rice Varieties, (In Korean),
W75-10853 3F

Consolidation and Rehabilitation of Canals in Poudre Valley,
W75-11061 4A

Cultivation of Netted Melon By Use of Trickle Irrigation in a Sand Field Plastic Greenhouse, (In Japanese),
W75-11095 3F

Nozzle Hydraulics in the Trickle Irrigation System--Relation Between Water Temperature and Nozzle Flow Rate (In Japanese),
W75-11096 3F

Practical Application of Surface Fixed-System for Multi-Purpose Sprinkler Irrigation Uses, (In Japanese),
W75-11097 3F

The Effect of Irrigation on the Yield and Quality of Maincrop Potatoes,
W75-11106 3F

IRRIGATION EFFECTS
Cultivation of Netted Melon By Use of Trickle Irrigation in a Sand Field Plastic Greenhouse, (In Japanese),
W75-11095 3F

IRRIGATION EFFICIENCY
Practical Application of Surface Fixed-System for Multi-Purpose Sprinkler Irrigation Uses, (In Japanese),
W75-11097 3F

IRRIGATION PRACTICE
Scheduling and Application Rates of Irrigation in a Humid Climate,
W75-11048 3F

IRRIGATION PRACTICES
Sprinkler Irrigation Practice. (La Pratique L'Irrigation Par Aspersion),
W75-10875

IRRIGATION PROGRAMS
Successful Irrigation Preparation, Realizat Exploritation. (Savoir Irriguer: Preparat Realisation, Exploitation),
W75-10874

IRRIGATION WATER
Phytophthora Species in Arizona Its Oc rence in Recycled Irrigation water,
W75-10883

Occurrence of 2, 4, 5-T and Picloram in face Runoff Water in the Blacklands of Te
W75-10895

ISOPODS
Factors Influencing Acute Toxicity Estim of Hydrogen Sulfide to Freshwater I tebrates,
W75-11027

ISOTOPE STUDIES
Weyl's Theory of Glaciation Supporte Isotopic Study of Norwegian Core K 11,
W75-11153

JAPAN
Some Observations on Behavior of the Tr Sewage Disposed in the Sea,
W75-11020

Cultivation of Netted Melon By Use of T Irrigation in a Sand Field Plastic Greenh (In Japanese),
W75-11095

Nozzle Hydraulics in the Trickle Irri System--Relation Between Water Tempe and Nozzle Flow Rate (In Japanese),
W75-11096

Practical Application of Surface Fixed-S for Multi-Purpose Sprinkler Irrigation Us Japanese),
W75-11097

Studies on the Relationship Between Matter Production and the Developmen Pine Forest on Coastal Sand Dunes ( Japanese),
W75-11098

Uranium Mineralization by Ground W Sedimentary Rocks, Japan.
W75-11145

JAPAN (WEST SEA AREA-KYUSHU)
Studies on the Inorganic Compone Marine Animals-III, on the Contents of um, Zinc, Copper, Lead and Iron in and Viscera of Marine Animals Capture West Sea Area of Kyushu, (In Japanese
W75-11087

JEBEL MARRA AREA (SUDAN)
Land and Water Resources Survey in t Marra Area, The Sudan.
W75-11139

JETS
Condensation in Jets, Industrial Plu Cooling Tower Plumes,
W75-11166

The Mechanics of Rock Failure Due Jet Impingement,
W75-11272

OBA
roducts from Jojoba: A Promising New Crop
or Arid Lands.
75-10890 3F

IPER TREES
ffects of Pinyon-Juniper Removal on Natural
esource Products and Uses in Arizona,
75-10886 3B

ENILE GROWTH STAGE
ffects of Some Components of Crude Oil on
oung Coho Salmon,
75-11088 5C

SAS
mperatures of Kansas Streams,
75-10933 2E

LIN
ssibilities of Reutilization of Kaolin from
ological Waste Water Sludges
oeglichkeiten der Wiederverwertung von
olin aus biologischen Abwasserchlaemmen),
5-11349 5D

TUCKY
ariance Analysis of Reservoir Development
ects on Property Tax Base,
5-10851 6B

Law of Water Allocation in Kentucky,
5-10898 6E

MATIC WAVE THEORY
ivation of Surface Water Lag Time for Con-
ing Overland Flow,
5-11156 2E

TICS
Kinetics of Crystallization of Scale-Form-
Minerals,
-11273 8G

AND CREEK (ARIZ)
rogeology and Water Resources of Middle
land Creek Basin, Yavapai County,
ona,
-10872 4B

RATORY TESTS
nuous Automatic Monitoring of Surface
r with Fish,
11079 5A

ts of Entrance Loss on Harbor Oscilla-
11147 8B

ed Droplet Collision Efficiency Measure-
11168 2B

Testing of Aquatic Herbicides for Control
eria Densa,
1200 5G

ORPHS
nfluence of Rainfall on the Reproduction
oran Desert Lagomorphs,
0871 4A

NS
Water Quality and Bottom Sediment
cteristics of New Jersey Lagoon
pments,
1104 5B

HUB (FISH)
Toxicity of Petrochemical Drilling Fluids
nents and Wastes to Fish,
265 5C

LAKE CORPUS CHRISTI (TEX)
Aquatic Plant Control on Lake Corpus Christi,
W75-11194 5G

LAKE ERIE
Primary Production in Lakes Ontario and Erie: A Comparative Study,
W75-11217 5C

Microbiological Examination of Offshore Lake Erie Sediments,
W75-11218 5C

Seasonal Abundance of Crustacean Zooplankton and Net Plankton Biomass of Lakes Huron, Erie, and Ontario,
W75-11238 5C

Preliminary Information on the Nature of Organic Matter in the Surface Sediments of Lakes Huron, Erie, and Ontario,
W75-11240 2J

LAKE FISHERIES
Some Limnological Characteristics of Arivaca Lake in Southern Arizona,
W75-10891 2H

LAKE HEFNER (OK)
Wind Effects on Chemical Films for Evaporation Suppression at Lake Hefner,
W75-10920 3B

LAKE HURON
Seasonal Abundance of Crustacean Zooplankton and Net Plankton Biomass of Lakes Huron, Erie, and Ontario,
W75-11238 5C

Preliminary Information on the Nature of Organic Matter in the Surface Sediments of Lakes Huron, Erie, and Ontario,
W75-11240 2J

LAKE KAINJI (NIGERIA)
The Effects of the Formation of Lake Kainji (Nigeria) Upon the Indigenous Fish Population,
W75-11223 5C

LAKE MCMILLAN (N MEX)
An Appraisal of Potential Water Salvage in the Lake McMillen Delta Area, Eddy County, New Mexico,
W75-10941 3B

LAKE MICHIGAN
Investigation of the Influence of Thermal Discharge from a Large Electric Power Station on the Temperature and Near-Shore Circulation of Lake Michigan,
W75-11190 5C

LAKE ONTARIO
Primary Production in Lakes Ontario and Erie: A Comparative Study,
W75-11217 5C

In Situ Measurement of the Settling Velocity Profile of Particulate Organic Carbon in Lake Ontario,
W75-11227 5C

Seasonal Abundance of Crustacean Zooplankton and Net Plankton Biomass of Lakes Huron, Erie, and Ontario,
W75-11238 5C

Preliminary Information on the Nature of Organic Matter in the Surface Sediments of Lakes Huron, Erie, and Ontario,
W75-11240 2J

LAKE PAAJARVI (FINLAND)
A General Description of the Oligotrophic Lake Paajarvi, Southern Finland, and the Ecological Studies on It,
W75-11229 5C

LAKE PONTCHARTRAIN (LA)
Epifaunal Invertebrates as Indicators of Water Quality in Southern Lake Pontchartain,
W75-10852 5C

LAKE POWELL (ARIZ-UTAH)
Man's Impact on a Newly Formed Reservoir,
W75-11233 5C

LAKE REHABILITATION
Acid Strip Mine Lake Recovery,
W75-11224 5C

LAKE SEDIMENTS
Concurrent Nitrification-Denitrification at the Sediment-Water Interface as a Mechanism for Nitrogen Losses from Lakes,
W75-10902 5C

The Geochemical Cycle of Arsenic in Lake Washington and its Relation to Other Elements,
W75-10922 5B

Microbiological Examination of Offshore Lake Erie Sediments,
W75-11218 5C

Application of the Manometric Technique in the Study of Sediment Oxygen Depletion,
W75-11222 5C

Preliminary Information on the Nature of Organic Matter in the Surface Sediments of Lakes Huron, Erie, and Ontario,
W75-11240 2J

LAKE WABAMUN (ALBERTA)
The Growth of Some Epiphytic Algae in a Lake Receiving Thermal Effluent,
W75-11225 5C

LAKE WARNIAK (POLAND)
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. IV. Feeding of Introduced and Autochthonous Non-Predatory Fish,
W75-11234 5C

LAKE WASHINGTON (WASH)
The Geochemical Cycle of Arsenic in Lake Washington and its Relation to Other Elements,
W75-10922 5B

LAKES
Two-Dimensional, Hydrostatic Simulation of Thermally-Influenced Hydrodynamic Flows,
W75-10901 2H

Wind Effects on Chemical Films for Evaporation Suppression at Lake Hefner,
W75-10920 3B

Stability of Nitrosamines in Samples of Lake Water, Soil, and Sewage,
W75-11019 5B

Utilization of Stream-Borne Phosphorus by Cayuga Lake Phytoplankton,
W75-11036 5C

Hydraulic Modeling of Mixing Phenomena in Stratified Lakes,
W75-11043 2H

Dissolved Organic Matter and Lake Metabolism,
W75-11188 5C

LAKES

The Growth of Some Epiphytic Algae in a Lake Receiving Thermal Effluent,
W75-11225 5C

A General Description of the Oligotrophic Lake Paajarvi, Southern Finland, and the Ecological Studies on It,
W75-11229 5C

Sediment Processes in Great Lakes,
W75-11237 2J

The Utilization of Sun-Glint in a Study of Lake Dynamics,
W75-11239 5A

The Measurement and Estimation of Lake Evaporation from Four Australian Water Storages,
W75-11300 2D

LAMELLA SEDIMENTATION
Lamella Sedimentation: A Compact Separation Technique,
W75-10989 5D

LAMELLA SEPARATORS
Lamella Sedimentation: A Compact Separation Technique,
W75-10989 5D

LAMINAR FLOW
Transition in Oscillatory Flow Over Rippled Beds,
W75-11149 8B

LAND DISPOSAL
Limitations of Using a Simulation Model of the Soil Under Irrigated Cultivation to Simulate the Functioning of the Soil as a Purifying System (Limites D'Utilisation D'Un Modele de Comportement du sol sous Culture Irriguee Pour Simuler le Fonctionnment du sol Comme Systeme Epurateur),
W75-11125 5B

LAND MANAGEMENT
Improving Productivity in Low Rainfall Areas, in India.
W75-11099 3F

LAND RECLAMATION
Guidelines for Revegetation and Stabilization of Surface Mined Areas in the Western States,
W75-11100 4D

LAND RESOURCES
Land and Water Resources Survey in the Jebel Marra Area, The Sudan.
W75-11139 4A

LAND SUBSIDENCE
Ground Water Depletion and Subsidence Problems in Taipei Basin,
W75-11262 4B

LAND USE
Balancing the Effects of Man's Actions on the Hydrological Cycle,
W75-10865 2A

Floodplain Land-Use Management: An Application of Operations Research Methodology,
W75-11037 6F

Prescriptive Economic Models for Nonstructural Flood Control,
W75-11060 6F

Improving Productivity in Low Rainfall Areas, in India.
W75-11099 3F

LANDFILLS
Illinois Landfill Law May Effect Nearby States.
W75-11011 5B

LANDSCAPING
Water Application Practices and Landscape Attributes Associated with Residential Water Consumption,
W75-11059 3D

LARVAE
A Reevaluation of the Combined Effects of Temperature and Salinity on Survival and Growth of Bivalve Larvae Using Response Surface Techniques,
W75-11081 5C

LARVICIDES
The Effects of Experimental Blackfly (Diptera: Simuliidae) Larviciding with Abate, Dursban, and Methoxychlor on Stream Invertebrates,
W75-11157 5C

LASER
Aquatic Weed Field Test Program Using a CO2 Electric Discharge Convection Laser,
W75-11208 5A

CO2 Laser Effects on Water Hyacinth,
W75-11209 5G

LAWRENCE LAKE (MICH)
Dissolved Organic Matter and Lake Metabolism,
W75-11188 5C

LEACHATE
Solid Wastes, Animal Refuse, and Organic Residues Disposal, and the Quality of Ground Water,
W75-11244 5B

LEACHING
Uranium Mineralization by Ground Water in Sedimentary Rocks, Japan.
W75-11145 2F

LEAD
Geochemical Reconaissance of Surficial Materials in the Vicinity of Shawangunk Mountain, New York,
W75-10928 5A

Uptake of Cadmium, Zinc, Copper, Lead and Chromium in the Pacific Oyster, Crassostrea Gigas, Grown in the Tamar River, Tasmania,
W75-11086 5B

Studies on the Inorganic Components of Marine Animals-III, on the Contents of Cadmium, Zinc, Copper, Lead and Iron in Muscle and Viscera of Marine Animals Captured in the West Sea Area of Kyushu, (In Japanese),
W75-11087 5C

The Use of Snakes as a Pollution Indicator Species,
W75-11089 5B

Mutagens and Potential Mutagens in the Biosphere: II. Metals--Mercury, Lead, Cadmium and Tin,
W75-11171 5B

LEAKAGE
How to Seal Tubing Collar Leaks.
W75-11287 8C

LEAVES
Root-Shoot and Leaf Area Relationships Macrophyte Communities in Chautauqua Lal New York,
W75-11009

The Role of Endogenous Abscisic Acid in Response of Plants to Stress,
W75-11319

LEGAL ASPECTS
Facing the Real Cost of Clean Water,
W75-10857

LEGISLATION
Facing the Real Cost of Clean Water,
W75-10857

Human Obstacles to the Control of Hydrological Cycle for the Benefit of Man,
W75-10866

Information as a Regulatory Tool in W Quality Control,
W75-10903

Role and Responsibilities of the Environme Protection Service (Canada),
W75-11000

Milestone Water Legislation Accompanied Millstone of Bureaucratic Red Tape,
W75-11007

Illinois Landfill Law May Effect Ne States.
W75-11011

Criteria for Herbicide Evaluation,
W75-11196

LETHAL LIMIT
Some Effects of Copper on the Polycl Phyllodoce Maculata,
W75-11136

LIGH INTENSITY
A Simple and Inexpensive Technique Determining Colored Light Intensity derwater,
W75-10919

LIGHT PENETRATION
A Simple and Inexpensive Technique Determining Colored Light Intensity derwater,
W75-10919

LIGNINS
Biodegradation of Components of Pulp Effluents by Bacteria. (1). Degradation of Lignin (In Japanese),
W75-11346

LIGNOSULFATE
Acute Toxicity of Petrochemical Drilling Components and Wastes to Fish,
W75-11265

LIME
Chemical-Biological Treatment With Bio Filters,
W75-11123

Effect of Lime Treatment on Molecular Distribution of Color Bodies from Kraft board Decker Effluents,
W75-11345

LIMITING FACTORS
Guidelines for Revegetation and Stabi of Surface Mined Areas in the Western S
W75-11100

MNOLOGY
Limnology of Desert Ponds,
W75-10880 2H

Some Limnological Characteristics of Arivaca Lake in Southern Arizona,
W75-10891 2H

NEAR PROGRAMMING
Prescriptive Economic Models for Nonstructural Flood Control,
W75-11060 6F

NINGS
Techniques for Linear Tie-Back Cementing,
W75-11277 8F

low to Seal Tubing Collar Leaks.
75-11287 8C

UID WASTES
roblems of Liquid Waste Disposal,
75-11112 5G

GGING (RECORDING)
aking Log Analysts of Geologists.
75-11288 7C

ISIANA
ifaunal Invertebrates as Indicators of Water ality in Southern Lake Pontchartain,
75-10852 5C

e Louisiana Environmental Management stem and Its Utility in Water Resource nning,
75-11177 5G

ld Tests of Slow-Release Herbicides,
5-11193 5G

2 Laser Effects on Water Hyacinth,
5-11209 5G

ter Level Manipulation: A Tool for Aquatic ed Control,
5-11216 4A

FLOW
v-Flow Characteristics of Selected Streams Northeastern Washington,
5-10939 2E

FLOW FREQUENCY
ughts, Distributions and Dependence: An lysis of Some Synthetic Data Generation hods,
-11305 2E

R MINNESOTA RIVER (MINN)
er Resources of the Lower Minnesota r Watershed, South-Central Minnesota,
-10947 7C

R ST. CROIX RIVER (MINN)
er Resources of the Lower St. Croix River rshed, East-Central Minnesota,
10945 7C

CANTS
ial Annulus Fluid Eases Casing Recovery.
11282 8G

ETERS
rential Release of Water from Arizona pacts,
10860 2C

OPHYTES
Shoot and Leaf Area Relationships of ophyte Communities in Chautauqua Lake, York,
11009 5C

MANAGEMENT
Successful Irrigation: Preparation, Realization, Exploritation, (Savoir Irriguer: Preparation, Realisation, Exploitation),
W75-10874 3F

Deprivation Contribution and Interference Effects of Multiple Wells in a Common Aquifer,
W75-11142 4B

Strategic Approach to Estuarine Environmental Management,
W75-11179 2L

Distribution-System Operation Analysis Model,
W75-11180 5D

Simulation of Water Quality Management Policies,
W75-11181 5G

MANGANESE
The Accumulation of Cadmium, Copper, Manganese and Zinc by Fucus Vesiculosus in the Bristol Channel,
W75-11083 5B

MANOMETERS
Application of the Manometric Technique in the Study of Sediment Oxygen Depletion,
W75-11222 5C

MAPLE
Vegetation, Soil, and Climate on the Green Mountains of Vermont,
W75-11021 2I

MAPPING
Making Log Analysts of Geologists.
W75-11288 7C

MAPS
The Hydrologic Cycle--As Applicable to the Pacific Northwest,
W75-10949 7C

Soil Map of the World, 1:5,000,000, Volume IV, South America.
W75-11138 7C

Land and Water Resources Survey in the Jebel Marra Area, The Sudan.
W75-11139 4A

MARINE ALGAE
Influence of Oil on Nucleic Acids of Algae,
W75-11232 5C

MARINE ANIMALS
The Effects of Oil Dispersants on the Cell in Fertilization and Development,
W75-11091 5C

MARINE FISH
The Effects of Oil Dispersants on the Cell in Fertilization and Development,
W75-11091 5C

A Survey of Fishes and Commercial Invertebrates of the Nearshore and Estuarine Zone Between Cape Romano and Cape Sable, Florida,
W75-11189 2I

MARINE MICROORGANISMS
Ammonia Excretion by Zooplankton and its Significance to Primary Productivity During Summer,
W75-11187 5C

The Role of Planktonic Protozoa in the Marine Food Chain. Seasonal Changes, Relative Abundance, and Cell Size Distribution of Tintinnida,
W75-11191 5C

MARINE PLANTS
Transplanting Sea Grass in Mississippi Sound,
W75-11207 4A

MARKOV PROCESSES
Multilag Markov Models for Eastern Australian Streams,
W75-11301 2E

MARMOT CREEK (ALBERTA)
Wind-Snow Relations at Marmot Creek, Alberta,
W75-11226 2C

MARSHES
Impact of Thermal Effluent from Steam-Electric Station on a Marshland Nursery Area during the Hot Season,
W75-11032 5C

MARYLAND
Behavior of Mn, Fe, Cu, Zn, Cd and Pb Discharged from a Wastewater Treatment Plant into an Estuarine Environment,
W75-11160 5B

Algae in Baltimore's Reservoirs,
W75-11221 5C

MASS TRANSFER
Some Results on Mass Transfer Processes in a Density-Stratified Flow,
W75-11057 8B

MASSACHUSETTS
Environmental Impact Evaluation in Freshwater Impoundments by Vegetation Analysis of the Terrestrial Ecosystem.
W75-10905 2I

Map Showing Depth to Bedrock, Worthington Quadrangle, Massachusetts,
W75-10951 7C

Map Showing Depth to Bedrock, Greenfield Quadrangle, Massachusetts,
W75-10952 7C

Map Showing Depth to Bedrock, Chester Quadrangle, Massachusetts,
W75-10953 7C

Preliminary Investigations into Copper Cycling in Indian Lake, Massachusetts: A Lake Treated Annually with Copper Sulfate,
W75-11039 5B

MATAGORDA ISLAND (TEX)
Matagorda Island, Texas: The Evolution of a Gulf Coast Barrier Complex,
W75-11144 2L

MATHEMATICAL ANALYSIS
Theory of Plasticity of Porous Media with Fluid Flow,
W75-11276 8E

MATHEMATICAL MODELS
A Three-Dimensional Model for Estuaries and Coastal Seas: Vol. II, Aspects of Computation,
W75-10900 2L

Thermal Response of Heated Streams, Solution by the Implicit Method,
W75-10909 5B

Wave Motion in Rockfill,
W75-10924 8D

**MATHEMATICAL MODELS**

Floodplain Land-Use Management: An Application of Operations Research Methodology,
W75-11037 6F

A Mathematical Model for Optimal Waste Load Allocations,
W75-11102 5G

Optimum Values for Operational Variables in Turbidity Removal,
W75-11110 5D

Hydrologic Investigation and Design of Urban Stormwater Drainage Systems,
W75-11141 4A

The Design of Storm Water Drainage Channels Using Mathematical Model Techniques,
W75-11150 8B

Approximation for Steady Interface Beneath a Well Pumping Fresh Water Overlying Salt Water,
W75-11255 4B

**MATHEMATICAL STUDIES**

Effects of Entrance Loss on Harbor Oscillations,
W75-11147 8B

Derivation of Surface Water Lag Time for Converging Overland Flow,
W75-11156 2E

**MEASUREMENT**

Measures of Biodegradability and Refractory Organics in Wastewaters: (Analysis, Interpretation, and Application of Measurement Techniques),
W75-11103 5D

Simple Field Checks Will Provide Accurate DST Data,
W75-11281 8G

How to Find Transition Zones in Soft Formations,
W75-11285 8G

**MEAT PACKING INDUSTRY**

Economic Analysis of Effluent Guidelines: Meat Packing Industry,
W75-11249 5G

Upgrading Meat Packing Facilities to Reduce Pollution. (Part 1). In-Process Modifications and Pretreatment,
W75-11320 5D

Upgrading Meat Packing Facilities to Reduce Pollution. (Part 2). Waste Treatment,
W75-11321 5D

Upgrading Meat Packing Facilities to Reduce Pollution. (Part 3). Choosing the Optimum Financial Strategy,
W75-11322 5D

**MECHANICAL AERATORS**

Aeration Devices: Basic Theory,
W75-10971 5D

**MECHANICAL PULPING**

Effluent Characteristics and Treatment of Mechanical Pulping Effluents,
W75-11331 5D

Mill Experience in the Treatment of Mechanical Pulping Effluent,
W75-11332 5D

**MELT WATER**

Differential Release of Water from Arizona Snowpacks,
W75-10860 2C

Subsurface Flow from Snowmelt Traced by Tritium,
W75-10921 2F

**MEMBRANE PROCESSES**

Membrane Desalting Gets Big Push,
W75-10982 3A

**MENUKE**

Mercury Contents in Biologically Preserved Specimens of Menuke (Sebastes Baramenuke and S. Flammeus),
W75-11078 5A

**MERCURY**

Mercury Content of Whales, (In Japanese),
W75-11029 5B

Mercury Contents in Biologically Preserved Specimens of Menuke (Sebastes Baramenuke and S. Flammeus),
W75-11078 5A

Mutagens and Potential Mutagens in the Biosphere: II. Metals--Mercury, Lead, Cadmium and Tin,
W75-11171 5B

Interference of Mercury(II) in the Colorimetric Determination of Inorganic Phosphate in Water,
W75-11340 5A

**METABOLISM**

Toxaphene Effects on Growth and Bone Composition of Fathead Minnows, Pimephales Promelas,
W75-11026 5C

Dissolved Organic Matter and Lake Metabolism,
W75-11188 5C

**METAL FINISHING WASTES**

Upgrading Metal-Finishing Facilities to Reduce Pollution. (Part 1). In-Process Pollution Abatement,
W75-11324 5D

Upgrading Metal-Finishing Facilities to Reduce Pollution. (Part 2). Waste Treatment,
W75-11325 5D

**METALS**

Copper Toxicity in Busycon Canaliculatum L.,
W75-11031 5C

Mercury Contents in Biologically Preserved Specimens of Menuke (Sebastes Baramenuke and S. Flammeus),
W75-11078 5A

The Accumulation of Cadmium, Copper, Manganese and Zinc by Fucus Vesiculosus in the Bristol Channel,
W75-11083 5B

Uptake of Cadmium, Zinc, Copper, Lead and Chromium in the Pacific Oyster, Crassostrea Gigas, Grown in the Tamar River, Tasmania,
W75-11086 5B

Studies on the Inorganic Components of Marine Animals-III, on the Contents of Cadmium, Zinc, Copper, Lead and Iron in Muscle and Viscera of Marine Animals Captured in the West Sea Area of Kyushu, (In Japanese),
W75-11087 5C

Some Effects of Copper on the Polychae
Phyllodoce Maculata,
W75-11136 5

Behavior of Mn, Fe, Cu, Zn, Cd and
Discharged from a Wastewater Treatment Pla
into an Estuarine Environment,
W75-11160

Upgrading Metal-Finishing Facilities to Redu
Pollution. (Part 1). In-Process Pollution Aba
ment,
W75-11324

Upgrading Metal-Finishing Facilities to Redu
Pollution. (Part 2). Waste Treatment,
W75-11325

**METHANE**

Anaerobic Acidogenesis of Wastewater Sludg
W75-10976

**METHODOLOGY**

Predicting Recessions Through Convolution,
W75-10917

Registration of Aquatic Herbicides,
W75-11212

How to Make Squeeze Cementing Successfu
W75-11286

Casing-Seat Testing - Why and How,
W75-11291

How to Conduct Corrosion Tests,
W75-11292

**METHOXYCHLOR**

The Effects of Experimental Blackfly (Dipt
Simuliidae) Larviciding with Abate, Dursb
and Methoxychlor on Stream Invertebrates,
W75-11157

**METHYL MERCURY**

Mercury Content of Whales, (In Japanese),
W75-11029

**MEXICO**

Phenology of Selected Sonoran Desert Plan
Punta Cirio, Sonora, Mexico.
W75-10862

Interbasin Water Transfers: A Case Stud
Mexico,
W75-10879

**MICHIGAN**

City/Township Joint Venture--A New W
Plant,
W75-11015

Dissolved Organic Matter and Lake Me
ism,
W75-11188

Changes in Vegetation and Surface Soil Pro
ties Following Irrigation of Woodlands
Municipal Wastewater,
W75-11243

**MICROBIAL DEGRADATION**

Temperature Effects on Microbial Grow
CSTR's,
W75-10968

**MICROORGANISMS**

Microbiological Examination of Offshore
Erie Sediments,
W75-11218

INERALOGY
Uranium Mineralization by Ground Water in Sedimentary Rocks, Japan.
W75-11145 2F

NERALS
Non-Renewable, Non-Energy Resources,
W75-11253 6B

NIMUM-ROUTE METHOD
mproved Design of Distribution Networks by Minimum Route,
V75-11175 4A

NING
uidelines for Revegetation and Stabilization f Surface Mined Areas in the Western States,
V75-11100 4D

lon-Renewable, Non-Energy Resources,
775-11253 6B

ubsurface Water -- Tool for Petroleum Exloration,
775-11289 4B

NNESOTA
ater Resources of the Lower St. Croix River atershed, East-Central Minnesota,
75-10945 7C

ater Resources of the Snake River atershed, East-Central Minnesota,
75-10946 7C

ater Resources of the Lower Minnesota ver Watershed, South-Central Minnesota,
75-10947 7C

ater Resources of the Cannon River atershed, Southeastern Minnesota,
75-10948 7C

NOWS
xaphene Effects on Growth and Bone Comition of Fathead Minnows, Pimephales melas,
5-11026 5C

ISSIPPI
Case Study of Some Economic Aspects of National Flood Insurance Program,
5-10906 6F

anic Color in Groundwater of Mississippi,
5-10907 5F

SSIPPI RIVER
rmal Response of Heated Streams, Solution he Implicit Method,
-10909 5B

D INTEGER PROGRAMMING
ribution-System Operation Analysis Model,
-11180 5D

G
raulic Modeling of Mixing Phenomena in ified Lakes,
-11043 2H

e Results on Mass Transfer Processes in a ity-Stratified Flow,
-11057 8B

BP Alaska Cements Through Permafrost.
11278 8F

L STUDIES
ree-Dimensional Model for Estuaries and al Seas: Vol. II, Aspects of Computation,
10900 2L

Implicit Numerical Modeling of Unsteady Flows,
W75-10925 8B

Stochastic Analysis of Particle Movement Over a Dune Bed,
W75-10942 2J

Hierarchial Model for Water-Supply-System Control,
W75-10996 4A

Study of Criteria and Models Establishing Optimum Level of Hydrogeologic Information for Groundwater Basin Management,
W75-11042 2F

Limitations of Using a Simulation Model of the Soil Under Irrigated Cultivation to Simulate the Functioning of the Soil as a Purifying System (Limites D'Utilisation D'Un Modele de Comportement du sol sous Culture Irriguee Pour Simuler le Fonctionnment du sol Comme Systeme Epurateur),
W75-11125 5B

Water Quality Control in Sewage Water Treatment, (In Japanese),
W75-11133 5D

Workshop on Computer-Aided Design and Simulation of Waste Treatment Systems.
W75-11338 5D

MOISTURE CONTENT
Soil Morphology and Soil Physical Properties: II. Mechanical Impedance and Moisture Retention and Movement,
W75-10885 2G

MOLECULAR WEIGHT
Effect of Lime Treatment on Molecular Weight Distribution of Color Bodies from Kraft Linerboard Decker Effluents,
W75-11345 5D

MOLLUSKS
Use of Steelon-Net Veils for Protection of the Hydro-Engineering Works Against Dreissena Polymorphia Pall,
W75-11033 5G

A Reevaluation of the Combined Effects of Temperature and Salinity on Survival and Growth of Bivalve Larvae Using Response Surface Techniques,
W75-11081 5C

Biomagnification of Dieldrin Residues by Food Chain Transfer from Clams to Blue Crabs Under Controlled Conditions,
W75-11135 5C

MONITORING
Continuous Automatic Monitoring of Surface Water with Fish,
W75-11079 5A

Treatment Plant Monitoring Programs: A Preliminary Analysis,
W75-11176 5D

Dissipation of Residues of Phenoxy Herbicides Applied for Water Milfoil Control in Large Reservoirs,
W75-11198 5B

MONOMOLECULAR FILMS
Surface Tension Reductions and Urban Wastes in The New York Bight,
W75-10927 5B

MONTE CARLO METHOD
Relative Importance of Decision Variables in Flood Frequency Analysis,
W75-10929 4A

MOROCCO
A Note on Salinity and Temperature in Some Moroccan Brackish Waters,
W75-10997 2L

MORTALITY
Effect of DDT and M.S. 222 on Learning a Simple Conditioned Response in Rainbow Trout (Salmo gairdneri),
W75-11025 5C

Factors Influencing Acute Toxicity Estimates of Hydrogen Sulfide to Freshwater Invertebrates,
W75-11027 5C

Survival and Growth Rate of Channel Catfish as a Function of Dissolved-Oxygen Concentration,
W75-11051 5C

Standard Curves for Nuvacron, Malathion, Sevin, DDT, and Kelthane Tested Against the Mosquito Culex Pipiens L. and the Microcrustacean Daphnia Magna Straus,
W75-11082 5B

MOSQUITOS
Standard Curves for Nuvacron, Malathion, Sevin, DDT, and Kelthane Tested Against the Mosquito Culex Pipiens L. and the Microcrustacean Daphnia Magna Straus,
W75-11082 5B

MOUNT CARMEL (CONN)
Map Showing Depth to Bedrock, Mount Carmel Quandrangle, Connecticut,
W75-10954 7C

MOUNTAIN STREAMS
Species Diversity of Benthic Macroin-Vertebrates and Limnological Conditions in a 1st Order Mountain Stream,
W75-10918 2I

MOUNTAINS
An Elevational Control of Peak Snowpack Variability,
W75-11155 2C

MUD
Uptake of Cadmium, Zinc, Copper, Lead and Chromium in the Pacific Oyster, Crassostrea Gigas, Grown in the Tamar River, Tasmania,
W75-11086 5B

Tests Show Potassium Mud Versatility,
W75-11284 8G

MULTIPLE-PURPOSE PROJECTS
The Louisiana Environmental Management System and Its Utility in Water Resource Planning,
W75-11177 5G

MUNICIPAL WASTES
Wastewater Treatment Plant Odors: A Continuing Enigma,
W75-10986 5D

On-Site Hypochlorite Generation,
W75-11109 5D

MUNICIPAL WATER
Membrane Desalting Gets Big Push,
W75-10982 3A

MUSKAT FLOW THROUGH POROUS MEDIA
Approximation for Steady Interface Beneath a Well Pumping Fresh Water Overlying Salt Water,
W75-11255 4B

MUSSELS
Use of Steelon-Net Veils for Protection of the Hydro-Engineering Works Against Dreissena Polymorphia Pall,
W75-11033 5G

MUTAGENS
Mutagens and Potential Mutagens in the Biosphere: I. DDT and Its Metabolites, Polychlorinated Biphenyls, Chlorodioxins, Polycyclic Aromatic Hydrocarbons, Haloethers,
W75-11170 5B

Mutagens and Potential Mutagens in the Biosphere: II. Metals--Mercury, Lead, Cadmium and Tin,
W75-11171 5B

NATIONAL FLOOD INSURANCE PROGRAM
The Economics of Flood Insurance: An Analysis of the National Flood Insurance Program,
W75-11038 6F

NATURAL FLOW
Estimated Mean-Monthly and Annual Runoff at Selected Sites in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico,
W75-10943 2E

NATURAL RESOURCES
Non-Renewable, Non-Energy Resources,
W75-11253 6B

NEAR-BOTTOM CHEMISTRY
Near-Bottom Chemistry in the Eastern Pacific and North Atlantic Oceans,
W75-10923 2K

NEBRASKA
Distribution-System Operation Analysis Model,
W75-11180 5D

NERITIC
A Survey of Fishes and Commercial Invertebrates of the Nearshore and Estuarine Zone Between Cape Romano and Cape Sable, Florida,
W75-11189 2I

NETHERLANDS
The Economic Impact of Pollution Abatement: The Case of Water Pollution by Degradable Organic Matter,
W75-11254 5G

NETS
Use of Steelon-Net Veils for Protection of the Hydro-Engineering Works Against Dreissena Polymorphia Pall,
W75-11033 5G

NETWORK DESIGN
Australian Arid Zone Streangauging,
W75-11307 2E

NETWORKS
Improved Design of Distribution Networks by Minimum Route,
W75-11175 4A

Advanced Techniques in the Mathematical Modeling of Water-Distribution Systems,
W75-11183 4A

Finite-Element Method for Water-Distribution Networks,
W75-11186 4A

NEUTRALIZATION
Acid Strip Mine Lake Recovery,
W75-11224 5C

NEVADA
Quality of Water in Aquifers of the Amargosa Desert and Vicinity, Nevada,
W75-10932 5B

The Minor and Trace Elements, Gas, and Isotope Compositions of the Principal Hot Springs of Nevada and Oregon,
W75-10937 2K

NEVADA ATOMIC TEST SITE
Quality of Water in Aquifers of the Amargosa Desert and Vicinity, Nevada,
W75-10932 5B

NEW JERSEY
The Water Quality and Bottom Sediment Characteristics of New Jersey Lagoon Developments,
W75-11104 5B

Dissipation of Phenoxy Herbicides Applied to Riparian Vegetation,
W75-11214 5B

NEW MEXICO
Establishing Alkali Sacaton on Harsh Sites in the Southwest,
W75-10882 4A

Estimated Availability of Surface and Ground Water in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico,
W75-10938 4A

An Appraisal of Potential Water Salvage in the Lake McMillen Delta Area, Eddy County, New Mexico,
W75-10941 3B

Estimated Mean-Monthly and Annual Runoff at Selected Sites in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico,
W75-10943 2E

NEW YORK
A Simple and Inexpensive Technique for Determining Colored Light Intensity Underwater,
W75-10919 7B

Geochemical Reconaissance of Surficial Materials in the Vicinity of Shawangunk Mountain, New York,
W75-10928 5A

Streamflow in the New York Part of the Susquehanna River Basin,
W75-10931 2E

Root:Shoot and Leaf Area Relationships of Macrophyte Communities in Chautauqua Lake, New York,
W75-11009 5C

Utilization of Stream-Borne Phosphorus by Cayuga Lake Phytoplankton,
W75-11036 5C

Evidence of Atmospheric Transport of Ozone into Urban Areas,
W75-11169 5A

The Role of Planktonic Protozoa in the Mar
Food Chain. Seasonal Changes Relat
Abundance, and Cell Size Distribution of T
tinnida,
W75-11191

NEW YORK BIGHT
Surface Tension Reductions and Urban Wa
in The New York Bight,
W75-10927

NEW YORK HARBOR
Surface Tension Reductions and Urban Wa
in The New York Bight,
W75-10927

NEW ZEALAND
Mass-Emplaced Sand-Fingers at Mararoa C
struction Site, Southern New Zealand,
W75-11161

The Aquatic Weed Problem. 1. Identificatio
W75-11220

NIGERIA
The Effects of the Formation of Lake K
(Nigeria) Upon the Indigenous Fish Populat
W75-11223

NITELLA HOOKERI
A Contribution to the Biology of N
Hookeri A. BR. in the Rotorua Lakes,
Zealand. II. Organic Nutrients and Phy
Factors,
W75-11235

NITRATES
Pilot-Plant Study of Denitrification Usi
Submerged Sand Filter at Rye Meads Se
Works,
W75-10955

NITRIFICATION
Concurrent Nitrification-Denitrification a
Sediment-Water Interface as a Mechanis
Nitrogen Losses from Lakes,
W75-10902

Some Studies on Nitrification in the Acti
Sludge Process,
W75-10961

Nitrogen Removal in a Pilot Plant,
W75-10984

The Effects of Free Ammonia and
Nitrous Acid on the Nitrification Process,
W75-11101

NITROGEN
The Influence of Density and Nitrogen
Outcome of Competition Between Two
Pasture Grasses (Hordeum Leporinum
and Lolium Rigidum Gaud.),
W75-10889

Nitrogenous Changes During the Settlem
Sewage,
W75-11120

Ammonia Excretion by Zooplankton
Significance to Primary Productivity
Summer,
W75-11187

NITROGEN COMPOUNDS
Stability of Nitrosamines in Samples
Water, Soil, and Sewage,
W75-11019

Natural and Fertilizer Nitrogen in Strea
Lakes,
W75-11311

ITROGEN REMOVAL
Nitrogen Removal by Catalyst-Aided Breakpoint Chlorination,
W75-10965 5D

ITROGEN REMOVAL RATES
Nitrogen Removal in the Operation of the Mililani Sewage Treatment Plant,
W75-11041 5D

ITROSAMINES
Stability of Nitrosamines in Samples of Lake Water, Soil, and Sewage,
W75-11019 5B

ITROUS ACID
The Effects of Free Ammonia and Free Nitrous Acid on the Nitrification Process,
W75-11101 5D

ON-POINT POLLUTANT SOURCES
Water Pollution from Nonpoint Sources,
W75-11158 5B

ON-STRUCTURAL ALTERNATIVES
Prescriptive Economic Models for Nonstructural Flood Control,
W75-11060 6F

ONLINEAR PROGRAMMING
An Implicit Approach to Pricing Agricultural Water Transfers to Urban Uses,
W75-11178 4A

RTH ATLANTIC
Veyl's Theory of Glaciation Supported by sotopic Study of Norwegian Core K 11,
W75-11153 2J

RWEGIAN SEA
Veyl's Theory of Glaciation Supported by otopic Study of Norwegian Core K 11,
75-11153 2J

ZZLES
ozzle Hydraulics in the Trickle Irrigation ystem--Relation Between Water Temperature d Nozzle Flow Rate (In Japanese),
75-11096 3F

LEAR EXPLOSIONS
uality of Water in Aquifers of the Amargosa esert and Vicinity, Nevada,
75-10932 5B

LEIC ACIDS
luence of Oil on Nucleic Acids of Algae,
75-11080 5C

luence of Oil on Nucleic Acids of Algae,
5-11232 5C

ANCE ALGAE
ae in Baltimore's Reservoirs,
5-11221 5C

ERICAL ANALYSIS
rmal Response of Heated Streams, Solution he Implicit Method,
5-10909 5B

licit Numerical Modeling of Unsteady ws,
5-10925 8B

ERICAL METHODS
hree-Dimensional Model for Estuaries and stal Seas: Vol. II, Aspects of Computation,
-10900 2L

NUTRIENT REMOVAL
Concurrent Nitrification-Denitrification at the Sediment-Water Interface as a Mechanism for Nitrogen Losses from Lakes,
W75-10902 5C

Physiochemical Treatment of Wastewater-Seawater Mixture by Electrolysis,
W75-10979 5D

Desirable Provision in Current Designs for Future Development in Relation to Reclamation of Effluent,
W75-10980 5D

NUTRIENT REQUIREMENTS
A Contribution to the Biology of Nitella Hookeri A. BR. in the Rotorua Lakes, New Zealand. II. Organic Nutrients and Physical Factors,
W75-11235 5C

OAK CREEK POWER PLANT (WIS)
Investigation of the Influence of Thermal Discharge from a Large Electric Power Station on the Temperature and Near-Shore Circulation of Lake Michigan,
W75-11190 5C

OCEANOGRAPHIC TEMPERATURE SENSORS
Note on the Measurement of the Response of Oceanographic Temperature Sensors,
W75-11146 7B

OCEANS
Some Observations on Behavior of the Treated Sewage Disposed in the Sea,
W75-11020 5B

ODOR
Biological Control: Isolation and Bacterial Oxidation of the Taste-and-Odor Compound Geosmin,
W75-11013 5F

ODOR-PRODUCING ALGAE
Biological Control: Isolation and Bacterial Oxidation of the Taste-and-Odor Compound Geosmin,
W75-11013 5F

ODORS
Wastewater Treatment Plant Odors: A Continuing Enigma,
W75-10986 5D

OFFSETS
Cavitation Control by Aeration of High-Velocity Jets,
W75-11152 8B

OGALLALA AQUIFER
Colorado City Solves Its Sand Pumping Problems,
W75-11261 8C

OIL
How Downhole Temperatures, Pressures Affect Drilling; Part 6: Correlating Geopressure Gradients with Hydrocarbon Accumulations,
W75-11296 8G

How Downhole Temperatures, Pressures Affect Drilling; Part 7: The Shale Resistivity Ratio - A Valuable Tool for Making Economic Drilling Decisions,
W75-11297 8G

How Downhole Temperatures, Pressures Affect Drilling; Part 8: Needless Spending of Drilling and Exploration Money Can Be Predicted-And Prevented,
W75-11298 8G

OIL DISPERSANTS
The Effects of Crude Oils and the Dispersant Corexit 8666 on Sea Urchin Gametes and Embryos,
W75-11090 5C

The Effects of Oil Dispersants on the Cell in Fertilization and Development,
W75-11091 5C

OIL INDUSTRY
Subsurface Water -- Tool for Petroleum Exploration,
W75-11289 4B

OIL POLLUTION
Oil Pollution and Seabirds in Denmark 1935-1968,
W75-10893 5C

Water Conservation in Sweden: III. Current Trends,
W75-10987 5G

Oil Separator with Coalescing Media,
W75-11071 5G

Influence of Oil on Nucleic Acids of Algae,
W75-11080 5C

Influence of Oil on Nucleic Acids of Algae,
W75-11232 5C

OIL SPILLS
Oil Spill Technology,
W75-11001 5G

OIL WASTES
Effects of Some Components of Crude Oil on Young Coho Salmon,
W75-11088 5C

OIL WELLS
How to Seal Tubing Collar Leaks.
W75-11287 8C

OKLAHOMA
Wind Effects on Chemical Films for Evaporation Suppression at Lake Hefner,
W75-10920 3B

Hydraulic Modeling of Mixing Phenomena in Stratified Lakes,
W75-11043 2H

Improved Design and Operating Criteria for Rural Water Districts,
W75-11056 6D

OLIGOTROPHY
A General Description of the Oligotrophic Lake Paajarvi, Southern Finland, and the Ecological Studies on It,
W75-11229 5C

OMAHA (NEB)
Distribution-System Operation Analysis Model,
W75-11180 5D

ON-SITE DATA COLLECTIONS
Investigation of the Influence of Thermal Discharge from a Large Electric Power Station on the Temperature and Near-Shore Circulation of Lake Michigan,
W75-11190 5C

ON-SITE INVESTIGATIONS
Field Testing of Aquatic Herbicides for Control of Egeria Densa,
W75-11200 5G

Basic Concepts and Practical Aspects of Corrosion Investigation,
W75-11271 8G

ON-SITE TESTS
Specific Conductance Method for in Situ Estimation of Total Dissolved Solids,
W75-11167 5A

OPEN CHANNEL FLOW
Implicit Numerical Modeling of Unsteady Flows,
W75-10925 8B

Effect of Pressure Gradient on Wind-Waves in a Laboratory Channel,
W75-11093 8B

The Design of Storm Water Drainage Channels Using Mathematical Model Techniques,
W75-11150 8B

Laboratory Investigation of One-Dimensional Wave Motion in Open Channels,
W75-11172 8B

OPERATING COSTS
The Economy of Various Methods for Dewatering Sludge From Biological Purification (Ueber die Wirtschaftlichkeit verschiedener Verfahren zur Entwaesserung von biologischem Klaerschlamm),
W75-11127 5D

OPERATION AND MAINTENANCE
Sprinkler Irrigation Practice, (La Pratique De L'Irrigation Par Aspersion),
W75-10875 3F

Considerations for Preparation of Operation and Maintenance Manuals,
W75-11317 5D

OPERATIONS
Distribution-System Operation Analysis Model,
W75-11180 5D

Advanced Techniques in the Mathematical Modeling of Water-Distribution Systems,
W75-11183 4A

Can a Computer Really Operate a Water-Filtration Plant,
W75-11184 5F

OPERATIONS RESEARCH
Floodplain Land-Use Management: An Application of Operations Research Methodology,
W75-11037 6F

OPTICAL PROPERTIES
A Simple and Inexpensive Technique for Determining Colored Light Intensity Underwater,
W75-10919 7B

OPTIMIZATION
Study of Criteria and Models Establishing Optimum Level of Hydrogeologic Information for Groundwater Basin Management,
W75-11042 2F

Upgrading Meat Packing Facilities to Reduce Pollution. (Part 3). Choosing the Optimum Financial Strategy,
W75-11322 5D

OPTIMUM DEVELOPMENT PLANS
Legal and Institutional Problems in the Management of Salinity,
W75-11047 5G

OREGON
The Minor and Trace Elements, Gas, and Isotope Compositions of the Principal Hot Springs of Nevada and Oregon,
W75-10937 2K

Ground Water in the Corvallis-Albany Area, Central Willamette Valley, Oregon,
W75-10940 2F

Strategic Approach to Estuarine Environmental Management,
W75-11179 2L

Ammonia Excretion by Zooplankton and its Significance to Primary Productivity During Summer,
W75-11187 5C

Dissipation of Residues of Phenoxy Herbicides Applied to the Watershed,
W75-11213 5B

ORGANIC CARBON
In Situ Measurement of the Settling Velocity Profile of Particulate Organic Carbon in Lake Ontario,
W75-11227 5C

ORGANIC COMPOUNDS
The Mechanism of Flocculation Processes in the Presence of Humic Stubtances,
W75-10958 5D

Studies on Toxicity of Sodium Nifurstyrenate (NFS-NA) in Cultured Yellowtail (In Japanese),
W75-11034 5C

Effects of Some Components of Crude Oil on Young Coho Salmon,
W75-11088 5C

Oxidation of Organic Compounds in Water (Oxidation organischer Verbindungen in Wasser),
W75-11118 5D

Apparatus for Concentration of Volatile Organic Pollutants in Water,
W75-11342 5A

ORGANIC MATTER
The Use of Soil as a Purifying System (L'Utilisation du sol Comme Systeme Epurateur),
W75-11126 5D

Dissolved Organic Matter and Lake Metabolism,
W75-11188 5C

Preliminary Information on the Nature of Organic Matter in the Surface Sediments of Lakes Huron, Erie, and Ontario,
W75-11240 2J

The Economic Impact of Pollution Abatement: The Case of Water Pollution by Degradable Organic Matter,
W75-11254 5G

ORGANIC PESTICIDES
Absorption and Elimination of Photodieldrin by Daphnia and Goldfish,
W75-11085 5B

ORGANIC WASTES
Wastewater Treatment Using Algae and Artemia,
W75-10967 5D

Wastewater Treatment Plant,
W75-11076 5D

ORGANOCHLORINE INSECTICIDES
Toxaphene Effects on Growth and Bone Composition of Fathead Minnows, Pimephales Promelas,
W75-11026 5C

ORIFICES
Predicting Cavitation in Sudden Enlargements
W75-11151 8B

OSCILLATORY FLOW
Transition in Oscillatory Flow Over Rippled Beds,
W75-11149 8F

OUTLET WORKS
Cavitation Control by Aeration of High Velocity Jets,
W75-11152 8I

OUTLETS
Design of the Optimal Outfall System for Stream Receiving Thermal and Organic Waste Discharges,
W75-11137 5

OVERFLOW
YWA Plan for Cleaner Rivers,
W75-11017 5

OVERLAND FLOW
Derivation of Surface Water Lag Time for Converging Overland Flow,
W75-11156

OXIDATION
Carbon Regeneration by Wet Air Oxidation,
W75-10988

How Silica Affects Iron Removal fr Groundwater,
W75-11016

Measures of Biodegradability and Refract Organics in Wastewaters: (Analysis, Interpre tion, and Application of Measurem Techniques),
W75-11103

Investigations on the Long Term Biochem Oxidation of Sewage,
W75-11116

Oxidation of Organic Compounds in W (Oxidation organischer Verbindungen Wasser),
W75-11118

Basic Concepts and Practical Aspects of Co sion Investigation,
W75-11271

OXYGEN
First Stage of the World's Largest Pure Ox Sewage Plant to Undergo Test.
W75-10960

OXYGEN DEMAND
Application of the Manometric Techniqu the Study of Sediment Oxygen Depletion,
W75-11222

OXYGEN SAG
Application of the Manometric Techniq the Study of Sediment Oxygen Depletion,
W75-11222

OXYGENATION
Huntingdon Research Centre Pasveer tion Plant--Six Years On,
W75-11115

OYODO RIVER (JAPAN)
A Planning of Catchment Sewerage for River (In Japanese),
W75-11113

YSTERS
A Reevaluation of the Combined Effects of Temperature and Salinity on Survival and Growth of Bivalve Larvae Using Response Surface Techniques,
W75-11081 5C

Uptake of Cadmium, Zinc, Copper, Lead and Chromium in the Pacific Oyster, Crassostrea Gigas, Grown in the Tamar River, Tasmania,
W75-11086 5B

Effects of Ozone-Treated Seawater on the Spawned, Fertilized, Meiotic, and Cleaving Eggs of the Commercial American Oyster,
W75-11256 5C

ZONE
Water and Wastewater Disinfection with Ozone: A Critical Review,
W75-10956 5D

Ozone Treatment Licks Color Problem.
W75-10959 5D

Water Treatment by Ozone, (In Japanese),
W75-11107 5D

vidence of Atmospheric Transport of Ozone nto Urban Areas,
/75-11169 5A

ffects of Ozone-Treated Seawater on the pawned, Fertilized, Meiotic, and Cleaving ggs of the Commercial American Oyster,
'75-11256 5C

IFIC NORTHWEST US
he Hydrologic Cycle--As Applicable to the acific Northwest,
'75-10949 7C

gae Control in Northwest Reservoirs,
75-11231 5G

IFIC OCEAN
ar-Bottom Chemistry in the Eastern Pacific d North Atlantic Oceans,
'5-10923 2K

monia Excretion by Zooplankton and its nificance to Primary Productivity During nmer,
5-11187 5C

FIC OYSTER
ake of Cadmium, Zinc, Copper, Lead and omium in the Pacific Oyster, Crassostrea as, Grown in the Tamar River, Tasmania,
-11086 5B

E ISLAND
ilization and Reconstruction of Texas stal Foredunes with Vegetation,
-10887 2L

CLE SIZE
hastic Analysis of Particle Movement Over ne Bed,
-10942 2J

Sorting During Suspension Transporta- Lognormality and Other Characteristics,
11162 2J

RE MANAGEMENT
ration of Arid Zone Rainfall and Runoff,
11303 2A

RES
nfluence of Density and Nitrogen on the me of Competition Between Two Annual Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.),
W75-10889 3F

PATENTS
Device for Automatic Determination of Suspended Solids Content in Water,
W75-11063 5A

Process for Treating Sewage Sludge,
W75-11064 5D

System for Softening and Dealkalizing Water by Electrodialysis,
W75-11065 5F

Process for Treating Industrial Wastes,
W75-11066 5D

Process for Treating Industrial Wastes,
W75-11067 5D

Electrolytic Sea Water Process,
W75-11068 3A

Aerobic Lagoon Waste Treatment System and Method,
W75-11069 5D

System for Optimal Pressure Control in a Multi-Stage Evaporation Unit,
W75-11070 3A

Oil Separator with Coalescing Media,
W75-11071 5G

Process for Raw Water Clarification,
W75-11072 5F

Mobile Unit for Treating Liquid Waste,
W75-11073 5D

Low Temperature Water Purification System,
W75-11074 5F

Beach Erosion Control Structure,
W75-11075 8A

Wastewater Treatment Plant,
W75-11076 5D

Flocculation Device for Waste Fluid Treatment,
W75-11077 5D

PATH OF POLLUTANTS
Occurrence of 2, 4, 5-T and Picloram in Surface Runoff Water in the Blacklands of Texas,
W75-10895 5B

Thermal Response of Heated Streams, Solution by the Implicit Method,
W75-10909 5B

Surface Tension Reductions and Urban Wastes in The New York Bight,
W75-10927 5B

Use of Productivity of Periphyton to Estimate Water Quality,
W75-10936 5B

Stability of Nitrosamines in Samples of Lake Water, Soil, and Sewage,
W75-11019 5B

Some Observations on Behavior of the Treated Sewage Disposed in the Sea,
W75-11020 5B

Preliminary Investigations into Copper Cycling in Indian Lake, Massachusetts: A Lake Treated Annually with Copper Sulfate,
W75-11039 5B

Process Studies and Modeling of Self-Cleaning Capacity of Mountain Creeks for Recreation Planning and Management,
W75-11055 5B

The Use of Snakes as a Pollution Indicator Species,
W75-11089 5B

Evidence of Atmospheric Transport of Ozone into Urban Areas,
W75-11169 5A

Solid Wastes, Animal Refuse, and Organic Residues Disposal, and the Quality of Ground Water,
W75-11244 5B

Fertilizer Phosphate in Streams and Lakes,
W75-11310 5B

Natural and Fertilizer Nitrogen in Streams and Lakes,
W75-11311 5B

PATHOGENIC ANOEBIC
Pathogenic Free-Living Amoebae in Arkansas Recreational Waters,
W75-11053 5A

PATHOGENIC BACTERIA
Pathogenic Free-Living Amoebae in Arkansas Recreational Waters,
W75-11053 5A

PEAK DISCHARGE
Flood Runoff from Urban Areas,
W75-10904 5B

PEAK WATER DEMAND
Water Application Practices and Landscape Attributes Associated with Residential Water Consumption,
W75-11059 3D

PENETRATION
'Self-Tapping Screw' Bit Would Use Lighter Weights,
W75-11283 8C

PENNSYLVANIA
Dissipation of Phenoxy Herbicides Applied to Riparian Vegetation,
W75-11214 5B

PERCOLATING WATER
Uranium Mineralization by Ground Water in Sedimentary Rocks, Japan.
W75-11145 2F

PERIPHYTON
Use of Productivity of Periphyton to Estimate Water Quality,
W75-10936 5B

The Growth of Some Epiphytic Algae in a Lake Receiving Thermal Effluent,
W75-11225 5C

PERMAFROST
How BP Alaska Cements Through Permafrost.
W75-11278 8F

PERMITS
Water Conservation in Sweden: III. Current Trends,
W75-10987 5G

PESTICIDE REGISTRATION
Criteria for Herbicide Evaluation,
W75-11196 5G

PESTICIDE RESIDUES
Registration of Herbicides for Aquatic Use, W75-11197 5G

Dissipation of Residues of Phenoxy Herbicides Applied for Water Milfoil Control in Large Reservoirs, W75-11198 5B

Dissipation of Residues of Phenoxy Herbicides Applied to the Watershed, W75-11213 5B

Dissipation of Phenoxy Herbicides Applied to Riparian Vegetation, W75-11214 5B

Extraction and Analytical Techniques for Pesticides in Soil, Sediment, and Water, W75-11236 5A

PESTICIDES
Standard Curves for Nuvacron, Malathion, Sevin, DDT, and Kelthane Tested Against the Mosquito Culex Pipiens L. and the Microcrustacean Daphnia Magna Straus, W75-11082 5B

PHAEOPHYTA
The Accumulation of Cadmium, Copper, Manganese and Zinc by Fucus Vesiculosus in the Bristol Channel, W75-11083 5B

PHENOLOGY
Phenology of Selected Sonoran Desert Plants at Punta Cirio, Sonora, Mexico. W75-10862 2I

PHENOLS
Endemic Nephrophathy and Its Relation to the Contamination of Well Water by Phenolic Compounds in Barsa-Arad (Nefropatia Endemica Si Relatia Cu Impurificarea Prin Compousi Fenolici in Apele Fintinilor Din Comuna Barsa-Arad), W75-11105 5B

Chromatographic Determination of Phenols in Water, W75-11344 5A

PHOSPHATES
Some Observations Concerning Preparation and Storage of Stream Samples for Dissolved Inorganic Phosphate Analysis, W75-11336 5A

Interference of Mercury(II) in the Colorimetric Determination of Inorganic Phosphate in Water, W75-11340 5A

PHOSPHORIC ACID
Use of Amendments to Reduce Water Requirements for Stand Establishment of Small-Seeded Crops, W75-11045 3F

PHOSPHORUS
Utilization of Stream-Borne Phosphorus by Cayuga Lake Phytoplankton, W75-11036 5C

PHOSPHORUS COMPOUNDS
Fertilizer Phosphate in Streams and Lakes, W75-11310 5B

PHOTODIELDRIN
Absorption and Elimination of Photodieldrin by Daphnia and Goldfish, W75-11085 5B

PHREATIC LINES
Application of Electrical Analogy to Draw Flow Nets for Sudden Drawdown Conditions in Earth Dams, W75-11143 8B

PHREATOPHYTES
An Appraisal of Potential Water Salvage in the Lake McMillen Delta Area, Eddy County, New Mexico, W75-10941 3B

PHYLLODOCE MACULATA
Some Effects of Copper on the Polychaete Phyllodoce Maculata, W75-11136 5C

PHYSICO-CHEMICAL TREATMENT
Physiochemical Treatment of Wastewater-Seawater Mixture by Electrolysis, W75-10979 5D

Simplified Waste Water Purification Through Physical-Chemical Treatment (Vereinfachte Abwasserreinigung durch physikalisch chemische Behandlung), W75-11122 5D

PHYTOPHTHORA
Phytophthora Species in Arizona: Its Occurrence in Recycled Irrigation water, W75-10883 5A

PHYTOPLANKTON
Utilization of Stream-Borne Phosphorus by Cayuga Lake Phytoplankton, W75-11036 5C

Biochrome Analysis as a Method for Assessing Phytoplankton Dynamics, Phase II, W75-11052 5C

In Situ Measurement of the Settling Velocity Profile of Particulate Organic Carbon in Lake Ontario, W75-11227 5C

Quantitative Estimation of the Daily Ingestion of Phytoplankton by Tilapia Nilotica and Haplochromis Nigripinnis in Lake George, Uganda, W75-11268 2H

PICLORAM
Occurrence of 2, 4, 5-T and Picloram in Surface Runoff Water in the Blacklands of Texas, W75-10895 5B

PIEZOMETERS
A Pneumatic System to Pump Water from Piezometers, W75-11257 8C

PINE HILL SWAMP (ILL)
Seasonal Abundance and Diversity of Benthos in a Southern Illinois, USA Swamp, W75-11312 2H

PINE TREES
Studies on the Relationship Between Dry-Matter Production and the Development of a Pine Forest on Coastal Sand Dunes (1), (In Japanese), W75-11098 4A

PINYON PINE TREES
Effects of Pinyon-Juniper Removal on Natural Resource Products and Uses in Arizona, W75-10886 3B

PIPES
Improved Design of Distribution Networks by Minimum Route, W75-11175 4A

Finite-Element Method for Water-Distribution Networks, W75-11186 4A

Special Annulus Fluid Eases Casing Recovery. W75-11282 8C

PITLESS ADAPTERS
Pitless Adapters: Emphasis on Sanitation, W75-11258 8

PITTING (CORROSION)
Predicting Cavitation in Sudden Enlargements W75-11151 8

Longer Life for Submersibles. W75-11259 8

PLANKTON
The Influence of the Warm Cooling Water fro a Fossil Fueled Power Plant on Oceanograph Conditions and Composition of Plankton Owase Bay I. Water Temperature in Relation Distribution of Microplankton, (In Japanese), W75-11030

Seasonal Abundance of Crustacean Zooplan ton and Net Plankton Biomass of Lakes Hur Erie, and Ontario, W75-11238

PLANNING
Successful Irrigation: Preparation, Realizati Exploritation, (Savoir Irriguer: Preparati Realisation, Exploitation), W75-10874

Water Resources, W75-11003

A Planning of Catchment Sewerage for Oy River (In Japanese), W75-11113

PLANT DISEASES
Comparison of Uredo Eichhorniae, the W hyacinth Rust, and Uromyces Pontederiae, W75-11092

Utilization of Phytopathogens as Biocon for Aquatic Weeds, W75-11206

PLANT GROWTH
Phenology of Selected Sonoran Desert Pla Punta Cirio, Sonora, Mexico. W75-10862

The Early Vegetative Growth of Two A Pasture Grasses (Hordeum Leporinum and Lolium Rigidum Gaud.), W75-10876

The Influence of Density and Nitrogen Outcome of Competition Between Two A Pasture Grasses (Hordeum Leporinum and Lolium Rigidum Gaud.), W75-10889

The Germination and Establishment o Annual Pasture Grasses (Hordeum Lep Link and Lolium Rigidum Gaud.), W75-10897

PLANT PATHOLOGY
Comparison of Uredo Eichhorniae, the hyacinth Rust, and Uromyces Pontederi W75-11092

**LANT PHYSIOLOGY**
Influence of Oil on Nucleic Acids of Algae,
W75-11232 5C

The Role of Endogenous Abscisic Acid in the Response of Plants to Stress,
W75-11319 3F

**LANTING MANAGEMENT**
The Early Vegetative Growth of Two Annual Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.),
W75-10876 3F

Transplanting Sea Grass in Mississippi Sound,
W75-11207 4A

**LASTIC DEFORMATION**
Theory of Plasticity of Porous Media with Fluid Flow,
W75-11276 8E

**EUMATIC PUMP**
A Pneumatic System to Pump Water from Piezometers,
W75-11257 8C

**CILLOPORA MEANDRINA**
A Comparison of Effects of Elevated Temperature Versus Temperature Fluctuations on Reef Corals at Kahe Point, Oahu,
W75-11084 5C

**LITICAL ASPECTS**
nstitutional Arrangements for Reducing Conflict Over Water Quality in International Rivers,
W75-11242 6E

**LLUTANT IDENTIFICATION**
pifaunal Invertebrates as Indicators of Water uality in Southern Lake Pontchartain,
75-10852 5C

ytophthora Species in Arizona: Its Occurnce in Recycled Irrigation water,
75-10883 5A

ochemical Reconaissance of Surficial aterials in the Vicinity of Shawangunk Moun-n, New York,
75-10928 5A

tivated Carbon in the Water Treatment nt,
5-10992 5D

nitest Method for Monitoring Effluent Quali-
5-10994 5D

vances in the Detection of Water Pollutants,
5-10995 5A

nogenic Free-Living Amoebae in Arkansas reational Waters,
5-11053 5A

ice for Automatic Determination of pended Solids Content in Water,
-11063 5A

cury Contents in Biologically Preserved imens of Menuke (Sebastes Baramenuke S. Flammeus),
-11078 5A

inuous Automatic Monitoring of Surface r with Fish,
-11079 5A

sures of Biodegradability and Refractory nics in Wastewaters: (Analysis, Interpretation, and Application of Measurement Techniques),
W75-11103 5D

Concentration and Genera of Algae in Selected Illinois Streams, 1971-1973,
W75-11165 5A

Evidence of Atmospheric Transport of Ozone into Urban Areas,
W75-11169 5A

Chelation Study of Copper (II): Fulvic Acid System,
W75-11219 5B

Extraction and Analytical Techniques for Pesticides in Soil, Sediment, and Water,
W75-11236 5A

Interference of Mercury(II) in the Colorimetric Determination of Inorganic Phosphate in Water,
W75-11340 5A

Modification of the Iodimetric Titration Method for the Determination of Bromide and Its Application to Mixed Domestic-Industrial Waste Effluents,
W75-11341 5A

Apparatus for Concentration of Volatile Organic Pollutants in Water,
W75-11342 5A

Interference of Sulfate Ion on SPADNS (Sodium 2-(Sulfophenylazo)-1,8-Dihydroxynaphthalene-3,6-Disulfonate) Colorimetric Determination of Fluorine in Waste Waters,
W75-11343 5A

Chromatographic Determination of Phenols in Water,
W75-11344 5A

**POLLUTANT IDENTIFICATIONS**
Retention of Cadmium in Mice Studied by Whole Body Autoradiography,
W75-11024 5A

**POLLUTANTS**
Water Pollution from Nonpoint Sources,
W75-11158 5B

Translations on Environmental Quality, No. 33.
W75-11246 5G

**POLLUTION**
Pitless Adapters: Emphasis on Sanitation,
W75-11258 8C

**POLLUTION ABATEMENT**
A New Look at Pollution Prevention on Lowland Rivers,
W75-11132 5G

Translations on Environmental Quality, No. 33.
W75-11246 5G

Economic Analysis of Effluent Guidelines: Meat Packing Industry,
W75-11249 5G

Economic Analysis of Effluent Guidelines. Ferroalloys Industry.
W75-11250 5G

The Economic Impact of Pollution Abatement: The Case of Water Pollution by Degradable Organic Matter,
W75-11254 5G

Conoco Technology Curbs Production Pollution,
W75-11267 5G

Upgrading Metal-Finishing Facilities to Reduce Pollution. (Part 1). In-Process Pollution Abatement,
W75-11324 5D

Upgrading Metal-Finishing Facilities to Reduce Pollution. (Part 2). Waste Treatment,
W75-11325 5D

Upgrading Textile Operations to Reduce Pollution. (Part 1). In-Plant Control of Pollution.
W75-11326 5D

**POLYCHAETES**
Some Effects of Copper on the Polychaete Phyllodoce Maculata,
W75-11136 5C

**POLYCHLORINATED BIPHENYLS**
Mutagens and Potential Mutagens in the Biosphere: I. DDT and Its Metabolites, Polychlorinated Biphenyls, Chlorodioxins, Polycyclic Aromatic Hydrocarbons, Haloethers,
W75-11170 5B

**POLYMERS**
Process for Treating Industrial Wastes,
W75-11066 5D

Analysis of Factors Influencing Mobility and Adsorption in the Flow of Polymer Solution Through Porous Media,
W75-11275 8B

**PONDS**
Limnology of Desert Ponds,
W75-10880 2H

**POROSITY**
Theory of Plasticity of Porous Media with Fluid Flow,
W75-11276 8E

**POROUS MEDIA**
Formulation of Boundary Conditions at the Surface of a Porous Medium,
W75-11269 8B

**PORTUGAL (RIO SADO)**
Experimental Study of the Cooling Water System, Setubal Power Plant, Rio Sado, Portugal,
W75-10855 5B

**POST AUDIT ANALYSIS**
Social Impacts of Water Resources Developments and Their Implication for Urban and Rural Development: A Post Audit Analysis of the Weber Basin Project in Utah,
W75-10854 6B

**POST-IMPOUNDMENT**
The Effects of the Formation of Lake Kainji (Nigeria) Upon the Indigenous Fish Population,
W75-11223 5C

**POTABLE WATER**
Facing the Real Cost of Clean Water,
W75-10857 5G

The Impact of the Safe Drinking Water Act on Utilities,
W75-10859 5G

Disinfecting Wastewater with Chlorination/Dechlorination Part 2,
W75-10964 5D

**POTABLE WATER**

Preventing Backflow in Piping Cross Connections,
W75-11018 5B

Endemic Nephrophathy and Its Relation to the Contamination of Well Water by Phenolic Compounds in Barsa-Arad (Nefropatia Endemica Si Relatia Cu Impurificarea Prin Compousi Fenolici in Apele Fintinilor Din Comuna Barsa-Arad),
W75-11105 5B

Water Treatment for Public Supply,
W75-11119 5F

Aquatic Plant Control Using Herbicides in a Large Potable Water Supply,
W75-11201 5G

**POTASSIUM COMPOUNDS**
Tests Show Potassium Mud Versatility,
W75-11284 8G

**POTASSIUM DICHROMATE**
Determination of Chemical Oxygen Demand, COD(Cr), in Waste Waters of Pulp and Paper Mills (Bestimmung des chemischen Sauerstoffbedarfes, CSB(Cr), in Restabwaessern von Zellstoff und Papierfabriken).
W75-11337 5A

**POTASSIUM LIGNITE**
Tests Show Potassium Mud Versatility,
W75-11284 8G

**POTATOES**
The Effect of Irrigation on the Yield and Quality of Maincrop Potatoes,
W75-11106 3F

**POUDRE VALLEY (COL)**
Consolidation and Rehabilitation of Canals in Poudre Valley,
W75-11061 4A

**POULTRY**
Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 1). In-Process Pollution Abatement,
W75-11328 5D

Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 2). Pretreatment of Poultry-Processing Wastes,
W75-11329 5D

Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 3). Waste Treatment.
W75-11330 5D

**POULTRY PROCESSING WASTES**
Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 1). In-Process Pollution Abatement,
W75-11328 5D

Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 2). Pretreatment of Poultry-Processing Wastes,
W75-11329 5D

Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 3). Waste Treatment.
W75-11330 5D

**POWERPLANTS**
Experimental Study of the Cooling Water System, Setubal Power Plant, Rio Sado, Portugal.
W75-10855 5B

Dissolved Gas Supersaturation and Dilution in Thermal Plumes from Steam Electric Generating Stations,
W75-11159 5B

**PRAIRIE RATTLESNAKES**
The Use of Snakes as a Pollution Indicator Species,
W75-11089 5B

**PRECIPITATION (ATMOSPHERIC)**
Analysis of Colorado Precipitation,
W75-11040 2B

**PRESERVATION**
Preserving Activated Sludge,
W75-10962 5D

**PRESSURE**
Simple Field Checks Will Provide Accurate DST Data,
W75-11281 8G

How to Find Transition Zones in Soft Formations,
W75-11285 8G

Casing-Seat Testing - Why and How,
W75-11291 8F

How Downhole Temperatures, Pressures Affect Drilling; Part 4: Pitfalls in Overpressure Prediction,
W75-11294 8G

How Downhole Temperatures, Pressures Affect Drilling; Part 5: Predicting Hydrocarbon Environments with Wireline Data,
W75-11295 8G

How Downhole Temperatures, Pressures Affect Drilling; Part 6: Correlating Geopressure Gradients with Hydrocarbon Accumulations,
W75-11296 8G

**PRESSURE-DEPTH GRADIENT**
How Downhole Temperatures, Pressures Affect Drilling; Part 6: Correlating Geopressure Gradients with Hydrocarbon Accumulations,
W75-11296 8G

**PRESSURE EFFECTS**
Predicting Cavitation in Sudden Enlargements,
W75-11151 8B

**PRICING**
An Implicit Approach to Pricing Agricultural Water Transfers to Urban Uses,
W75-11178 4A

**PRIMARY PRODUCTIVITY**
Seasonal Variation in Composition, Plant Biomass, and Net Primary Productivity of a Tropical Grassland at Kurukshetra, India,
W75-11006 2I

The Influence of the Warm Cooling Water from a Fossil Fueled Power Plant on Oceanographic Conditions and Composition of Plankton in Owase Bay I. Water Temperature in Relation to Distribution of Microplankton, (In Japanese),
W75-11030 5C

The Accumulation of Cadmium, Copper, Manganese and Zinc by Fucus Vesiculosus in the Bristol Channel,
W75-11083 5B

Primary Production in Lakes Ontario and Erie: A Comparative Study,
W75-11217 5C

**PROBABILITY**
Relative Importance of Decision Variables in Flood Frequency Analysis,
W75-10929 4A

Some Observations on Rainfall in Western New South Wales,
W75-11304 2I

**PRODUCTIVITY**
Man's Impact on a Newly Formed Reservoir,
W75-11233 5C

**PROJECT PLANNING**
Successful Irrigation: Preparation, Realization Exploitation, (Savoir Irriguer: Preparation Realisation, Exploitation),
W75-10874 3

**PROPERTY VALUES**
Covariance Analysis of Reservoir Development Effects on Property Tax Base,
W75-10851 6

A Case Study of Some Economic Aspects of the National Flood Insurance Program,
W75-10906 6

**PROTOZOA**
Population Dynamics of Protozoa in Wastewater,
W75-10957 5

The Role of Planktonic Protozoa in the Marine Food Chain. Seasonal Changes, Relative Abundance, and Cell Size Distribution of Tintinnida,
W75-11191

**PUBLIC HEALTH**
A Waterborne Gastroenteritis Epidemic in Perris, California,
W75-11005

Endemic Nephrophathy and Its Relation to the Contamination of Well Water by Phenolic Compounds in Barsa-Arad (Nefropatia Endemica Si Relatia Cu Impurificarea Prin Compousi Fenolici in Apele Fintinilor Din Comuna Barsa-Arad),
W75-11105

**PUBLIC LAW 92-500**
Milestone Water Legislation Accompanied by Millstone of Bureaucratic Red Tape,
W75-11007

**PUBLIC UTILITIES**
Water System Accessories,
W75-11299

**PUBLICATIONS**
The Awareness of the Relevant Water Resources Literature by the Personnel of the Wisconsin Department of Natural Resources,
W75-10899

Considerations for Preparation of Operation and Maintenance Manuals,
W75-11317

**PUERTO RICE**
Water Hyacinth Research in Puerto Rico,
W75-11215

**PULP AND PAPER INDUSTRY**
Measures in the Sulfite Pulp Industry for Decreasing Waste Water Load (Massnahmen der Sulfitzellstoff-Industrie zur Minderung der Abwasserbelastung),
W75-11339

B(ritish) C(olumbia) Presses for Forest Industries CleanaUp.
W75-11350 5G

LP WASTES
Bark as Trickling-Filter Dewatering Medium for Pulp and Paper Mill Sludge,
W75-11241 5D

Waste Water Survey, St. Regis Paper Company, Cantonment, Florida.
W75-11314 5D

Effluent Characteristics and Treatment of Mechanical Pulping Effluents,
W75-11331 5D

Mill Experience in the Treatment of Mechanical Pulping Effluent,
W75-11332 5D

apermaking Complex at Dunaujvaros Hungary) -- Preserving the Danube (Au complexe papetier de Dunaujvaros -- preserver le anube),
75-11333 5D

etermination of Chemical Oxygen Demand, OD(Cr), in Waste Waters of Pulp and Paper ills (Bestimmung des chemischen Sauerstoffdarfes, CSB(Cr), in Restabwaessern von ellstoff und Papierfabriken).
75-11337 5A

fect of Lime Treatment on Molecular Weight stribution of Color Bodies from Kraft Linerard Decker Effluents,
5-11345 5D

degradation of Components of Pulp Waste Tuents by Bacteria. (1). Degradation of Kraft nin (In Japanese),
5-11346 5B

P
Pneumatic System to Pump Water from zometers,
5-11257 8C

TESTING
alling Submersibles.
5-11264 8C

ING
rivation Contribution and Interference Effs of Multiple Wells in a Common Aquifer,
-11142 4B

rado City Solves Its Sand Pumping lems,
-11261 8C

S
kler Irrigation Practice, (La Pratique De igation Par Aspersion),
-10875 3F

Selection,
11002 8C

lution to Pump Stoppages,
11111 8C

er Life for Submersibles.
11259 8G

Submersibles Make Jet Pumps Obsolete.
11263 8C

ling Submersibles.
1264 8C

System Accessories,
1299 8C

PURIFICATION
The Use of Soil as a Purifying System (L'Utilisation du sol Comme Systeme Epurateur),
W75-11126 5D

QUALITY CONTROL
Colorado City Solves Its Sand Pumping Problems,
W75-11261 8C

R FACTOR
Drug Resistant Coliforms Call for Re-Evaluation of Water Quality Standards,
W75-11130 5B

RADIOACTIVE DATING
Determination of Regional Hydraulic Conductivity Through Use of C-14 Dating of Groundwater,
W75-10930 2F

RADIOACTIVE WASTES
A Field Study of Physico-Chemical States of Artificial Radionuclides in Seawater,
W75-11022 5B

RADIOCHEMICAL ANALYSIS
A Field Study of Physico-Chemical States of Artificial Radionuclides in Seawater,
W75-11022 5B

RADIOGRAPHY
Retention of Cadmium in Mice Studied by Whole Body Autoradiography,
W75-11024 5A

RADIOISOTOPES
A Field Study of Physico-Chemical States of Artificial Radionuclides in Seawater,
W75-11022 5B

RAIN GAGES
Aspects of Rainfall Measurement in a New England Location,
W75-11309 2B

RAINBOW TROUT
Effect of DDT and M.S. 222 on Learning a Simple Conditioned Response in Rainbow Trout (Salmo gairdneri),
W75-11025 5C

Acute Toxicity of Petrochemical Drilling Fluids Components and Wastes to Fish,
W75-11265 5C

RAINFALL
The Influence of Rainfall on the Reproduction of Sonoran Desert Lagomorphs,
W75-10871 4A

Some Observations on Rainfall in Western New South Wales,
W75-11304 2B

Aspects of Rainfall Measurement in a New England Location,
W75-11309 2B

RAINFALL INTENSITY
The Influence of Rainfall on the Reproduction of Sonoran Desert Lagomorphs,
W75-10871 4A

Derivation of Surface Water Lag Time for Converging Overland Flow,
W75-11156 2E

RAINFALL-RUNOFF RELATIONSHIPS
Hydrologic Investigation and Design of Urban Stormwater Drainage Systems,
W75-11141 4A

Generation of Arid Zone Rainfall and Runoff,
W75-11303 2A

RANGE GRASSES
Salt and Specific Ion Effects on Germination of Four Grasses,
W75-10894 2K

RANGE MANAGEMENT
The Influence of Rainfall on the Reproduction of Sonoran Desert Lagomorphs,
W75-10871 4A

Seasonal Variations in the Infiltration Rate of a Whitehouse Soil in Southern Arizona,
W75-10873 2G

Salt and Specific Ion Effects on Germination of Four Grasses,
W75-10894 2K

Hydrologic Relations on Undisturbed and Converted Big Sagebrush Lands: The Status of Our Knowledge,
W75-11313 4D

RAPID BLOC PROCESS
Nitrogen Removal in the Operation of the Mililani Sewage Treatment Plant,
W75-11041 5D

RATES OF APPLICATION
Scheduling and Application Rates of Irrigation in a Humid Climate,
W75-11048 3F

Nozzle Hydraulics in the Trickle Irrigation System--Relation Between Water Temperature and Nozzle Flow Rate (In Japanese),
W75-11096 3F

REAERATION
Process Studies and Modeling of Self-Cleaning Capacity of Mountain Creeks for Recreation Planning and Management,
W75-11055 5B

RECARBONIZATION
Liquid CO2 Protects our Water's Quality,
W75-10990 5F

RECESSION CURVES
Predicting Recessions Through Convolution,
W75-10917 2E

Moisture and Energy Conditions in a Draining Soil Mass,
W75-11054 2G

RECREATION
Pathogenic Free-Living Amoebae in Arkansas Recreational Waters,
W75-11053 5A

Man's Impact on a Newly Formed Reservoir,
W75-11233 5C

RECYCLING
Phytophthora Species in Arizona: Its Occurrence in Recycled Irrigation water,
W75-10883 5A

Total Waste Recycle System for Water Purification Plant Using Alum as Primary Coagulant,
W75-11094 5D

REFLECTANCE
The Utilization of Sun-Glint in a Study of Lake Dynamics,
W75-11239 5A

REFRACTIVITY
Measures of Biodegradability and Refractory Organics in Wastewaters: (Analysis, Interpretation, and Application of Measurement Techniques), W75-11103 5D

REGIONAL ADMINISTRATION
The Water Industry in Transition, W75-11252 3E

REGIONAL DEVELOPMENT
International Development Strategies for the Sahel. W75-10861 4A

An Economic Analysis of the Pollution Problems in the Colorado River Basin: The Upper Main Stem Sub-Basin, W75-11247 5G

REGRESSION ANALYSIS
Estimated Mean-Monthly and Annual Runoff at Selected Sites in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico, W75-10943 2E

REGULATION
Criteria for Herbicide Evaluation, W75-11196 5G

REHABILITATION
Guidelines for Revegetation and Stabilization of Surface Mined Areas in the Western States, W75-11100 4D

REMOTE SENSING
The Utilization of Sun-Glint in a Study of Lake Dynamics, W75-11239 5A

REPRODUCTION
Establishing Alkali Sacaton on Harsh Sites in the Southwest, W75-10882 4A

RESEARCH AND DEVELOPMENT
Aquatic Plant Research and Control in Florida, W75-11195 4A

RESERVOIR CONSTRUCTION
Guidelines for the Identification of Potential Environmental Impacts in the Construction and Operation of a Reservoir, W75-11316 5C

RESERVOIR OPERATION
Guidelines for the Identification of Potential Environmental Impacts in the Construction and Operation of a Reservoir, W75-11316 5C

RESERVOIR SITES
Could The Sea be Used to Store Water for Supply.--A Possible Scheme, W75-11129 4A

RESERVOIR-STORAGE
A Practical Way to Find Minimum Drainage Area for a Well, W75-11290 4B

RESERVOIR YIELD
A Practical Way to Find Minimum Drainage Area for a Well, W75-11290 4B

RESERVOIRS
Two-Dimensional, Hydrostatic Simulation of Thermally-Influenced Hydrodynamic Flows, W75-10901 2H

Could The Sea be Used to Store Water for Supply.--A Possible Scheme, W75-11129 4A

Water Level Manipulation: A Tool for Aquatic Weed Control, W75-11216 4A

Algae in Baltimore's Reservoirs, W75-11221 5C

Algae Control in Northwest Reservoirs, W75-11231 5G

Man's Impact on a Newly Formed Reservoir, W75-11233 5C

RESIDENCE TIME
Subsurface Flow from Snowmelt Traced by Tritium, W75-10921 2F

RESISTIVITY
Electrical Tests for Submersible Pumps, W75-11260 8G

Making Log Analysts of Geologists. W75-11288 7C

How Downhole Temperatures, Pressures Affect Drilling; Part 7: The Shale Resistivity Ratio - A Valuable Tool for Making Economic Drilling Decisions, W75-11297 8G

RESONANCE
Effects of Entrance Loss on Harbor Oscillations, W75-11147 8B

RESOURCE ALLOCATION
Non-Renewable, Non-Energy Resources, W75-11253 6B

RESPONSE TIME
Note on the Measurement of the Response of Oceanographic Temperature Sensors, W75-11146 7B

RETENTION
Available Water-Holding Capacities of Soils in Southern Idaho, W75-11140 2G

RETURN FLOW
Occurrence of 2, 4, 5-T and Picloram in Surface Runoff Water in the Blacklands of Texas, W75-10895 5B

Status of Waste Heat Utilization and Dual-Purpose Plant Projects, W75-11251 3E

REVEGETATION
Salt and Specific Ion Effects on Germination of Four Grasses, W75-10894 2K

Guidelines for Revegetation and Stabilization of Surface Mined Areas in the Western States, W75-11100 4D

REVERSE OSMOSIS
Solute-Solute Interactions in Ultrafiltration Treatment of Paper Mill Wastes, W75-11334 5D

REVIEWS
Heavy Metals and Other Trace Elements, W75-10934 5B

Review of Conference on Hydrology of Deep Sedimentary Basins, W75-10935 5B

Water and Wastewater Disinfection with Ozone: A Critical Review, W75-10956 5I

Advances in the Detection of Water Pollutants, W75-10995 5A

Water Treatment by Ozone, (In Japanese), W75-11107 5I

Computer Systems and Water Resources, W75-11174 6

Extraction and Analytical Techniques for Pesticides in Soil, Sediment, and Water, W75-11236 5

The Toxicity of Drilling Fluid Components to Aquatic Biological Systems, A Literatu Review, W75-11266 5

RHIZOCTONIA SOLANI
Utilization of Phytopathogens as Biocontro for Aquatic Weeds, W75-11206

RHODESIA
Water Pollution Problems in Salisbury, Rhod sia: Present and Future, W75-10983

Chemical-Biological Treatment With Biologi Filters, W75-11123

RHODOPHYTA
Influence of Oil on Nucleic Acids of Algae, W75-11080

RICE
Effects of Irrigation in Rain-Fed Fields on Growth and Yield of Upland Rice Varieties, Korean), W75-10853

Effect of Soil-Water Relations on the F Porosity, Transpiration and Ion Uptake in R W75-10916

RIPARIAN PLANTS
Dissipation of Phenoxy Herbicides Applie Riparian Vegetation, W75-11214

RIPPLED BED
Transition in Oscillatory Flow Over Rip Beds, W75-11149

RISKS
The Economics of Flood Insurance: An A sis of the National Flood Insurance Progra W75-11038

RIVER BASIN DEVELOPMENT
International Development Strategies fo Sahel. W75-10861

RODENTS
Retention of Cadmium in Mice Studi Whole Body Autoradiography, W75-11024

ROMANIA (BARSA-ARAD)
Endemic Nephrophathy and Its Relation Contamination of Well Water by Ph Compounds in Barsa-Arad (Nefropati demica Si Relatia Cu Impurificarea Prin pousi Fenolici in Apele Fintinilor Din C Barsa-Arad), W75-11105

OOTS
Effect of Soil-Water Relations on the Root Porosity, Transpiration and Ion Uptake in Rice,
W75-10916 3F

Root:Shoot and Leaf Area Relationships of Macrophyte Communities in Chautauqua Lake, New York,
W75-11009 5C

OTORUA LAKES (NEW ZEALAND)
A Contribution to the Biology of Nitella Hookeri A. BR. in the Rotorua Lakes, New Zealand. II. Organic Nutrients and Physical Factors,
W75-11235 5C

NOFF
Occurrence of 2, 4, 5-T and Picloram in Surface Runoff Water in the Blacklands of Texas,
W75-10895 5B

Approximate Annual Water Budgets of Two Chained Pinyon-Juniper Sites,
W75-10896 4A

NOFF FORECASTING
lood Runoff from Urban Areas,
75-10904 5B

RAL WATER DISTRICT
nproved Design and Operating Criteria for ural Water Districts,
75-11056 6D

TS
mparison of Uredo Eichhorniae, the Water-acinth Rust, and Uromyces Pontederiae,
75-11092 5G

E DRINKING WATER ACT
e Responsibility of U.S. Water Suppliers,
75-10856 5G

cing the Real Cost of Clean Water,
75-10857 5G

e Impact of the Safe Drinking Water Act on ilities,
75-10859 5G

ELIAN ZONE
ernational Development Strategies for the nel.
5-10861 4A

NE WATER-FRESH WATER INTERFACES
proximation for Steady Interface Beneath a ll Pumping Fresh Water Overlying Salt ter,
5-11255 4B

NE WATER-FRESHWATER INTERFACES
nagement of Retardation of Salt Water In-ion in Coastal Aquifers,
-11058 2F

E WATER INTRUSION
agement of Retardation of Salt Water In-ion in Coastal Aquifers,
-11058 2F

roximation for Steady Interface Beneath a Pumping Fresh Water Overlying Salt er,
-11255 4B

ITY
ote on Salinity and Temperature in Some ccan Brackish Waters,
-10997 2L

Adaptation of Copepod Populations to Thermal Stress,
W75-11046 5C

A Reevaluation of the Combined Effects of Temperature and Salinity on Survival and Growth of Bivalve Larvae Using Response Surface Techniques,
W75-11081 5C

SALINITY CONTROL
Legal and Institutional Problems in the Management of Salinity,
W75-11047 5G

SALMON
Effects of Some Components of Crude Oil on Young Coho Salmon,
W75-11088 5C

SALMON CREEK (NY)
Utilization of Stream-Borne Phosphorus by Cayuga Lake Phytoplankton,
W75-11036 5C

SALMONIDS
Effect of DDT and M.S. 222 on Learning a Simple Conditioned Response in Rainbow Trout (Salmo gairdneri),
W75-11025 5C

Effects of Some Components of Crude Oil on Young Coho Salmon,
W75-11088 5C

SALT TOLERANCE
Salt and Specific Ion Effects on Germination of Four Grasses,
W75-10894 2K

SAN JUAN MOUNTAINS (COL)
An Elevational Control of Peak Snowpack Variability,
W75-11155 2C

SAND PUMPING
Colorado City Solves Its Sand Pumping Problems,
W75-11261 8C

SANDS
Cultivation of Netted Melon By Use of Trickle Irrigation in a Sand Field Plastic Greenhouse, (In Japanese),
W75-11095 3F

Studies on the Relationship Between Dry-Matter Production and the Development of a Pine Forest on Coastal Sand Dunes (1), (In Japanese),
W75-11098 4A

Colorado City Solves Its Sand Pumping Problems,
W75-11261 8C

SANTA FE COUNTY (N MEX)
Estimated Availability of Surface and Ground Water in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico,
W75-10938 4A

Estimated Mean-Monthly and Annual Runoff at Selected Sites in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico,
W75-10943 2E

SATURATION
Condensation in Jets, Industrial Plumes and Cooling Tower Plumes,
W75-11166 2B

SCALING
The Kinetics of Crystallization of Scale-Forming Minerals,
W75-11273 8G

SCALING EFFECTS
Predicting Cavitation in Sudden Enlargements,
W75-11151 8B

SEA GRASS
Transplanting Sea Grass in Mississippi Sound,
W75-11207 4A

SEA URCHINS
The Effects of Crude Oils and the Dispersant Corexit 8666 on Sea Urchin Gametes and Embryos,
W75-11090 5C

The Effects of Oil Dispersants on the Cell in Fertilization and Development,
W75-11091 5C

SEA WATER
Physiochemical Treatment of Wastewater-Seawater Mixture by Electrolysis,
W75-10979 5D

Electrolytic Sea Water Process,
W75-11068 3A

SEABIRDS
Oil Pollution and Seabirds in Denmark 1935-1968,
W75-10893 5C

SEALANTS
How to Make Squeeze Cementing Successful,
W75-11286 8F

SEASONAL
Seasonal Variation in Composition, Plant Biomass, and Net Primary Productivity of a Tropical Grassland at Kurukshetra, India,
W75-11006 2I

Impact of Thermal Effluent from Steam-Electric Station on a Marshland Nursery Area during the Hot Season,
W75-11032 5C

Seasonal Abundance of Crustacean Zooplankton and Net Plankton Biomass of Lakes Huron, Erie, and Ontario,
W75-11238 5C

SECONDARY PRODUCTIVITY
The Influence of the Warm Cooling Water from a Fossil Fueled Power Plant on Oceanographic Conditions and Composition of Plankton in Owase Bay I. Water Temperature in Relation to Distribution of Microplankton, (In Japanese),
W75-11030 5C

SEDIMENT CONCENTRATION
Investigation of the Operating Characteristics of the Iowa Sediment Concentration Measuring System,
W75-11163 2J

SEDIMENT DISTRIBUTION
Investigation of the Operating Characteristics of the Iowa Sediment Concentration Measuring System,
W75-11163 2J

SEDIMENT SAMPLER
Investigation of the Operating Characteristics of the Iowa Sediment Concentration Measuring System,
W75-11163 2J

SEDIMENT TRANSPORT
Stochastic Analysis of Particle Movement Over a Dune Bed, W75-10942 2J

Mass-Emplaced Sand-Fingers at Mararoa Construction Site, Southern New Zealand, W75-11161 2J

Size-Sorting During Suspension Transportation--Lognormality and Other Characteristics, W75-11162 2J

SEDIMENT-WATER INTERFACES
Concurrent Nitrification-Denitrification at the Sediment-Water Interface as a Mechanism for Nitrogen Losses from Lakes, W75-10902 5C

SEDIMENTARY STRUCTURES
Mass-Emplaced Sand-Fingers at Mararoa Construction Site, Southern New Zealand, W75-11161 2J

SEDIMENTATION
Matagorda Island, Texas: The Evolution of a Gulf Coast Barrier Complex, W75-11144 2L

Denudation Studies: Can We Assume Stream Steady State, W75-11154 2J

Sediment Processes in Great Lakes, W75-11237 2J

SEDIMENTOLOGY
Review of Conference on Hydrology of Deep Sedimentary Basins, W75-10935 5B

Sediment Processes in Great Lakes, W75-11237 2J

SEDIMENTS
Hydrogeology and Water Resources of Middle Kirkland Creek Basin, Yavapai County, Arizona, W75-10872 4B

Measurement of Cobble Abrasion in Natural Streams, W75-10881 2J

Mass-Emplaced Sand-Fingers at Mararoa Construction Site, Southern New Zealand, W75-11161 2J

Size-Sorting During Suspension Transportation--Lognormality and Other Characteristics, W75-11162 2J

Extraction and Analytical Techniques for Pesticides in Soil, Sediment, and Water, W75-11236 5A

SEED TREATMENT
Establishing Alkali Sacaton on Harsh Sites in the Southwest, W75-10882 4A

SEEDS
The Early Vegetative Growth of Two Annual Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.), W75-10876 3F

The Germination and Establishment of Two Annual Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.), W75-10897 2I

SELF-PURIFICATION
Process Studies and Modeling of Self-Cleaning Capacity of Mountain Creeks for Recreation Planning and Management, W75-11055 5B

SEMIARID CLIMATES
Factors Affecting Erosion in a Semi-Arid Watershed, W75-10884 2J

Revegetating Disturbed Areas in the Semiarid Southwest, W75-10892 4D

SEMINOLE COUNTY (FLA)
Recharge Areas of the Floridan Aquifer in Seminole County and Vicinity, Florida, W75-10944 7C

SENSITIVITY ANALYSIS
Study of Criteria and Models Establishing Optimum Level of Hydrogeologic Information for Groundwater Basin Management, W75-11042 2F

SEPARATION TECHNIQUES
Slurry Deliquoring by Expression, W75-10969 5D

Lamella Sedimentation: A Compact Separation Technique, W75-10989 5D

Oil Separator with Coalescing Media, W75-11071 5G

Extraction and Analytical Techniques for Pesticides in Soil, Sediment, and Water, W75-11236 5A

SEPHOLOSPORIUM ZONATUM
Utilization of Phytopathogens as Biocontrols for Aquatic Weeds, W75-11206 5G

SEPTIC TANKS
Wastewater Treatment Plant, W75-11076 5D

SETTLING BASINS
Lamella Sedimentation: A Compact Separation Technique, W75-10989 5D

SETTLING VELOCITY
In Situ Measurement of the Settling Velocity Profile of Particulate Organic Carbon in Lake Ontario, W75-11227 5C

SEWAGE
Stability of Nitrosamines in Samples of Lake Water, Soil, and Sewage, W75-11019 5B

The Water Quality and Bottom Sediment Characteristics of New Jersey Lagoon Developments, W75-11104 5B

SEWAGE BACTERIA
Drug Resistant Coliforms Call for Re-Evaluation of Water Quality Standards, W75-11130 5B

SEWAGE LAGOONS
Aerobic Lagoon Waste Treatment System and Method, W75-11069 5D

SEWAGE POISONING
A Waterborne Gastroenteritis Epidemic in Pico Rivers, California, W75-11005 5F

SEWAGE TREATMENT
Pilot-Plant Study of Denitrification Using a Submerged Sand Filter at Rye Meads Sewage Works, W75-10955 5D

First Stage of the World's Largest Pure Oxygen Sewage Plant to Undergo Test. W75-10960 5D

Some Studies on Nitrification in the Activated Sludge Process, W75-10961 5D

Wastewater Treatment Using Algae and Artemia, W75-10967 5D

Slurry Deliquoring by Expression, W75-10969 5D

Innovative Process Treats Wastewater, W75-10975 5D

Anaerobic Acidogenesis of Wastewater Sludge W75-10976 5D

$3-Million and Two-and-a-Half Years to Solv Campbell River's Sewage Problems, W75-10977 5D

ICI's Deep Shaft 'Halves Sludge Volume', W75-10981 5D

Water Pollution Problems in Salisbury, Rhodesia: Present and Future, W75-10983 5C

Pump Selection, W75-11002 8

YWA Plan for Cleaner Rivers, W75-11017 5

Nitrogen Removal in the Operation of th Mililani Sewage Treatment Plant, W75-11041 5

Process for Treating Sewage Sludge, W75-11064 5

Aerobic Lagoon Waste Treatment System a Method, W75-11069 5

Wastewater Treatment Plant, W75-11076

Activated Carbon Adsorption Technique Third Stage Sewage Water Treatment, Japanese), W75-11108

On-Site Hypochlorite Generation, W75-11109

A Solution to Pump Stoppages, W75-11111

Investigations on the Long Term Biochem Oxidation of Sewage, W75-11116

Nitrogenous Changes During the Settlemen Sewage, W75-11120

Aeration Devices: The Manufacturer's V point, W75-11121

Simplified Waste Water Purification Through Physical-Chemical Treatment (Vereinfachte Abwasserreinigung durch physikalisch chemische Behandlung),
W75-11122 5D

Water Quality Control in Sewage Water Treatment, (In Japanese),
W75-11133 5D

EWERAGE
A Planning of Catchment Sewerage for Oyodo River (In Japanese),
W75-11113 5D

WERS
Design Considerations--Water and Effluent Disposal,
W75-11128 5D

Design of the Optimal Outfall System for a Stream Receiving Thermal and Organic Waste Discharges,
W75-11137 5B

ALE
How Downhole Temperatures, Pressures Affect Drilling; Part 7: The Shale Resistivity Ratio - A Valuable Tool for Making Economic Drilling Decisions,
W75-11297 8G

ALE RESISTIVITY RATIO
How Downhole Temperatures, Pressures Affect Drilling; Part 7: The Shale Resistivity Ratio - A Valuable Tool for Making Economic Drilling Decisions,
W75-11297 8G

WANGUNK MTS (NY)
Geochemical Reconaissance of Surficial Materials in the Vicinity of Shawangunk Mountain, New York,
W75-10928 5A

EP
Water Consumption and Water Turnover of Sheep Grazing Semiarid Pasture Communities in New South Wales,
W75-10888 3F

OWNERS
Economics of Great Lakes Shipping in an Extended Season,
W75-11248 6C

Economics of Great Lakes Shipping in an Extended Season,
W75-11248 6C

E PROTECTION
Stabilization and Reconstruction of Texas Coastal Foredunes with Vegetation,
W75-10887 2L

Beach Erosion Control Structure,
W75-11075 8A

BS
Shrub Transplanting for Watershed Management and Range Improvement in Iran,
W75-10870 4D

ZEMS
Stoniness of Desert Pavement in Yuma County, Arizona,
W75-10868 2G

Management of Southwestern Desert Soils,
W75-10877 2G

Soils of the Desert Southwest,
W75-10878 2G

SIEVE ANALYSIS
Size-Sorting During Suspension Transportation--Lognormality and Other Characteristics,
W75-11162 2J

SILICA
How Silica Affects Iron Removal from Groundwater,
W75-11016 5F

SIMULATION ANALYSIS
A Three-Dimensional Model for Estuaries and Coastal Seas: Vol. II, Aspects of Computation,
W75-10900 2L

An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W75-11049 4A

Limitations of Using a Simulation Model of the Soil Under Irrigated Cultivation to Simulate the Functioning of the Soil as a Purifying System (Limites D'Utilisation D'Un Modele de Comportement du sol sous Culture Irriguee Pour Simuler le Fonctionnment du sol Comme Systeme Epurateur),
W75-11125 5B

Hydrologic Investigation and Design of Urban Stormwater Drainage Systems,
W75-11141 4A

Simulation of Water Quality Management Policies,
W75-11181 5G

Advanced Techniques in the Mathematical Modeling of Water-Distribution Systems,
W75-11183 4A

SLIDE GATES
Cavitation Control by Aeration of High-Velocity Jets,
W75-11152 8B

SLOPE STABILITY
Application of Electrical Analogy to Draw Flow Nets for Sudden Drawdown Conditions in Earth Dams,
W75-11143 8B

SLUDGE
Dewaters Sludge.
W75-10966 5D

SLUDGE DIGESTION
A Solution to Pump Stoppages,
W75-11111 8C

SLUDGE DISPOSAL
Some Observations on Behavior of the Treated Sewage Disposed in the Sea,
W75-11020 5B

Design Considerations--Water and Effluent Disposal,
W75-11128 5D

Bark as Trickling-Filter Dewatering Medium for Pulp and Paper Mill Sludge,
W75-11241 5D

SLUDGE DRYING
Bark as Trickling-Filter Dewatering Medium for Pulp and Paper Mill Sludge,
W75-11241 5D

SLUDGE TREATMENT
Settlement and Sludge Return in Activated-Sludge Type Package Plants,
W75-10973 5D

Anaerobic Acidogenesis of Wastewater Sludge,
W75-10976 5D

Total Waste Recycle System for Water Purification Plant Using Alum as Primary Coagulant,
W75-11094 5D

The Economy of Various Methods for Dewatering Sludge From Biological Purification (Ueber die Wirtschaftlichkeit verschiedener Verfahren zur Entwaesserung von biologischem Klaerschlamm),
W75-11127 5D

Bark as Trickling-Filter Dewatering Medium for Pulp and Paper Mill Sludge,
W75-11241 5D

Possibilities of Reutilization of Kaolin from Biological Waste Water Sludges (Moeglichkeiten der Wiederverwertung von Kaolin aus biologischen Abwasserchlaemmen),
W75-11349 5D

SLURRIES
How to Make Squeeze Cementing Successful,
W75-11286 8F

SMALL WATERSHEDS
Difficulties in Gauging Small Catchments - A Case Study,
W75-11306 2E

SNAILS
Copper Toxicity in Busycon Canaliculatum L.,
W75-11031 5C

SNAKE RIVER WATERSHED (MINN)
Water Resources of the Snake River Watershed, East-Central Minnesota,
W75-10946 7C

SNAKES
The Use of Snakes as a Pollution Indicator Species,
W75-11089 5B

SNOW MANAGEMENT
Differential Release of Water from Arizona Snowpacks,
W75-10860 2C

Wind-Snow Relations at Marmot Creek, Alberta,
W75-11226 2C

Hydrologic Relations on Undisturbed and Converted Big Sagebrush Lands: The Status of Our Knowledge,
W75-11313 4D

SNOW SURVEYS
An Elevational Control of Peak Snowpack Variability,
W75-11155 2C

SNOW-WIND RELATIONSHIPS
Wind-Snow Relations at Marmot Creek, Alberta,
W75-11226 2C

SNOWFALL
Wind-Snow Relations at Marmot Creek, Alberta,
W75-11226 2C

SNOWMELT
Differential Release of Water from Arizona Snowpacks,
W75-10860 2C

An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W75-11049 4A

SNOWMELT RUNOFF
An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W75-11049 4A

SNOWPACKS
An Elevational Control of Peak Snowpack Variability,
W75-11155 2C

SOCIAL IMPACT
Social Impacts of Water Resources Developments and Their Implication for Urban and Rural Development: A Post Audit Analysis of the Weber Basin Project in Utah,
W75-10854 6B

SOCIAL VALUES
Social Impacts of Water Resources Developments and Their Implication for Urban and Rural Development: A Post Audit Analysis of the Weber Basin Project in Utah,
W75-10854 6B

SODA ASH
Longer Life for Submersibles.
W75-11259 8G

SODIUM ARSENITE
The Geochemical Cycle of Arsenic in Lake Washington and its Relation to Other Elements,
W75-10922 5B

SODIUM COMPOUNDS
On-Site Hypochlorite Generation,
W75-11109 5D

SODIUM NIFURSTYRENATE
Studies on Toxicity of Sodium Nifurstyrenate (NFS-NA) in Cultured Yellowtail (In Japanese),
W75-11034 5C

SOIL
The Use of Soil as a Purifying System (L'Utilisation du sol Comme Systeme Epurateur),
W75-11126 5D

SOIL AMENDMENTS
Use of Amendments to Reduce Water Requirements for Stand Establishment of Small-Seeded Crops,
W75-11045 3F

SOIL ANALYSIS
Barrenness of Desert Pavement in Yuma County, Arizona,
W75-10868 2G

SOIL CHEMICAL PROPERTIES
Management of Southwestern Desert Soils,
W75-10877 2G

SOIL CLASSIFICATION
Soils of the Desert Southwest,
W75-10878 2G

SOIL CRUSTING
Use of Amendments to Reduce Water Requirements for Stand Establishment of Small-Seeded Crops,
W75-11045 3F

SOIL DENSITY
Soil Morphology and Soil Physical Properties. II. Mechanical Impedance and Moisture Retention and Movement,
W75-10885 2G

SOIL ENVIRONMENT
Stability of Nitrosamines in Samples of Lake Water, Soil, and Sewage,
W75-11019 5B

SOIL INVESTIGATIONS
Soils of the Desert Southwest,
W75-10878 2G

SOIL MANAGEMENT
Management of Southwestern Desert Soils,
W75-10877 2G

SOIL MECHANICAL IMPEDANCE
Soil Morphology and Soil Physical Properties: II. Mechanical Impedance and Moisture Retention and Movement,
W75-10885 2G

SOIL MOISTURE
Establishing Alkali Sacaton on Harsh Sites in the Southwest,
W75-10882 4A

Vegetation, Soil, and Climate on the Green Mountains of Vermont,
W75-11021 2I

The Effect of Irrigation on the Yield and Quality of Maincrop Potatoes,
W75-11106 3F

Available Water-Holding Capacities of Soils in Southern Idaho,
W75-11140 2G

SOIL PHYSICAL PROPERTIES
Management of Southwestern Desert Soils,
W75-10877 2G

Soils of the Desert Southwest,
W75-10878 2G

Soil Morphology and Soil Physical Properties: II. Mechanical Impedance and Moisture Retention and Movement,
W75-10885 2G

SOIL STABILIZATION
Revegetating Disturbed Areas in the Semiarid Southwest,
W75-10892 4D

SOIL SURFACES
Soils of the Desert Southwest,
W75-10878 2G

SOIL SURVEYS
Map Showing Depth to Bedrock, Greenfield Quadrangle, Massachusetts,
W75-10952 7C

Map Showing Depth to Bedrock, Chester Quadrangle, Massachusetts,
W75-10953 7C

SOIL TEXTURE
Barrenness of Desert Pavement in Yuma County, Arizona,
W75-10868 2G

SOIL WATER
Effect of Soil-Water Relations on the Root Porosity, Transpiration and Ion Uptake in Rice.
W75-10916 3F

SOIL WATER MOVEMENT
Moisture and Energy Conditions in a Draining Soil Mass.
W75-11054 2G

SOIL-WATER-PLANT RELATIONSHIPS
Phenology of Selected Sonoran Desert Plants at Punta Cirio, Sonora, Mexico.
W75-10862 2I

Management of Southwestern Desert Soils,
W75-10877 2G

The Germination and Establishment of Two Annual Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.),
W75-10897 2I

SOILS
Soils of the Desert Southwest,
W75-10878 2G

Soil Map of the World, 1:5,000,000, Volume IV, South America.
W75-11138 7C

Extraction and Analytical Techniques for Pesticides in Soil, Sediment, and Water,
W75-11236 5A

SOILS SURVEYS
Contour Map of the Bedrock Surface, New Britain Quadrangle, Connecticut,
W75-10950 7C

Map Showing Depth to Bedrock, Worthington Quadrangle, Massachusetts,
W75-10951 7C

Map Showing Depth to Bedrock, Mount Carmel Quandrangle, Connecticut,
W75-10954 7

SOLAR RADIATION
The Nature and Components of the Hydrological Cycle,
W75-10864 2

SOLID WASTES
Illinois Landfill Law May Effect Neart States.
W75-11011

SORGHUM
Effects of Antitranspirants on Yield of Gra Sorghum Under Limited Irrigation,
W75-10858

SOUTH AFRICA
Aeration Devices: The Manufacturer's Vie point,
W75-11121

South African Eutrophication Problems: A P spective,
W75-11131

SOUTH AMERICA
Soil Map of the World, 1:5,000,000, Volu IV, South America.
W75-11138

SOUTH CAROLINA
Biological Control of Alligator Weed, 1 1972,
W75-11202

OUTH DAKOTA
Watershed Management in the Black Hills: The Status of Our Knowledge,
W75-11318 4D

OUTHEAST US
Denudation Studies: Can We Assume Stream Steady State,
W75-11154 2J

OUTHWEST
Products from Jojoba: A Promising New Crop for Arid Lands.
W75-10890 3F

OUTHWEST U.S.
Revegetating Disturbed Areas in the Semiarid Southwest,
W75-10892 4D

Use of Amendments to Reduce Water Requirements for Stand Establishment of Small-Seeded Crops,
W75-11045 3F

UTHWEST US
Soils of the Desert Southwest,
W75-10878 2G

ATIAL DISTRIBUTION
Biochrome Analysis as a Method for Assessing Phytoplankton Dynamics, Phase II,
W75-11052 5C

low Downhole Temperatures, Pressures Affect Drilling; Part 5: Predicting Hydrocarbon Environments with Wireline Data,
W75-11295 8G

ow Downhole Temperatures, Pressures Affct Drilling; Part 6: Correlating Geopressure radients with Hydrocarbon Accumulations,
75-11296 8G

WNING
fects of Ozone-Treated Seawater on the awned, Fertilized, Meiotic, and Cleaving gs of the Commercial American Oyster,
75-11256 5C

IES DIVERSITY
ecies Diversity of Benthic Macroin-Verrates and Limnological Conditions in a 1st der Mountain Stream,
5-10918 2I

IFIC CONDUCTIVITY
ecific Conductance Method for in Situ Estiion of Total Dissolved Solids,
5-11167 5A

IFICATIONS
teria for Herbicide Evaluation,
5-11196 5G

ES
tophthora Species in Arizona: Its Occure in Recycled Irrigation water,
-10883 5A

T FISHING
e Limnological Characteristics of Arivaca e in Southern Arizona,
-10891 2H

KLER IRRIGATION
nkler Irrigation Practice, (La Pratique De igation Par Aspersion),
-10875 3F

Practical Application of Surface Fixed-System for Multi-Purpose Sprinkler Irrigation Uses, (In Japanese),
W75-11097 3F

SQUEEZE CEMENTING
How to Make Squeeze Cementing Successful,
W75-11286 8F

STAGE-DISCHARGE RELATIONS
Automated Distribution of Gauge and Shift Corrections,
W75-10911 7C

STARCH
Solute-Solute Interactions in Ultrafiltration Treatment of Paper Mill Wastes,
W75-11334 5D

STATISTICAL METHODS
Time-Variant Characteristics of Selected Wastewater Treatment Plants of Nevada,
W75-11245 5D

Detection of Change in Sequences of Hydrologic Data,
W75-11302 7C

STATISTICAL MODELS
Multilag Markov Models for Eastern Australian Streams,
W75-11301 2E

STATISTICAL STUDIES
Covariance Analysis of Reservoir Development Effects on Property Tax Base,
W75-10851 6B

STATUTES
Information as a Regulatory Tool in Water Quality Control,
W75-10903 5G

STEAM
How Steam is Produced and Handled at the Geyers,
W75-11280 4B

STEAM-ELECTRIC PLANTS
Impact of Thermal Effluent from Steam-Electric Station on a Marshland Nursery Area during the Hot Season,
W75-11032 5C

STEELON-NET VEILS
Use of Steelon-Net Veils for Protection of the Hydro-Engineering Works Against Dreissena Polymorphia Pall,
W75-11033 5G

STOCHASTIC PROCESSES
Stochastic Analysis of Particle Movement Over a Dune Bed,
W75-10942 2J

STORAGE
Flood Runoff from Urban Areas,
W75-10904 5B

Some Observations Concerning Preparation and Storage of Stream Samples for Dissolved Inorganic Phosphate Analysis,
W75-11336 5A

STORM DRAINS
The Design of Storm Water Drainage Channels Using Mathematical Model Techniques,
W75-11150 8B

STORM RUNOFF
YWA Plan for Cleaner Rivers,
W75-11017 5D

The Design of Storm Water Drainage Channels Using Mathematical Model Techniques,
W75-11150 8B

STORM WATER
Flood Runoff from Urban Areas,
W75-10904 5B

STORMS
Analysis of Colorado Precipitation,
W75-11040 2B

STRATIFICATION
Hydraulic Modeling of Mixing Phenomena in Stratified Lakes,
W75-11043 2H

STRATIFIED FLOW
Hydraulic Modeling of Mixing Phenomena in Stratified Lakes,
W75-11043 2H

Some Results on Mass Transfer Processes in a Density-Stratified Flow,
W75-11057 8B

STREAM EROSION
Measurement of Cobble Abrasion in Natural Streams,
W75-10881 2J

Factors Affecting Erosion in a Semi-Arid Watershed,
W75-10884 2J

STREAM GAGES
Difficulties in Gauging Small Catchments - A Case Study,
W75-11306 2E

STREAMFLOW
Automated Hourly Computations,
W75-10915 7C

Predicting Recessions Through Convolution,
W75-10917 2E

Streamflow in the New York Part of the Susquehanna River Basin,
W75-10931 2E

Estimated Availability of Surface and Ground Water in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico,
W75-10938 4A

Low-Flow Characteristics of Selected Streams in Northeastern Washington,
W75-10939 2E

Estimated Mean-Monthly and Annual Runoff at Selected Sites in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico,
W75-10943 2E

Multilag Markov Models for Eastern Australian Streams,
W75-11301 2E

Australian Arid Zone Streangauging,
W75-11307 2E

Variability, Persistence and Yield of Australian Streams,
W75-11308 2E

STREAMFLOW FORECASTING
Droughts, Distributions and Dependence: An Analysis of Some Synthetic Data Generation Methods,
W75-11305 2E

STREAMS
Temperatures of Kansas Streams,
W75-10933 2E

Utilization of Stream-Borne Phosphorus by Cayuga Lake Phytoplankton,
W75-11036 5C

Denudation Studies: Can We Assume Stream Steady State,
W75-11154 2J

A Study of Factors Controlling the Chemical Quality of Water in Cartwright Creek Basin, Williamson County, Tennessee,
W75-11164 2K

Concentration and Genera of Algae in Selected Illinois Streams, 1971-1973,
W75-11165 5A

STREPTOMYCES-SCABIES
The Effect of Irrigation on the Yield and Quality of Maincrop Potatoes,
W75-11106 3F

STRIP MINE LAKES
Acid Strip Mine Lake Recovery,
W75-11224 5C

SUBMERGED PLANTS
Chemical Control of Egeria Densa,
W75-11199 5G

Transplanting Sea Grass in Mississippi Sound,
W75-11207 4A

SUBMERSIBLE PUMP
Electrical Tests for Submersible Pumps,
W75-11260 8G

Will Submersibles Make Jet Pumps Obsolete.
W75-11263 8C

SUBMERSIBLES
Installing Submersibles.
W75-11264 8C

SUBSURFACE MAPPING
Computer Algorithms Useful for Determining a Subsurface Electrical Profile Via High Frequency Probing,
W75-10910 8G

SUBSURFACE RUNOFF
Subsurface Flow from Snowmelt Traced by Tritium,
W75-10921 2F

Moisture and Energy Conditions in a Draining Soil Mass,
W75-11054 2G

SUDAN
Land and Water Resources Survey in the Jebel Marra Area, The Sudan.
W75-11139 4A

SUDDEN DRAWDOWN
Application of Electrical Analogy to Draw Flow Nets for Sudden Drawdown Conditions in Earth Dams,
W75-11143 8B

SULFATES
Interference of Sulfate Ion on SPADNS (Sodium 2-(Sulfophenylazo)-1,8-Dihydroxynaphthalene-3,6-Disulfonate) Colorimetric Determination of Fluorine in Waste Waters,
W75-11343 5A

SULFITE LIQUORS
Treating Effluents from a Sulphite Pulp Mill by Flotation,
W75-11347 5D

SULFURIC ACID
Use of Amendments to Reduce Water Requirements for Stand Establishment of Small-Seeded Crops,
W75-11045 3F

SUMMER
Impact of Thermal Effluent from Steam-Electric Station on a Marshland Nursery Area during the Hot Season,
W75-11032 5C

SUN-GLINT
The Utilization of Sun-Glint in a Study of Lake Dynamics,
W75-11239 5A

SUPERSATURATION
Dissolved Gas Supersaturation and Dilution in Thermal Plumes from Steam Electric Generating Stations,
W75-11159 5B

SUPPLEMENTAL IRRIGATION
Scheduling and Application Rates of Irrigation in a Humid Climate,
W75-11048 3F

SURFACE TENSION
Surface Tension Reductions and Urban Wastes in The New York Bight,
W75-10927 5B

SURFACE WATERS
Concentration and Genera of Algae in Selected Illinois Streams, 1971-1973,
W75-11165 5A

SURFACTANTS
Surface Tension Reductions and Urban Wastes in The New York Bight,
W75-10927 5B

Tensids (Syndets) and the Water Pollution Problem, (Gesund-Heitliche Aspekte Des Tensid-Gebrauchs),
W75-11134 5D

SURVEYS
Geochemical Reconaissance of Surficial Materials in the Vicinity of Shawangunk Mountain, New York,
W75-10928 5A

Land and Water Resources Survey in the Jebel Marra Area, The Sudan.
W75-11139 4A

SUSPENDED SOLIDS
Device for Automatic Determination of Suspended Solids Content in Water,
W75-11063 5A

Investigation of the Operating Characteristics of the Iowa Sediment Concentration Measuring System,
W75-11163 2J

SUSQUEHANNA RIVER BASIN (NY)
Streamflow in the New York Part of the Susquehanna River Basin,
W75-10931 2E

SWAMPS
Seasonal Abundance and Diversity of Benthos in a Southern Illinois, USA Swamp,
W75-11312 2H

SWEDEN
Underground Wastewater Treatment Plants
W75-10974 5D

Water Conservation in Sweden III Current Trends,
W75-10987 5G

SYCAMORE CREEK (ARIZONA)
Factors Affecting Erosion in a Semi-Arid Watershed,
W75-10884 2J

SYNTHETIC HYDROLOGY
Generation of Arid Zone Rainfall and Runoff,
W75-11303 2A

Droughts, Distributions and Dependence: An Analysis of Some Synthetic Data Generation Methods,
W75-11305 2E

SYSTEMATICS
The Role of Planktonic Protozoa in the Marin Food Chain Seasonal Changes, Relativ Abundance, and Cell Size Distribution of Tin tinnida,
W75-11191 5C

SYSTEMS OPERATIONAL ANALYSIS MODEL
Distribution-System Operation Analysis Mode
W75-11180 5

TAIWAN (TAIPEI BASIN)
Ground Water Depletion and Subsidenc Problems in Taipei Basin,
W75-11262 4

TAMARISK
An Appraisal of Potential Water Salvage in t Lake McMillen Delta Area, Eddy County, Ne Mexico,
W75-10941

TAX RATES
Covariance Analysis of Reservoir Developme Effects on Property Tax Base,
W75-10851

TECHNOLOGY
Computer Systems and Water Resources,
W75-11174

TEMPERATURE
Temperature Effects on Microbial Growth CSTR's,
W75-10968

Relations Between Algal Populations and pH of Their Media,
W75-11028

Water Resource Observatory Climatolog Data, Water Year 1973.
W75-11035

A Reevaluation of the Combined Effects Temperature and Salinity on Survival Growth of Bivalve Larvae Using Respo Surface Techniques,
W75-11081

A Comparison of Effects of Elevated Temp ture Versus Temperature Fluctuations on Corals at Kahe Point, Oahu,
W75-11084

Note on the Measurement of the Respons Oceanographic Temperature Sensors,
W75-11146

How Downhole Temperatures, Pressures Affect Drilling; Part 4: Pitfalls in Overpressure Prediction,
W75-11294 8G

How Downhole Temperatures, Pressures Affect Drilling; Part 5: Predicting Hydrocarbon Environments with Wireline Data,
W75-11295 8G

How Downhole Temperatures, Pressures Affect Drilling; Part 6: Correlating Geopressure Gradients with Hydrocarbon Accumulations,
W75-11296 8G

EMPERATURE TOLERANCE
Adaptation of Copepod Populations to Thermal Stress,
W75-11046 5C

EMPORAL DISTRIBUTION
Biochrome Analysis as a Method for Assessing Phytoplankton Dynamics, Phase II,
W75-11052 5C

Time-Variant Characteristics of Selected Wastewater Treatment Plants of Nevada,
W75-11245 5D

ENNESSEE
A Study of Factors Controlling the Chemical Quality of Water in Cartwright Creek Basin, Williamson County, Tennessee,
W75-11164 2K

NNESSEE VALLEY AUTHORITY
Dissipation of Residues of Phenoxy Herbicides Applied for Water Milfoil Control in Large Reservoirs,
W75-11198 5B

RTIARY TREATMENT
Advanced Wastewater Treatment (In apanese),
V75-11114 5D

STING
imple Field Checks Will Provide Accurate ST Data,
/75-11281 8G

asing-Seat Testing - Why and How,
'75-11291 8F

TING PROCEDURES
ectrical Tests for Submersible Pumps,
75-11260 8G

ow to Conduct Corrosion Tests,
75-11292 8G

termination of Chemical Oxygen Demand, OD(Cr), in Waste Waters of Pulp and Paper lls (Bestimmung des chemischen Sauerstoff-darfes, CSB(Cr), in Restabwaessern von llstoff und Papierfabriken).
75-11337 5A

AS
tagorda Island, Texas: The Evolution of a lf Coast Barrier Complex,
5-11144 2L

uatic Plant Control on Lake Corpus Christi,
5-11194 5G

grated Controls on Noxious Aquatic Plants,
5-11204 5G

y to Seal Tubing Collar Leaks.
-11287 8C

TEXTILE INDUSTRY WASTES
Upgrading Textile Operations to Reduce Pollution. (Part 1). In-Plant Control of Pollution.
W75-11326 5D

Upgrading Textile Operations to Reduce Pollution. (Part 2). Wastewater Treatment Systems.
W75-11327 5D

TEXTILES
Upgrading Textile Operations to Reduce Pollution. (Part 1). In-Plant Control of Pollution.
W75-11326 5D

Upgrading Textile Operations to Reduce Pollution. (Part 2). Wastewater Treatment Systems.
W75-11327 5D

THERMAL POLLUTION
Two-Dimensional, Hydrostatic Simulation of Thermally-Influenced Hydrodynamic Flows,
W75-10901 2H

Thermal Response of Heated Streams, Solution by the Implicit Method,
W75-10909 5B

The Influence of the Warm Cooling Water from a Fossil Fueled Power Plant on Oceanographic Conditions and Composition of Plankton in Owase Bay I. Water Temperature in Relation to Distribution of Microplankton, (In Japanese),
W75-11030 5C

Impact of Thermal Effluent from Steam-Electric Station on a Marshland Nursery Area during the Hot Season,
W75-11032 5C

Adaptation of Copepod Populations to Thermal Stress,
W75-11046 5C

A Comparison of Effects of Elevated Temperature Versus Temperature Fluctuations on Reef Corals at Kahe Point, Oahu,
W75-11084 5C

Dissolved Gas Supersaturation and Dilution in Thermal Plumes from Steam Electric Generating Stations,
W75-11159 5B

Investigation of the Influence of Thermal Discharge from a Large Electric Power Station on the Temperature and Near-Shore Circulation of Lake Michigan,
W75-11190 5C

The Growth of Some Epiphytic Algae in a Lake Receiving Thermal Effluent,
W75-11225 5C

THERMAL POWERPLANTS
The Influence of the Warm Cooling Water from a Fossil Fueled Power Plant on Oceanographic Conditions and Composition of Plankton in Owase Bay I. Water Temperature in Relation to Distribution of Microplankton, (In Japanese),
W75-11030 5C

Impact of Thermal Effluent from Steam-Electric Station on a Marshland Nursery Area during the Hot Season,
W75-11032 5C

How Steam is Produced and Handled at the Geyers,
W75-11280 4B

THERMAL PROPERTIES
Note on the Measurement of the Response of Oceanographic Temperature Sensors,
W75-11146 7B

THERMAL STRATIFICATION
Two-Dimensional, Hydrostatic Simulation of Thermally-Influenced Hydrodynamic Flows,
W75-10901 2H

THERMAL STRESS
Adaptation of Copepod Populations to Thermal Stress,
W75-11046 5C

THERMOMETERS
Note on the Measurement of the Response of Oceanographic Temperature Sensors,
W75-11146 7B

THIXOTROPIC CEMENT
Cementing Today's Problem Wells.
W75-11293 8F

THREE-DIMENSIONAL FLOW MODEL
A Three-Dimensional Model for Estuaries and Coastal Seas: Vol. II, Aspects of Computation,
W75-10900 2L

THRUST FAULT (GEOLOGY)
Theory of Plasticity of Porous Media with Fluid Flow,
W75-11276 8E

TIDES
Automated Tidal Computations,
W75-10912 7C

TILAPIA-NILOTICA
Quantitative Estimation of the Daily Ingestion of Phytoplankton by Tilapia Nilotica and Haplochromis Nigripinnis in Lake George, Uganda,
W75-11268 2H

TIME LAG
Derivation of Surface Water Lag Time for Converging Overland Flow,
W75-11156 2E

TIME SERIES ANALYSIS
Turbulent Structure Near Smooth Boundary,
W75-11148 8B

Detection of Change in Sequences of Hydrologic Data,
W75-11302 7C

TINTINNIDA
The Role of Planktonic Protozoa in the Marine Food Chain. Seasonal Changes, Relative Abundance, and Cell Size Distribution of Tintinnida,
W75-11191 5C

TISSUE ANALYSIS
Mercury Contents in Biologically Preserved Specimens of Menuke (Sebastes Baramenuke and S. Flammeus),
W75-11078 5A

Uptake of Cadmium, Zinc, Copper, Lead and Chromium in the Pacific Oyster, Crassostrea Gigas, Grown in the Tamar River, Tasmania,
W75-11086 5B

Studies on the Inorganic Components of Marine Animals-III, on the Contents of Cadmium, Zinc, Copper, Lead and Iron in Muscle and Viscera of Marine Animals Captured in the West Sea Area of Kyushu, (In Japanese),
W75-11087 5C

**TOTAL ORGANIC CARBON**
Effluent Characteristics and Treatment of Mechanical Pulping Effluents,
W75-11331 5D

**TOXAPHENE**
Toxaphene Effects on Growth and Bone Composition of Fathead Minnows, Pimephales Promelas,
W75-11026 5C

**TOXICITY**
Effect of DDT and M.S. 222 on Learning a Simple Conditioned Response in Rainbow Trout (Salmo gairdneri),
W75-11025 5C

Toxaphene Effects on Growth and Bone Composition of Fathead Minnows, Pimephales Promelas,
W75-11026 5C

Factors Influencing Acute Toxicity Estimates of Hydrogen Sulfide to Freshwater Invertebrates,
W75-11027 5C

Copper Toxicity in Busycon Canaliculatum L.,
W75-11031 5C

Studies on Toxicity of Sodium Nifurstyrenate (NFS-NA) in Cultured Yellowtail (In Japanese),
W75-11034 5C

Continuous Automatic Monitoring of Surface Water with Fish,
W75-11079 5A

Standard Curves for Nuvacron, Malathion, Sevin, DDT, and Kelthane Tested Against the Mosquito Culex Pipiens L. and the Microcrustacean Daphnia Magna Straus,
W75-11082 5B

Effects of Some Components of Crude Oil on Young Coho Salmon,
W75-11088 5C

The Effects of Crude Oils and the Dispersant Corexit 8666 on Sea Urchin Gametes and Embryos,
W75-11090 5C

Some Effects of Copper on the Polychaete Phyllodoce Maculata,
W75-11136 5C

Interactions of Heavy Metals in the Activated Sludge Process,
W75-11173 5D

Registration of Herbicides for Aquatic Use,
W75-11197 5G

Herbicide Chemicals and Their Effect on the Aquatic Environment,
W75-11211 5C

Acute Toxicity of Petrochemical Drilling Fluids Components and Wastes to Fish,
W75-11265 5C

The Toxicity of Drilling Fluid Components to Aquatic Biological Systems, A Literature Review,
W75-11266 5C

Effluent Characteristics and Treatment of Mechanical Pulping Effluents,
W75-11331 5D

**TRACE ELEMENTS**
Heavy Metals and Other Trace Elements,
W75-10934 5B

Behavior of Mn, Fe, Cu, Zn, Cd and Pb Discharged from a Wastewater Treatment Plant into an Estuarine Environment,
W75-11160 5B

**TRACERS**
Subsurface Flow from Snowmelt Traced by Tritium,
W75-10921 2F

**TRACES**
Copper Toxicity in Busycon Canaliculatum L.,
W75-11031 5C

**TRANSITION FLOW**
Transition in Oscillatory Flow Over Rippled Beds,
W75-11149 8B

**TRANSITION ZONES OF PRESSURE**
How to Find Transition Zones in Soft Formations,
W75-11285 8G

**TRANSPIRATION**
Effect of Soil-Water Relations on the Root Porosity, Transpiration and Ion Uptake in Rice,
W75-10916 3F

**TRANSPLANTATION**
Transplanting Sea Grass in Mississippi Sound,
W75-11207 4A

**TRANSPORTATION**
Operations Platforms,
W75-11210 4A

Economics of Great Lakes Shipping in an Extended Season,
W75-11248 6C

**TREATMENT FACILITIES**
Ozone Treatment Licks Color Problem.
W75-10959 5D

Settlement and Sludge Return in Activated-Sludge Type Package Plants,
W75-10973 5D

Underground Wastewater Treatment Plants,
W75-10974 5D

$3-Million and Two-and-a-Half Years to Solve Campbell River's Sewage Problems,
W75-10977 5D

Membrane Desalting Gets Big Push,
W75-10982 3A

Industry and Community in Cooperation,
W75-10985 5D

Virus Removal and Inactivation During Water Treatment,
W75-10991 5D

Activated Carbon in the Water Treatment Plant,
W75-10992 5D

High Costs Modify Sewage Plant Expansion.
W75-10993 5D

How to Estimate and Escalate Costs of Wastewater Equipment,
W75-11014 5D

Wastewater Treatment Plant,
W75-11076 5D

Huntingdon Research Centre Pasveer Oxidation Plant--Six Years On,
W75-11115 5D

Can a Computer Really Operate a Water-Filtration Plant,
W75-11184 5E

Time-Variant Characteristics of Selected Wastewater Treatment Plants of Nevada,
W75-11245 5D

Waste Water Survey, St. Regis Paper Company, Cantonment, Florida.
W75-11314 5D

Considerations for Preparation of Operation and Maintenance Manuals,
W75-11317 5

Pollution Abatement in a Brewing Facility.
W75-11323 5

Upgrading Poultry-Processing Facilities Reduce Pollution. (Part 3). Waste Treatment.
W75-11330 5

Workshop on Computer-Aided Design and Simulation of Waste Treatment Systems.
W75-11338 5

**TREES**
Studies on the Relationship Between Dry Matter Production and the Development of Pine Forest on Coastal Sand Dunes (1), (In Japanese),
W75-11098

**TRICKLE IRRIGATION**
Cultivation of Netted Melon By Use of Trickle Irrigation in a Sand Field Plastic Greenhouse (In Japanese),
W75-11095

Nozzle Hydraulics in the Trickle Irrigation System--Relation Between Water Temperature and Nozzle Flow Rate (In Japanese),
W75-11096

**TRICKLING FILTERS**
Bark as Trickling-Filter Dewatering Medium for Pulp and Paper Mill Sludge,
W75-11241

**TRITIUM**
Subsurface Flow from Snowmelt Traced by Tritium,
W75-10921

**TROPICAL GRASSLANDS**
Seasonal Variation in Composition, Biomass, and Net Primary Productivity of a Tropical Grassland at Kurukshetra, India,
W75-11006

**TUBES**
Special Annulus Fluid Eases Casing Recovery
W75-11282

**TUBING COLLAR**
How to Seal Tubing Collar Leaks.
W75-11287

**TUNDRA**
How BP Alaska Cements Through Permafrost
W75-11278

**TURBIDITY**
Optimum Values for Operational Variables in Turbidity Removal,
W75-11110

RBIDITY REMOVAL
ptimum Values for Operational Variables in urbidity Removal,
75-11110 5D

RBULENCE
urbulent Structure Near Smooth Boundary,
75-11148 8B

RBULENT BOUNDARY LAYERS
ffect of Pressure Gradient on Wind-Waves in Laboratory Channel,
75-11093 8B

BULENT FLOW
me Results on Mass Transfer Processes in a nsity-Stratified Flow,
75-11057 8B

ansition in Oscillatory Flow Over Rippled ds,
5-11149 8B

BULENT STRUCTURE
rbulent Structure Near Smooth Boundary,
5-11148 8B

GOR
Role of Endogenous Abscisic Acid in the ponse of Plants to Stress,
5-11319 3F

DA (LAKE GEORGE)
ntitative Estimation of the Daily Ingestion Phytoplankton by Tilapia Nilotica and lochromis Nigripinnis in Lake George, nda,
-11268 2H

RGROUND TREATMENT PLANTS
erground Wastewater Treatment Plants,
-10974 5D

RSEAS WATER STORAGE
d The Sea be Used to Store Water for ly.--A Possible Scheme,
-11129 4A

X FISH
ex Studies on the White Amur,
11205 5C

D STATES
y Metals and Other Trace Elements,
10934 5B

water Ecosystem Research in Water ty Management,
11012 6G

Pollution from Nonpoint Sources,
1158 5B

ADY FLOW
it Numerical Modeling of Unsteady
0925 8B

M
m Mineralization by Ground Water in entary Rocks, Japan.
1145 2F

DRAINAGE
logic Investigation and Design of Urban vater Drainage Systems,
141 4A

sign of Storm Water Drainage Channels Mathematical Model Techniques,
150 8B

URBAN HYDROLOGY
Flood Runoff from Urban Areas,
W75-10904 5B

Hydrologic Investigation and Design of Urban Stormwater Drainage Systems,
W75-11141 4A

The Design of Storm Water Drainage Channels Using Mathematical Model Techniques,
W75-11150 8B

URBAN LANDSCAPES
Water Application Practices and Landscape Attributes Associated with Residential Water Consumption,
W75-11059 3D

URBAN SOCIOLOGY
Social Impacts of Water Resources Developments and Their Implication for Urban and Rural Development: A Post Audit Analysis of the Weber Basin Project in Utah,
W75-10854 6B

URBAN WASTES
Surface Tension Reductions and Urban Wastes in The New York Bight,
W75-10927 5B

URBAN WATER SYSTEMS
An Implicit Approach to Pricing Agricultural Water Transfers to Urban Uses,
W75-11178 4A

URBAN WATER USE
An Implicit Approach to Pricing Agricultural Water Transfers to Urban Uses,
W75-11178 4A

URBANIZATION
Balancing the Effects of Man's Actions on the Hydrological Cycle,
W75-10865 2A

URINE
Vacuum Distillation/Vapor Filtration Water Recovery,
W75-11315 5D

USSR
Translations on Environmental Quality, No. 33.
W75-11246 5G

UTAH
Social Impacts of Water Resources Developments and Their Implication for Urban and Rural Development: A Post Audit Analysis of the Weber Basin Project in Utah,
W75-10854 6B

Approximate Annual Water Budgets of Two Chained Pinyon-Juniper Sites,
W75-10896 4A

Process Studies and Modeling of Self-Cleaning Capacity of Mountain Creeks for Recreation Planning and Management,
W75-11055 5B

UTILITIES
The Impact of the Safe Drinking Water Act on Utilities,
W75-10859 5G

VACUUM SYSTEMS
Vacuum Distillation/Vapor Filtration Water Recovery,
W75-11315 5D

VARIABILITY
An Elevational Control of Peak Snowpack Variability,
W75-11155 2C

Variability, Persistence and Yield of Australian Streams,
W75-11308 2E

VARIETIES
The Aquatic Weed Problem. 1. Identification,
W75-11220 2I

VEGETATION
Vegetation, Soil, and Climate on the Green Mountains of Vermont,
W75-11021 2I

Dissipation of Residues of Phenoxy Herbicides Applied to the Watershed,
W75-11213 5B

VEGETATION EFFECTS
Effects of Pinyon-Juniper Removal on Natural Resource Products and Uses in Arizona,
W75-10886 3B

Stabilization and Reconstruction of Texas Coastal Foredunes with Vegetation,
W75-10887 2L

Approximate Annual Water Budgets of Two Chained Pinyon-Juniper Sites,
W75-10896 4A

Environmental Impact Evaluation in Freshwater Impoundments by Vegetation Analysis of the Terrestrial Ecosystem,
W75-10905 2I

VEGETATION ESTABLISHMENT
Establishing Alkali Sacaton on Harsh Sites in the Southwest,
W75-10882 4A

Stabilization and Reconstruction of Texas Coastal Foredunes with Vegetation,
W75-10887 2L

Revegetating Disturbed Areas in the Semiarid Southwest,
W75-10892 4D

VERDIGRIS RIVER BASIN (OKLA)
A Mathematical Model for Optimal Waste Load Allocations,
W75-11102 5G

VERMONT
Vegetation, Soil, and Climate on the Green Mountains of Vermont,
W75-11021 2I

VIRAL REMOVAL
Virus Removal and Inactivation During Water Treatment,
W75-10991 5D

VIRGINIA
Aquatic Plant Control Using Herbicides in a Large Potable Water Supply,
W75-11201 5G

VIRUSES
Virus Removal and Inactivation During Water Treatment,
W75-10991 5D

VISCOSITY
Theory of Plasticity of Porous Media with Fluid Flow,
W75-11276 8E

VOLUMETRIC ANALYSIS
Chelation Study of Copper (II): Fulvic Acid System,
W75-11219 5B

Modification of the Iodimetric Titration Method for the Determination of Bromide and Its Application to Mixed Domestic-Industrial Waste Effluents,
W75-11341 5A

WALES
The Water Industry in Transition,
W75-11252 3E

WALKER'S DAM IMPOUNDMENT (VA)
Aquatic Plant Control Using Herbicides in a Large Potable Water Supply,
W75-11201 5G

WARM AIR
The Role of Endogenous Abscisic Acid in the Response of Plants to Stress,
W75-11319 3F

WARM-WATER FISH
Limnology of Desert Ponds,
W75-10880 2H

WASHINGTON
The Geochemical Cycle of Arsenic in Lake Washington and its Relation to Other Elements,
W75-10922 5B

Use of Productivity of Periphyton to Estimate Water Quality,
W75-10936 5B

Low-Flow Characteristics of Selected Streams in Northeastern Washington,
W75-10939 2E

Ammonia Excretion by Zooplankton and its Significance to Primary Productivity During Summer,
W75-11187 5C

WASTE DISPOSAL
Water Conservation in Sweden: III. Current Trends,
W75-10987 5G

Illinois Landfill Law May Effect Nearby States.
W75-11011 5B

Mobile Unit for Treating Liquid Waste,
W75-11073 5D

The Water Quality and Bottom Sediment Characteristics of New Jersey Lagoon Developments,
W75-11104 5B

WASTE HEAT
Status of Waste Heat Utilization and Dual-Purpose Plant Projects,
W75-11251 3E

WASTE LOAD ALLOCATIONS
A Mathematical Model for Optimal Waste Load Allocations,
W75-11102 5G

WASTE RECYCLING
Total Waste Recycle System for Water Purification Plant Using Alum as Primary Coagulant,
W75-11094 5D

WASTE TREATMENT
Oxidation of Organic Compounds in Water (Oxidation organischer Verbindungen in Wasser).
W75-11118 5D

The Use of Soil as a Purifying System (L'Utilisation du sol Comme Systeme Epurateur),
W75-11126 5D

Evaluation of the Adsorptive Properties of Fly Ash with Reference to a Pulp and Paper Mill Waste Effluent,
W75-11335 5D

Possibilities of Reutilization of Kaolin from Biological Waste Water Sludges (Moeglichkeiten der Wiederverwertung von Kaolin aus biologischen Abwasserchlaemmen),
W75-11349 5D

WASTE WATER DISPOSAL
Use of Productivity of Periphyton to Estimate Water Quality,
W75-10936 5B

WASTE WATER (POLLUTION)
Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 1). In-Process Pollution Abatement.
W75-11328 5D

Modification of the Iodimetric Titration Method for the Determination of Bromide and Its Application to Mixed Domestic-Industrial Waste Effluents,
W75-11341 5A

Interference of Sulfate Ion on SPADNS (Sodium 2-(Sulfophenylazo)-1,8-Dihydroxynaphthalene-3,6-Disulfonate) Colorimetric Determination of Fluorine in Waste Waters,
W75-11343 5A

WASTE WATER TREATMENT
Pilot-Plant Study of Denitrification Using a Submerged Sand Filter at Rye Meads Sewage Works,
W75-10955 5D

Water and Wastewater Disinfection with Ozone: A Critical Review,
W75-10956 5D

Population Dynamics of Protozoa in Wastewater,
W75-10957 5D

The Mechanism of Flocculation Processes in the Presence of Humic Stubtances,
W75-10958 5D

Ozone Treatment Licks Color Problem.
W75-10959 5D

First Stage of the World's Largest Pure Oxygen Sewage Plant to Undergo Test.
W75-10960 5D

Some Studies on Nitrification in the Activated Sludge Process,
W75-10961 5D

Preserving Activated Sludge,
W75-10962 5D

Disinfecting Wastewater with Chlorination/Dechlorination Part 1,
W75-10963 5D

Nitrogen Removal by Catalyst-Aided Breakpoint Chlorination,
W75-10965 5D

Dewaters Sludge.
W75-10966 5D

Wastewater Treatment Using Algae and temia.
W75-10967

Temperature Effects on Microbial Grow CSTR's.
W75-10968

Slurry Deliquoring by Expression,
W75-10969

Chlorine-Containing Organic Constitue Chlorinated Effluents,
W75-10970

Aeration Devices: Basic Theory,
W75-10971

Adjudicating Tenders for Aeration De Best Value and Reliability,
W75-10972

Settlement and Sludge Return in Act Sludge Type Package Plants,
W75-10973

Underground Wastewater Treatment Pla
W75-10974

Innovative Process Treats Wastewater,
W75-10975

Anaerobic Acidogenesis of Wastewater
W75-10976

$3-Million and Two-and-a-Half Years t Campbell River's Sewage Problems,
W75-10977

Algae Removal Using Dissolved Air Flo
W75-10978

Physiochemical Treatment of Wastewa water Mixture by Electrolysis,
W75-10979

Desirable Provision in Current Designs ture Development in Relation to Rec of Effluent,
W75-10980

ICI's Deep Shaft 'Halves Sludge Volum
W75-10981

Membrane Desalting Gets Big Push,
W75-10982

Water Pollution Problems in Salisbury sia: Present and Future,
W75-10983

Nitrogen Removal in a Pilot Plant,
W75-10984

Industry and Community in Cooperatio
W75-10985

Wastewater Treatment Plant Odors: A ing Enigma,
W75-10986

Water Conservation in Sweden: III Trends,
W75-10987

Carbon Regeneration by Wet Air Oxid
W75-10988

Lamella Sedimentation: A Compact S Technique,
W75-10989

Virus Removal and Inactivation Dur Treatment.
W75-10991

tivated Carbon in the Water Treatment nt,
5-10992 5D

h Costs Modify Sewage Plant Expansion.
5-10993 5D

itest Method for Monitoring Effluent Quali-
5-10994 5D

p Selection,
5-11002 8C

ium Sulfate Solubility in Brackish Water centrates and Applications to Reverse Os-is Processes: Polyphosphate Additives,
-11004 5D

to Estimate and Escalate Costs of Waste-r Equipment,
-11014 5D

Silica Affects Iron Removal from ndwater,
11016 5F

Plan for Cleaner Rivers,
11017 5D

gen Removal in the Operation of the ni Sewage Treatment Plant,
11041 5D

ss for Treating Sewage Sludge,
11064 5D

ss for Treating Industrial Wastes,
1066 5D

ss for Treating Industrial Wastes,
1067 5D

ic Lagoon Waste Treatment System and d,
1069 5D

Unit for Treating Liquid Waste,
1073 5D

water Treatment Plant,
1076 5D

lation Device for Waste Fluid Treat-
077 5D

Waste Recycle System for Water Purifi-Plant Using Alum as Primary Coagulant,
094 5D

ffects of Free Ammonia and Free Acid on the Nitrification Process,
101 5D

es of Biodegradability and Refractory s in Wastewaters: (Analysis, Interpreta-and Application of Measurement ues),
03 5D

reatment by Ozone, (In Japanese),
07 5D

d Carbon Adsorption Technique for tage Sewage Water Treatment, (In ),
08 5D

Hypochlorite Generation,
09 5D

Values for Operational Variables in Removal,
10 5D

A Solution to Pump Stoppages,
W75-11111 8C

A Planning of Catchment Sewerage for Oyodo River (In Japanese),
W75-11113 5D

Advanced Wastewater Treatment (In Japanese),
W75-11114 5D

Huntingdon Research Centre Pasveer Oxidation Plant--Six Years On,
W75-11115 5D

Investigations on the Long Term Biochemical Oxidation of Sewage,
W75-11116 5D

Treatment Methods of Groundwater Containing a Large Quantity of Humic Acid (Aufbereitungsversuche an einem stark huminstoffbelasteten Tiefengrundwasser),
W75-11117 5D

Oxidation of Organic Compounds in Water (Oxidation organischer Verbindungen in Wasser),
W75-11118 5D

Nitrogenous Changes During the Settlement of Sewage,
W75-11120 5D

Aeration Devices: The Manufacturer's Viewpoint,
W75-11121 5D

Simplified Waste Water Purification Through Physical-Chemical Treatment (Vereinfachte Abwasserreinigung durch physikalisch chemische Behandlung),
W75-11122 5D

Chemical-Biological Treatment With Biological Filters,
W75-11123 5D

Aeration by Means of Blast Nozzle--A Possibility for the Aeration of Biological Waste Water Treatment Plants (Die Strahldueseneinbegasung--eine Moeglichkeit zur Belueftung biologischer Klaeranlagen),
W75-11124 5D

The Economy of Various Methods for Dewatering Sludge From Biological Purification (Ueber die Wirtschaftlichkeit verschiedener Verfahren zur Entwaesserung von biologischem Klaerschlamm),
W75-11127 5D

Water Quality Control in Sewage Water Treatment, (In Japanese),
W75-11133 5D

Tensids (Syndets) and the Water Pollution Problem, (Gesund-Heitliche Aspekte Des Tensid-Gebrauchs),
W75-11134 5D

Interactions of Heavy Metals in the Activated Sludge Process,
W75-11173 5D

Treatment Plant Monitoring Programs: A Preliminary Analysis,
W75-11176 5D

Bark as Trickling-Filter Dewatering Medium for Pulp and Paper Mill Sludge,
W75-11241 5D

Changes in Vegetation and Surface Soil Properties Following Irrigation of Woodlands with Municipal Wastewater,
W75-11243 5B

Time-Variant Characteristics of Selected Wastewater Treatment Plants of Nevada,
W75-11245 5D

Waste Water Survey, St. Regis Paper Company, Cantonment, Florida.
W75-11314 5D

Vacuum Distillation/Vapor Filtration Water Recovery,
W75-11315 5D

Considerations for Preparation of Operation and Maintenance Manuals,
W75-11317 5D

Upgrading Meat Packing Facilities to Reduce Pollution. (Part 1). In-Process Modifications and Pretreatment,
W75-11320 5D

Upgrading Meat Packing Facilities to Reduce Pollution. (Part 2). Waste Treatment,
W75-11321 5D

Upgrading Meat Packing Facilities to Reduce Pollution. (Part 3). Choosing the Optimum Financial Strategy,
W75-11322 5D

Pollution Abatement in a Brewing Facility.
W75-11323 5D

Upgrading Metal-Finishing Facilities to Reduce Pollution. (Part 1). In-Process Pollution Abatement,
W75-11324 5D

Upgrading Metal-Finishing Facilities to Reduce Pollution. (Part 2). Waste Treatment,
W75-11325 5D

Upgrading Textile Operations to Reduce Pollution. (Part 1). In-Plant Control of Pollution.
W75-11326 5D

Upgrading Textile Operations to Reduce Pollution. (Part 2). Wastewater Treatment Systems.
W75-11327 5D

Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 2). Pretreatment of Poultry-Processing Wastes,
W75-11329 5D

Mill Experience in the Treatment of Mechanical Pulping Effluent,
W75-11332 5D

Papermaking Complex at Dunaujvaros (Hungary) -- Preserving the Danube (Au complexe papetier de Dunaujvaros -- preserver le Danube),
W75-11333 5D

Solute-Solute Interactions in Ultrafiltration Treatment of Paper Mill Wastes,
W75-11334 5D

Evaluation of the Adsorptive Properties of Fly Ash with Reference to a Pulp and Paper Mill Waste Effluent,
W75-11335 5D

Workshop on Computer-Aided Design and Simulation of Waste Treatment Systems.
W75-11338 5D

**WASTE WATER TREATMENT**

Measures in the Sulfite Pulp Industry for Decreasing Waste Water Load (Massnahmen der Sulfitzellstoff-Industrie zur Minderung der Abwasserbelastung),
W75-11339 5D

Effect of Lime Treatment on Molecular Weight Distribution of Color Bodies from Kraft Linerboard Decker Effluents,
W75-11345 5D

Treating Effluents from a Sulphite Pulp Mill by Flotation,
W75-11347 5D

Study of Electrochemical Treatment Method for Removing Colloidal Particles from Pulp and Paper Industry Effluents (Tutkimus selluteollisuuden jatevesien kolloidaalisten ainesten poistomahdollisuudesta sahkokemialliesti),
W75-11348 5D

**WASTEWATER TREATMENT**

Disinfecting Wastewater with Chlorination/Dechlorination Part 2,
W75-10964 5D

**WATER**

Extraction and Analytical Techniques for Pesticides in Soil, Sediment, and Water,
W75-11236 5A

**WATER ALLOCATION (POLICY)**

Impact of Energy Development on the Law of the Colorado River,
W75-10869 4C

The Law of Water Allocation in Kentucky,
W75-10898 6E

**WATER ANALYSIS**

The Geochemical Cycle of Arsenic in Lake Washington and its Relation to Other Elements,
W75-10922 5B

Specific Conductance Method for in Situ Estimation of Total Dissolved Solids,
W75-11167 5A

Some Observations Concerning Preparation and Storage of Stream Samples for Dissolved Inorganic Phosphate Analysis,
W75-11336 5A

Determination of Chemical Oxygen Demand, COD(Cr), in Waste Waters of Pulp and Paper Mills (Bestimmung des chemischen Sauerstoffbedarfes, CSB(Cr), in Restabwaessern von Zellstoff und Papierfabriken).
W75-11337 5A

Interference of Mercury(II) in the Colorimetric Determination of Inorganic Phosphate in Water,
W75-11340 5A

Modification of the Iodimetric Titration Method for the Determination of Bromide and Its Application to Mixed Domestic-Industrial Waste Effluents,
W75-11341 5A

Apparatus for Concentration of Volatile Organic Pollutants in Water,
W75-11342 5A

Interference of Sulfate Ion on SPADNS (Sodium 2-(Sulfophenylazo)-1,8-Dihydroxynaphthalene-3,6-Disulfonate) Colorimetric Determination of Fluorine in Waste Waters,
W75-11343 5A

Chromatographic Determination of Phenols in Water,
W75-11344 5A

**WATER BALANCE**

Approximate Annual Water Budgets of Two Chained Pinyon-Juniper Sites,
W75-10896 4A

**WATER CHEMISTRY**

Near-Bottom Chemistry in the Eastern Pacific and North Atlantic Oceans,
W75-10923 2K

A Study of Factors Controlling the Chemical Quality of Water in Cartwright Creek Basin, Williamson County, Tennessee,
W75-11164 2K

**WATER CONSERVATION**

An Appraisal of Potential Water Salvage in the Lake McMillen Delta Area, Eddy County, New Mexico,
W75-10941 3B

Water Conservation in Sweden: III. Current Trends,
W75-10987 5G

Water Application Practices and Landscape Attributes Associated with Residential Water Consumption,
W75-11059 3D

**WATER CONSUMPTION**

Water Consumption and Water Turnover of Sheep Grazing Semiarid Pasture Communities in New South Wales,
W75-10888 3F

**WATER COSTS**

Facing the Real Cost of Clean Water,
W75-10857 5G

**WATER DEMAND**

Improved Design and Operating Criteria for Rural Water Districts,
W75-11056 6D

**WATER DISTRIBUTION (APPLIED)**

The Law of Water Allocation in Kentucky,
W75-10898 6E

Hierarchial Model for Water-Supply-System Control,
W75-10996 4A

Improved Design of Distribution Networks by Minimum Route,
W75-11175 4A

Distribution-System Operation Analysis Model,
W75-11180 5D

Computer Analysis of Water-Distribution Systems,
W75-11182 4A

Advanced Techniques in the Mathematical Modeling of Water-Distribution Systems,
W75-11183 4A

Macroscopic Distribution-System Modeling,
W75-11185 4A

Finite-Element Method for Water-Distribution Networks,
W75-11186 4A

**WATER DISTRICTS**

Improved Design and Operating Criteria for Rural Water Districts,
W75-11056 6D

**WATER HYACINTH**

Comparison of Uredo Eichhorniae, the Wat
hyacinth Rust, and Uromyces Pontederiae,
W75-11092

Operation Clean Sweep,
W75-11192

Aquatic Plant Control on Lake Corpus Chris
W75-11194

CO2 Laser Effects on Water Hyacinth,
W75-11209

Water Hyacinth Research in Puerto Rico,
W75-11215

**WATER JETS**

The Mechanics of Rock Failure Due to W
Jet Impingement,
W75-11272

**WATER LAW**

Human Obstacles to the Control of
Hydrological Cycle for the Benefit of Man,
W75-10866

Impact of Energy Development on the La
the Colorado River,
W75-10869

Information as a Regulatory Tool in
Quality Control,
W75-10903

**WATER LEVEL FLUCTUATIONS**

Water Level Manipulation: A Tool for Ac
Weed Control,
W75-11216

**WATER LEVELS**

Automated Hourly Computations,
W75-10915

**WATER MANAGEMENT (APPLIED)**

Man's Influence on the Hydrological Cy
Draft Report of the UNESCO/FAO W
Group on the International Hydrol
Decade.
W75-10863

Balancing the Effects of Man's Actions
Hydrological Cycle,
W75-10865

Study of Criteria and Models Establishi
timum Level of Hydrogeologic Informat
Groundwater Basin Management,
W75-11042

Consolidation and Rehabilitation of Ca
Poudre Valley,
W75-11061

The Louisiana Environmental Mana
System and Its Utility in Water R
Planning,
W75-11177

The Water Industry in Transition,
W75-11252

Upgrading Poultry-Processing Facili
Reduce Pollution. (Part 1). In-Process
Abatement,
W75-11328

**WATER PERMITS**

Information as a Regulatory Tool i
Quality Control,
W75-10903

TER POLICY
stitutional Arrangements for Reducing Conct Over Water Quality in International vers,
75-11242 6E

e Water Industry in Transition,
75-11252 3E

ER POLLUTION
sign Considerations--Water and Effluent sposal,
75-11128 5D

ter Pollution from Nonpoint Sources,
5-11158 5B

navior of Mn, Fe, Cu, Zn, Cd and Pb charged from a Wastewater Treatment Plant an Estuarine Environment,
5-11160 5B

lation Study of Copper (II): Fulvic Acid tem,
5-11219 5B

sures in the Sulfite Pulp Industry for reasing Waste Water Load (Massnahmen Sulfitzellstoff-Industrie zur Minderung der asserbelastung),
-11339 5D

R POLLUTION CONTROL
er Pollution Problems in Salisbury, Rhode-Present and Future,
-10983 5G

and Responsibilities of the Environmental ction Service (Canada),
11000 6G

pill Technology,
11001 5G

r Resources,
11003 5G

Plan for Cleaner Rivers,
11017 5D

e for Automatic Determination of nded Solids Content in Water,
1063 5A

thematical Model for Optimal Waste Allocations,
1102 5G

Quality Control in Sewage Water Treat- (In Japanese),
1133 5D

ent Plant Monitoring Programs: A inary Analysis,
1176 5D

tions on Environmental Quality, No. 33.
246 5G

nic Analysis of Effluent Guidelines: acking Industry,
249 5G

nic Analysis of Effluent Guidelines. Fer- Industry.
250 5G

C(olumbia) Presses for Forest Indus- ean-Up.
350 5G

WATER POLLUTION EFFECTS
Impact of Thermal Effluent from Steam-Electric Station on a Marshland Nursery Area during the Hot Season,
W75-11032 5C

The Toxicity of Drilling Fluid Components to Aquatic Biological Systems, A Literature Review,
W75-11266 5C

Fertilizer Phosphate in Streams and Lakes,
W75-11310 5B

Natural and Fertilizer Nitrogen in Streams and Lakes,
W75-11311 5B

WATER POLLUTION SOURCES
Quality of Water in Aquifers of the Amargosa Desert and Vicinity, Nevada,
W75-10932 5B

Heavy Metals and Other Trace Elements,
W75-10934 5B

Preventing Backflow in Piping Cross Connections,
W75-11018 5B

Water Pollution from Nonpoint Sources,
W75-11158 5B

WATER POLLUTION TREATMENT
Preliminary Investigations into Copper Cycling in Indian Lake, Massachusetts: A Lake Treated Annually with Copper Sulfate,
W75-11039 5B

System for Optimal Pressure Control in a Multi-Stage Evaporation Unit,
W75-11070 3A

Oil Separator with Coalescing Media,
W75-11071 5G

Upgrading Metal-Finishing Facilities to Reduce Pollution. (Part 1). In-Process Pollution Abatement,
W75-11324 5D

Upgrading Metal-Finishing Facilities to Reduce Pollution. (Part 2). Waste Treatment,
W75-11325 5D

WATER PRESSURE
A Pneumatic System to Pump Water from Piezometers,
W75-11257 8C

Water System Accessories,
W75-11299 8C

WATER PURIFICATION
Liquid CO2 Protects our Water's Quality,
W75-10990 5F

Electrolytic Sea Water Process,
W75-11068 3A

Process for Raw Water Clarification,
W75-11072 5F

Low Temperature Water Purification System,
W75-11074 5F

Flocculation Device for Waste Fluid Treatment,
W75-11077 5D

WATER QUALITY
Water Conservation in Sweden: III. Current Trends,
W75-10987 5G

Liquid CO2 Protects our Water's Quality,
W75-10990 5F

Milestone Water Legislation Accompanied by Millstone of Bureaucratic Red Tape,
W75-11007 5G

Freshwater Ecosystem Research in Water Quality Management,
W75-11012 6G

System for Optimal Pressure Control in a Multi-Stage Evaporation Unit,
W75-11070 3A

Continuous Automatic Monitoring of Surface Water with Fish,
W75-11079 5A

A Mathematical Model for Optimal Waste Load Allocations,
W75-11102 5G

Concentration and Genera of Algae in Selected Illinois Streams, 1971-1973,
W75-11165 5A

Institutional Arrangements for Reducing Conflict Over Water Quality in International Rivers,
W75-11242 6E

WATER QUALITY CONTROL
The Responsibility of U.S. Water Suppliers,
W75-10856 5G

The Impact of the Safe Drinking Water Act on Utilities,
W75-10859 5G

Use of Productivity of Periphyton to Estimate Water Quality,
W75-10936 5B

Device for Automatic Determination of Suspended Solids Content in Water,
W75-11063 5A

System for Softening and Dealkalizing Water by Electrodialysis,
W75-11065 5F

Oil Separator with Coalescing Media,
W75-11071 5G

Low Temperature Water Purification System,
W75-11074 5F

The Water Quality and Bottom Sediment Characteristics of New Jersey Lagoon Developments,
W75-11104 5B

Problems of Liquid Waste Disposal,
W75-11112 5G

A Planning of Catchment Sewerage for Oyodo River (In Japanese),
W75-11113 5D

Water Treatment for Public Supply,
W75-11119 5F

A New Look at Pollution Prevention on Lowland Rivers,
W75-11132 5G

Simulation of Water Quality Management Policies,
W75-11181 5G

WATER QUALITY STANDARDS
The Responsibility of U.S. Water Suppliers,
W75-10856 5G

**WATER QUALITY STANDARDS**

The Impact of the Safe Drinking Water Act on Utilities,
W75-10859 5G

Activated Carbon in the Water Treatment Plant,
W75-10992 5D

Drug Resistant Coliforms Call for Re-Evaluation of Water Quality Standards,
W75-11130 5B

Registration of Herbicides for Aquatic Use,
W75-11197 5G

**WATER REQUIREMENTS**

Water Consumption and Water Turnover of Sheep Grazing Semiarid Pasture Communities in New South Wales,
W75-10888 3F

**WATER RESOURCES**

Water Resources of the Lower St. Croix River Watershed, East-Central Minnesota,
W75-10945 7C

Water Resources of the Snake River Watershed, East-Central Minnesota,
W75-10946 7C

Water Resources of the Lower Minnesota River Watershed, South-Central Minnesota,
W75-10947 7C

Water Resources of the Cannon River Watershed, Southeastern Minnesota,
W75-10948 7C

Land and Water Resources Survey in the Jebel Marra Area, The Sudan.
W75-11139 4A

Computer Systems and Water Resources,
W75-11174 6A

**WATER RESOURCES DEVELOPMENT**

Man's Influence on the Hydrological Cycle: A Draft Report of the UNESCO/FAO Working Group on the International Hydrological Decade.
W75-10863 2A

Human Obstacles to the Control of the Hydrological Cycle for the Benefit of Man,
W75-10866 2A

Interbasin Water Transfers: A Case Study in Mexico,
W75-10879 4A

The Louisiana Environmental Management System and Its Utility in Water Resource Planning,
W75-11177 5G

**WATER RESOURCES DEVELOPMENT ACT**

The Responsibility of U.S. Water Suppliers,
W75-10856 5G

**WATER REUSE**

Changes in Vegetation and Surface Soil Properties Following Irrigation of Woodlands with Municipal Wastewater,
W75-11243 5B

Vacuum Distillation/Vapor Filtration Water Recovery,
W75-11315 5D

Possibilities of Reutilization of Kaolin from Biological Waste Water Sludges (Moeglichkeiten der Wiederverwertung von Kaolin aus biologischen Abwasserchlaemmen),
W75-11349 5D

**WATER SOFTENING**

System for Softening and Dealkalizing Water by Electrodialysis,
W75-11065 5F

**WATER SOURCES**

An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W75-11049 4A

**WATER STORAGE**

Could The Sea be Used to Store Water for Supply.--A Possible Scheme,
W75-11129 4A

**WATER SUPPLY**

Impact of Energy Development on the Law of the Colorado River,
W75-10869 4C

Ozone Treatment Licks Color Problem.
W75-10959 5D

Hierarchial Model for Water-Supply-System Control,
W75-10996 4A

Horizontal Groundwater Collectors, Hydraulics and Design,
W75-10998 8B

Horizontal Groundwater Collectors, 'Canada's Largest Water Well',
W75-10999 8B

A Waterborne Gastroenteritis Epidemic in Pico Rivers, California,
W75-11005 5F

Induced Infiltration Supply System Among Biggest.
W75-11010 5F

City/Township Joint Venture--A New Water Plant,
W75-11015 5F

Endemic Nephrophathy and Its Relation to the Contamination of Well Water by Phenolic Compounds in Barsa-Arad (Nefropatia Endemica Si Relatia Cu Impurificarea Prin Compousi Fenolici in Apele Fintinilor Din Comuna Barsa-Arad),
W75-11105 5B

Could The Sea be Used to Store Water for Supply.--A Possible Scheme,
W75-11129 4A

A Practical Way to Find Minimum Drainage Area for a Well,
W75-11290 4B

**WATER SUPPLY DEVELOPMENT**

The Responsibility of U.S. Water Suppliers,
W75-10856 5G

A New Look at Pollution Prevention on Lowland Rivers,
W75-11132 5G

Water System Accessories,
W75-11299 8C

**WATER SYSTEM ACCESSORIES**

Water System Accessories,
W75-11299 8C

**WATER TEMPERATURE**

Temperatures of Kansas Streams,
W75-10933 2E

A Note on Salinity and Temperature in Sor Moroccan Brackish Waters
W75-10997

The Influence of th. Warm Cooling Water fr a Fossil Fueled Power Plant on Oceanograph Conditions and Composition of Plankton Owase Bay I Water Temperature in Relation Distribution of Microplankton, (In Japanese)
W75-11030

Note on the Measurement of the Response Oceanographic Temperature Sensors,
W75-11146

**WATER TEMPERATURE FREQUENCY DISTRIBUTION**

Temperatures of Kansas Streams,
W75-10933

**WATER TRANSFER**

Interbasin Water Transfers: A Case Study Mexico,
W75-10879

An Implicit Approach to Pricing Agricult Water Transfers to Urban Uses,
W75-11178

**WATER TREATMENT**

Organic Color in Groundwater of Mississipp
W75-10907

Water and Wastewater Disinfection Ozone: A Critical Review,
W75-10956

Liquid CO2 Protects our Water's Quality,
W75-10990

City/Township Joint Venture--A New W Plant,
W75-11015

How Silica Affects Iron Removal Groundwater,
W75-11016

Corrosion by Domestic Waters,
W75-11062

System for Softening and Dealkalizing W by Electrodialysis,
W75-11065

Process for Raw Water Clarification,
W75-11072

Low Temperature Water Purification Syst
W75-11074

Total Waste Recycle System for Water I cation Plant Using Alum as Primary Coagu
W75-11094

Water Treatment by Ozone, (In Japanese)
W75-11107

Optimum Values for Operational Variab Turbidity Removal,
W75-11110

Water Treatment for Public Supply,
W75-11119

Distribution-System Operation Analysis I
W75-11180

Can a Computer Really Operate a Water tion Plant,
W75-11184

Algae in Baltimore's Reservoirs,
W75-11221

ectrolytic Control of Algae,
75-11228 5F

ER UTILIZATION
bsurface Water -- Tool for Petroleum Exration,
5-11289 4B

ER WELLS
rizontal Groundwater Collectors, 'Canada's gest Water Well',
5-10999 8B

w to Seal Tubing Collar Leaks.
5-11287 8C

ing-Seat Testing - Why and How,
5-11291 8F

enting Today's Problem Wells.
5-11293 8F

R YIELD IMPROVEMENT
cts of Pinyon-Juniper Removal on Natural urce Products and Uses in Arizona,
-10886 3B

elopment of a Bibliographic Information em for Water Yield Improvement Prac-
11050 10B

ologic Relations on Undisturbed and Cond Big Sagebrush Lands: The Status of Our vledge,
11313 4D

RCOURSES (LEGAL ASPECTS)
Evaluation of Watercourse Management sex,
11008 5G

SHED MANAGEMENT
nalysis of the Motor-Row Conversion of Colorado River Float Trips,
0867 6B

Transplanting for Watershed Manageand Range Improvement in Iran,
0870 4D

al Variations in the Infiltration Rate of a house Soil in Southern Arizona,
0873 2G

flow in the New York Part of the hanna River Basin,
0931 2E

Resources of the Lower St. Croix River hed, East-Central Minnesota,
0945 7C

Resources of the Snake River hed, East-Central Minnesota,
0946 7C

Resources of the Lower Minnesota /atershed, South-Central Minnesota,
0947 7C

Resources of the Cannon River hed, Southeastern Minnesota,
0948 7C

ment of a Bibliographic Information for Water Yield Improvement Prac-
050 10B

gic Relations on Undisturbed and Conig Sagebrush Lands: The Status of Our ige,
13 4D

Watershed Management in the Black Hills: The Status of Our Knowledge,
W75-11318 4D

**WATERSHEDS (BASINS)**
Factors Affecting Erosion in a Semi-Arid Watershed,
W75-10884 2J

Derivation of Surface Water Lag Time for Converging Overland Flow,
W75-11156 2E

Dissipation of Residues of Phenoxy Herbicides Applied to the Watershed,
W75-11213 5B

**WAVES (WATER)**
Wave Motion in Rockfill,
W75-10924 8D

Effects of Entrance Loss on Harbor Oscillations,
W75-11147 8B

Laboratory Investigation of One-Dimensional Wave Motion in Open Channels,
W75-11172 8B

**WEATHER PATTERNS**
International Development Strategies for the Sahel.
W75-10861 4A

**WEBER BASIN PROJECT (UTAH)**
Social Impacts of Water Resources Developments and Their Implication for Urban and Rural Development: A Post Audit Analysis of the Weber Basin Project in Utah,
W75-10854 6B

**WEED CONTROL**
Dissipation of Residues of Phenoxy Herbicides Applied to the Watershed,
W75-11213 5B

**WEIGHT**
'Self-Tapping Screw' Bit Would Use Lighter Weights,
W75-11283 8C

**WELFARE (ECONOMICS)**
The Economics of Flood Insurance: An Analysis of the National Flood Insurance Program,
W75-11038 6F

**WELL CASINGS**
Techniques for Linear Tie-Back Cementing,
W75-11277 8F

Special Annulus Fluid Eases Casing Recovery.
W75-11282 8G

**WELL FILTERS**
Colorado City Solves Its Sand Pumping Problems,
W75-11261 8C

**WELL PITS**
Pitless Adapters: Emphasis on Sanitation,
W75-11258 8C

**WELL REGULATIONS**
Pitless Adapters: Emphasis on Sanitation,
W75-11258 8C

**WELLS**
Pitless Adapters: Emphasis on Sanitation,
W75-11258 8C

How to Make Squeeze Cementing Successful,
W75-11286 8F

**WEST GERMANY**
Translations on Environmental Quality, No. 33.
W75-11246 5G

**WET AIR OXIDATION**
Carbon Regeneration by Wet Air Oxidation,
W75-10988 5D

**WHALES**
Mercury Content of Whales, (In Japanese),
W75-11029 5B

**WHITE AMUR**
Unisex Studies on the White Amur,
W75-11205 5C

**WHITE-HOUSE SANDY LOAM**
Seasonal Variations in the Infiltration Rate of a Whitehouse Soil in Southern Arizona,
W75-10873 2G

**WHITE WATER**
Solute-Solute Interactions in Ultrafiltration Treatment of Paper Mill Wastes,
W75-11334 5D

**WILTING**
The Role of Endogenous Abscisic Acid in the Response of Plants to Stress,
W75-11319 3F

**WIND-GENERATED WAVES**
Effect of Pressure Gradient on Wind-Waves in a Laboratory Channel,
W75-11093 8B

**WIND TIDES**
Effect of Pressure Gradient on Wind-Waves in a Laboratory Channel,
W75-11093 8B

**WIND VELOCITY**
Wind-Snow Relations at Marmot Creek, Alberta,
W75-11226 2C

**WINDS**
Wind Effects on Chemical Films for Evaporation Suppression at Lake Hefner,
W75-10920 3B

**WINTER**
Economics of Great Lakes Shipping in an Extended Season,
W75-11248 6C

**WISCONSIN**
Information as a Regulatory Tool in Water Quality Control,
W75-10903 5G

Investigation of the Influence of Thermal Discharge from a Large Electric Power Station on the Temperature and Near-Shore Circulation of Lake Michigan,
W75-11190 5C

**WISCONSIN DEPARTMENT OF NATURAL RESOURCES**
The Awareness of the Relevant Water Resources Literature by the Personnel of the Wisconsin Department of Natural Resources,
W75-10899 10C

**WITHDRAWAL**
Non-Renewable, Non-Energy Resources,
W75-11253 6B

**WORMS**
Some Effects of Copper on the Polychaete Phyllodoce Maculata,
W75-11136 5C

WORTHINGTON (MASS)
Map Showing Depth to Bedrock, Worthington Quadrangle, Massachusetts,
W75-10951 7C

YAVAPAI COUNTY (ARIZ)
Hydrogeology and Water Resources of Middle Kirkland Creek Basin, Yavapai County, Arizona,
W75-10872 4B

YELLOWTAIL
Studies on Toxicity of Sodium Nifurstyrenate (NFS-NA) in Cultured Yellowtail (In Japanese),
W75-11034 5C

ZINC
The Accumulation of Cadmium, Copper, Manganese and Zinc by Fucus Vesiculosus in the Bristol Channel,
W75-11083 5B

Uptake of Cadmium, Zinc, Copper, Lead and Chromium in the Pacific Oyster, Crassostrea Gigas, Grown in the Tamar River, Tasmania,
W75-11086 5B

Studies on the Inorganic Components of Marine Animals-III, on the Contents of Cadmium, Zinc, Copper, Lead and Iron in Muscle and Viscera of Marine Animals Captured in the West Sea Area of Kyushu, (In Japanese),
W75-11087 5C

ZOOPLANKTON
Ammonia Excretion by Zooplankton and its Significance to Primary Productivity During Summer,
W75-11187 5C

Seasonal Abundance of Crustacean Zooplankton and Net Plankton Biomass of Lakes Huron, Erie, and Ontario,
W75-11238 5C

# AUTHOR INDEX


**BOTT, C. E.**
Charged Droplet Collision Efficiency Measurements,
W75-11168 2B

**TKEN, A. P.**
Hydrologic Investigation and Design of Urban Stormwater Drainage Systems,
W75-11141 4A

**LAYLA, M. A.**
Optimum Values for Operational Variables in Turbidity Removal,
W75-11110 5D

**CORN, S. R.**
Limnology of Desert Ponds,
W75-10880 2H

**ON, E. F.**
Establishing Alkali Sacaton on Harsh Sites in the Southwest,
W75-10882 4A

Revegetating Disturbed Areas in the Semiarid Southwest,
W75-10892 4D

**TI, A.**
Water Pollution from Nonpoint Sources,
W75-11158 5B

**XANDER, M.**
Stability of Nitrosamines in Samples of Lake Water, Soil, and Sewage,
W75-11019 5B

**XANDER, S. M.**
Advanced Techniques in the Mathematical Modeling of Water-Distribution Systems,
W75-11183 4A

**N, R. M.**
Phytophthora Species in Arizona: Its Occurrence in Recycled Irrigation water,
W75-10883 5A

**SON, S. V.**
Successful Irrigation: Preparation, Realization, Valorization, (Savoir Irriguer: Preparation, Realisation, Exploitation),
W75-10874 3F

**WOOD, J. K.**
Economic Analysis of Effluent Guidelines: Fruit Packing Industry,
W75-11249 5G

**SO, C. V.**
Some Results on Mass Transfer Processes in a Density-Stratified Flow,
W75-11057 8B

**I, M.**
Explicit Numerical Modeling of Unsteady Flows,
W75-10925 8B

**SON, H. W. JR.**
Water Resources of the Cannon River Watershed, Southeastern Minnesota,
W75-10948 7C

Water Resources of the Lower Minnesota River Watershed, South-Central Minnesota,
W75-10947 7C

**SON, J. W.**
Magnification of Dieldrin Residues by Food Chain Transfer from Clams to Blue Crabs Under Controllled Conditions,
W75-11135 5C

**ANDREWS, W. H.**
Social Impacts of Water Resources Developments and Their Implication for Urban and Rural Development: A Post Audit Analysis of the Weber Basin Project in Utah,
W75-10854 6B

**ANTHONISEN, A. C.**
The Effects of Free Ammonia and Free Nitrous Acid on the Nitrification Process,
W75-11101 5D

**APPAN, S. G.**
Stabilization and Reconstruction of Texas Coastal Foredunes with Vegetation,
W75-10887 2L

**APPEL, D. W.**
Aerobic Lagoon Waste Treatment System and Method,
W75-11069 5D

**APPLETON, B.**
ICI's Deep Shaft 'Halves Sludge Volume',
W75-10981 5D

YWA Plan for Cleaner Rivers,
W75-11017 5D

**ARAGAKI, T.**
Slurry Deliquoring by Expression,
W75-10969 5D

**ARAZAKI, S.**
Some Observations on Behavior of the Treated Sewage Disposed in the Sea,
W75-11020 5B

**ARIMA, S.**
Mercury Content of Whales, (In Japanese),
W75-11029 5B

**ATKINS, A.**
Economics of Great Lakes Shipping in an Extended Season,
W75-11248 6C

**AUERBACH, S. I.**
Freshwater Ecosystem Research in Water Quality Management,
W75-11012 6G

**AUSNESS, R. C.**
The Law of Water Allocation in Kentucky,
W75-10898 6E

**AYLING, G. M.**
Uptake of Cadmium, Zinc, Copper, Lead and Chromium in the Pacific Oyster, Crassostrea Gigas, Grown in the Tamar River, Tasmania,
W75-11086 5B

**AYRES, K. W.**
Soil Morphology and Soil Physical Properties: II. Mechanical Impedance and Moisture Retention and Movement,
W75-10885 2G

**BACK, W.**
Determination of Regional Hydraulic Conductivity Through Use of C-14 Dating of Groundwater,
W75-10930 2F

**BAILEY, M. W.**
Solute-Solute Interactions in Ultrafiltration Treatment of Paper Mill Wastes,
W75-11334 5D

**BAIRD, J. H.**
Cost Evaluation of Watercourse Management in Essex,
W75-11008 5G

**BAKER, M. B.**
Effects of Pinyon-Juniper Removal on Natural Resource Products and Uses in Arizona,
W75-10886 3B

**BALE, A. J.**
The Accumulation of Cadmium, Copper, Manganese and Zinc by Fucus Vesiculosus in the Bristol Channel,
W75-11083 5B

**BALL, J. W.**
Predicting Cavitation in Sudden Enlargements,
W75-11151 8B

**BANNERT, C.**
Oxidation of Organic Compounds in Water (Oxidation organischer Verbindungen in Wasser),
W75-11118 5D

**BARABAS, S.**
Advances in the Detection of Water Pollutants,
W75-10995 5A

**BARE, W. F. R.**
Algae Removal Using Dissolved Air Flotation,
W75-10978 5D

**BARLOW, J. P.**
Utilization of Stream-Borne Phosphorus by Cayuga Lake Phytoplankton,
W75-11036 5C

**BARNARD, J. L.**
Desirable Provision in Current Designs for Future Development in Relation to Reclamation of Effluent,
W75-10980 5D

**BARNES, W. W.**
Dissipation of Residues of Phenoxy Herbicides Applied for Water Milfoil Control in Large Reservoirs,
W75-11198 5B

**BARRY, J. R.**
Field Testing of Aquatic Herbicides for Control of Egeria Densa,
W75-11200 5G

**BATEMAN, S. J.**
Simple Field Checks Will Provide Accurate DST Data,
W75-11281 8G

**BAUERLE, B.**
The Use of Snakes as a Pollution Indicator Species,
W75-11089 5B

**BAUR, J. R.**
Occurrence of 2, 4, 5-T and Picloram in Surface Runoff Water in the Blacklands of Texas,
W75-10895 5B

**BAYLOR, E. R.**
Surface Tension Reductions and Urban Wastes in The New York Bight,
W75-10927 5B

**BEALL, S. E.**
Status of Waste Heat Utilization and Dual-Purpose Plant Projects,
W75-11251 3E

BEARDSLEY, G.
$3-Million and Two-and-a-Half Years to Solve Campbell River's Sewage Problems,
W75-10977 5D

BECKER, D. A.
Pathogenic Free-Living Amoebae in Arkansas Recreational Waters,
W75-11053 5A

BECKSCHAFER, K.
Flocculation Device for Waste Fluid Treatment,
W75-11077 5D

BEETEM, W. A.
Quality of Water in Aquifers of the Amargosa Desert and Vicinity, Nevada,
W75-10932 5B

BEICHLEY, G. L.
Cavitation Control by Aeration of High-Velocity Jets,
W75-11152 8B

BELL, D. T.
Guidelines for the Identification of Potential Environmental Impacts in the Construction and Operation of a Reservoir,
W75-11316 5C

BELL, J. B.
Microbiological Examination of Offshore Lake Erie Sediments,
W75-11218 5C

BELLA, D. A.
Strategic Approach to Estuarine Environmental Management,
W75-11179 2L

BENDER, D. F.
Modification of the Iodimetric Titration Method for the Determination of Bromide and Its Application to Mixed Domestic-Industrial Waste Effluents,
W75-11341 5A

BENFORD, H.
Economics of Great Lakes Shipping in an Extended Season,
W75-11248 6C

BENN, B. O.
Operations Platforms,
W75-11210 4A

BENNETT, G. H.
Population Dynamics of Protozoa in Wastewater,
W75-10957 5D

BENNETT, J. E.
Electrolytic Sea Water Process,
W75-11068 3A

BERRY, C. R.
Aquatic Plant Control Using Herbicides in a Large Potable Water Supply,
W75-11201 5G

BERTHOUEX, P. M.
Treatment Plant Monitoring Programs: A Preliminary Analysis,
W75-11176 5D

BEST, D. G.
Root:Shoot and Leaf Area Relationships of Macrophyte Communities in Chautauqua Lake, New York,
W75-11009 5C

BETZER, S. B.
Copper Toxicity in Busycon Canaliculatum L.,
W75-11031 5C

BEUSCHER, D. B.
Concentration and Genera of Algae in Selected Illinois Streams, 1971-1973,
W75-11165 5A

BHATTACHARYYA, B.
Electrolytic Control of Algae,
W75-11228 5F

BIALAS, W. F.
Prescriptive Economic Models for Nonstructural Flood Control,
W75-11060 6F

BIRD, D. W.
Advanced Techniques in the Mathematical Modeling of Water-Distribution Systems,
W75-11183 4A

BISHNOI, O. P.
Estimation of Safe Periods for Crop Planning Under Dryland Agriculture,
W75-10926 3F

BLACKBURN, R. D.
Chemical Control of Egeria Densa,
W75-11199 5G

BLECKER, H. G.
How to Estimate and Escalate Costs of Wastewater Equipment,
W75-11014 5D

BLINCO, P. H.
Turbulent Structure Near Smooth Boundary,
W75-11148 8B

BLOGOSLAWSKI, W. J.
Effects of Ozone-Treated Seawater on the Spawned, Fertilized, Meiotic, and Cleaving Eggs of the Commercial American Oyster,
W75-11256 5C

BONANSINGA, P.
Computer Analysis of Water-Distribution Systems,
W75-11182 4A

BOND, M. T.
Organic Color in Groundwater of Mississippi,
W75-10907 5F

BONE, L. W.
Pathogenic Free-Living Amoebae in Arkansas Recreational Waters,
W75-11053 5A

BOULDIN, D. R.
Some Observations Concerning Preparation and Storage of Stream Samples for Dissolved Inorganic Phosphate Analysis,
W75-11336 5A

BOURGEOIS, P. O.
Horizontal Groundwater Collectors, Hydraulics and Design,
W75-10998 8B

BOVEY, R. W.
Occurrence of 2, 4, 5-T and Picloram in Surface Runoff Water in the Blacklands of Texas,
W75-10895 5B

BOWIE, J. E.
Organic Color in Groundwater of Mississippi,
W75-10907 5F

BOYD, D. R.
Liquid CO2 Protects our Water's Quality,
W75-10990 5F

BRADLEY, B. P.
Adaptation of Copepod Populations to Therma
Stress,
W75-11046 5

BRAND, W. E.
Design Considerations--Water and Effluer
Disposal,
W75-11128 5

BRISCOE, E. R. E.
Huntingdon Research Centre Pasveer Oxid
tion Plant--Six Years On,
W75-11115 5

BROOKER, M. P.
Cost Evaluation of Watercourse Manageme
in Essex,
W75-11008 5

BROUSSARD, W. L.
Water Resources of the Cannon Riv
Watershed, Southeastern Minnesota,
W75-10948

Water Resources of the Lower Minnes
River Watershed, South-Central Minnesota,
W75-10947

Water Resources of the Lower St. Croix Ri
Watershed, East-Central Minnesota,
W75-10945

Water Resources of the Snake Ri
Watershed, East-Central Minnesota,
W75-10946

BROWN, J. M. A.
A Contribution to the Biology of Nit
Hookeri A. BR. in the Rotorua Lakes, N
Zealand. II. Organic Nutrients and Phys
Factors,
W75-11235

BROWN, S. J.
Upgrading Meat Packing Facilities to Red
Pollution. (Part 2). Waste Treatment,
W75-11321

BRUECKNER, T. G.
Physiochemical Treatment of Wastewater-
water Mixture by Electrolysis,
W75-10979

BUCHANAN, M. A.
Effect of Lime Treatment on Molecular We
Distribution of Color Bodies from Kraft L
board Decker Effluents,
W75-11345

BUGLIARELLO, G.
Computer Systems and Water Resources,
W75-11174

BUKATA, R. P.
The Utilization of Sun-Glint in a Study of
Dynamics,
W75-11239

BURANT, W. JR.
Carbon Regeneration by Wet Air Oxidatio
W75-10988

BURKHALTER, T. D.
Criteria for Herbicide Evaluation,
W75-11196

BURNETT, E.
Occurrence of 2, 4, 5-T and Picloram i
face Runoff Water in the Blacklands of Te
W75-10895

RNS, C. V.
emperatures of Kansas Streams,
V75-10933 2E

RNS, N. M.
n Situ Measurement of the Settling Velocity
rofile of Particulate Organic Carbon in Lake
ntario,
775-11227 5C

RSZTYNSKY, T. A.
pgrading Poultry-Processing Facilities to
educe Pollution. (Part 1). In-Process Pollution
patement,
75-11328 5D

CH, C. D.
heduling and Application Rates of Irrigation
a Humid Climate,
75-11048 3F

TON, R. G.
il Morphology and Soil Physical Properties:
Mechanical Impedance and Moisture Reten-
n and Movement,
75-10885 2G

IE, N.
Elevational Control of Peak Snowpack
riability,
5-11155 2C

PBELL, D. E.
Pneumatic System to Pump Water from
zometers,
5-11257 8C

PBELL, R. E.
ects of Pinyon-Juniper Removal on Natural
ource Products and Uses in Arizona,
5-10886 3B

OZZI, C. A.
ironmental Impact Evaluation in Fresh-
r Impoundments by Vegetation Analysis of
Terrestrial Ecosystem,
-10905 2I

SON, F. R.
surement of Cobble Abrasion in Natural
ams,
-10881 2J

NTER, G. F.
onal Abundance of Crustacean Zooplank-
nd Net Plankton Biomass of Lakes Huron,
and Ontario,
11238 5C

W. E. S.
ct of Thermal Effluent from Steam-Elec-
tation on a Marshland Nursery Area dur-
e Hot Season,
11032 5C

R, R. M.
Emplaced Sand-Fingers at Mararoa Con-
ion Site, Southern New Zealand,
1161 2J

UX, G.
Use of Soil as a Purifying System
lisation du sol Comme Systeme Epu-
).
1126 5D

R. C.
atographic Determination of Phenols in
1344 5A

CHAPMAN, J. D.
Algae Control in Northwest Reservoirs,
W75-11231 5G

CHAPMAN, V. J.
A Contribution to the Biology of Nitella Hookeri A. BR. in the Rotorua Lakes, New Zealand. II. Organic Nutrients and Physical Factors,
W75-11235 5C

CHARI, K. V.
Electrolytic Control of Algae,
W75-11228 5F

CHARUDATTAN, R.
Comparison of Uredo Eichhorniae, the Water-hyacinth Rust, and Uromyces Pontederiae,
W75-11092 5G

Utilization of Phytopathogens as Biocontrols for Aquatic Weeds,
W75-11206 5G

CHEAM, V.
Chelation Study of Copper (II): Fulvic Acid System,
W75-11219 5B

CHEATHAM, J. B. JR.
Theory of Plasticity of Porous Media with Fluid Flow,
W75-11276 8E

CHEATHAM, L. R.
A Case Study of Some Economic Aspects of the National Flood Insurance Program,
W75-10906 6F

CHEN, C-L.
Process Studies and Modeling of Self-Cleaning Capacity of Mountain Creeks for Recreation Planning and Management,
W75-11055 5B

CHENG, K. H.
An Investigation of Glycolate Excretion in Two Species of Blue-Green Algae,
W75-11230 5C

CHENG, M. H.
Interactions of Heavy Metals in the Activated Sludge Process,
W75-11173 5D

CHENOUARD, L.
Weyl's Theory of Glaciation Supported by Isotopic Study of Norwegian Core K 11,
W75-11153 2J

CHESTERS, G.
Extraction and Analytical Techniques for Pesticides in Soil, Sediment, and Water,
W75-11236 5A

CHISMAN, J. A.
Simulation of Water Quality Management Policies,
W75-11181 5G

CHIU, S. Y.
Water Pollution from Nonpoint Sources,
W75-11158 5B

CHO, T.
Cultivation of Netted Melon By Use of Trickle Irrigation in a Sand Field Plastic Greenhouse, (In Japanese),
W75-11095 3F

Practical Application of Surface Fixed-System for Multi-Purpose Sprinkler Irrigation Uses, (In Japanese),
W75-11097 3F

CHRISWELL, C. D.
Chromatographic Determination of Phenols in Water,
W75-11344 5A

CHU, H-L.
Implicit Numerical Modeling of Unsteady Flows,
W75-10925 8B

CINKE, J. E.
Electrolytic Sea Water Process,
W75-11068 3A

CLARY, W. P.
Effects of Pinyon-Juniper Removal on Natural Resource Products and Uses in Arizona,
W75-10886 3B

CLESCERI, N. L.
Freshwater Ecosystem Research in Water Quality Management,
W75-11012 6G

COCKS, P. S.
The Early Vegetative Growth of Two Annual Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.),
W75-10876 3F

The Germination and Establishment of Two Annual Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.),
W75-10897 2I

The Influence of Density and Nitrogen on the Outcome of Competition Between Two Annual Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.),
W75-10889 3F

COFFEY, P. E.
Evidence of Atmospheric Transport of Ozone into Urban Areas,
W75-11169 5A

COLES, S. L.
A Comparison of Effects of Elevated Temperature Versus Temperature Fluctuations on Reef Corals at Kahe Point, Oahu,
W75-11084 5C

COLLINS, A. G.
Finite-Element Method for Water-Distribution Networks,
W75-11186 4A

COLLINS, J. G.
CO2 Laser Effects on Water Hyacinth,
W75-11209 5G

COLLINS, L. A.
A Survey of Fishes and Commercial Invertebrates of the Nearshore and Estuarine Zone Between Cape Romano and Cape Sable, Florida,
W75-11189 2I

COLLINSON, B.
Pilot-Plant Study of Denitrification Using a Submerged Sand Filter at Rye Meads Sewage Works,
W75-10955 5D

COLMAN, B.
An Investigation of Glycolate Excretion in Two Species of Blue-Green Algae,
W75-11230 5C

CONRAD, J. R.
Anaerobic Acidogenesis of Wastewater Sludge,
W75-10976 5D

CONWAY, K. E.
Comparison of Uredo Eichhorniae, the Water-hyacinth Rust, and Uromyces Pontederiae,
W75-11092 5G

COOK, C. W.
Guidelines for Revegetation and Stabilization of Surface Mined Areas in the Western States,
W75-11100 4D

COPENHAVER, E. D.
Heavy Metals and Other Trace Elements,
W75-10934 5B

CORNING, R. V.
Aquatic Plant Control Using Herbicides in a Large Potable Water Supply,
W75-11201 5G

CORNISH, B. A.
Difficulties in Gauging Small Catchments - A Case Study,
W75-11306 2E

COSTIN, A. B.
Balancing the Effects of Man's Actions on the Hydrological Cycle,
W75-10865 2A

COTTER, D. J.
Water Application Practices and Landscape Attributes Associated with Residential Water Consumption,
W75-11059 3D

COULSON, J. R.
Biological Control of Alligator Weed, 1959-1972,
W75-11202 5G

COURCHENE, J. E.
Algae Control in Northwest Reservoirs,
W75-11231 5G

COX, E. R.
An Appraisal of Potential Water Salvage in the Lake McMillen Delta Area, Eddy County, New Mexico,
W75-10941 3B

COX, S. K.
Analysis of Colorado Precipitation,
W75-11040 2B

COX, W. A.
Milestone Water Legislation Accompanied by Millstone of Bureaucratic Red Tape,
W75-11007 5G

CRANE, J. D.
Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 1). In-Process Pollution Abatement,
W75-11328 5D

CRECELIUS, E. A.
The Geochemical Cycle of Arsenic in Lake Washington and its Relation to Other Elements,
W75-10922 5B

CROFT, D. B.
Water Application Practices and Landscape Attributes Associated with Residential Water Consumption,
W75-11059 3D

CROW, F. R.
Wind Effects on Chemical Films for Evaporation Suppression at Lake Hefner,
W75-10920 3B

CULBERSON, C. H.
Near-Bottom Chemistry in the Eastern Pacific and North Atlantic Oceans,
W75-10923 2K

CULLEN, P. W.
Fertilizer Phosphate in Streams and Lakes,
W75-11310 5B

CUMMINGS, J. C.
Registration of Herbicides for Aquatic Use,
W75-11197 5G

CUMMINGS, R. G.
Interbasin Water Transfers: A Case Study in Mexico,
W75-10879 4A

DAHL, B. E.
Stabilization and Reconstruction of Texas Coastal Foredunes with Vegetation,
W75-10887 2L

DANIEL, T. C.
Extraction and Analytical Techniques for Pesticides in Soil, Sediment, and Water,
W75-11236 5A

DANNINGER, H.
Measures in the Sulfite Pulp Industry for Decreasing Waste Water Load (Massnahmen der Sulfitzellstoff-Industrie zur Minderung der Abwasserbelastung),
W75-11339 5D

DANTIN, E. J.
The Louisiana Environmental Management System and Its Utility in Water Resource Planning,
W75-11177 5G

DAUCHER, H-H.
Aeration by Means of Blast Nozzle--A Possibility for the Aeration of Biological Waste Water Treatment Plants (Die Strahlduesenbegasung--eine Moeglichkeit zur Belueftung biologischer Klaeranlagen),
W75-11124 5D

DAVAVIN, I. A.
Influence of Oil on Nucleic Acids of Algae,
W75-11080 5C

Influence of Oil on Nucleic Acids of Algae,
W75-11232 5C

DAVIS, K. D.
Process Studies and Modeling of Self-Cleaning Capacity of Mountain Creeks for Recreation Planning and Management,
W75-11055 5B

DAVIS, L. R.
Factors Affecting Erosion in a Semi-Arid Watershed,
W75-10884 2J

DE CONINCK, E.
A Note on Salinity and Temperature in Some Moroccan Brackish Waters,
W75-10997 2L

DE JONG, E.
Soil Morphology and Soil Physical Properties: II. Mechanical Impedance and Moisture Retention and Movement,
W75-10885 2G

DECKER, C. S.
Acid Strip Mine Lake Recovery,
W75-11224 5C

DEGAN, A.
Sprinkler Irrigation Practice, (La Pratique D L'Irrigation Par Aspersion),
W75-10875 3

DEGUCHI, Y.
Some Observations on Behavior of the Treate Sewage Disposed in the Sea,
W75-11020 5

DEMOYER, R. JR.
Macroscopic Distribution-System Modeling,
W75-11185 4

DEN HARTOG, H.
The Economic Impact of Pollution Abatemen The Case of Water Pollution by Degradable O ganic Matter,
W75-11254 5

DENNIS, R. E.
Use of Amendments to Reduce Water Requi ments for Stand Establishment of Small-Seed Crops,
W75-11045

DEVINE, R. F.
Interference of Sulfate Ion on SPADN (Sodium 2-(Sulfophenylazo)-1,8-Dihydro ynaphthalene-3,6-Disulfonate) Colorimet Determination of Fluorine in Waste Waters,
W75-11343

DICKEY, E. E.
Effect of Lime Treatment on Molecular Wei Distribution of Color Bodies from Kraft Lin board Decker Effluents,
W75-11345

DICKEY, P. A.
Review of Conference on Hydrology of D Sedimentary Basins,
W75-10935

DIETRICH, K. R.
Simplified Waste Water Purification Thro Physical-Chemical Treatment (Vereinfac Abwasserreinigung durch physikali chemische Behandlung),
W75-11122

DIXON, K. W.
Process for Raw Water Clarification,
W75-11072

Process for Treating Industrial Wastes,
W75-11066

Process for Treating Industrial Wastes,
W75-11067

Process for Treating Sewage Sludge,
W75-11064

DOI, K.
Uranium Mineralization by Ground Wat Sedimentary Rocks, Japan.
W75-11145

DONALD, C. M.
The Early Vegetative Growth of Two A Pasture Grasses (Hordeum Leporinum and Lolium Rigidum Gaud.),
W75-10876

The Germination and Establishment of Annual Pasture Grasses (Hordeum Lepo Link and Lolium Rigidum Gaud.),
W75-10897

OGE, J. C. I.
alancing the Effects of Man's Actions on the Hydrological Cycle,
/75-10865
2A

he Nature and Components of the Hydrological Cycle,
775-10864
2A

RAN, D. G.
roughts, Distributions and Dependence: An nalysis of Some Synthetic Data Generation ethods,
75-11305
2E

VNE, A. E. R.
e Effects of Experimental Blackfly (Diptera: muliidae) Larviciding with Abate, Dursban, d Methoxychlor on Stream Invertebrates,
75-11157
5C

INSKY, Z.
lations Between Algal Populations and the of Their Media,
5-11028
5C

AL, H. S.
ect of Lime Treatment on Molecular Weight tribution of Color Bodies from Kraft Liner-rd Decker Effluents,
5-11345
5D

AN, G. L.
rogen Removal in the Operation of the lani Sewage Treatment Plant,
5-11041
5D

ESSY, J. C.
yl's Theory of Glaciation Supported by opic Study of Norwegian Core K 11,
5-11153
2J

ANCE, R. E.
Awareness of the Relevant Water urces Literature by the Personnel of the consin Department of Natural Resources,
-10899
10C

A, B. J.
obiological Examination of Offshore Lake Sediments,
-11218
5C

F.
Aquatic Weed Problem. 1. Identification,
11220
2I

VORTH, L.
and Responsibilities of the Environmental ction Service (Canada),
11000
6G

ND, C. E.
f Amendments to Reduce Water Require- for Stand Establishment of Small-Seeded
11045
3F

LSDOERFER, D.
ment Methods of Groundwater Containing arge Quantity of Humic Acid ereitungsversuche an einem stark humin-elasteten Tiefengrundwasser),
1117
5D

ERG, E. S.
nal Invertebrates as Indicators of Water y in Southern Lake Pontchartain,
0852
5C

EL-GAYAR, F. M.
Standard Curves for Nuvacron, Malathion, Sevin, DDT, and Kelthane Tested Against the Mosquito Culex Pipiens L. and the Microcrustacean Daphnia Magna Straus,
W75-11082
5B

EL-SHAZLI, A. Y.
Standard Curves for Nuvacron, Malathion, Sevin, DDT, and Kelthane Tested Against the Mosquito Culex Pipiens L. and the Microcrustacean Daphnia Magna Straus,
W75-11082
5B

ELEUTERIUS, L. N.
Transplanting Sea Grass in Mississippi Sound,
W75-11207
4A

ELFVING, E.
Minitest Method for Monitoring Effluent Quality,
W75-10994
5D

ENGELS, P.
A Note on Salinity and Temperature in Some Moroccan Brackish Waters,
W75-10997
2L

ENGLER, G.
A Note on Salinity and Temperature in Some Moroccan Brackish Waters,
W75-10997
2L

EPSTEIN, H. S.
How to Estimate and Escalate Costs of Wastewater Equipment,
W75-11014
5D

ERICKSON, E. A.
Changes in Vegetation and Surface Soil Properties Following Irrigation of Woodlands with Municipal Wastewater,
W75-11243
5B

ERICSON, D. W.
Water Resources of the Snake River Watershed, East-Central Minnesota,
W75-10946
7C

ERICSSON, B.
Nitrogen Removal in a Pilot Plant,
W75-10984
5D

EVANS, R. L.
Concentration and Genera of Algae in Selected Illinois Streams, 1971-1973,
W75-11165
5A

FABLE, W. A.
A Survey of Fishes and Commercial Invertebrates of the Nearshore and Estuarine Zone Between Cape Romano and Cape Sable, Florida,
W75-11189
2I

FAIR, S. S.
Beach Erosion Control Structure,
W75-11075
8A

FAIRBAIRN, P. W.
Environmental Impact Evaluation in Freshwater Impoundments by Vegetation Analysis of the Terrestrial Ecosystem,
W75-10905
2I

FALK, M. R.
Acute Toxicity of Petrochemical Drilling Fluids Components and Wastes to Fish,
W75-11265
5C

FALL, B. A.
Stabilization and Reconstruction of Texas Coastal Foredunes with Vegetation,
W75-10887
2L

FALLSIDE, F.
Hierarchial Model for Water-Supply-System Control,
W75-10996
4A

FAN, L. T.
Design of the Optimal Outfall System for a Stream Receiving Thermal and Organic Waste Discharges,
W75-11137
5B

FARRELL, D. F.
Water Resources of the Cannon River Watershed, Southeastern Minnesota,
W75-10948
7C

Water Resources of the Lower Minnesota River Watershed, South-Central Minnesota,
W75-10947
7C

Water Resources of the Lower St. Croix River Watershed, East-Central Minnesota,
W75-10945
7C

FELSHEIM, P. E.
Water Resources of the Cannon River Watershed, Southeastern Minnesota,
W75-10948
7C

FELSTEHAUSEN, H. H.
Information as a Regulatory Tool in Water Quality Control,
W75-10903
5G

FERRIS, J.
Freshwater Ecosystem Research in Water Quality Management,
W75-11012
6G

FERTL, W. H.
How Downhole Temperatures, Pressures Affect Drilling; Part 4: Pitfalls in Overpressure Prediction,
W75-11294
8G

How Downhole Temperatures, Pressures Affect Drilling; Part 5: Predicting Hydrocarbon Environments with Wireline Data,
W75-11295
8G

How Downhole Temperatures, Pressures Affect Drilling; Part 6: Correlating Geopressure Gradients with Hydrocarbon Accumulations,
W75-11296
8G

How Downhole Temperatures, Pressures Affect Drilling; Part 7: The Shale Resistivity Ratio - A Valuable Tool for Making Economic Drilling Decisions,
W75-11297
8G

How Downhole Temperatures, Pressures Affect Drilling; Part 8: Needless Spending of Drilling and Exploration Money Can Be Predicted-And Prevented,
W75-11298
8G

How to Find Transition Zones in Soft Formations,
W75-11285
8G

FFOLLIOTT, P. F.
An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W75-11049
4A

**FFOLLIOTT, P. F.**

Development of a Bibliographic Information System for Water Yield Improvement Practices,
W75-11050 10B

**FILAN, S. J.**
Some Observations on Rainfall in Western New South Wales,
W75-11304 2B

**FINKEL, H.**
Human Obstacles to the Control of the Hydrological Cycle for the Benefit of Man,
W75-10866 2A

**FINLEY, H. E.**
Population Dynamics of Protozoa in Wastewater,
W75-10957 5D

**FISH, H.**
A New Look at Pollution Prevention on Lowland Rivers,
W75-11132 5G

**FISHBEIN, L.**
Mutagens and Potential Mutagens in the Biosphere: I. DDT and Its Metabolites, Polychlorinated Biphenyls, Chlorodioxins, Polycyclic Aromatic Hydrocarbons, Haloethers,
W75-11170 5B

Mutagens and Potential Mutagens in the Biosphere: II. Metals--Mercury, Lead, Cadmium and Tin,
W75-11171 5B

**FISHER, I. H.**
Generation of Arid Zone Rainfall and Runoff,
W75-11303 2A

**FLYNN, B. H.**
The Law of Water Allocation in Kentucky,
W75-10898 6E

**FORMAN, S. E.**
The Mechanics of Rock Failure Due to Water Jet Impingement,
W75-11272 8E

**FORSBERG, A.**
Minitest Method for Monitoring Effluent Quality,
W75-10994 5D

**FORSBERG, C.**
Minitest Method for Monitoring Effluent Quality,
W75-10994 5D

**FORSELL, B.**
Lamella Sedimentation: A Compact Separation Technique,
W75-10989 5D

**FOSTER, J. H.**
Floodplain Land-Use Management: An Application of Operations Research Methodology,
W75-11037 6F

**FOX, J. A.**
Some Results on Mass Transfer Processes in a Density-Stratified Flow,
W75-11057 8B

**FRANK, F. J.**
Ground Water in the Corvallis-Albany Area, Central Willamette Valley, Oregon,
W75-10940 2F

**FRANK, P. A.**
Registration of Aquatic Herbicides,
W75-11212 4A

**FREEMAN, T. E.**
Utilization of Phytopathogens as Biocontrols for Aquatic Weeds,
W75-11206 5G

**FRENCH, R.**
Australian Arid Zone Streangauging,
W75-11307 2E

**FRIEDMANN, C. T. H.**
A Waterborne Gastroenteritis Epidemic in Pico Rivers, California,
W75-11005 5F

**FRITSCHEN, L. J.**
Evapotranspiration of Four Forest Types Measured With the Eddy Correlation Technique,
W75-11044 2D

**FRITZ, J. S.**
Chromatographic Determination of Phenols in Water,
W75-11344 5A

**FUEHRING, H. D.**
Effects of Antitranspirants on Yield of Grain Sorghum Under Limited Irrigation,
W75-10858 3F

**FUJIMOTO, E.**
Water Quality Control in Sewage Water Treatment, (In Japanese),
W75-11133 5D

**FUJITA, T.**
Mercury Content of Whales, (In Japanese),
W75-11029 5B

**FULLER, W. H.**
Management of Southwestern Desert Soils,
W75-10877 2G

Soils of the Desert Southwest,
W75-10878 2G

**GAABOUB, I. A.**
Standard Curves for Nuvacron, Malathion, Sevin, DDT, and Kelthane Tested Against the Mosquito Culex Pipiens L. and the Microcrustacean Daphnia Magna Straus,
W75-11082 5B

**GANGSTAD, E. O.**
Registration of Aquatic Herbicides,
W75-11212 4A

**GANGWAR, M. S.**
Effect of Soil-Water Relations on the Root Porosity, Transpiration and Ion Uptake in Rice,
W75-10916 3F

**GARTON, J. E.**
Improved Design and Operating Criteria for Rural Water Districts,
W75-11056 6D

**GATI, P.**
Papermaking Complex at Dunaujvaros (Hungary) -- Preserving the Danube (Au complexe papetier de Dunaujvaros -- preserver le Danube),
W75-11333 5D

**GEISTERT, W.**
System for Optimal Pressure Control in a Multi-Stage Evaporation Unit,
W75-11070 3A

**GERLT, J. L.**
Distribution-System Operation Analysis Model
W75-11180 5D

**GERMON, J-C.**
The Use of Soil as a Purifying System (L'Utilisation du sol Comme Systeme Epurateur),
W75-11126 5D

**GHILDYAL, B. P.**
Effect of Soil-Water Relations on the Root Porosity, Transpiration and Ion Uptake in Rice,
W75-10916 3F

**GHOSH, S.**
Anaerobic Acidogenesis of Wastewater Sludge,
W75-10976 5I

**GIESEL, J. T.**
Impact of Thermal Effluent from Steam-Electric Station on a Marshland Nursery Area during the Hot Season,
W75-11032 5C

**GIFFORD, G. S.**
Approximate Annual Water Budgets of Two Chained Pinyon-Juniper Sites,
W75-10896 4

**GILBERT, E.**
Man's Impact on a Newly Formed Reservoir,
W75-11233 5

**GINSBERG, M. H.**
Map Showing Depth to Bedrock, Mount Carmel Quandrangle, Connecticut,
W75-10954 7

**GITCHEL, W. B.**
Carbon Regeneration by Wet Air Oxidation,
W75-10988 5

**GLENN, N. L.**
Advanced Techniques in the Mathematical Modeling of Water-Distribution Systems,
W75-11183

**GLOOSCHENKO, W. A.**
Primary Production in Lakes Ontario and Erie A Comparative Study,
W75-11217

**GLOVER, J. R.**
Investigation of the Operating Characteristics of the Iowa Sediment Concentration Measuring System,
W75-11163

**GODFREY, P. J.**
A Computer Program Package for Aquatic Ecologists,
W75-10908

**GOLD, K.**
The Role of Planktonic Protozoa in the Marine Food Chain. Seasonal Changes, Relative Abundance, and Cell Size Distribution of Tintinnida,
W75-11191

**GOULD, B. W.**
Problems of Liquid Waste Disposal,
W75-11112

**GRABOW, W. O. K.**
Drug Resistant Coliforms Call for Re-Evaluation of Water Quality Standards,
W75-11130

DY, C. P. L.
mperature Effects on Microbial Growth in TR's,
75-10968 5D

FFIN, P.
nitations of Using a Simulation Model of the l Under Irrigated Cultivation to Simulate the nctioning of the Soil as a Purifying System mites D'Utilisation D'Un Modele de Com-tement du sol sous Culture Irriguee Pour uler le Fonctionnment du sol Comme teme Epurateur),
5-11125 5B

: Use of Soil as a Purifying System Utilisation du sol Comme Systeme Epu-ur),
5-11126 5D

N, R. L.
siderations for Preparation of Operation Maintenance Manuals,
5-11317 5D

G, I. R. M.
ation Devices: The Manufacturer's View-t,
-11121 5D

, R. L.
cts of Some Components of Crude Oil on g Coho Salmon,
-11088 5C

E, J. O.
ratus for Concentration of Volatile Or- Pollutants in Water,
11342 5A

RA, L. V.
rated Controls on Noxious Aquatic Plants,
11204 5G

IER, F. J.
puter Systems and Water Resources,
11174 6A

, V. L.
Variant Characteristics of Selected ewater Treatment Plants of Nevada,
1245 5D

C. A.
ding Meat Packing Facilities to Reduce ion. (Part 2). Waste Treatment,
1321 5D

, G. F.
pution-System Operation Analysis Model,
1180 5D

R. M.
sful Irrigation: Preparation, Realization, itation, (Savoir Irriguer: Preparation, ation, Exploitation),
0874 3F

OM, B. E.
ffects of Crude Oils and the Dispersant 8666 on Sea Urchin Gametes and Emb-
5C

fects of Oil Dispersants on the Cell in ation and Development,
091 5C

R.
tudies on Nitrification in the Activated Process,
961 5D

HALL, J. R.
A Survey of Fishes and Commercial Invertebrates of the Nearshore and Estuarine Zone Between Cape Romano and Cape Sable, Florida,
W75-11189 2I

HALLIDAY, J.
Adjudicating Tenders for Aeration Devices: Best Value and Reliability,
W75-10972 5D

HANDMAN, E. H.
Contour Map of the Bedrock Surface, New Britain Quadrangle, Connecticut,
W75-10950 7C

Map Showing Depth to Bedrock, Mount Carmel Quandrangle, Connecticut,
W75-10954 7C

HANF, E. N.
Upgrading Metal-Finishing Facilities to Reduce Pollution. (Part 1). In-Process Pollution Abatement,
W75-11324 5D

HANKS, A. R.
Biomagnification of Dieldrin Residues by Food Chain Transfer from Clams to Blue Crabs Under Controllied Conditions,
W75-11135 5C

HANSHAW, B. B.
Determination of Regional Hydraulic Conductivity Through Use of C-14 Dating of Groundwater,
W75-10930 2F

HANSMANN, E. W.
Man's Impact on a Newly Formed Reservoir,
W75-11233 5C

HARANG, D.
The Louisiana Environmental Management System and Its Utility in Water Resource Planning,
W75-11177 5G

HARDY, C. D.
Surface Tension Reductions and Urban Wastes in The New York Bight,
W75-10927 5B

HARLEMAN, D. R. F.
Experimental Study of the Cooling Water System, Setubal Power Plant, Rio Sado, Portugal,
W75-10855 5B

HARP, J. F.
Deprivation Contribution and Interference Effects of Multiple Wells in a Common Aquifer,
W75-11142 4B

HARPE, T.
Treatment Methods of Groundwater Containing a Large Quantity of Humic Acid (Aufbereitungsversuche an einem stark huminstoffbelasteten Tiefengrundwasser),
W75-11117 5D

HART, F. L.
Measures of Biodegradability and Refractory Organics in Wastewaters: (Analysis, Interpretation, and Application of Measurement Techniques),
W75-11103 5D

HAUBOLD, R. G.
Approximation for Steady Interface Beneath a Well Pumping Fresh Water Overlying Salt Water,
W75-11255 4B

HAUSHILD, W. L.
Use of Productivity of Periphyton to Estimate Water Quality,
W75-10936 5B

HAVENS, J. S.
An Appraisal of Potential Water Salvage in the Lake McMillen Delta Area, Eddy County, New Mexico,
W75-10941 3B

HEDSTROEM, B.
Lamella Sedimentation: A Compact Separation Technique,
W75-10989 5D

HEIDBREDER, G. A.
A Waterborne Gastroenteritis Epidemic in Pico Rivers, California,
W75-11005 5F

HEIP, C.
A Note on Salinity and Temperature in Some Moroccan Brackish Waters,
W75-10997 2L

HELGESEN, J. O.
Water Resources of the Lower St. Croix River Watershed, East-Central Minnesota,
W75-10945 7C

Water Resources of the Snake River Watershed, East-Central Minnesota,
W75-10946 7C

HELZ, G. R.
Behavior of Mn, Fe, Cu, Zn, Cd and Pb Discharged from a Wastewater Treatment Plant into an Estuarine Environment,
W75-11160 5B

HERGERT, G. W.
Some Observations Concerning Preparation and Storage of Stream Samples for Dissolved Inorganic Phosphate Analysis,
W75-11336 5A

HERGERT, S. L.
Upgrading Meat Packing Facilities to Reduce Pollution. (Part 2). Waste Treatment,
W75-11321 5D

HETLING, L. J.
Nitrogen Removal by Catalyst-Aided Breakpoint Chlorination,
W75-10965 5D

HICKMAN, M.
The Growth of Some Epiphytic Algae in a Lake Receiving Thermal Effluent,
W75-11225 5C

HIKICHI, M.
Studies on the Relationship Between Dry-Matter Production and the Development of a Pine Forest on Coastal Sand Dunes (1), (In Japanese),
W75-11098 4A

HILL, J. M.
Behavior of Mn, Fe, Cu, Zn, Cd and Pb Discharged from a Wastewater Treatment Plant into an Estuarine Environment,
W75-11160 5B

HILSON, M. A.
Water Treatment for Public Supply,
W75-11119 5F

HIRASAKI, G. J.
Analysis of Factors Influencing Mobility and Adsorption in the Flow of Polymer Solution Through Porous Media,
W75-11275 8B

HIRON, R. W. P.
The Role of Endogenous Abscisic Acid in the Response of Plants to Stress,
W75-11319 3F

HIRONO, S.
Uranium Mineralization by Ground Water in Sedimentary Rocks, Japan.
W75-11145 2F

HOLBO, H. R.
Evapotranspiration of Four Forest Types Measured With the Eddy Correlation Technique,
W75-11044 2D

HONEGGER, R. J.
Vacuum Distillation/Vapor Filtration Water Recovery,
W75-11315 5D

HOPFENBERG, H. B.
Solute-Solute Interactions in Ultrafiltration Treatment of Paper Mill Wastes,
W75-11334 5D

HOPPE, A.
System for Optimal Pressure Control in a Multi-Stage Evaporation Unit,
W75-11070 3A

HORNKE, R.
Measures in the Sulfite Pulp Industry for Decreasing Waste Water Load (Massnahmen der Sulfitzellstoff-Industrie zur Minderung der Abwasserbelastung),
W75-11339 5D

HORWITZ, L. B.
Macroscopic Distribution-System Modeling,
W75-11185 4A

HOUSTON, C. E.
Successful Irrigation: Preparation, Realization, Exploritation, (Savoir Irriguer: Preparation, Realisation, Exploitation),
W75-10874 3F

HOWARD, T. E.
Effluent Characteristics and Treatment of Mechanical Pulping Effluents,
W75-11331 5D

Mill Experience in the Treatment of Mechanical Pulping Effluent,
W75-11332 5D

HOWE, C. W.
An Economic Analysis of the Pollution Problems in the Colorado River Basin: The Upper Main Stem Sub-Basin,
W75-11247 5G

HOY, E. D.
The Measurement and Estimation of Lake Evaporation from Four Australian Water Storages,
W75-11300 2D

HUBERT, W. A.
Seasonal Abundance and Diversity of Benthos in a Southern Illinois, USA Swamp,
W75-11312 2H

HUDSON, J. C.
Aquatic Plant Research and Control in Florida,
W75-11195 4A

HUGGETT, R. J.
Behavior of Mn, Fe, Cu, Zn, Cd and Pb Discharged from a Wastewater Treatment Plant into an Estuarine Environment,
W75-11160 5B

HUMISTON, G. F.
Low Temperature Water Purification System,
W75-11074 5F

HUMMEL, R. J.
Registration of Herbicides for Aquatic Use,
W75-11197 5G

HUMPHREY, R. R.
Phenology of Selected Sonoran Desert Plants at Punta Cirio, Sonora, Mexico.
W75-10862 2I

HUNTER, W. G.
Treatment Plant Monitoring Programs: A Preliminary Analysis,
W75-11176 5D

HURST, W. S.
Note on the Measurement of the Response of Oceanographic Temperature Sensors,
W75-11146 7B

HWANG, C. L.
Design of the Optimal Outfall System for a Stream Receiving Thermal and Organic Waste Discharges,
W75-11137 5B

HYDE, R. M.
Guidelines for Revegetation and Stabilization of Surface Mined Areas in the Western States,
W75-11100 4D

HYDEN, J. W.
Simulation of Water Quality Management Policies,
W75-11181 5G

HYNES, H. B. N.
The Effects of Experimental Blackfly (Diptera: Simuliidae) Larviciding with Abate, Dursban, and Methoxychlor on Stream Invertebrates,
W75-11157 5C

INABA, D.
Some Observations on Behavior of the Treated Sewage Disposed in the Sea,
W75-11020 5B

INOUE, M.
Practical Application of Surface Fixed-System for Multi-Purpose Sprinkler Irrigation Uses, (In Japanese),
W75-11097 3F

ISGARD, E.
Underground Wastewater Treatment Plants,
W75-10974 5D

ISHIGURO, M.
A Planning of Catchment Sewerage for Oyodo River (In Japanese),
W75-11113 5D

ISHIHARA, T. S.
Studies on Toxicity of Sodium Nifurstyrenate (NFS-NA) in Cultured Yellowtail (In Japanese),
W75-11034 5C

ISHIHARA, Y.
Device for Automatic Determination Suspended Solids Content in Water,
W75-11063

JACKSON, F. H.
Mobile Unit for Treating Liquid Waste,
W75-11073

JACKSON, I. J.
Aspects of Rainfall Measurement in a New gland Location,
W75-11309

JACOBSON, A. R.
Wastewater Treatment Using Algae and temia,
W75-10967

JACOBY, G. C.
Impact of Energy Development on the La the Colorado River,
W75-10869

JAKOBSEN, P.
Natural and Fertilizer Nitrogen in Streams Lakes,
W75-11311

JANICKE, I. J.
Tensids (Syndets) and the Water Poll Problem, (Gesund-Heitliche Aspekte Des sid-Gebrauchs),
W75-11134

JAWED, M.
Ammonia Excretion by Zooplankton an Significance to Primary Productivity D Summer,
W75-11187

JEH, S. Y.
Effects of Irrigation in Rain-Fed Fields o Growth and Yield of Upland Rice Varietie Korean),
W75-10853

JIRKA, G.
Experimental Study of the Cooling System, Setubal Power Plant, Rio Sado, gal,
W75-10855

JOBSON, H. E.
Stochastic Analysis of Particle Movemen a Dune Bed,
W75-10942

JOENSEN, A. H.
Oil Pollution and Seabirds in Denmark 1968,
W75-10893

JOHNSEN, T. N. JR.
Effects of Pinyon-Juniper Removal on Resource Products and Uses in Arizona,
W75-10886

JOHNSON, A. H.
Some Observations Concerning Prej and Storage of Stream Samples for D Inorganic Phosphate Analysis,
W75-11336

JOHNSON, F. L.
Guidelines for the Identification of I Environmental Impacts in the Construc Operation of a Reservoir,
W75-11316

HNSON, R. L.
Finite-Element Method for Water-Distribution Networks,
W75-11186 4A

HNSON, R. W.
egal and Institutional Problems in the Management of Salinity,
'75-11047 5G

INSON, W. M.
onsiderations for Preparation of Operation d Maintenance Manuals,
75-11317 5D

LEY, R. L.
lorine-Containing Organic Constituents in lorinated Effluents,
75-10970 5D

ES, L. W.
Separator with Coalescing Media,
5-11071 5G

S, M. E.
ferential Release of Water from Arizona wpacks,
5-10860 2C

S, N. B.
ae Removal Using Dissolved Air Flotation,
5-10978 5D

S, P. H.
iew of Conference on Hydrology of Deep imentary Basins,
-10935 5B

S, R. H.
rading Poultry-Processing Facilities to ice Pollution. (Part I). In-Process Pollution cement,
-11328 5D

L. S.
ication of Electrical Analogy to Draw Nets for Sudden Drawdown Conditions in Dams,
11143 8B

TA, S.
Observations on Behavior of the Treated ge Disposed in the Sea,
1020 5B

, Y. P.
ic Conductance Method for in Situ Esti- n of Total Dissolved Solids,
1167 5A

URA, S.
ry Contents in Biologically Preserved nens of Menuke (Sebastes Baramenuke Flammeus),
1078 5A

T.
radation of Components of Pulp Waste nts by Bacteria. (1). Degradation of Kraft (In Japanese),
346 5B

RA, T.
ed Carbon Adsorption Technique for Stage Sewage Water Treatment, (In e),
108 5D

A. I.
ment of Retardation of Salt Water In- in Coastal Aquifers,
958 2F

KASHIWAGI, S.
Studies on Toxicity of Sodium Nifurstyrenate (NFS-NA) in Cultured Yellowtail (In Japanese),
W75-11034 5C

KAWAKAMI, H.
Biodegradation of Components of Pulp Waste Effluents by Bacteria. (1). Degradation of Kraft Lignin (In Japanese),
W75-11346 5B

KAWASAKI, H.
Nozzle Hydraulics in the Trickle Irrigation System--Relation Between Water Temperature and Nozzle Flow Rate (In Japanese),
W75-11096 3F

KEEGAN, J. F.
Preventing Backflow in Piping Cross Connections,
W75-11018 5B

KEENEY, D. R.
Concurrent Nitrification-Denitrification at the Sediment-Water Interface as a Mechanism for Nitrogen Losses from Lakes,
W75-10902 5C

KEMP, A. L. W.
Preliminary Information on the Nature of Organic Matter in the Surface Sediments of Lakes Huron, Erie, and Ontario,
W75-11240 2J

KENNEDY, E. M.
The Responsibility of U.S. Water Suppliers,
W75-10856 5G

KENNEDY, J. L.
'Self-Tapping Screw' Bit Would Use Lighter Weights,
W75-11283 8C

KEOKOSKY, E.
A Computer Program Package for Aquatic Ecologists,
W75-10908 2H

KHAN, H. M.
Absorption and Elimination of Photodieldrin by Daphnia and Goldfish,
W75-11085 5B

KHAN, M. A. Q.
Absorption and Elimination of Photodieldrin by Daphnia and Goldfish,
W75-11085 5B

KIDD, D. E.
Man's Impact on a Newly Formed Reservoir,
W75-11233 5C

KING, D. L.
Acid Strip Mine Lake Recovery,
W75-11224 5C

Cavitation Control by Aeration of High-Velocity Jets,
W75-11152 8B

KINMAN, R. N.
Water and Wastewater Disinfection with Ozone: A Critical Review,
W75-10956 5D

KINOSHITA, S.
Studies on the Relationship Between Dry-Matter Production and the Development of a Pine Forest on Coastal Sand Dunes (1), (In Japanese),
W75-11098 4A

KIRTON, M. P.
Effects of Some Components of Crude Oil on Young Coho Salmon,
W75-11088 5C

KLARER, D. M.
The Growth of Some Epiphytic Algae in a Lake Receiving Thermal Effluent,
W75-11225 5C

KLASS, D. L.
Anaerobic Acidogenesis of Wastewater Sludge,
W75-10976 5D

KNOLL, J. R.
Registration of Aquatic Herbicides,
W75-11212 4A

KOGA, T.
Mercury Content of Whales, (In Japanese),
W75-11029 5B

KOJIC, M.
Theory of Plasticity of Porous Media with Fluid Flow,
W75-11276 8E

KOOPMAN, F. C.
Estimated Availability of Surface and Ground Water in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico,
W75-10938 4A

KREIDER, J. F.
An Economic Analysis of the Pollution Problems in the Colorado River Basin: The Upper Main Stem Sub-Basin,
W75-11247 5G

KROETZSCH, P.
Aeration by Means of Blast Nozzle--A Possibility for the Aeration of Biological Waste Water Treatment Plants (Die Strahlduesenbegasung--eine Moeglichkeit zur Belueftung biologischer Klaeranlagen),
W75-11124 5D

KRULL, J. N.
Seasonal Abundance and Diversity of Benthos in a Southern Illinois, USA Swamp,
W75-11312 2H

KU, H. F. H.
Streamflow in the New York Part of the Susquehanna River Basin,
W75-10931 2E

KUHN, A.
On-Site Hypochlorite Generation,
W75-11109 5D

KUO, M.
Analysis of Colorado Precipitation,
W75-11040 2B

KURIHARA, M.
Mercury Content of Whales, (In Japanese),
W75-11029 5B

KYES, W. K.
City/Township Joint Venture--A New Water Plant,
W75-11015 5F

LAFRANCE, D. E.
Low-Flow Characteristics of Selected Streams in Northeastern Washington,
W75-10939 2E

LAGER, D. L.
Computer Algorithms Useful for Determining a Subsurface Electrical Profile Via High Frequency Probing,
W75-10910 8G

LAGUROS, J. G.
Deprivation Contribution and Interference Effects of Multiple Wells in a Common Aquifer,
W75-11142 4B

LANCY, L. E.
Upgrading Metal-Finishing Facilities to Reduce Pollution. (Part 2). Waste Treatment,
W75-11325 5D

LAND, B.
The Toxicity of Drilling Fluid Components to Aquatic Biological Systems, A Literature Review,
W75-11266 5C

LANGFORD, K. J.
Detection of Change in Sequences of Hydrologic Data,
W75-11302 7C

LANTZ, P. M.
Calcium Sulfate Solubility in Brackish Water Concentrates and Applications to Reverse Osmosis Processes: Polyphosphate Additives,
W75-11004 5D

LARSEN, D. C.
Available Water-Holding Capacities of Soils in Southern Idaho,
W75-11140 2G

LARSON, D. K.
An Analysis of the Motor-Row Conversion Issue of Colorado River Float Trips,
W75-10867 6B

LARSON, T. E.
Corrosion by Domestic Waters,
W75-11062 5F

LAWRENCE, M. J.
Acute Toxicity of Petrochemical Drilling Fluids Components and Wastes to Fish,
W75-11265 5C

LAWRENCE, R. J.
Drilling Rate Affects Costs More than Bit Life,
W75-11279 8C

LE COMPTE, A. R. JR.
Aerobic Lagoon Waste Treatment System and Method,
W75-11069 5D

LEE, B. K.
Stochastic Analysis of Particle Movement Over a Dune Bed,
W75-10942 2J

LEE, G. F.
Dissolved Gas Supersaturation and Dilution in Thermal Plumes from Steam Electric Generating Stations,
W75-11159 5B

LEE, J.
Experimental Study of the Cooling Water System, Setubal Power Plant, Rio Sado, Portugal,
W75-10855 5B

LEENDERTSE, J. J.
A Three-Dimensional Model for Estuaries and Coastal Seas: Vol. II, Aspects of Computation,
W75-10900 2L

LEGAZ, G. J.
Social Impacts of Water Resources Developments and Their Implication for Urban and Rural Development: A Post Audit Analysis of the Weber Basin Project in Utah,
W75-10854 6B

LELAND, H. V.
Heavy Metals and Other Trace Elements,
W75-10934 5B

LENGYEL, A. L.
Mobile Unit for Treating Liquid Waste,
W75-11073 5D

LESLIE, R. G.
Mill Experience in the Treatment of Mechanical Pulping Effluent,
W75-11332 5D

LEWIS, D. S. C.
The Effects of the Formation of Lake Kainji (Nigeria) Upon the Indigenous Fish Population,
W75-11223 5C

LEWIS, R. A.
Detection of Change in Sequences of Hydrologic Data,
W75-11302 7C

LIANG, H. C.
Effect of Pressure Gradient on Wind-Waves in a Laboratory Channel,
W75-11093 8B

LIGHTSEY, G. R.
Bark as Trickling-Filter Dewatering Medium for Pulp and Paper Mill Sludge,
W75-11241 5D

LIN, J. D.
Effect of Pressure Gradient on Wind-Waves in a Laboratory Channel,
W75-11093 8B

LIN, S. D.
Concentration and Genera of Algae in Selected Illinois Streams, 1971-1973,
W75-11165 5A

LIN, S. H.
Design of the Optimal Outfall System for a Stream Receiving Thermal and Organic Waste Discharges,
W75-11137 5B

LINDALL, W. N.
A Survey of Fishes and Commercial Invertebrates of the Nearshore and Estuarine Zone Between Cape Romano and Cape Sable, Florida,
W75-11189 2I

LINDHOLM, G. F.
Water Resources of the Lower St. Croix River Watershed, East-Central Minnesota,
W75-10945 7C

Water Resources of the Snake River Watershed, East-Central Minnesota,
W75-10946 7C

LINDSEY, H. E. JR.
Techniques for Linear Tie-Back Cementing,
W75-11277 8F

LIU, D.
Application of the Manometric Technique in the Study of Sediment Oxygen Depletion,
W75-11222 5C

LIU, D. L. S.
Microbiological Examination of Offshore Lal Erie Sediments.
W75-11218

LIU, S-K.
A Three-Dimensional Model for Estuaries a Coastal Seas Vol II. Aspects of Computatio
W75-10900

LOCHER, F. A.
Investigation of the Operating Characteris of the Iowa Sediment Concentration Measur System,
W75-11163

LOFTFIELD, R. E.
Electrolytic Sea Water Process,
W75-11068

LOHMANN, J.
The Economy of Various Methods for watering Sludge From Biological Purifica (Ueber die Wirtschaftlichkeit verschiede Verfahren zur Entwaesserung biologischem Klaerschlamm),
W75-11127

LOHSE, A.
Stabilization and Reconstruction of T Coastal Foredunes with Vegetation,
W75-10887

LONDQUIST, C. J.
Map Showing Depth to Bedrock, Ch Quadrangle, Massachusetts,
W75-10953

Map Showing Depth to Bedrock, Green Quadrangle, Massachusetts,
W75-10952

Map Showing Depth to Bedrock, Worthi Quadrangle, Massachusetts,
W75-10951

LONGWELL, A. C.
Effects of Ozone-Treated Seawater o Spawned, Fertilized, Meiotic, and Cl Eggs of the Commercial American Oyster
W75-11256

LONNING, S.
The Effects of Crude Oils and the Disp Corexit 8666 on Sea Urchin Gametes and ryos,
W75-11090

The Effects of Oil Dispersants on the Fertilization and Development,
W75-11091

LOUGH, R. G.
A Reevaluation of the Combined Eff Temperature and Salinity on Surviv Growth of Bivalve Larvae Using R Surface Techniques,
W75-11081

LUEDTKE, J. R.
The Awareness of the Relevant Resources Literature by the Personne Wisconsin Department of Natural Reso
W75-10899

LUNDKVIST, S.
Water Conservation in Sweden: III. Trends,
W75-10987

LURVEY, C. F.
Consolidation and Rehabilitation of Canals in Poudre Valley,
W75-11061 4A

LYTLE, R. J.
Computer Algorithms Useful for Determining a Subsurface Electrical Profile Via High Frequency Probing,
W75-10910 8G

MACAGNO, E. O.
Thermal Response of Heated Streams, Solution by the Implicit Method,
W75-10909 5B

MACAULAY, H. H.
Simulation of Water Quality Management Policies,
W75-11181 5G

MACKAY, W. C.
Effect of DDT and M.S. 222 on Learning a Simple Conditioned Response in Rainbow Trout (Salmo gairdneri),
W75-11025 5C

MACLEAN, S. A.
Effects of Ozone-Treated Seawater on the Spawned, Fertilized, Meiotic, and Cleaving Eggs of the Commercial American Oyster,
W75-11256 5C

MACNISH, R. D.
Streamflow in the New York Part of the Susquehanna River Basin,
W75-10931 2E

MACON, J. A.
Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 1). In-Process Pollution Abatement,
W75-11328 5D

MADSEN, G. E.
Social Impacts of Water Resources Developments and Their Implication for Urban and Rural Development: A Post Audit Analysis of the Weber Basin Project in Utah,
W75-10854 6B

MADSEN, R. L.
The Influence of Rainfall on the Reproduction of Sonoran Desert Lagomorphs,
W75-10871 4A

MAHONEY, L. E.
Waterborne Gastroenteritis Epidemic in Pico Rivers, California,
W75-11005 5F

MAIS, G. V. R.
Aeration Devices: Basic Theory,
W75-10971 5D

MALCUS, B. A.
A Simple and Inexpensive Technique for Determining Colored Light Intensity Underwater,
W75-10919 7B

MALIC, C.
Papermaking Complex at Dunaujvaros (Hungary) -- Preserving the Danube (Au complexe papetier de Dunaujvaros -- preserver le Danube),
W75-11333 5D

MANNER, R. H.
Minor and Trace Elements, Gas, and Isotope Compositions of the Principal Hot Springs of Nevada and Oregon,
W75-10937 2K

MARR, B. E.
Water Resources,
W75-11003 5G

MARSHALL, C. R.
Upgrading Meat Packing Facilities to Reduce Pollution. (Part 3). Choosing the Optimum Financial Strategy,
W75-11322 5D

MARSHALL, W. L.
Calcium Sulfate Solubility in Brackish Water Concentrates and Applications to Reverse Osmosis Processes: Polyphosphate Additives,
W75-11004 5D

MARTIN, P. H.
Dissolved Gas Supersaturation and Dilution in Thermal Plumes from Steam Electric Generating Stations,
W75-11159 5B

MARTINEC, J.
Subsurface Flow from Snowmelt Traced by Tritium,
W75-10921 2F

MASQATI, M. S.
A Mathematical Model for Optimal Waste Load Allocations,
W75-11102 5G

MATALAS, N. C.
Relative Importance of Decision Variables in Flood Frequency Analysis,
W75-10929 4A

MATEI, S.
Endemic Nephrophathy and Its Relation to the Contamination of Well Water by Phenolic Compounds in Barsa-Arad (Nefropatia Endemica Si Relatia Cu Impurificarea Prin Compousi Fenolici in Apele Fintinilor Din Comuna Barsa-Arad),
W75-11105 5B

MATHIS, B. J.
Species Diversity of Benthic Macroin-Vertebrates and Limnological Conditions in a 1st Order Mountain Stream,
W75-10918 2I

MATTSON, M. E.
Membrane Desalting Gets Big Push,
W75-10982 3A

MAYER, F. L. JR.
Toxaphene Effects on Growth and Bone Composition of Fathead Minnows, Pimephales Promelas,
W75-11026 5C

MCCOLL, W. D.
The Utilization of Sun-Glint in a Study of Lake Dynamics,
W75-11239 5A

MCCORQUODALE, J. A.
Wave Motion in Rockfill,
W75-10924 8D

MCCUEN, R. H.
Flood Runoff from Urban Areas,
W75-10904 5B

MCDOLE, R. E.
Available Water-Holding Capacities of Soils in Southern Idaho,
W75-11140 2G

MCELROY, A. D.
Water Pollution from Nonpoint Sources,
W75-11158 5B

MCGEHEE, J. T.
Operation Clean Sweep,
W75-11192 5G

MCLAUGHLIN, D. K.
Hydraulic Modeling of Mixing Phenomena in Stratified Lakes,
W75-11043 2H

MCLUSKY, D. S.
Some Effects of Copper on the Polychaete Phyllodoce Maculata,
W75-11136 5C

MCMAHON, T. A.
Variability, Persistence and Yield of Australian Streams,
W75-11308 2E

MCMASTER, G. M.
Available Water-Holding Capacities of Soils in Southern Idaho,
W75-11140 2G

MCNICHOLL, P. G.
Effect of DDT and M.S. 222 on Learning a Simple Conditioned Response in Rainbow Trout (Salmo gairdneri),
W75-11025 5C

MEDINA TORRES, J. G.
Seasonal Variations in the Infiltration Rate of a Whitehouse Soil in Southern Arizona,
W75-10873 2G

MEHRLE, P. M.
Toxaphene Effects on Growth and Bone Composition of Fathead Minnows, Pimephales Promelas,
W75-11026 5C

MEI, C. C.
Effects of Entrance Loss on Harbor Oscillations,
W75-11147 8B

MEIDL, J. A.
Carbon Regeneration by Wet Air Oxidation,
W75-10988 5D

MERKLE, M. G.
Occurrence of 2, 4, 5-T and Picloram in Surface Runoff Water in the Blacklands of Texas,
W75-10895 5B

MEYER, R. L.
Biochrome Analysis as a Method for Assessing Phytoplankton Dynamics, Phase II,
W75-11052 5C

MIDDLEBROOKS, E. J.
Algae Removal Using Dissolved Air Flotation,
W75-10978 5D

Optimum Values for Operational Variables in Turbidity Removal,
W75-11110 5D

MIDDLETON, R. C.
Electrical Tests for Submersible Pumps,
W75-11260 8G

MILLER, A. G.
An Investigation of Glycolate Excretion in Two Species of Blue-Green Algae,
W75-11230 5C

MILLER, W. A. JR.
Laboratory Investigation of One-Dimensional Wave Motion in Open Channels,
W75-11172 8B

MILLION, C. L.
Conoco Technology Curbs Production Pollution,
W75-11267 5G

MIRONOV, O. G.
Influence of Oil on Nucleic Acids of Algae,
W75-11080 5C

Influence of Oil on Nucleic Acids of Algae,
W75-11232 5C

MISRA, A. P.
Application of Electrical Analogy to Draw Flow Nets for Sudden Drawdown Conditions in Earth Dams,
W75-11143 8B

MITCHELL, A. L. JR.
Wind Effects on Chemical Films for Evaporation Suppression at Lake Hefner,
W75-10920 3B

MIYAHARA, S.
Studies on the Inorganic Components of Marine Animals-III, on the Contents of Cadmium, Zinc, Copper, Lead and Iron in Muscle and Viscera of Marine Animals Captured in the West Sea Area of Kyushu, (In Japanese),
W75-11087 5C

MIYAMOTO, S.
Salt and Specific Ion Effects on Germination of Four Grasses,
W75-10894 2K

MOLENAAR, D.
The Hydrologic Cycle--As Applicable to the Pacific Northwest,
W75-10949 7C

MONDSHINE, T. C.
Tests Show Potassium Mud Versatility,
W75-11284 8G

MOORE, J. E.
Primary Production in Lakes Ontario and Erie: A Comparative Study,
W75-11217 5C

MOORE, P. L.
Casing-Seat Testing - Why and How,
W75-11291 8F

MORETTI, P. M.
Hydraulic Modeling of Mixing Phenomena in Stratified Lakes,
W75-11043 2H

MORIARTY, C. M.
Quantitative Estimation of the Daily Ingestion of Phytoplankton by Tilapia Nilotica and Haplochromis Nigripinnis in Lake George, Uganda,
W75-11268 2H

MORIARTY, D. W. J.
Quantitative Estimation of the Daily Ingestion of Phytoplankton by Tilapia Nilotica and Haplochromis Nigripinnis in Lake George, Uganda,
W75-11268 2H

MORRIS, A. W.
The Accumulation of Cadmium, Copper, Manganese and Zinc by Fucus Vesiculosus in the Bristol Channel,
W75-11083 5B

MORROW, J. E.
Effects of Some Components of Crude Oil on Young Coho Salmon,
W75-11088 5C

MORTIMER, C. H.
Investigation of the Influence of Thermal Discharge from a Large Electric Power Station on the Temperature and Near-Shore Circulation of Lake Michigan,
W75-11190 5C

MORTIMER, G. H.
Could The Sea be Used to Store Water for Supply.--A Possible Scheme,
W75-11129 4A

MOXHAM, R. L.
Geochemical Reconaissance of Surficial Materials in the Vicinity of Shawangunk Mountain, New York,
W75-10928 5A

MUCK, R. E.
Temperature Effects on Microbial Growth in CSTR's,
W75-10968 5D

MULINO, M. A.
Epifaunal Invertebrates as Indicators of Water Quality in Southern Lake Pontchartain,
W75-10852 5C

MUNAWAR, M.
Primary Production in Lakes Ontario and Erie: A Comparative Study,
W75-11217 5C

MURASE, T.
Slurry Deliquoring by Expression,
W75-10969 5D

MUROOKA, H.
Some Observations on Behavior of the Treated Sewage Disposed in the Sea,
W75-11020 5B

MURRAY, R. A.
A Waterborne Gastroenteritis Epidemic in Pico Rivers, California,
W75-11005 5F

MUSICK, H. B.
Barrenness of Desert Pavement in Yuma County, Arizona,
W75-10868 2G

MUSTATA, N.
Endemic Nephrophathy and Its Relation to the Contamination of Well Water by Phenolic Compounds in Barsa-Arad (Nefropatia Endemica Si Relatia Cu Impurificarea Prin Compousi Fenolici in Apele Fintinilor Din Comuna Barsa-Arad),
W75-11105 5B

MYREEN, B.
Treating Effluents from a Sulphite Pulp Mill by Flotation,
W75-11347 5D

NADER, W.
Formulation of Boundary Conditions at the Surface of a Porous Medium,
W75-11269 8B

NAGAKURA, K.
Mercury Content of Whales, (In Japanese),
W75-11029 5B

NAGAYA, Y.
A Field Study of Physico-Chemical States of Artificial Radionuclides in Seawater,
W75-11022 5B

NAKAJIMA, S.
Improved Design of Distribution Networks by Minimum Route,
W75-11175 4A

NAKAMURA, K.
A Field Study of Physico-Chemical States of Artificial Radionuclides in Seawater,
W75-11022 5B

NAKATO, T.
Investigation of the Operating Characteristics of the Iowa Sediment Concentration Measuring System,
W75-11163 2J

NAKAYAMA, N.
Device for Automatic Determination of Suspended Solids Content in Water,
W75-11063 5A

NANCOLLAS, G. H.
The Kinetics of Crystallization of Scale-Forming Minerals,
W75-11273 8C

NARAYAN, L. V.
Biological Control: Isolation and Bacterial Oxidation of the Taste-and-Odor Compound Geosmin,
W75-11013 5

NARKIS, N.
The Mechanism of Flocculation Processes the Presence of Humic Stubtances,
W75-10958 5

NASSER, M. S.
Wave Motion in Rockfill,
W75-10924 8

NEAL, G.
Formulation of Boundary Conditions at t Surface of a Porous Medium,
W75-11269

NEBGEN, J. W.
Water Pollution from Nonpoint Sources,
W75-11158

NEELEY, A. B.
Chemical-Biological Treatment With Biolog Filters,
W75-11123

NELSON, S.
A Solution to Pump Stoppages,
W75-11111

NELSON, W. E.
Solid Wastes, Animal Refuse, and Org Residues Disposal, and the Quality of Gr Water,
W75-11244

NEMATI, N.
Shrub Transplanting for Watershed Ma ment and Range Improvement in Iran,
W75-10870

NEUDORF, S.
Absorption and Elimination of Photodield Daphnia and Goldfish,
W75-11085

NEUFELD, R. D.
Wastewater Treatment Plant Odors: A Co ing Enigma,
W75-10986

EVERIL, R. B.
Vacuum Distillation/Vapor Filtration Water Recovery,
W75-11315 5D

ICHOLS, T. M.
How to Estimate and Escalate Costs of Wastewater Equipment,
W75-11014 5D

CHOLSON, S. A.
Root:Shoot and Leaf Area Relationships of Macrophyte Communities in Chautauqua Lake, New York,
W75-11009 5C

LSSON, L.
ndustry and Community in Cooperation,
W75-10985 5D

SSEN, J. A.
Preserving Activated Sludge,
V75-10962 5D

MURA, Y.
ractical Application of Surface Fixed-System or Multi-Purpose Sprinkler Irrigation Uses, (In apanese),
/75-11097 3F

RRIS, L. E.
issipation of Residues of Phenoxy Herbicides pplied to the Watershed,
75-11213 5B

RRMAN, G.
eating Effluents from a Sulphite Pulp Mill by otation,
75-11347 5D

OSAD, C. J.
uatic Plant Control on Lake Corpus Christi,
75-11194 5G

ACKI, H.
onomics of Great Lakes Shipping in an Extded Season,
5-11248 6C

KI, Y.
dies on the Inorganic Components of rine Animals-III, on the Contents of Cadmi- Zinc, Copper, Lead and Iron in Muscle Viscera of Marine Animals Captured in the st Sea Area of Kyushu, (In Japanese),
5-11087 5C

Z, W. J.
ogical Control: Isolation and Bacterial Oxon of the Taste-and-Odor Compound smin,
-11013 5F

ER, W. L.
sture and Energy Conditions in a Draining Mass,
-11054 2G

NELL, P. F.
cts of Pinyon-Juniper Removal on Natural urce Products and Uses in Arizona,
10886 3B

LIVAN, D. A.
vative Process Treats Wastewater,
10975 5D

C. E.
ontal Groundwater Collectors, 'Canada's st Water Well',
10999 8B

ODA, K.
Water Treatment by Ozone, (In Japanese),
W75-11107 5D

OGASAWARA, R.
Studies on the Relationship Between Dry-Matter Production and the Development of a Pine Forest on Coastal Sand Dunes (1), (In Japanese),
W75-11098 4A

OGG, C. W.
Acid Strip Mine Lake Recovery,
W75-11224 5C

OKADA, Y.
Advanced Wastewater Treatment (In Japanese),
W75-11114 5D

OLSEN, A. E.
Upgrading Metal-Finishing Facilities to Reduce Pollution. (Part 1). In-Process Pollution Abatement,
W75-11324 5D

OPACIC, D. J.
Mobile Unit for Treating Liquid Waste,
W75-11073 5D

ORR, H. K.
Watershed Management in the Black Hills: The Status of Our Knowledge,
W75-11318 4D

OSEID, D. M.
Factors Influencing Acute Toxicity Estimates of Hydrogen Sulfide to Freshwater Invertebrates,
W75-11027 5C

OSTROFF, A. G.
Subsurface Water -- Tool for Petroleum Exploration,
W75-11289 4B

PAGE, G. L. JR.
Considerations for Preparation of Operation and Maintenance Manuals,
W75-11317 5D

PAILY, P. P.
Thermal Response of Heated Streams, Solution by the Implicit Method,
W75-10909 5B

PALMER, J. D.
How to Conduct Corrosion Tests,
W75-11292 8G

PANZER, H. P.
Process for Raw Water Clarification,
W75-11072 5F

Process for Treating Industrial Wastes
W75-11066 5D

Process for Treating Industrial Wastes,
W75-11067 5D

Process for Treating Sewage Sludge,
W75-11064 5D

PARTINGTON, G. L.
Interference of Sulfate Ion on SPADNS (Sodium 2-(Sulfophenylazo)-1,8-Dihydroxynaphthalene-3,6-Disulfonate) Colorimetric Determination of Fluorine in Waste Waters,
W75-11343 5A

PASHLEY, A. E.
In Situ Measurement of the Settling Velocity Profile of Particulate Organic Carbon in Lake Ontario,
W75-11227 5C

PATANKAR, U. M.
Upgrading Meat Packing Facilities to Reduce Pollution. (Part 3). Choosing the Optimum Financial Strategy,
W75-11322 5D

PATTON, C. C.
Dissolved Gases Are Key Corrosion Culprits,
W75-11274 8G

PAUL, S. K.
Electrolytic Control of Algae,
W75-11228 5F

PEARCE, D.
Non-Renewable, Non-Energy Resources,
W75-11253 6B

PERRY, P. F.
Hierarchial Model for Water-Supply-System Control,
W75-10996 4A

PETROCELLI, S. R.
Biomagnification of Dieldrin Residues by Food Chain Transfer from Clams to Blue Crabs Under Controllled Conditions,
W75-11135 5C

PFANNKUCH, H. O.
Study of Criteria and Models Establishing Optimum Level of Hydrogeologic Information for Groundwater Basin Management,
W75-11042 2F

PHILLIPS, C. N. K.
Some Effects of Copper on the Polychaete Phyllodoce Maculata,
W75-11136 5C

PILGRIM, D. H.
Difficulties in Gauging Small Catchments - A Case Study,
W75-11306 2E

PILKINGTON, P. E.
How to Find Transition Zones in Soft Formations,
W75-11285 8G

PILLSBURY, A. F.
Sprinkler Irrigation Practice, (La Pratique De L'Irrigation Par Aspersion),
W75-10875 3F

PIONKE, H. G.
Extraction and Analytical Techniques for Pesticides in Soil, Sediment, and Water,
W75-11236 5A

POELS, C. L. M.
Continuous Automatic Monitoring of Surface Water with Fish,
W75-11079 5A

POIRRIER, M. A.
Epifaunal Invertebrates as Indicators of Water Quality in Southern Lake Pontchartain,
W75-10852 5C

POON, C. P. C.
Physiochemical Treatment of Wastewater-Seawater Mixture by Electrolysis,
W75-10979 5D

POPE, G. A.
Analysis of Factors Influencing Mobility and Adsorption in the Flow of Polymer Solution Through Porous Media,
W75-11275 8B

POPP, K. H.
Aeration by Means of Blast Nozzle--A Possibility for the Aeration of Biological Waste Water Treatment Plants (Die Strahlduesenbegasung--eine Moeglichkeit zur Belueftung biologischer Klaeranlagen),
W75-11124 5D

PRASAD, R. K.
A Practical Way to Find Minimum Drainage Area for a Well,
W75-11290 4B

PREJS, A.
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. IV. Feeding of Introduced and Autochthonous Non-Predatory Fish,
W75-11234 5C

PRESSER, T. S.
The Minor and Trace Elements, Gas, and Isotope Compositions of the Principal Hot Springs of Nevada and Oregon,
W75-10937 2K

PRICE, R. K.
The Design of Storm Water Drainage Channels Using Mathematical Model Techniques,
W75-11150 8B

PROZESKY, O. W.
Drug Resistant Coliforms Call for Re-Evaluation of Water Quality Standards,
W75-11130 5B

PYTKOWICZ, R. M.
Near-Bottom Chemistry in the Eastern Pacific and North Atlantic Oceans,
W75-10923 2K

RAIBLE, R. W.
Survival and Growth Rate of Channel Catfish as a Function of Dissolved-Oxygen Concentration,
W75-11051 5C

RANDALL, A. D.
Streamflow in the New York Part of the Susquehanna River Basin,
W75-10931 2E

RANDALL, J. H.
Hydrogeology and Water Resources of Middle Kirkland Creek Basin, Yavapai County, Arizona,
W75-10872 4B

RAPP, J. B.
The Minor and Trace Elements, Gas, and Isotope Compositions of the Principal Hot Springs of Nevada and Oregon,
W75-10937 2K

RAWASH, I. A.
Standard Curves for Nuvacron, Malathion, Sevin, DDT, and Kelthane Tested Against the Mosquito Culex Pipiens L. and the Microcrustacean Daphnia Magna Straus,
W75-11082 5B

REBHUN, M.
The Mechanism of Flocculation Processes in the Presence of Humic Stubtances,
W75-10958 5D

REDDY, M. M.
The Kinetics of Crystallization of Scale-Forming Minerals,
W75-11273 8G

REILAND, L. J.
Estimated Availability of Surface and Ground Water in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico,
W75-10938 4A

Estimated Mean-Monthly and Annual Runoff at Selected Sites in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico,
W75-10943 2E

REMUS, G. A.
Vacuum Distillation/Vapor Filtration Water Recovery,
W75-11315 5D

RICE, R. L.
Upgrading Metal-Finishing Facilities to Reduce Pollution. (Part 2). Waste Treatment,
W75-11325 5D

RICHARDSON, C.
Occurrence of 2, 4, 5-T and Picloram in Surface Runoff Water in the Blacklands of Texas,
W75-10895 5B

RICHARDSON, L. V.
Water Level Manipulation: A Tool for Aquatic Weed Control,
W75-11216 4A

RIKE, J. L.
How to Make Squeeze Cementing Successful,
W75-11286 8F

RIORDAN, M. A.
Basic Concepts and Practical Aspects of Corrosion Investigation,
W75-11271 8G

ROBBINS, C. W.
Use of Amendments to Reduce Water Requirements for Stand Establishment of Small-Seeded Crops,
W75-11045 3F

ROBERTS, B. R.
Two-Dimensional, Hydrostatic Simulation of Thermally-Influenced Hydrodynamic Flows,
W75-10901 2H

ROBERTS, K. P.
Australian Arid Zone Streangauging,
W75-11307 2E

ROBINSON, B. P.
Quality of Water in Aquifers of the Amargosa Desert and Vicinity, Nevada,
W75-10932 5B

ROBINSON, L. R. JR.
How Silica Affects Iron Removal from Groundwater,
W75-11016 5F

ROCHESTER, E. W.
Scheduling and Application Rates of Irrigation in a Humid Climate,
W75-11048 3F

ROE, L. A.
Some Results on Mass Transfer Processes in a Density-Stratified Flow,
W75-11057 8B

ROGERS, J. S.
Epifaunal Invertebrates as Indicators of Water Quality in Southern Lake Pontchartain,
W75-10852 5C

ROMANO, W.
Water System Accessories,
W75-11299 8C

ROSS, S. L.
Oil Spill Technology,
W75-11001 5G

ROTEM, J.
Relations Between Algal Populations and the pH of Their Media,
W75-11028 5C

RUSHING, W. N.
Water Hyacinth Research in Puerto Rico,
W75-11215 5G

RUUHIJARVI, R.
A General Description of the Oligotrophic Lake Paajarvi, Southern Finland, and the Ecological Studies on It,
W75-11229 5C

RYAN, J.
Salt and Specific Ion Effects on Germination of Four Grasses,
W75-10894 2K

SAHA, A. K.
Effect of Soil-Water Relations on the Root Porosity, Transpiration and Ion Uptake in Rice.
W75-10916 3F

SAKAMAKI, Y.
Uranium Mineralization by Ground Water in Sedimentary Rocks, Japan.
W75-11145 2F

SATO, G. K.
Investigation of the Influence of Therma Discharge from a Large Electric Power Statior on the Temperature and Near-Shore Circula tion of Lake Michigan,
W75-11190 5C

SATO, N.
Water Quality Control in Sewage Water Treat ment, (In Japanese),
W75-11133 5I

SCHMIDT, S.
Concurrent Nitrification-Denitrification at th Sediment-Water Interface as a Mechanism fo Nitrogen Losses from Lakes,
W75-10902 5

SCHNEIDER, G.
Changes in Vegetation and Surface Soil Prope ties Following Irrigation of Woodlands wi Municipal Wastewater,
W75-11243

SCHRECK, C. B.
Aquatic Plant Control Using Herbicides in Large Potable Water Supply,
W75-11201

SCHULENBURG, E. L.
A Waterborne Gastroenteritis Epidemic in F Rivers, California,
W75-11005

SEARS, J. W.
The Impact of the Safe Drinking Water Ac Utilities,
W75-10859

OR, G. A.
he Mechanics of Rock Failure Due to Water
t Impingement,
75-11272 8E

INE, T.
ater Quality Control in Sewage Water Treat-
ent, (In Japanese),
75-11133 5D

TZER, R. E.
onomic Analysis of Effluent Guidelines:
eat Packing Industry,
75-11249 5G

GUPTA, S.
e-Sorting During Suspension Transporta-
n--Lognormality and Other Characteristics,
5-11162 2J

ATA, H.
ention of Cadmium in Mice Studied by
ole Body Autoradiography,
5-11024 5A

AYAMA, Z.
dies on the Relationship Between Dry-
ter Production and the Development of a
Forest on Coastal Sand Dunes (1), (In
nese),
-11098 4A

DDO, M.
anced Wastewater Treatment (In
nese),
-11114 5D

TO, M.
y Deliquoring by Expression,
10969 5D

ER, W. W.
gen Removal by Catalyst-Aided Break-
Chlorination,
10965 5D

MA, T. G.
ation, Soil, and Climate on the Green
tains of Vermont,
1021 2I

ER, J. J.
Strip Mine Lake Recovery,
1224 5C

, D. B.
lent Structure Near Smooth Boundary,
1148 8B

L.
ines for Revegetation and Stabilization
ace Mined Areas in the Western States,
100 4D

. S.
al Variation in Composition, Plant
s, and Net Primary Productivity of a
l Grassland at Kurukshetra, India,
006 2I

Conductance Method for in Situ Esti-
of Total Dissolved Solids,
167 5A

. P.
on of Surface Water Lag Time for Con-
Overland Flow,
56 2E

SKOGERBOE, G. V.
An Implicit Approach to Pricing Agricultural Water Transfers to Urban Uses,
W75-11178 4A

SLEATH, J. F. A.
Transition in Oscillatory Flow Over Rippled Beds,
W75-11149 8B

SLY, P. G.
Sediment Processes in Great Lakes,
W75-11237 2J

SMIAROWSKI, J. F.
Floodplain Land-Use Management: An Application of Operations Research Methodology,
W75-11037 6F

SMITH, L. L. JR.
Factors Influencing Acute Toxicity Estimates of Hydrogen Sulfide to Freshwater Invertebrates,
W75-11027 5C

SMITH, L. S.
Drug Resistant Coliforms Call for Re-Evaluation of Water Quality Standards,
W75-11130 5B

SMITH, M. O.
Evapotranspiration of Four Forest Types Measured With the Eddy Correlation Technique,
W75-11044 2D

SMITH, P. A.
Aquatic Weed Field Test Program Using a CO2 Electric Discharge Convection Laser,
W75-11208 5A

SNYDER, R. E.
How Steam is Produced and Handled at the Geyers,
W75-11280 4B

SNYDER, W. M.
Predicting Recessions Through Convolution,
W75-10917 2E

SOMMERFELDT, T. G.
A Pneumatic System to Pump Water from Piezometers,
W75-11257 8C

SOPPER, W. E.
Dissipation of Phenoxy Herbicides Applied to Riparian Vegetation,
W75-11214 5B

SPEISER, P.
Oxidation of Organic Compounds in Water (Oxidation organischer Verbindungen in Wasser),
W75-11118 5D

SPENCER, N. R.
Biological Control of Eurasian Water Milfoil,
W75-11203 4A

SPRING, B. J.
Huntingdon Research Centre Pasveer Oxidation Plant--Six Years On,
W75-11115 5D

SPRINKLE, C. L.
A Study of Factors Controlling the Chemical Quality of Water in Cartwright Creek Basin, Williamson County, Tennessee,
W75-11164 2K

SPROUL, O. J.
Virus Removal and Inactivation During Water Treatment,
W75-10991 5D

STANLEY, J. G.
Unisex Studies on the White Amur,
W75-11205 5C

STANNETT, V. T.
Solute-Solute Interactions in Ultrafiltration Treatment of Paper Mill Wastes,
W75-11334 5D

STARLING, M. B.
A Contribution to the Biology of Nitella Hookeri A. BR. in the Rotorua Lakes, New Zealand. II. Organic Nutrients and Physical Factors,
W75-11235 5C

STASIUK, W. N.
Evidence of Atmospheric Transport of Ozone into Urban Areas,
W75-11169 5A

Nitrogen Removal by Catalyst-Aided Breakpoint Chlorination,
W75-10965 5D

STEFFEN, A. J.
Upgrading Meat Packing Facilities to Reduce Pollution. (Part 1). In-Process Modifications and Pretreatment,
W75-11320 5D

Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 2). Pretreatment of Poultry-Processing Wastes,
W75-11329 5D

STEPHENS, S. K.
The Measurement and Estimation of Lake Evaporation from Four Australian Water Storages,
W75-11300 2D

STEWART, K. W.
Automated Distribution of Gauge and Shift Corrections,
W75-10911 7C

Automated Hourly Computations,
W75-10915 7C

Automated Tidal Computations,
W75-10912 7C

Flow File Operations Manual,
W75-10913 7C

STICKEL, R.
Aeration by Means of Blast Nozzle--A Possibility for the Aeration of Biological Waste Water Treatment Plants (Die Strahlduesenbegasung--eine Moeglichkeit zur Belueftung biologischer Klaeranlagen),
W75-11124 5D

STONES, T.
Investigations on the Long Term Biochemical Oxidation of Sewage,
W75-11116 5D

Nitrogenous Changes During the Settlement of Sewage,
W75-11120 5D

STORR, D.
Wind-Snow Relations at Marmot Creek, Alberta,
W75-11226 2C

**STOTT, P. E.**

**STOTT, P. E.**
The Water Industry in Transition,
W75-11252 3E

**STRANGE, R. J.**
Aquatic Plant Control Using Herbicides in a Large Potable Water Supply,
W75-11201 5G

**STREET, R. L.**
Two-Dimensional, Hydrostatic Simulation of Thermally-Influenced Hydrodynamic Flows,
W75-10901 2H

**STRIPLING, T.**
Predicting Cavitation in Sudden Enlargements,
W75-11151 8B

**STROEHLEIN, J. L.**
Salt and Specific Ion Effects on Germination of Four Grasses,
W75-10894 2K

**STURGES, D. L.**
Hydrologic Relations on Undisturbed and Converted Big Sagebrush Lands: The Status of Our Knowledge,
W75-11313 4D

**SUGIURA, M.**
Biodegradation of Components of Pulp Waste Effluents by Bacteria. (1). Degradation of Kraft Lignin (In Japanese),
W75-11346 5B

**SUNAHARA, H.**
Device for Automatic Determination of Suspended Solids Content in Water,
W75-11063 5A

**SWANSON, J. W.**
Effect of Lime Treatment on Molecular Weight Distribution of Color Bodies from Kraft Linerboard Decker Effluents,
W75-11345 5D

**SYERS, J. K.**
Interference of Mercury(II) in the Colorimetric Determination of Inorganic Phosphate in Water,
W75-11340 5A

**SYLVIA, A. E.**
Activated Carbon in the Water Treatment Plant,
W75-10992 5D

**SYMMES, K. H.**
Preliminary Investigations into Copper Cycling in Indian Lake, Massachusetts: A Lake Treated Annually with Copper Sulfate,
W75-11039 5B

**SZLAUER, L.**
Use of Steelon-Net Veils for Protection of the Hydro-Engineering Works Against Dreissena Polymorphia Pall,
W75-11033 5G

**TAFELSKI, R. D.**
Colorado City Solves Its Sand Pumping Problems,
W75-11261 8C

**TAKEUCHI, Y.**
Cultivation of Netted Melon By Use of Trickle Irrigation in a Sand Field Plastic Greenhouse, (In Japanese),
W75-11095 3F

Practical Application of Surface Fixed-System for Multi-Purpose Sprinkler Irrigation Uses, (In Japanese),
W75-11097 3F

**TASH, J. C.**
Some Limnological Characteristics of Arivaca Lake in Southern Arizona,
W75-10891 2H

**TATE, R. L. III**
Stability of Nitrosamines in Samples of Lake Water, Soil, and Sewage,
W75-11019 5B

**TAWARA, S.**
The Influence of the Warm Cooling Water from a Fossil Fueled Power Plant on Oceanographic Conditions and Composition of Plankton in Owase Bay I. Water Temperature in Relation to Distribution of Microplankton, (In Japanese),
W75-11030 5C

**TEJEDA, A. R.**
System for Softening and Dealkalizing Water by Electrodialysis,
W75-11065 5F

**TEMME, K. E.**
Flocculation Device for Waste Fluid Treatment,
W75-11077 5D

**THOMPSON, W. E.**
Field Tests of Slow-Release Herbicides,
W75-11193 5G

**THOMSON, S. V.**
Phytophthora Species in Arizona: Its Occurrence in Recycled Irrigation water,
W75-10883 5A

**THORUD, D. B.**
An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W75-11049 4A

Development of a Bibliographic Information System for Water Yield Improvement Practices,
W75-11050 10B

**THURLOW, E. H.**
The Water Quality and Bottom Sediment Characteristics of New Jersey Lagoon Developments,
W75-11104 5B

**TIBBALS, C. H.**
Recharge Areas of the Floridan Aquifer in Seminole County and Vicinity, Florida,
W75-10944 7C

**TILLEY, L. J.**
Use of Productivity of Periphyton to Estimate Water Quality,
W75-10936 5B

**TILLMAN, R. W.**
Interference of Mercury(II) in the Colorimetric Determination of Inorganic Phosphate in Water,
W75-11340 5A

**TIMKO, D. J.**
How Downhole Temperatures, Pressures Affect Drilling; Part 4: Pitfalls in Overpressure Prediction,
W75-11294 8G

How Downhole Temperatures, Pressures Affect Drilling, Part 5: Predicting Hydrocarbon Environments with Wireline Data,
W75-11295 8

How Downhole Temperatures, Pressures Affect Drilling, Part 6: Correlating Geopressure Gradients with Hydrocarbon Accumulations,
W75-11296 8

How Downhole Temperatures, Pressures Affect Drilling, Part 7: The Shale Resistivity Ratio - A Valuable Tool for Making Economic Drilling Decisions,
W75-11297

How Downhole Temperatures, Pressures Affect Drilling, Part 8: Needless Spending In Drilling and Exploration Money Can Be Predicted-And Prevented,
W75-11298

**TOERIEN, D. F.**
South African Eutrophication Problems: A Perspective,
W75-11131

**TORPEY, W. N.**
Wastewater Treatment Plant,
W75-11076

**TRAIN, R. E.**
Facing the Real Cost of Clean Water,
W75-10857

**TRIMBLE, S. W.**
Denudation Studies: Can We Assume Steady State,
W75-11154

**TSCHANTZ, B. A.**
Laboratory Investigation of One-Dimensional Wave Motion in Open Channels,
W75-11172

**TSIMBAL, I. M.**
Influence of Oil on Nucleic Acids of Algae
W75-11080

Influence of Oil on Nucleic Acids of Algae
W75-11232

**TSUBOI, K.**
Studies on the Relationship Between Matter Production and the Development of Pine Forest on Coastal Sand Dunes (I Japanese),
W75-11098

**TSURUTA, A.**
The Influence of the Warm Cooling Water from a Fossil Fueled Power Plant on Oceanographic Conditions and Composition of Plankton in Owase Bay I. Water Temperature in Relation to Distribution of Microplankton, (In Japanese)
W75-11030

**TSUTSUI, R. T.**
Nitrogen Removal in the Operation of the Mililani Sewage Treatment Plant,
W75-11041

**TULLIS, J. P.**
Predicting Cavitation in Sudden Enlargements
W75-11151

**TUNTURI, P. J.**
Study of Electrochemical Treatment Methods for Removing Colloidal Particles from Paper Industry Effluents (Tutkimus sähkökemiallisuuden jätevesien kolloidaalisten aineiden poistomahdollisuudesta sahkokemiallisesta
W75-11348

**DIS, B.**
An Economic Analysis of the Pollution Problems in the Colorado River Basin: The Upper Main Stem Sub-Basin,
W75-11247 5G

**RICH, J. C.**
Possibilities of Reutilization of Kaolin from Biological Waste Water Sludges Moeglichkeiten der Wiederverwertung von Kaolin aus biologischen Abwasserchlaemmen),
/75-11349 5D

**LUATA, U.**
ffects of Entrance Loss on Harbor Oscillaons,
75-11147 8B

**E, D.**
anges in Vegetation and Surface Soil Properss Following Irrigation of Woodlands with unicipal Wastewater,
75-11243 5B

**CIK, J. A.**
gae in Baltimore's Reservoirs,
5-11221 5C

**HORN, S. L.**
uatic Plant Control Using Herbicides in a rge Potable Water Supply,
5-11201 5G

**DEGRIFT, A. E.**
ter Pollution from Nonpoint Sources,
5-11158 5B

**IA, M. M.**
ulation Dynamics of Protozoa in Waste-er,
-10957 5D

**HAN, C. M. JR.**
ariance Analysis of Reservoir Development cts on Property Tax Base,
-10851 6B

**G. A.**
Economics of Flood Insurance: An Analy- the National Flood Insurance Program,
11038 6F

**HUEREN, G.**
te on Salinity and Temperature in Some ccan Brackish Waters,
10997 2L

**ND, P. A.**
rving Activated Sludge,
0962 5D

s Theory of Glaciation Supported by ic Study of Norwegian Core K 11,
1153 2J

**NI, S. M.**
tion of Safe Periods for Crop Planning Dryland Agriculture,
0926 3F

**WEIDER, R. A.**
y Production in Lakes Ontario and Erie: parative Study,
217 5C

**, P. B. B.**
ent and Sludge Return in Activated-Type Package Plants,
973 5D

**WAGNER, J. R.**
Institutional Arrangements for Reducing Conflict Over Water Quality in International Rivers,
W75-11242 6E

**WALDEN, C. C.**
Effluent Characteristics and Treatment of Mechanical Pulping Effluents,
W75-11331 5D

**WALKER, C. R.**
Herbicide Chemicals and Their Effect on the Aquatic Environment,
W75-11211 5C

Registration of Aquatic Herbicides,
W75-11212 4A

**WALKER, R.**
Pump Selection,
W75-11002 8C

**WALKER, R. D.**
The Awareness of the Relevant Water Resources Literature by the Personnel of the Wisconsin Department of Natural Resources,
W75-10899 10C

**WALKER, W. R.**
An Implicit Approach to Pricing Agricultural Water Transfers to Urban Uses,
W75-11178 4A

**WALLACE, R. R.**
The Effects of Experimental Blackfly (Diptera: Simuliidae) Larviciding with Abate, Dursban, and Methoxychlor on Stream Invertebrates,
W75-11157 5C

**WALLIS, J. R.**
Relative Importance of Decision Variables in Flood Frequency Analysis,
W75-10929 4A

**WALTHER, C. K.**
Flocculation Device for Waste Fluid Treatment,
W75-11077 5D

**WANG, L. K.**
Total Waste Recycle System for Water Purification Plant Using Alum as Primary Coagulant,
W75-11094 5D

**WARD, N. E.**
Mill Experience in the Treatment of Mechanical Pulping Effluent,
W75-11332 5D

**WATANABE, Y.**
A Planning of Catchment Sewerage for Oyodo River (In Japanese),
W75-11113 5D

**WATKINS, J. JR.**
Can a Computer Really Operate a Water-Filtration Plant,
W75-11184 5F

**WATSON, N. H. F.**
Seasonal Abundance of Crustacean Zooplankton and Net Plankton Biomass of Lakes Huron, Erie, and Ontario,
W75-11238 5C

**WEATHERFORD, G. D.**
Impact of Energy Development on the Law of the Colorado River,
W75-10869 4C

**WELLINGS, L. W.**
The Effect of Irrigation on the Yield and Quality of Maincrop Potatoes,
W75-11106 3F

**WELLS, C. G.**
Water Pollution Problems in Salisbury, Rhodesia: Present and Future,
W75-10983 5G

**WELLS, P. B.**
Upgrading Meat Packing Facilities to Reduce Pollution. (Part 2). Waste Treatment,
W75-11321 5D

**WELLS, W. J. JR.**
Upgrading Meat Packing Facilities to Reduce Pollution. (Part 2). Waste Treatment,
W75-11321 5D

**WEST, A. S.**
The Effects of Experimental Blackfly (Diptera: Simuliidae) Larviciding with Abate, Dursban, and Methoxychlor on Stream Invertebrates,
W75-11157 5C

**WETZEL, R. G.**
Dissolved Organic Matter and Lake Metabolism,
W75-11188 5C

**WHITE, D. P.**
Changes in Vegetation and Surface Soil Properties Following Irrigation of Woodlands with Municipal Wastewater,
W75-11243 5B

**WHITE, G. C.**
Disinfecting Wastewater with Chlorination/Dechlorination Part 1,
W75-10963 5D

Disinfecting Wastewater with Chlorination/Dechlorination Part 2,
W75-10964 5D

**WHITE, L.**
A Computer Program Package for Aquatic Ecologists,
W75-10908 2H

**WHITE, L. M.**
Development of a Bibliographic Information System for Water Yield Improvement Practices,
W75-11050 10B

**WHITE, W. R.**
The Design of Storm Water Drainage Channels Using Mathematical Model Techniques,
W75-11150 8B

**WHITEHURST, C. A.**
The Louisiana Environmental Management System and Its Utility in Water Resource Planning,
W75-11177 5G

**WHITTEMORE, R. C.**
Evaluation of the Adsorptive Properties of Fly Ash with Reference to a Pulp and Paper Mill Waste Effluent,
W75-11335 5D

**WIGLEY, T. M. L.**
Condensation in Jets, Industrial Plumes and Cooling Tower Plumes,
W75-11166 2B

**WILKES, D. J.**
Heavy Metals and Other Trace Elements,
W75-10934 5B

WILKINSON, B. H.
Matagorda Island, Texas: The Evolution of a Gulf Coast Barrier Complex,
W75-11144 2I.

WILKINSON, C.
Concurrent Nitrification-Denitrification at the Sediment-Water Interface as a Mechanism for Nitrogen Losses from Lakes,
W75-10902 5C

WILLEY, L. M.
The Minor and Trace Elements, Gas, and Isotope Compositions of the Principal Hot Springs of Nevada and Oregon,
W75-10937 2K

WILLIS, C.
Floodplain Land-Use Management: An Application of Operations Research Methodology,
W75-11037 6F

WILLIS, J. F.
Operation Clean Sweep,
W75-11192 5G

WILSON, A. D.
Water Consumption and Water Turnover of Sheep Grazing Semiarid Pasture Communities in New South Wales,
W75-10888 3F

WITSELL, W. J.
Pitless Adapters: Emphasis on Sanitation,
W75-11258 8C

WRIGHT, G. L.
Multilag Markov Models for Eastern Australian Streams,
W75-11301 2E

WRIGHT, S. T. C.
The Role of Endogenous Abscisic Acid in the Response of Plants to Stress,
W75-11319 3F

WU, C.
Ground Water Depletion and Subsidence Problems in Taipei Basin,
W75-11262 4B

YADAVA, P. S.
Seasonal Variation in Composition, Plant Biomass, and Net Primary Productivity of a Tropical Grassland at Kurukshetra, India,
W75-11006 2I

YAMAMOTO, T.
Cultivation of Netted Melon By Use of Trickle Irrigation in a Sand Field Plastic Greenhouse, (In Japanese),
W75-11095 3F

Nozzle Hydraulics in the Trickle Irrigation System--Relation Between Water Temperature and Nozzle Flow Rate (In Japanese),
W75-11096 3F

Practical Application of Surface Fixed-System for Multi-Purpose Sprinkler Irrigation Uses, (In Japanese),
W75-11097 3F

YANG, J. Y.
Total Waste Recycle System for Water Purification Plant Using Alum as Primary Coagulant,
W75-11094 5D

YAROSH, M. M.
Status of Waste Heat Utilization and Dual-Purpose Plant Projects,
W75-11251

YASUDA, M.
Studies on Toxicity of Sodium Nifurstyrenate (NFS-NA) in Cultured Yellowtail (In Japanese),
W75-11034 5C

YATES, P.
Predicting Recessions Through Convolution,
W75-10917 2E

YEATTS, L. B.
Calcium Sulfate Solubility in Brackish Water Concentrates and Applications to Reverse Osmosis Processes: Polyphosphate Additives,
W75-11004 5D

YEVICH, P. P.
Copper Toxicity in Busycon Canaliculatum L.,
W75-11031 5C

YOUNG, R. H. F.
Nitrogen Removal in the Operation of the Mililani Sewage Treatment Plant,
W75-11041 5D

ZAWADZKI, E. A.
Mobile Unit for Treating Liquid Waste,
W75-11073 5D

ZEIGER, C. F.
Operation Clean Sweep,
W75-11192 5G

ZETTLER, F. W.
Utilization of Phytopathogens as Biocontrols for Aquatic Weeds,
W75-11206 5G

ZIEBELL, C. D.
Some Limnological Characteristics of Arivaca Lake in Southern Arizona,
W75-10891 2H

ZUCK, G. J.
The Awareness of the Relevant Water Resources Literature by the Personnel of the Wisconsin Department of Natural Resources,
W75-10899 10C

# ORGANIZATIONAL INDEX


ENVIRONICS, MELBOURNE TRALIA).
te-Element Method for Water-Distribution works,
-11186 4A

CY OF INDUSTRIAL SCIENCE AND NOLOGY, TOKYO (JAPAN). (ASSIGNEE)
ce for Automatic Determination of ended Solids Content in Water,
-11063 5A

ULTURAL RESEARCH SERVICE, NS, GA. SOUTHEAST WATERSHED RCH CENTER.
cting Recessions Through Convolution,
10917 2E

ULTURAL RESEARCH SERVICE, VILLE, MD.
gical Control of Alligator Weed, 1959-
1202 5G

ULTURAL RESEARCH SERVICE, GE STATION, TEX.
rence of 2, 4, 5-T and Picloram in Sur-unoff Water in the Blacklands of Texas,
0895 5B

LTURAL RESEARCH SERVICE, FORT RDALE, FLA.
cal Control of Egeria Densa,
1199 5G

LTURAL RESEARCH SERVICE, VILLE, FLA. BIOLOGICAL CONTROL
cal Control of Eurasian Water Milfoil,
203 4A

OM (A.) OSAKEYHTIO, VARKAUS D). PAPER AND PULP DIV.
g Effluents from a Sulphite Pulp Mill by n,
347 5D

A AGRICULTURAL EXPERIMENT , AUBURN.
ing and Application Rates of Irrigation nid Climate,
48 3F

UNIV., COLLEGE. DEPT. OF CAL SCIENCES.
of Some Components of Crude Oil on oho Salmon,
88 5C

UNIV., EDMONTON.
ion of Boundary Conditions at the f a Porous Medium,
9 8B

UNIV., EDMONTON. DEPT. OF
th of Some Epiphytic Algae in a Lake Thermal Effluent,
5 5C

UNIV., EDMONTON. DEPT. OF
DDT and M.S. 222 on Learning a onditioned Response in Rainbow mo gairdneri),
5C

IA UNIV. (EGYPT). FACULTY OF RE.
Curves for Nuvacron, Malathion, T, and Kelthane Tested Against the Mosquito Culex Pipiens L. and the Microcrustacean Daphnia Magna Straus,
W75-11082 5B

ALL-INDIA COORDINATED DRYLAND AGRICULTURE RESEARCH PROJECT, HISSAR.
Estimation of Safe Periods for Crop Planning Under Dryland Agriculture,
W75-10926 3F

AMERICAN CYANAMID CO., STAMFORD, CONN. (ASSIGNEE)
Process for Treating Sewage Sludge,
W75-11064 5D

Process for Treating Industrial Wastes,
W75-11066 5D

Process for Treating Industrial Wastes,
W75-11067 5D

Process for Raw Water Clarification,
W75-11072 5F

AMES LAB., IOWA.
Chromatographic Determination of Phenols in Water,
W75-11344 5A

AMOCO PRODUCTION CO., TULSA, OKLA. (ASSIGNEE)
Oil Separator with Coalescing Media,
W75-11071 5G

ARIZONA UNIV., TUCSON.
Barrenness of Desert Pavement in Yuma County, Arizona,
W75-10868 2G

Some Limnological Characteristics of Arivaca Lake in Southern Arizona,
W75-10891 2H

ARIZONA UNIV., TUCSON. DEPT. OF BIOLOGICAL SCIENCES.
Phenology of Selected Sonoran Desert Plants at Punta Cirio, Sonora, Mexico.
W75-10862 2I

The Influence of Rainfall on the Reproduction of Sonoran Desert Lagomorphs,
W75-10871 4A

Limnology of Desert Ponds,
W75-10880 2H

ARIZONA UNIV., TUCSON. DEPT. OF CIVIL ENGINEERING AND ENGINEERING MECHANICS.
Factors Affecting Erosion in a Semi-Arid Watershed,
W75-10884 2J

ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY AND WATER RESOURCES.
Hydrogeology and Water Resources of Middle Kirkland Creek Basin, Yavapai County, Arizona,
W75-10872 4B

Measurement of Cobble Abrasion in Natural Streams,
W75-10881 2J

ARIZONA UNIV., TUCSON. DEPT. OF PLANT SCIENCES.
Use of Amendments to Reduce Water Requirements for Stand Establishment of Small-Seeded Crops,
W75-11045 3F

ARIZONA UNIV., TUCSON. DEPT. OF SOILS, WATER AND ENGINEERING.
Management of Southwestern Desert Soils,
W75-10877 2G

Soils of the Desert Southwest,
W75-10878 2G

Salt and Specific Ion Effects on Germination of Four Grasses,
W75-10894 2K

ARIZONA UNIV., TUCSON. DEPT. OF WATERSHED MANAGEMENT.
Differential Release of Water from Arizona Snowpacks,
W75-10860 2C

An Analysis of the Motor-Row Conversion Issue of Colorado River Float Trips,
W75-10867 6B

Shrub Transplanting for Watershed Management and Range Improvement in Iran,
W75-10870 4D

Seasonal Variations in the Infiltration Rate of a Whitehouse Soil in Southern Arizona,
W75-10873 2G

ARIZONA UNIV., TUCSON. INST. OF GOVERNMENT RESEARCH.
Institutional Arrangements for Reducing Conflict Over Water Quality in International Rivers,
W75-11242 6E

ARIZONA UNIV., TUCSON. SCHOOL OF RENEWABLE NATURAL RESOURCES.
An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W75-11049 4A

Development of a Bibliographic Information System for Water Yield Improvement Practices,
W75-11050 10B

ARKANSAS UNIV., FAYETTEVILLE. DEPT. OF BOTANY AND BACTERIOLOGY.
Biochrome Analysis as a Method for Assessing Phytoplankton Dynamics, Phase II,
W75-11052 5C

ARKANSAS UNIV., FAYETTEVILLE. DEPT. OF ZOOLOGY.
Pathogenic Free-Living Amoebae in Arkansas Recreational Waters,
W75-11053 5A

ARKANSAS UNIV., LITTLE ROCK. DEPT. OF ELECTRONICS AND INSTRUMENTATION.
Survival and Growth Rate of Channel Catfish as a Function of Dissolved-Oxygen Concentration,
W75-11051 5C

ARMY ENGINEER DISTRICT, GALVESTON, TEX.
Aquatic Plant Control on Lake Corpus Christi,
W75-11194 5G

ARMY ENGINEER DISTRICT, JACKSONVILLE, FLA.
Operation Clean Sweep,
W75-11192 5G

ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
Field Tests of Slow-Release Herbicides,
W75-11193 5G

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Aquatic Weed Field Test Program Using a CO2 Electric Discharge Convection Laser, W75-11208 5A

CO2 Laser Effects on Water Hyacinth, W75-11209 5G

Operations Platforms, W75-11210 4A

Water Hyacinth Research in Puerto Rico, W75-11215 5G

ASSOCIATED ENGINEERING SERVICES LTD., VANCOUVER (BRITISH COLUMBIA).
Pump Selection, W75-11002 8C

ATMOSPHERIC ENVIRONMENT SERVICE, CALGARY (ALBERTA).
Wind-Snow Relations at Marmot Creek, Alberta, W75-11226 2C

AUCKLAND UNIV. (NEW ZEALAND). DEPT. OF BOTANY.
A Contribution to the Biology of Nitella Hookeri A. BR. in the Rotorua Lakes, New Zealand. II. Organic Nutrients and Physical Factors, W75-11235 5C

AUTOTROL CORP., MILWAUKEE, WIS. (ASSIGNEE)
Wastewater Treatment Plant, W75-11076 5D

AXEL JOHNSON INSTITUTET FOR INDUSTRIFORSKNING, NYNASHAMN (SWEDEN). ENGINEERING DEPT.
Lamella Sedimentation: A Compact Separation Technique, W75-10989 5D

B.C. RESEARCH, VANCOUVER(BRITISH COLUMBIA).
Effluent Characteristics and Treatment of Mechanical Pulping Effluents, W75-11331 5D

Mill Experience in the Treatment of Mechanical Pulping Effluent, W75-11332 5D

BALTIMORE CITY DEPT. OF PUBLIC WORKS, MD. WATER SUPPLY TREATMENT AND PUMPING DIV.
Algae in Baltimore's Reservoirs, W75-11221 5C

BECK (R. W.) AND ASSOCIATES, SEATTLE, WASH.
Advanced Techniques in the Mathematical Modeling of Water-Distribution Systems, W75-11183 4A

BELL, GALYARDT AND WELLS, OMAHA, NEBR.
Upgrading Meat Packing Facilities to Reduce Pollution. (Part 2). Waste Treatment, W75-11321 5D

BELL TELEPHONE LABS., INC., WHIPPANY, N.J.
The Mechanics of Rock Failure Due to Water Jet Impingement, W75-11272 8E

BOR ILAN UNIV., RAMAT-GAN (ISRAEL). DEPT. OF LIFE SCIENCES.
Relations Between Algal Populations and the pH of Their Media, W75-11028 5C

BOSTON METROPOLITAN DISTRICT COMMITTEE, MASS.
The Impact of the Safe Drinking Water Act on Utilities, W75-10859 5G

BRADLEY UNIV., PEORIA, ILL. DEPT. OF BIOLOGY.
Species Diversity of Benthic Macroin-Vertebrates and Limnological Conditions in a 1st Order Mountain Stream, W75-10918 2I

BRITISH COLUMBIA WATER RESOURCES SERVICE, VANCOUVER.
Water Resources, W75-11003 5G

BUNDESGESUNDHEITSAMT, BERLIN (WEST GERMANY). INSTITUT FUER WASSER-, BODENUND LAFTHYGIENE.
Tensids (Syndets) and the Water Pollution Problem, (Gesund-Heitliche Aspekte Des Tensid-Gebrauchs), W75-11134 5D

BUREAU OF METEOROLOGY, MELBOURNE (AUSTRALIA).
The Measurement and Estimation of Lake Evaporation from Four Australian Water Storages, W75-11300 2D

BUREAU OF RECLAMATION, DENVER, COLO. HYDRAULICS BRANCH.
Cavitation Control by Aeration of High-Velocity Jets, W75-11152 8B

BUREAU OF SPORT FISHERIES AND WILDLIFE, STUTTGART, ARK. FISH FARMING EXPERIMENT STATION.
Unisex Studies on the White Amur, W75-11205 5C

BUREAU OF SPORT FISHERIES AND WILDLIFE, WASHINGTON, D.C. DIV. OF FISHERY RESEARCH.
Herbicide Chemicals and Their Effect on the Aquatic Environment, W75-11211 5C

CALCUTTA METROPOLITAN DEVELOPMENT AUTHORITY (INDIA).
Electrolytic Control of Algae, W75-11228 5F

CALGON CORP., PITTSBURGH, PA. CALGON LABS.
Interference of Sulfate Ion on SPADNS (Sodium 2-(Sulfophenylazo)-1,8-Dihydroxynaphthalene-3,6-Disulfonate) Colorimetric Determination of Fluorine in Waste Waters, W75-11343 5A

CALIFORNIA UNIV., BERKELEY. DEPT. OF PLANT PATHOLOGY.
Phytophthora Species in Arizona: Its Occurrence in Recycled Irrigation water, W75-10883 5A

CALIFORNIA UNIV., DAVIS DEPT. OF IRRIGATION.
Successful Irrigation: Preparation, Realization, Exploitation, Preparation, Realisation, Exploitation, W75-10874 3F

CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
Computer Algorithms Useful for Determining Subsurface Electrical Profile Via High Frequency Probing, W75-10910 8G

CALIFORNIA UNIV., LOS ANGELES. SCHOOL OF LAW.
Impact of Energy Development on the Law of the Colorado River, W75-10869 6E

CALIFORNIA UNIV., LOS ANGELES. WATER RESOURCES CENTER.
Sprinkler Irrigation Practice (La Pratique de L'Irrigation Par Aspersion), W75-10875 3F

CAMBRIDGE UNIV. (ENGLAND) DEPT. OF APPLIED BIOLOGY.
Cost Evaluation of Watercourse Management in Essex, W75-11008 4A

CAMBRIDGE UNIV. (ENGLAND). DEPT. OF ENGINEERING.
Hierarchial Model for Water-Supply-System Control, W75-10996 4A

Transition in Oscillatory Flow Over Ripple Beds, W75-11149 2J

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
Advances in the Detection of Water Pollutants, W75-10995 5A

Primary Production in Lakes Ontario and Erie: A Comparative Study, W75-11217 2H

Microbiological Examination of Offshore Lake Erie Sediments, W75-11218 5A

Chelation Study of Copper (II): Fulvic Acid System, W75-11219 5B

Application of the Manometric Technique to the Study of Sediment Oxygen Depletion, W75-11222 5A

In Situ Measurement of the Settling Velocity Profile of Particulate Organic Carbon in Lake Ontario, W75-11227 2J

Sediment Processes in Great Lakes, W75-11237 2J

Seasonal Abundance of Crustacean Zooplankton and Net Plankton Biomass of Lakes Erie, and Ontario, W75-11238 2H

The Utilization of Sun-Glint in a Study of Dynamics, W75-11239 2J

reliminary Information on the Nature of Or-
nic Matter in the Surface Sediments of Lakes
uron, Erie, and Ontario,
75-11240 2J

BERRA COLL. OF ADVANCED
CATION (AUSTRALIA).
rtilizer Phosphate in Streams and Lakes,
75-11310 5B

E TOWN UNIV. (SOUTH AFRICA). DEPT.
VATER RESOURCES AND PUBLIC
LTH ENGINEERING.
ration Devices: Basic Theory,
5-10971 5D

TRAAL PLANBUREAU, THE HAGUE
HERLANDS).
e Economic Impact of Pollution Abatement:
e Case of Water Pollution by Degradable Or-
ic Matter,
5-11254 5G

RAL MICHIGAN UNIV., MT. PLEASANT.
. OF BIOLOGY.
sonal Abundance and Diversity of Benthos
Southern Illinois, USA Swamp,
-11312 2H

RE NATIONAL DE LA RECHERCHE
TIFIQUE, GIF-SUR-YVETTE (FRANCE).
RE DES FAIBLES RADIOACTIVITIES.
l's Theory of Glaciation Supported by
pic Study of Norwegian Core K 11,
-11153 2J

FIX, INC., PITTSBURGH, PA.
NEE)
le Unit for Treating Liquid Waste,
11073 5D

EFASER LENZING A.G. (AUSTRIA).
ures in the Sulfite Pulp Industry for
easing Waste Water Load (Massnahmen
ulfitzellstoff-Industrie zur Minderung der
sserbelastung),
11339 5D

NATI UNIV., OHIO.
and Wastewater Disinfection with
: A Critical Review,
0956 5D

ADO STATE UNIV., FORT COLLINS.
F AGRICULTURAL ENGINEERING.
lidation and Rehabilitation of Canals in
e Valley,
1061 4A

plicit Approach to Pricing Agricultural
Transfers to Urban Uses,
178 4A

DO STATE UNIV., FORT COLLINS.
F ATMOSPHERIC SCIENCE.
s of Colorado Precipitation,
040 2B

DO STATE UNIV., FORT COLLINS.
RANGE SCIENCE.
es for Revegetation and Stabilization
ce Mined Areas in the Western States,
00 4D

DO STATE UNIV., FORT COLLINS.
IACHINERY LAB.
g Cavitation in Sudden Enlargements,
51 8B

COLORADO UNIV., BOULDER.
An Economic Analysis of the Pollution Problems in the Colorado River Basin: The Upper Main Stem Sub-Basin,
W75-11247 5G

COLORADO UNIV., BOULDER. INST. OF ARCTIC AND ALPINE RESEARCH; AND COLORADO UNIV., BOULDER. DEPT. OF GEOGRAPHY.
An Elevational Control of Peak Snowpack Variability,
W75-11155 2C

COMMINS (J. A.) AND ASSOCIATES, INC., FORT WASHINGTON, PA.
Upgrading Meat Packing Facilities to Reduce Pollution. (Part 3). Choosing the Optimum Financial Strategy,
W75-11322 5D

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV. OF LAND USE RESEARCH.
Natural and Fertilizer Nitrogen in Streams and Lakes,
W75-11311 5B

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV. OF PLANT INDUSTRY.
Balancing the Effects of Man's Actions on the Hydrological Cycle,
W75-10865 2A

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, DENILIQUIN (AUSTRALIA). RIVERINA LAB.
Water Consumption and Water Turnover of Sheep Grazing Semiarid Pasture Communities in New South Wales,
W75-10888 3F

CONCORDIA UNIV., MONTREAL (QUEBEC). DEPT. OF CIVIL ENGINEERING.
Wave Motion in Rockfill,
W75-10924 8D

CONNECTICUT UNIV., STORRS.
Measures of Biodegradability and Refractory Organics in Wastewaters: (Analysis, Interpretation, and Application of Measurement Techniques),
W75-11103 5D

CONNECTICUT UNIV., STORRS. DEPT. OF CIVIL ENGINEERING.
Effect of Pressure Gradient on Wind-Waves in a Laboratory Channel,
W75-11093 8B

CONTINENTAL OIL CO., HOUSTON, TEX.
Conoco Technology Curbs Production Pollution,
W75-11267 5G

How to Find Transition Zones in Soft Formations,
W75-11285 8G

CONTINENTAL OIL CO., HOUSTON, TEX. PRODUCTION ENGINEERING SERVICES.
How Downhole Temperatures, Pressures Affect Drilling; Part 5: Predicting Hydrocarbon Environments with Wireline Data,
W75-11295 8G

How Downhole Temperatures, Pressures Affect Drilling; Part 6: Correlating Geopressure Gradients with Hydrocarbon Accumulations,
W75-11296 8G

How Downhole Temperatures, Pressures Affect Drilling; Part 7: The Shale Resistivity Ratio - A Valuable Tool for Making Economic Drilling Decisions,
W75-11297 8G

How Downhole Temperatures, Pressures Affect Drilling; Part 8: Needless Spending of Drilling and Exploration Money Can Be Predicted-And Prevented,
W75-11298 8G

CONTINENTAL OIL CO., PONCA CITY, OKLA. PRODUCTION RESEARCH DEPT.
How Downhole Temperatures, Pressures Affect Drilling; Part 4: Pitfalls in Overpressure Prediction,
W75-11294 8G

CORNELL UNIV., ITHACA, N.Y.
A Computer Program Package for Aquatic Ecologists,
W75-10908 2H

Prescriptive Economic Models for Nonstructural Flood Control,
W75-11060 6F

The Effects of Free Ammonia and Free Nitrous Acid on the Nitrification Process,
W75-11101 5D

CORNELL UNIV., ITHACA, N.Y. DEPT. OF AGRICULTURAL ENGINEERING.
Temperature Effects on Microbial Growth in CSTR's,
W75-10968 5D

CORNELL UNIV., ITHACA, N.Y. DEPT. OF AGRONOMY.
Some Observations Concerning Preparation and Storage of Stream Samples for Dissolved Inorganic Phosphate Analysis,
W75-11336 5A

CORNELL UNIV., ITHACA, N.Y. LAB. OF SOIL MICROBIOLOGY.
Stability of Nitrosamines in Samples of Lake Water, Soil, and Sewage,
W75-11019 5B

CORROSION CONTROL TECHNOLOGISTS, HOUSTON, TEX.
Basic Concepts and Practical Aspects of Corrosion Investigation,
W75-11271 8G

DEPARTMENT OF THE ENVIRONMENT, LETHBRIDGE (ALBERTA). RESEARCH STATION.
A Pneumatic System to Pump Water from Piezometers,
W75-11257 8C

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER RESOURCES BRANCH.
Automated Distribution of Gauge and Shift Corrections,
W75-10911 7C

Automated Tidal Computations,
W75-10912 7C

Flow File Operations Manual,
W75-10913 7C

**DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER RESOURCES BRANCH.**

Description of Card and Tape Formats for Supplying Data to Users.
W75-10914 7C

Automated Hourly Computations,
W75-10915 7C

**DETROIT UNIV., MICH. DEPT. OF BIOLOGY.**
Biological Control: Isolation and Bacterial Oxidation of the Taste-and-Odor Compound Geosmin,
W75-11013 5F

**DEUTSCHE TEXCO A.G., HAMBURG. (WEST GERMANY). (ASSIGNEE)**
System for Optimal Pressure Control in a Multi-Stage Evaporation Unit,
W75-11070 3A

**DEVELOPMENT PLANNING AND RESEARCH ASSOCIATES, INC., MANHATTAN, KANS.**
Economic Analysis of Effluent Guidelines: Meat Packing Industry,
W75-11249 5G

**DIAMOND SHAMROCK CORP., CLEVELAND, OHIO. (ASSIGNEE)**
Electrolytic Sea Water Process,
W75-11068 3A

**EAST LANSING-MERIDIAN WATER AND SEWER AUTHORITY, EAST LANSING, MICH.**
City/Township Joint Venture--A New Water Plant,
W75-11015 5F

**ELLSWORTH ENGINEERING AND ASSOCIATES, IDAHO FALLS, IDAHO.**
Algae Removal Using Dissolved Air Flotation,
W75-10978 5D

**ENVIRONMENTAL ENGINEERING, INC., GAINESVILLE, FLA.**
Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 1). In-Process Pollution Abatement,
W75-11328 5D

**ENVIRONMENTAL PROTECTION AGENCY, ATHENS, GA. SURVEILLANCE AND ANALYSIS DIV.**
Waste Water Survey, St. Regis Paper Company, Cantonment, Florida.
W75-11314 5D

**ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.**
Facing the Real Cost of Clean Water,
W75-10857 5G

**ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. DIV. OF WATER SUPPLY.**
Pitless Adapters: Emphasis on Sanitation,
W75-11258 8C

**ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF PESTICIDE PROGRAMS.**
Criteria for Herbicide Evaluation,
W75-11196 5G

Registration of Herbicides for Aquatic Use,
W75-11197 5G

**ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF WATER PROGRAM OPERATIONS.**
Considerations for Preparation of Operation and Maintenance Manuals,
W75-11317 5D

**ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. TECHNOLOGY TRANSFER STAFF.**
Upgrading Meat Packing Facilities to Reduce Pollution. (Part 1). In-Process Modifications and Pretreatment,
W75-11320 5D

Pollution Abatement in a Brewing Facility
W75-11323 5D

Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 2). Pretreatment of Poultry-Processing Wastes,
W75-11329 5D

**ENVIRONMENTAL PROTECTION SERVICE, OTTAWA (ONTARIO).**
Role and Responsibilities of the Environmental Protection Service (Canada),
W75-11000 6G

**ENVIRONMENTAL PROTECTION SERVICE, OTTAWA (ONTARIO). ENVIRONMENTAL EMERGENCY BRANCH.**
Oil Spill Technology,
W75-11001 5G

**ENVIRONMENTAL PROTECTION SERVICE, OTTAWA (ONTARIO). WATER POLLUTION CONTROL DIRECTORATE.**
Workshop on Computer-Aided Design and Simulation of Waste Treatment Systems.
W75-11338 5D

**ENVIRONMENTAL QUALITY RESEARCH AND DEVELOPMENT UNIT. NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY.**
Nitrogen Removal by Catalyst-Aided Breakpoint Chlorination,
W75-10965 5D

**FISH AND WILDLIFE SERVICE, COLUMBIA, MO. FISH-PESTICIDE RESEARCH LAB.**
Toxaphene Effects on Growth and Bone Composition of Fathead Minnows, Pimephales Promelas,
W75-11026 5C

**FISHERIES AND MARINE SERVICE, WINNIPEG (MANITOBA).**
The Toxicity of Drilling Fluid Components to Aquatic Biological Systems, A Literature Review,
W75-11266 5C

**FISHERIES AND MARINE SERVICE, WINNIPEG (MANITOBA). RESOURCE MANAGEMENT BRANCH.**
Acute Toxicity of Petrochemical Drilling Fluids Components and Wastes to Fish,
W75-11265 5C

**FLORIDA DEPT. OF NATURAL RESOURCES, TALLAHASSEE.**
Aquatic Plant Research and Control in Florida,
W75-11195 4A

**FLORIDA UNIV. AT MARINELAND, ST. AUGUSTINE. C.V. WHITNEY MARINE LAB.**
Impact of Thermal Effluent from Steam-Electric Station on a Marshland Nursery Area during the Hot Season,
W75-11032 5C

**FLORIDA UNIV., GAINESVILLE. DEPT. OF COASTAL AND OCEANOGRAPHIC ENGINEERING.**
Effects of Entrance Loss on Harbor Oscillations,
W75-11147 8B

**FLORIDA UNIV., GAINESVILLE. DEPT. OF PLANT PATHOLOGY.**
Comparison of Uredo Eichorniae the Wate hyacinth Rust, and Uromyces Pontederiae.
W75-11092

Utilization of Phytopathogens as Biocontro for Aquatic Weeds,
W75-11206

**FOOD AND AGRICULTURAL ORGANIZATIO OF THE UNITED NATIONS, ROME (ITALY); AND UNITED NATIONS EDUCATIONAL, SCIENTIFIC, AND CULTURAL ORGANIZATION, PARIS (FRANCE).**
Soil Map of the World, 1:5,000,000, Volu IV, South America.
W75-11138

**FOOD AND AGRICULTURE ORGANIZATIO OF THE UNITED NATIONS, ROME (ITALY).**
Improving Productivity in Low Rainfall Are in India.
W75-11099

Land and Water Resources Survey in the Ja Marra Area, The Sudan.
W75-11139

**FOOD AND AGRICULTURE ORGANIZATIO OF THE UNITED NATIONS, ROME (ITALY). LAND AND WATER DEVELOPMENT DIV.**
Man's Influence on the Hydrological Cycl Draft Report of the UNESCO/FAO Wor Group on the International Hydrolo Decade.
W75-10863

**FOREST SERVICE (USDA), ALBUQUERQU N. MEX. ROCKY MOUNTAIN FOREST AN RANGE EXPERIMENT STATION.**
Revegetating Disturbed Areas in the Sem Southwest,
W75-10892

**FOREST SERVICE (USDA), FORT COLLIN COLO. ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION.**
Hydrologic Relations on Undisturbed and verted Big Sagebrush Lands: The Status o Knowledge,
W75-11313

Watershed Management in the Black Hills Status of Our Knowledge,
W75-11318

**FOREST SERVICE (USDA), PHOENIX, AR ROCKY MOUNTAIN FOREST AND RANG EXPERIMENT STATION.**
Effects of Pinyon-Juniper Removal on W Resource Products and Uses in Arizona,
W75-10886

**FOREST SERVICE, (USDA), TUCSON, AR ROCKY MOUNTAIN FOREST AND RANG EXPERIMENT STATION.**
Establishing Alkali Sacaton on Harsh S the Southwest.
W75-10882

**GAME BIOLOGY STATION, RONDE (DENMARK).**
Oil Pollution and Seabirds in Denmar 1968,
W75-10893

**GENERAL AMERICAN TRANSPORTATI CORP., NILES, ILL.**
Vacuum Distillation/Vapor Filtration Recovery,
W75-11315

ENERAL ELECTRIC CO., PHILADELPHIA, A. RE-ENTRY AND ENVIRONMENTAL YSTEMS DIV.
Macroscopic Distribution-System Modeling, W75-11185 4A

ENESEE COMMUNITY COLL., BATAVIA, Y. MATHEMATICS AND SCIENCE DIV.
A Simple and Inexpensive Technique for Determining Colored Light Intensity Underwater, W75-10919 7B

EOLOGICAL SURVEY, ALBANY, N.Y.
Streamflow in the New York Part of the Susquehanna River Basin, W75-10931 2E

COLOGICAL SURVEY, ALBUQUERQUE, N. EX.
Estimated Availability of Surface and Ground Water in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico, W75-10938 4A

Estimated Mean-Monthly and Annual Runoff t Selected Sites in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico, 775-10943 2E

OLOGICAL SURVEY, BAY SAINT LOUIS, S.
tochastic Analysis of Particle Movement Over Dune Bed, 75-10942 2J

OLOGICAL SURVEY, BOSTON, MASS.
ap Showing Depth to Bedrock, Worthington uadrangle, Massachusetts, 75-10951 7C

ap Showing Depth to Bedrock, Greenfield adrangle, Massachusetts, 75-10952 7C

p Showing Depth to Bedrock, Chester adrangle, Massachusetts, 5-10953 7C

LOGICAL SURVEY, DENVER, COLO.
ality of Water in Aquifers of the Amargosa sert and Vicinity, Nevada, 5-10932 5B

LOGICAL SURVEY, HARTFORD, CONN.
ntour Map of the Bedrock Surface, New ain Quadrangle, Connecticut, 5-10950 7C

Showing Depth to Bedrock, Mount Carr Quandrangle, Connecticut, 5-10954 7C

OGICAL SURVEY, LAWRENCE, KANS.
peratures of Kansas Streams, -10933 2E

OGICAL SURVEY, MENLO PARK,
vy Metals and Other Trace Elements, -10934 5B

of Productivity of Periphyton to Estimate r Quality, 10936 5B

Minor and Trace Elements, Gas, and pe Compositions of the Principal Hot gs of Nevada and Oregon, 10937 2K

GEOLOGICAL SURVEY, RESTON, VA.
Determination of Regional Hydraulic Conductivity Through Use of C-14 Dating of Groundwater, W75-10930 2F

Ground Water in the Corvallis-Albany Area, Central Willamette Valley, Oregon, W75-10940 2F

An Appraisal of Potential Water Salvage in the Lake McMillen Delta Area, Eddy County, New Mexico, W75-10941 3B

Water Resources of the Lower St. Croix River Watershed, East-Central Minnesota, W75-10945 7C

Water Resources of the Snake River Watershed, East-Central Minnesota, W75-10946 7C

Water Resources of the Lower Minnesota River Watershed, South-Central Minnesota, W75-10947 7C

Water Resources of the Cannon River Watershed, Southeastern Minnesota, W75-10948 7C

GEOLOGICAL SURVEY, TACOMA, WASH.
Low-Flow Characteristics of Selected Streams in Northeastern Washington, W75-10939 2E

The Hydrologic Cycle--As Applicable to the Pacific Northwest, W75-10949 7C

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.
Recharge Areas of the Floridan Aquifer in Seminole County and Vicinity, Florida, W75-10944 7C

GEORGIA INST. OF TECH., ATLANTA. DEPT. OF CHEMICAL ENGINEERING.
Bark as Trickling-Filter Dewatering Medium for Pulp and Paper Mill Sludge, W75-11241 5D

GEORGIA UNIV., ATHENS. SCHOOL OF FOREST RESOURCES.
Moisture and Energy Conditions in a Draining Soil Mass, W75-11054 2G

GHENT RIJKSUNIVERSITEIT (BELGIUM). DEPT. OF ZOOLOGY.
A Note on Salinity and Temperature in Some Moroccan Brackish Waters, W75-10997 2L

GIFFELS ASSOCIATES, INC., DETROIT, MICH.
Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 3). Waste Treatment. W75-11330 5D

GOVIND BALLABH PANT UNIV. OF AGRICULTURE AND TECHNOLOGY, PANTNAGAR (INDIA). DEPT. OF SOIL SCIENCE.
Effect of Soil-Water Relations on the Root Porosity, Transpiration and Ion Uptake in Rice, W75-10916 3F

GRUY (H. J.) AND ASSOCIATES, INC., DALLAS, TEX.
A Practical Way to Find Minimum Drainage Area for a Well, W75-11290 4B

GULF COAST RESEARCH LAB., OCEAN SPRINGS, MISS.
Transplanting Sea Grass in Mississippi Sound, W75-11207 4A

HALLIBURTON SERVICES, MONAHANS, TEX.
Simple Field Checks Will Provide Accurate DST Data, W75-11281 8G

HAMPTON ROADS SANITARY DISTRICT, NORFOLK, VA.
Milestone Water Legislation Accompanied by Millstone of Bureaucratic Red Tape, W75-11007 5G

HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER.
Nitrogen Removal in the Operation of the Mililani Sewage Treatment Plant, W75-11041 5D

HAWAIIAN ELECTRIC CO., INC., HONOLULU. ENVIRONMENTAL DEPT.
A Comparison of Effects of Elevated Temperature Versus Temperature Fluctuations on Reef Corals at Kahe Point, Oahu, W75-11084 5C

HELSINKI UNIV. (FINLAND). DEPT. OF BOTANY.
A General Description of the Oligotrophic Lake Paajarvi, Southern Finland, and the Ecological Studies on It, W75-11229 5C

HELSINKI UNIVERSITY OF TECHNOLOGY, OTANIEMI (FINLAND). DEPT. OF METALLURGY.
Study of Electrochemical Treatment Method for Removing Colloidal Particles from Pulp and Paper Industry Effluents (Tutkimus selluteollisuuden jatevesien kolloidaalisten ainesten poistomahdollisuudesta sahkokemialliesti). W75-11348 5D

HOWARD UNIV., WASHINGTON, D.C. BIOENVIRONMENTAL ENGINEERING AND SCIENCES RESEARCH LAB.
Population Dynamics of Protozoa in Wastewater, W75-10957 5D

HUNTINGDON RESEARCH CENTRE (ENGLAND). DEPT. OF BUILDING AND MAINTENANCE.
Huntingdon Research Centre Pasveer Oxidation Plant--Six Years On, W75-11115 5D

HYDRAULICS RESEARCH STATION, WALLINGFORD (ENGLAND).
The Design of Storm Water Drainage Channels Using Mathematical Model Techniques, W75-11150 8B

IBM WATSON RESEARCH CENTER, YORKTOWN HEIGHTS, N.Y.
Relative Importance of Decision Variables in Flood Frequency Analysis, W75-10929 4A

ICARUS CORP., SILVER SPRING, MD.
How to Estimate and Escalate Costs of Wastewater Equipment, W75-11014 5D

IDAHO AGRICULTURAL EXPERIMENT STATION, ABERDEEN.
Available Water-Holding Capacities of Soils in Southern Idaho, W75-11140 2G

**IFE UNIV. (NIGERIA). KAINJI DAM RESEARCH PROJECT.**
The Effects of the Formation of Lake Kainji (Nigeria) Upon the Indigenous Fish Population,
W75-11223 5C

**ILLINOIS INST. OF TECH., CHICAGO.**
Interactions of Heavy Metals in the Activated Sludge Process,
W75-11173 5D

**ILLINOIS STATE UNIV., NORMAL. COLL. OF APPLIED SCIENCE AND TECHNOLOGY.**
Wastewater Treatment Using Algae and Artemia,
W75-10967 5D

**ILLINOIS STATE WATER SURVEY, URBANA.**
Corrosion by Domestic Waters,
W75-11062 5F

Concentration and Genera of Algae in Selected Illinois Streams, 1971-1973,
W75-11165 5A

**ILLINOIS UNIV., CHICAGO. DEPT. OF BIOLOGICAL SCIENCES.**
Absorption and Elimination of Photodieldrin by Daphnia and Goldfish,
W75-11085 5B

**ILLINOIS UNIV., URBANA. DEPT. OF FORESTRY.**
Guidelines for the Identification of Potential Environmental Impacts in the Construction and Operation of a Reservoir,
W75-11316 5C

**INDIAN STATISTICAL INST., CALCUTTA. GEOLOGICAL STUDIES UNIT.**
Size-Sorting During Suspension Transportation--Lognormality and Other Characteristics,
W75-11162 2J

**INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE, DIJON (FRANCE). LABORATOIRE DE MICROBIOLOGIE DES SOLS.**
The Use of Soil as a Purifying System (L'Utilisation du sol Comme Systeme Epurateur),
W75-11126 5D

**INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE, VERSAILLES (FRANCE). SOILS LAB.**
Limitations of Using a Simulation Model of the Soil Under Irrigated Cultivation to Simulate the Functioning of the Soil as a Purifying System (Limites D'Utilisation D'Un Modele de Comportement du sol sous Culture Irriguee Pour Simuler le Fonctionnment du sol Comme Systeme Epurateur),
W75-11125 5B

**INSTITUTE FOR MARINE ENVIRONMENTAL RESEARCH, PLYMOUTH (ENGLAND).**
The Accumulation of Cadmium, Copper, Manganese and Zinc by Fucus Vesiculosus in the Bristol Channel,
W75-11083 5B

**INSTITUTE OF BIOLOGY OF THE SOUTHERN SEAS, ODESSA (USSR).**
Influence of Oil on Nucleic Acids of Algae,
W75-11080 5C

**INSTITUTE OF BIOLOGY OF THE SOUTHERN SEAS, SEVASTOPOL (USSR).**
Influence of Oil on Nucleic Acids of Algae,
W75-11232 5C

**INSTITUTE OF GAS TECHNOLOGY, CHICAGO, ILL.**
Anaerobic Acidogenesis of Wastewater Sludge,
W75-10976 5D

**INSTITUTE OF PAPER CHEMISTRY, APPLETON, WIS.**
Effect of Lime Treatment on Molecular Weight Distribution of Color Bodies from Kraft Linerboard Decker Effluents,
W75-11345 5D

**INSTITUTE OF TEXTILE TECHNOLOGY, CHARLOTTESVILLE, VIRGINIA.**
Upgrading Textile Operations to Reduce Pollution. (Part 1). In-Plant Control of Pollution.
W75-11326 5D

**INTERNATIONAL WATER SUPPLY LTD., MONTREAL (QUEBEC).**
Horizontal Groundwater Collectors, Hydraulics and Design,
W75-10998 8B

**IOWA UNIV., IOWA CITY. INST. OF HYDRAULIC RESEARCH.**
Thermal Response of Heated Streams, Solution by the Implicit Method,
W75-10909 5B

Investigation of the Operating Characteristics of the Iowa Sediment Concentration Measuring System,
W75-11163 2J

**IRVINE RANCH WATER DISTRICT, CALIF.**
A Solution to Pump Stoppages,
W75-11111 8C

**IWATE PREFECTURE FISHERIES EXPERIMENTAL STATION, KAMAISHI (JAPAN).**
Mercury Contents in Biologically Preserved Specimens of Menuke (Sebastes Baramenuke and S. Flammeus),
W75-11078 5A

**JOINT PUBLICATIONS RESEARCH SERVICE, ARLINGTON, VA.**
Translations on Environmental Quality, No. 33.
W75-11246 5G

**K-KONSULT, LUND (SWEDEN).**
Industry and Community in Cooperation,
W75-10985 5D

**KANSAS CITY WATER DEPT., MO.**
Liquid CO2 Protects our Water's Quality,
W75-10990 5F

**KANSAS STATE UNIV., MANHATTAN. INST. FOR SYSTEMS DESIGN AND OPTIMIZATION.**
Design of the Optimal Outfall System for a Stream Receiving Thermal and Organic Waste Discharges,
W75-11137 5B

**KEARNEY (A. T.) AND CO., INC., CHICAGO, ILL.**
Economic Analysis of Effluent Guidelines. Ferroalloys Industry.
W75-11250 5G

**KENNEDY ENGINEERS, INC., TACOMA, WASH.**
Can a Computer Really Operate a Water-Filtration Plant,
W75-11184 5F

**KENTUCKY WATER RESOURCES INST., LEXINGTON.**
Covariance Analysis of Reservoir Development Effects on Property Tax Base.
W75-10851 6B

The Law of Water Allocation in Kentucky.
W75-10898 6E

**KEURINGSINSTITUUT VOOR WATERLEIDINGARTIKELEN, RIJSWIJK (NETHERLANDS).**
Continuous Automatic Monitoring of Surface Water with Fish,
W75-11079 5A

**KIMBERLY-CLARK CORP., NEENAH, WIS. (ASSIGNEE)**
Aerobic Lagoon Waste Treatment System and Method,
W75-11069 5D

**KIPINVEST, BUDAPEST (HUNGARY).**
Papermaking Complex at Dunaujvaros (Hungary) -- Preserving the Danube (Au complexe papetier de Dunaujvaros -- preserver l Danube),
W75-11333 5D

**KURUKSHETRA UNIV. (INDIA). DEPT. OF BOTANY.**
Seasonal Variation in Composition. Pla Biomass, and Net Primary Productivity of Tropical Grassland at Kurukshetra, India,
W75-11006

**KYUNGPOOK NATIONAL UNIV., TAEGU (REPUBLIC OF KOREA). COLL. OF AGRICULTURE.**
Effects of Irrigation in Rain-Fed Fields on t Growth and Yield of Upland Rice Varieties, ( Korean),
W75-10853

**LANCY LABS., INC., ZELIENOPLE, PA.**
Upgrading Metal-Finishing Facilities to Redu Pollution. (Part 2). Waste Treatment,
W75-11325

**LEICESTER UNIV (ENGLAND). PUBLIC SECTOR ECONOMICS RESEARCH CENTRE**
Non-Renewable, Non-Energy Resources,
W75-11253

**LOS ANGELES COUNTY HEALTH SERVICE DEPT., CALIF. IMMUNIZATION PROJECT.**
A Waterborne Gastroenteritis Epidemic in I Rivers, California,
W75-11005

**LOUISIANA STATE UNIV., BATON ROUGE DIV. OF ENGINEERING RESEARCH.**
The Louisiana Environmental Manage System and Its Utility in Water Reso Planning,
W75-11177

**LOUISIANA WILD LIFE AND FISHERIES COMMISSION, TIOGA. AQUATIC WEED RESEARCH.**
Water Level Manipulation: A Tool for Aq Weed Control,
W75-11216

**MAINE UNIV., ORONO. DEPT. OF CIVIL ENGINEERING.**
Virus Removal and Inactivation During Treatment,
W75-10991

RYLAND UNIV., CATONSVILLE. DIV. OF LOGICAL SCIENCES.
daptation of Copepod Populations to Thermal ress,
75-11046 5C

RYLAND UNIV., COLLEGE PARK. DEPT. CHEMISTRY.
havior of Mn, Fe, Cu, Zn, Cd and Pb scharged from a Wastewater Treatment Plant o an Estuarine Environment,
'5-11160 5B

YLAND UNIV., COLLEGE PARK. DEPT. IVIL ENGINEERING.
od Runoff from Urban Areas,
5-10904 5B

SACHUSETTS DEPT. OF PUBLIC LTH, LAWRENCE. LAWRENCE RIMENT STATION.
ivated Carbon in the Water Treatment t,
5-10992 5D

ACHUSETTS INST. OF TECH., RIDGE. DEPT. OF CIVIL NEERING.
erimental Study of the Cooling Water em, Setubal Power Plant, Rio Sado, Portu-
-10855 5B

ACHUSETTS UNIV., AMHERST. DEPT. RICULTURAL AND FOOD OMICS.
Economics of Flood Insurance: An Analy- the National Flood Insurance Program,
11038 6F

CHUSETTS UNIV., AMHERST. DEPT. OD AND RESOURCE ECONOMICS.
dplain Land-Use Management: An Appli- of Operations Research Methodology,
11037 6F

CHUSETTS UNIV., AMHERST. WATER RCES RESEARCH CENTER.
onmental Impact Evaluation in Fresh- Impoundments by Vegetation Analysis of rrestrial Ecosystem,
0905 2I

inary Investigations into Copper Cycling an Lake, Massachusetts: A Lake Treated lly with Copper Sulfate,
1039 5B

UNIV., PALMERSTON NORTH (NEW D).
rence of Mercury(II) in the Colorimetric ination of Inorganic Phosphate in
340 5A

RNE AND METROPOLITAN BOARD KS (AUSTRALIA).
on of Change in Sequences of gic Data,
302 7C

LL., GRAND JUNCTION, COLO. BIOLOGICAL SCIENCES.
e of Snakes as a Pollution Indicator
089 5B

F AND EDDY, INC., BOSTON, MASS.
ng Textile Operations to Reduce Pollu- rt 2). Wastewater Treatment Systems.
27 5D

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF FORESTRY.
Changes in Vegetation and Surface Soil Properties Following Irrigation of Woodlands with Municipal Wastewater,
W75-11243 5B

MICHIGAN STATE UNIV., HICKORY CORNERS. W. K. KELLOGG BIOLOGICAL STATION.
Dissolved Organic Matter and Lake Metabolism,
W75-11188 5C

MICHIGAN UNIV., ANN ARBOR. DEPT. OF GEOLOGY AND MINERALOGY.
Matagorda Island, Texas: The Evolution of a Gulf Coast Barrier Complex,
W75-11144 2L

MICHIGAN UNIV., ANN ARBOR. DEPT. OF NAVAL ARCHITECTURE AND MARINE ENGINEERING.
Economics of Great Lakes Shipping in an Extended Season,
W75-11248 6C

MIDWEST RESEARCH INST., KANSAS CITY, MO.
Water Pollution from Nonpoint Sources,
W75-11158 5B

MINISTRY OF AGRICULTURE, STOCKHOLM (SWEDEN).
Water Conservation in Sweden: III. Current Trends,
W75-10987 5G

MINNESOTA UNIV., MINNEAPOLIS. DEPT. OF GEOLOGY AND GEOPHYSICS.
Study of Criteria and Models Establishing Optimum Level of Hydrogeologic Information for Groundwater Basin Management,
W75-11042 2F

MINNESOTA UNIV., ST. PAUL. DEPT. OF ENTOMOLOGY, FISHERIES AND WILDLIFE.
Factors Influencing Acute Toxicity Estimates of Hydrogen Sulfide to Freshwater Invertebrates,
W75-11027 5C

MISSISSIPPI STATE UNIV., MISSISSIPPI STATE. DEPT. OF CIVIL ENGINEERING.
Organic Color in Groundwater of Mississippi,
W75-10907 5F

MISSISSIPPI STATE UNIV., MISSISSIPPI STATE. DIV. OF BUSINESS RESEARCH.
A Case Study of Some Economic Aspects of the National Flood Insurance Program,
W75-10906 6F

MISSISSIPPI UNIV., UNIVERSITY. DEPT. OF MECHANICAL ENGINEERING.
Some Results on Mass Transfer Processes in a Density-Stratified Flow,
W75-11057 8B

MISSOURI UNIV., COLUMBIA. DEPT. OF CIVIL ENGINEERING.
Acid Strip Mine Lake Recovery,
W75-11224 5C

MOBIL RESEARCH AND DEVELOPMENT CORP., DALLAS, TEX.
Subsurface Water -- Tool for Petroleum Exploration,
W75-11289 4B

MONASH UNIV., CLAYTON (AUSTRALIA). DEPT. OF CIVIL ENGINEERING.
Variability, Persistence and Yield of Australian Streams,
W75-11308 2E

MOSUL UNIV. (IRAQ).
Optimum Values for Operational Variables in Turbidity Removal,
W75-11110 5D

MWL TOOL AND SUPPLY CO., MIDLAND, TEX.
Techniques for Linear Tie-Back Cementing,
W75-11277 8F

NAGASAKI UNIV. (JAPAN).
Studies on Toxicity of Sodium Nifurstyrenate (NFS-NA) in Cultured Yellowtail (In Japanese),
W75-11034 5C

Studies on the Inorganic Components of Marine Animals-III, on the Contents of Cadmium, Zinc, Copper, Lead and Iron in Muscle and Viscera of Marine Animals Captured in the West Sea Area of Kyushu, (In Japanese),
W75-11087 5C

NAGOYA UNIV. (JAPAN). DEPT. OF CHEMICAL ENGINEERING.
Slurry Deliquoring by Expression,
W75-10969 5D

NAGOYA UNIV. (JAPAN). FACULTY OF AGRICULTURE.
Biodegradation of Components of Pulp Waste Effluents by Bacteria. (1). Degradation of Kraft Lignin (In Japanese),
W75-11346 5B

NATIONAL BUREAU OF STANDARDS, WASHINGTON, D.C. INST. FOR BASIC STANDARDS.
Note on the Measurement of the Response of Oceanographic Temperature Sensors,
W75-11146 7B

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH, BOULDER, COLO.
Charged Droplet Collision Efficiency Measurements,
W75-11168 2B

NATIONAL CENTER FOR TOXICOLOGICAL RESEARCH, JEFFERSON, ARK.
Mutagens and Potential Mutagens in the Biosphere: I. DDT and Its Metabolites, Polychlorinated Biphenyls, Chlorodioxins, Polycyclic Aromatic Hydrocarbons, Haloethers,
W75-11170 5B

Mutagens and Potential Mutagens in the Biosphere: II. Metals--Mercury, Lead, Cadmium and Tin,
W75-11171 5B

NATIONAL COUNCIL OF THE PAPER INDUSTRY FOR AIR AND STREAM IMPROVEMENT, INC., NEW YORK.
Evaluation of the Adsorptive Properties of Fly Ash with Reference to a Pulp and Paper Mill Waste Effluent,
W75-11335 5D

NATIONAL ENVIRONMENTAL RESEARCH CENTER, CINCINNATI, OHIO. METHODS

**DEVELOPMENTS AND QUALITY ASSURANCE RESEARCH LAB.**
Modification of the Iodimetric Titration Method for the Determination of Bromide and Its Application to Mixed Domestic-Industrial Waste Effluents,
W75-11341 5A

**NATIONAL INST. FOR WATER RESEARCH, PRETORIA (SOUTH AFRICA).**
Desirable Provision in Current Designs for Future Development in Relation to Reclamation of Effluent,
W75-10980 5D

Drug Resistant Coliforms Call for Re-Evaluation of Water Quality Standards,
W75-11130 5B

South African Eutrophication Problems: A Perspective,
W75-11131 5C

**NATIONAL INST. OF RADIOLOGICAL SCIENCES, CHIBA (JAPAN). DEPT. OF ENVIRONMENTAL CONTAMINATION.**
A Field Study of Physico-Chemical States of Artificial Radionuclides in Seawater,
W75-11022 5B

**NATIONAL INST. OF RADIOLOGICAL SCIENCES, CHIBA (JAPAN). DIV. OF TRAINING SCHOOLS.**
Retention of Cadmium in Mice Studied by Whole Body Autoradiography,
W75-11024 5A

**NATIONAL MARINE FISHERIES SERVICE, PANAMA CITY, FLA. GULF COASTAL FISHERIES CENTER.**
A Survey of Fishes and Commercial Invertebrates of the Nearshore and Estuarine Zone Between Cape Romano and Cape Sable, Florida,
W75-11189 2I

**NATIONAL RESEARCH COUNCIL, WASHINGTON, D.C. COMMITTEE ON JOJOBA UTILIZATION.**
Products from Jojoba: A Promising New Crop for Arid Lands.
W75-10890 3F

**NATIONAL TAIWAN UNIV., TAIPEI. HYDRAULIC LAB.**
Ground Water Depletion and Subsidence Problems in Taipei Basin,
W75-11262 4B

**NATIONAL WATER COUNCIL, LONDON (ENGLAND).**
The Water Industry in Transition,
W75-11252 3E

**NEVADA UNIV., RENO. DESERT RESEARCH INST.**
Time-Variant Characteristics of Selected Wastewater Treatment Plants of Nevada,
W75-11245 5D

**NEW MEXICO INST. OF MINING AND TECHNOLOGY, SOCORRO.**
Derivation of Surface Water Lag Time for Converging Overland Flow,
W75-11156 2E

Approximation for Steady Interface Beneath a Well Pumping Fresh Water Overlying Salt Water,
W75-11255 4B

**NEW MEXICO STATE UNIV., CLOVIS. PLAINS BRANCH AGRICULTURAL EXPERIMENT STATION.**
Effects of Antitranspirants on Yield of Grain Sorghum Under Limited Irrigation,
W75-10858 3F

**NEW MEXICO STATE UNIV., UNIVERSITY PARK. DEPT. OF HORTICULTURE.**
Water Application Practices and Landscape Attributes Associated with Residential Water Consumption,
W75-11059 3D

**NEW MEXICO UNIV., ALBUQUERQUE. DEPT. OF BIOLOGY.**
Man's Impact on a Newly Formed Reservoir,
W75-11233 5C

**NEW ORLEANS UNIV., LA. DEPT. OF BIOLOGICAL SCIENCES.**
Epifaunal Invertebrates as Indicators of Water Quality in Southern Lake Pontchartain,
W75-10852 5C

**NEW SOUTH WALES DEPT. OF PUBLIC WORKS, SYDNEY (AUSTRALIA). WATER SUPPLY AND SEWERAGE BRANCH.**
Australian Arid Zone Streangauging,
W75-11307 2E

**NEW SOUTH WALES UNIV., KENSINGTON (AUSTRALIA). DEPT. OF CIVIL ENGINEERING.**
Problems of Liquid Waste Disposal,
W75-11112 5G

**NEW SOUTH WALES UNIV., KENSINGTON (AUSTRALIA). SCHOOL OF CIVIL ENGINEERING.**
Multilag Markov Models for Eastern Australian Streams,
W75-11301 2E

Droughts, Distributions and Dependence: An Analysis of Some Synthetic Data Generation Methods,
W75-11305 2E

Difficulties in Gauging Small Catchments - A Case Study,
W75-11306 2E

**NEW SOUTH WALES UNIV., KENSINGTON (AUSTRALIA). SCHOOL OF WOOL AND PASTORAL SCIENCES.**
Some Observations on Rainfall in Western New South Wales,
W75-11304 2B

**NEW YORK AQUARIUM, BROOKLYN. OSBORN LABS. OF MARINE SCIENCES.**
The Role of Planktonic Protozoa in the Marine Food Chain. Seasonal Changes, Relative Abundance, and Cell Size Distribution of Tintinnida,
W75-11191 5C

**NEW YORK STATE COLL. OF AGRICULTURE AND LIFE SCIENCES, ITHACA, N.Y. ECOLOGY AND SYSTEMATICS SECTION.**
Utilization of Stream-Borne Phosphorus by Cayuga Lake Phytoplankton,
W75-11036 5C

**NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY. DIV. OF AIR RESOURCES.**
Evidence of Atmospheric Transport of Ozone into Urban Areas,
W75-11169 5A

**NIHON SUIDO CONSULTANTS CO., TOKYO (JAPAN).**
Improved Design of Distribution Networks by Minimum Route,
W75-11175 4A

**NIHON UNIV., TOKYO (JAPAN). DEPT. OF FISHERIES.**
Some Observations on Behavior of the Treated Sewage Disposed in the Sea,
W75-11020 5

**NL INDUSTRIES, INC., HOUSTON, TEX. BAROID DIV.**
Tests Show Potassium Mud Versatility,
W75-11284 8

**NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF CHEMICAL ENGINEERING.**
Solute-Solute Interactions in Ultrafiltration Treatment of Paper Mill Wastes,
W75-11334 5

**NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF CIVIL ENGINEERING.**
Implicit Numerical Modeling of Unsteady Flows,
W75-10925

Management of Retardation of Salt Water Intrusion in Coastal Aquifers,
W75-11058

**NORTHERN FOREST RESEARCH CENTER, EDMONTON (ALBERTA).**
Specific Conductance Method for in Situ Determination of Total Dissolved Solids,
W75-11167

**OAK RIDGE NATIONAL LAB., TENN.**
Chlorine-Containing Organic Constituents in Chlorinated Effluents,
W75-10970

Calcium Sulfate Solubility in Brackish Water Concentrates and Applications to Reverse Osmosis Processes: Polyphosphate Additives,
W75-11004

Status of Waste Heat Utilization and Dual-Purpose Plant Projects,
W75-11251

**OFFICE OF THE CHIEF OF ENGINEERS (ARMY), WASHINGTON, D.C.**
Registration of Aquatic Herbicides,
W75-11212

**OFFICE OF WATER RESEARCH AND TECHNOLOGY, WASHINGTON, D.C.**
Membrane Desalting Gets Big Push,
W75-10982

**OKLAHOMA STATE UNIV., STILLWATER. DEPT. OF AGRICULTURAL ENGINEERING.**
Wind Effects on Chemical Films for Evaporation Suppression at Lake Hefner,
W75-10920

Improved Design and Operating Criteria for Rural Water Districts,
W75-11056

**OKLAHOMA STATE UNIV., STILLWATER. SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING.**
Hydraulic Modeling of Mixing Phenomena in Stratified Lakes,
W75-11043

LAHOMA UNIV., NORMAN.
A Mathematical Model for Optimal Waste Load Allocations,
W75-11102 5G

LAHOMA UNIV., NORMAN. DEPT. OF IL ENGINEERING AND ENVIRONMENTAL ENCE.
eprivation Contribution and Interference Effects of Multiple Wells in a Common Aquifer,
75-11142 4B

AHA METROPOLITAN UTILITIES TRICT, NEBR. SERVICES DEPT.
stribution-System Operation Analysis Model,
75-11180 5D

GON STATE UNIV., CORVALLIS. DEPT. IVIL ENGINEERING.
ategic Approach to Estuarine Environmental nagement,
75-11179 2L

GON STATE UNIV., CORVALLIS. OOL OF FORESTRY.
sipation of Residues of Phenoxy Herbicides plied to the Watershed,
5-11213 5B

GON STATE UNIV., CORVALLIS. OOL OF OCEANOGRAPHY.
r-Bottom Chemistry in the Eastern Pacific North Atlantic Oceans,
5-10923 2K

eevaluation of the Combined Effects of perature and Salinity on Survival and wth of Bivalve Larvae Using Response ace Techniques,
-11081 5C

O UNIV., DUNEDIN (NEW ZEALAND). OF GEOLOGY.
-Emplaced Sand-Fingers at Mararoa Conion Site, Southern New Zealand,
11161 2J

ETAL FINISHING CORP., MADISON TS, MICH.
ding Metal-Finishing Facilities to Reduce ion. (Part I). In-Process Pollution Abate-
1324 5D

FABRIK BIBERIST (SWITZERLAND).
ilities of Reutilization of Kaolin from ical Waste Water Sludges lichkeiten der Wiederverwertung von aus biologischen Abwasserchlaemmen),
1349 5D

LVANIA STATE UNIV., UNIVERSITY CHOOL OF FORESTRY.
tion of Phenoxy Herbicides Applied to n Vegetation,
214 5B

ECH LTD., LONDON (ENGLAND).
ed Gases Are Key Corrosion Culprits,
274 8G

RGH UNIV., PA. DEPT. OF CIVIL RING.
ater Treatment Plant Odors: A Continuma,
986 5D

ON CONTROL, INC., SOUTH BARRE, GNEE)
mperature Water Purification System,
74 5F

POLYTECHNIC INSTITUTE OF NEW YORK, BROOKLYN; AND ILLINOIS UNIV., CHICAGO.
Computer Systems and Water Resources,
W75-11174 6A

POWER REACTOR AND NUCLEAR FUEL DEVELOPMENT CORP., TOKYO (JAPAN). RAW MATERIALS DIV.
Uranium Mineralization by Ground Water in Sedimentary Rocks, Japan.
W75-11145 2F

PRINCE GEORGE CITY ENGINEER'S OFFICE (BRITISH COLUMBIA).
Horizontal Groundwater Collectors, 'Canada's Largest Water Well',
W75-10999 8B

QUEENSLAND UNIV., BRISBANE (AUSTRALIA). DEPT. OF ZOOLOGY.
Quantitative Estimation of the Daily Ingestion of Phytoplankton by Tilapia Nilotica and Haplochromis Nigripinnis in Lake George, Uganda,
W75-11268 2H

RAND CORP., SANTA MONICA, CALIF.
A Three-Dimensional Model for Estuaries and Coastal Seas: Vol. II, Aspects of Computation,
W75-10900 2L

RENSSELAER POLYTECHNIC INST., TROY, N.Y. DEPT. OF CHEMICAL ENGINEERING; AND RENSSELAER POLYTECHNIC INST., TROY, N.Y. DEPT. OF ENVIRONMENTAL ENGINEERING.
Total Waste Recycle System for Water Purification Plant Using Alum as Primary Coagulant,
W75-11094 5D

RENSSELAER POLYTECHNIC INST., TROY, N.Y. FRESH WATER INST.
Freshwater Ecosystem Research in Water Quality Management,
W75-11012 6G

RESOURCES FOR THE FUTURE, INC., WASHINGTON, D.C.
Interbasin Water Transfers: A Case Study in Mexico,
W75-10879 4A

RHODE ISLAND UNIV., KINGSTON. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Physiochemical Treatment of Wastewater-Seawater Mixture by Electrolysis,
W75-10979 5D

RHODE ISLAND UNIV., KINGSTON. GRADUATE SCHOOL OF OCEANOGRAPHY.
Copper Toxicity in Busycon Canaliculatum L.,
W75-11031 5C

RICE UNIV., HOUSTON, TEX.
Theory of Plasticity of Porous Media with Fluid Flow,
W75-11276 8E

RIKE SERVICE, NEW ORLEANS, LA.
How to Make Squeeze Cementing Successful,
W75-11286 8F

ROYAL UNIV. OF MALTA, VALLETTA. DEPT. OF CHEMISTRY.
The Role of Endogenous Abscisic Acid in the Response of Plants to Stress,
W75-11319 3F

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J.
The Water Quality and Bottom Sediment Characteristics of New Jersey Lagoon Developments,
W75-11104 5B

SALFORD UNIV. (ENGLAND).
On-Site Hypochlorite Generation,
W75-11109 5D

SALISBURY CITY ENGINEER'S DEPT. (RHODESIA).
Chemical-Biological Treatment With Biological Filters,
W75-11123 5D

SANDIA LABS., ALBUQUERQUE, N. MEX.
Drilling Rate Affects Costs More than Bit Life,
W75-11279 8C

SASKATCHEWAN UNIV., SASKATOON. DEPT. OF SOIL SCIENCE.
Soil Morphology and Soil Physical Properties: II. Mechanical Impedance and Moisture Retention and Movement,
W75-10885 2G

SEATTLE DEPT. OF WATER, WASH.
Algae Control in Northwest Reservoirs,
W75-11231 5G

SENATE, WASHINGTON, D.C.
The Responsibility of U.S. Water Suppliers,
W75-10856 5G

SHEFFIELD WATER POLLUTION CONTROL DEPT. (ENGLAND).
Some Studies on Nitrification in the Activated Sludge Process,
W75-10961 5D

SHELL OIL CO., HOUSTON, TEX.
Analysis of Factors Influencing Mobility and Adsorption in the Flow of Polymer Solution Through Porous Media,
W75-11275 8B

SHIMONOSEKI UNIV. OF FISHERIES (JAPAN).
The Influence of the Warm Cooling Water from a Fossil Fueled Power Plant on Oceanographic Conditions and Composition of Plankton in Owase Bay I. Water Temperature in Relation to Distribution of Microplankton, (In Japanese),
W75-11030 5C

SNOWY MOUNTAINS ENGINEERING CORP., CANBERRA (AUSTRALIA).
Hydrologic Investigation and Design of Urban Stormwater Drainage Systems,
W75-11141 4A

SOUTH AUSTRALIA DEPT. OF AGRICULTURE, ADELAIDE.
The Early Vegetative Growth of Two Annual Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.),
W75-10876 3F

The Influence of Density and Nitrogen on the Outcome of Competition Between Two Annual Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.),
W75-10889 3F

The Germination and Establishment of Two Annual Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.),
W75-10897 2I

**SPRINGFIELD DEPT. OF WATER, LIGHT AND POWER, ILL.**
Computer Analysis of Water-Distribution Systems,
W75-11182 4A

**STANFORD UNIV., CALIF. DEPT. OF CIVIL ENGINEERING.**
Two-Dimensional, Hydrostatic Simulation of Thermally-Influenced Hydrodynamic Flows,
W75-10901 2H

**STATE UNIV. COLL., FREDONIA, N.Y. DEPT. OF BIOLOGY.**
Root:Shoot and Leaf Area Relationships of Macrophyte Communities in Chautauqua Lake, New York,
W75-11009 5C

**STATE UNIV. OF NEW YORK, BUFFALO.**
The Kinetics of Crystallization of Scale-Forming Minerals,
W75-11273 8G

**STATE UNIV. OF NEW YORK STONY BROOK. MARINE SCIENCES RESEARCH CENTER.**
Surface Tension Reductions and Urban Wastes in The New York Bight,
W75-10927 5B

**STIRLING UNIV. (SCOTLAND). DEPT. OF BIOLOGY.**
Some Effects of Copper on the Polychaete Phyllodoce Maculata,
W75-11136 5C

**STONE AND WEBSTER ENGINEERING CORP., DENVER, COLO.**
Turbulent Structure Near Smooth Boundary,
W75-11148 8B

**SWISS FEDERAL INST. FOR SNOW AND AVALANCHE RESEARCH, DAVOS-WEISSFLUHJOCH.**
Subsurface Flow from Snowmelt Traced by Tritium,
W75-10921 2F

**TASMANIAN DEPT. OF THE ENVIRONMENT, HOBART (AUSTRALIA).**
Uptake of Cadmium, Zinc, Copper, Lead and Chromium in the Pacific Oyster, Crassostrea Gigas, Grown in the Tamar River, Tasmania,
W75-11086 5B

**TECHNION - ISRAEL INST. OF TECH., HAIFA.**
The Mechanism of Flocculation Processes in the Presence of Humic Stubtances,
W75-10958 5D

**TECHNION - ISRAEL INST. OF TECH. HAIFA (ISRAEL). DEPT. OF AGRICULTURAL ENGINEERING.**
Human Obstacles to the Control of the Hydrological Cycle for the Benefit of Man,
W75-10866 2A

**TEKMAR CO., CINCINNATI, OHIO.**
Apparatus for Concentration of Volatile Organic Pollutants in Water,
W75-11342 5A

**TENNESSEE UNIV., KNOXVILLE. COLL. OF ENGINEERING.**
Laboratory Investigation of One-Dimensional Wave Motion in Open Channels,
W75-11172 8B

**TENNESSEE VALLEY AUTHORITY, MUSCLE SHOALS, ALA.**
Dissipation of Residues of Phenoxy Herbicides Applied for Water Milfoil Control in Large Reservoirs,
W75-11198 5B

**TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF BIOCHEMISTRY AND BIOPHYSICS.**
Biomagnification of Dieldrin Residues by Food Chain Transfer from Clams to Blue Crabs Under Controllied Conditions,
W75-11135 5C

**TEXAS PARKS AND WILDLIFE DEPT., SAN ANTONIO. STATEWIDE NOXIOUS VEGETATION CONTROL PROGRAM.**
Integrated Controls on Noxious Aquatic Plants,
W75-11204 5G

**TEXAS TECH UNIV., LUBBOCK.**
Stabilization and Reconstruction of Texas Coastal Foredunes with Vegetation,
W75-10887 2L

**TEXAS UNIV. AT DALLAS, RICHARDSON. INST. FOR ENVIRONMENTAL SCIENCES.**
Dissolved Gas Supersaturation and Dilution in Thermal Plumes from Steam Electric Generating Stations,
W75-11159 5B

**THAMES WATER AUTHORITY, LONDON (ENGLAND).**
A New Look at Pollution Prevention on Lowland Rivers,
W75-11132 5G

**TOTTORI UNIV. (JAPAN). DEPT. OF FORESTRY MANAGEMENT.**
Studies on the Relationship Between Dry-Matter Production and the Development of a Pine Forest on Coastal Sand Dunes (1), (In Japanese),
W75-11098 4A

**TOTTORI UNIV. (JAPAN). SAND DUNE RESEARCH INST.**
Cultivation of Netted Melon By Use of Trickle Irrigation in a Sand Field Plastic Greenhouse, (In Japanese),
W75-11095 3F

Nozzle Hydraulics in the Trickle Irrigation System--Relation Between Water Temperature and Nozzle Flow Rate (In Japanese),
W75-11096 3F

Practical Application of Surface Fixed-System for Multi-Purpose Sprinkler Irrigation Uses, (In Japanese),
W75-11097 3F

**TROMSO UNIV. (NORWAY). INST. OF BIOLOGY AND GEOLOGY.**
The Effects of Crude Oils and the Dispersant Corexit 8666 on Sea Urchin Gametes and Embryos,
W75-11090 5C

The Effects of Oil Dispersants on the Cell in Fertilization and Development,
W75-11091 5C

**TULSA UNIV., OKLA. DEPT. OF EARTH SCIENCES.**
Review of Conference on Hydrology of Deep Sedimentary Basins,
W75-10935 5B

**TUSKEGEE INST., ALA. SCHOOL OF APPLIED SCIENCES.**
Solid Wastes, Animal Refuse, and Organic Residues Disposal, and the Quality of Ground Water,
W75-11244 5B

**UHDE (FRIEDRICH) G.M.B.H., DORTMUND (WEST GERMANY).**
The Economy of Various Methods for Dewatering Sludge From Biological Purification (Ueber die Wirtschaftlichkeit verschiedener Verfahren zur Entwaesserung von biologischem Klaerschlamm),
W75-11127 5D

**UNIVERSITY COLL., DUBLIN, (IRELAND). DEPT. OF CIVIL ENGINEERING.**
The Nature and Components of the Hydrological Cycle,
W75-10864 2A

**UNIVERSITY COLL. OF ENGINEERING, BURLA (INDIA). DEPT. OF CIVIL ENGINEERING.**
Application of Electrical Analogy to Draw
Flow Nets for Sudden Drawdown Conditions i
Earth Dams,
W75-11143 8

**UNIVERSITY OF NEW ENGLAND, ARMIDALE (AUSTRALIA). DEPT. OF GEOGRAPHY.**
Aspects of Rainfall Measurement in a New E
gland Location,
W75-11309 2

**UNIVERSITY OF NEW ENGLAND, ARMIDALE (AUSTRALIA). SCHOOL OF NATURAL RESOURCES.**
Generation of Arid Zone Rainfall and Runoff
W75-11303

**UNIVERSITY OF SOUTHWESTERN LOUISIANA, LAFAYETTE. DEPT. OF PLANT INDUSTRY.**
Field Testing of Aquatic Herbicides for Cont
of Egeria Densa,
W75-11200

**UPPSALA UNIV. (SWEDEN). ALGAL ASSAY LAB.**
Minitest Method for Monitoring Effluent Qu
ty,
W75-10994

**UTAH STATE UNIV., LOGAN. DEPT. OF CI AND ENVIRONMENTAL ENGINEERING.**
Process Studies and Modeling of Self-Clea
Capacity of Mountain Creeks for Recrea
Planning and Management,
W75-11055

**UTAH STATE UNIV., LOGAN. INST. FOR SOCIAL SCIENCE RESEARCH ON NATUR RESOURCES.**
Social Impacts of Water Resources Dev
ments and Their Implication for Urban
Rural Development: A Post Audit Analy
the Weber Basin Project in Utah,
W75-10854

**UTAH STATE UNIV., LOGAN. WATERSH SCIENCE UNIT.**
Approximate Annual Water Budgets of
Chained Pinyon-Juniper Sites,
W75-10896

**ERBILT UNIV., NASHVILLE, TENN. . OF GEOLOGY.**
tudy of Factors Controlling the Chemical lity of Water in Cartwright Creek Basin, iamson County, Tennessee,
-11164 2K

**(J.) ASSOCIATES, INC., NEW YORK. GNEE)**
em for Softening and Dealkalizing Water lectrodialysis,
-11065 5F

**ENBYGGNADSBYRAN LTD., KHOLM (SWEDEN).**
gen Removal in a Pilot Plant,
10984 5D

**NBYGGNADSBYRAN LTD., HOLM (SWEDEN). WATER AND ONMENTAL DIV.**
rground Wastewater Treatment Plants,
10974 5D

**RIA STATE COLL., CARLTON ALIA). DEPT. OF PLANT OLOGY.**
quatic Weed Problem. 1. Identification,
1220 2I

**IA POLYTECHNIC INST. AND STATE BLACKSBURG. DEPT. OF FISHERIES LDLIFE SCIENCES.**
ic Plant Control Using Herbicides in a Potable Water Supply,
1201 5G

**A STATE WATER CONTROL BOARD, ND.**
tion of Water Quality Management Poli-
181 5G

**V UNIV. (POLAND). DEPT. OF BIOLOGY.**
nentally Increased Fish Stock in the ype Lake Warniak. IV. Feeding of In- d and Autochthonous Non-Predatory
234 5C

**GTON UNIV., SEATTLE. COLL. OF RESOURCES.**
ranspiration of Four Forest Types Mea- ith the Eddy Correlation Technique,
044 2D

**GTON UNIV., SEATTLE. DEPT. OF GRAPHY.**
ochemical Cycle of Arsenic in Lake ton and its Relation to Other Elements,
22 5B

a Excretion by Zooplankton and its nce to Primary Productivity During
87 5C

**TON UNIV., SEATTLE. SCHOOL OF**
nd Institutional Problems in the ent of Salinity,
47 5G

**O UNIV. (ONTARIO). DEPT. OF**
cts of Experimental Blackfly (Diptera: e) Larviciding with Abate, Dursban, oxychlor on Stream Invertebrates,
7 5C

**WATERLOO UNIV. (ONTARIO). DEPT. OF MECHANICAL ENGINEERING.**
Condensation in Jets, Industrial Plumes and Cooling Tower Plumes,
W75-11166 2B

**WATTS REGULATOR CO., LAWRENCE, MASS.**
Preventing Backflow in Piping Cross Connections,
W75-11018 5B

**WHEELABRATOR-FRYE INC., NEW YORK. (ASSIGNEE)**
Flocculation Device for Waste Fluid Treatment,
W75-11077 5D

**WIGGINS-RIMER AND ASSOCIATES, DURHAM, N.C.**
Preserving Activated Sludge,
W75-10962 5D

**WISCONSIN UNIV., MADISON. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.**
Treatment Plant Monitoring Programs: A Preliminary Analysis,
W75-11176 5D

**WISCONSIN UNIV., MADISON. DEPT. OF SOIL SCIENCE.**
Concurrent Nitrification-Denitrification at the Sediment-Water Interface as a Mechanism for Nitrogen Losses from Lakes,
W75-10902 5C

**WISCONSIN UNIV., MADISON. LAND TENURE CENTER; AND WISCONSIN UNIV., MADISON. DEPT. OF AGRICULTURAL JOURNALISM.**
Information as a Regulatory Tool in Water Quality Control,
W75-10903 5G

**WISCONSIN UNIV., MADISON. LIBRARY SCHOOL.**
The Awareness of the Relevant Water Resources Literature by the Personnel of the Wisconsin Department of Natural Resources,
W75-10899 10C

**WISCONSIN UNIV., MADISON. WATER RESOURCES CENTER.**
Extraction and Analytical Techniques for Pesticides in Soil, Sediment, and Water,
W75-11236 5A

**WISCONSIN UNIV., MILWAUKEE. CENTER FOR GREAT LAKES STUDIES.**
Investigation of the Influence of Thermal Discharge from a Large Electric Power Station on the Temperature and Near-Shore Circulation of Lake Michigan,
W75-11190 5C

**WISCONSIN UNIV., MILWAUKEE. DEPT. OF GEOGRAPHY.**
Denudation Studies: Can We Assume Stream Steady State,
W75-11154 2J

**WRIGHT WATER ENGINEERS, INC., DENVER, COLO.**
Colorado City Solves Its Sand Pumping Problems,
W75-11261 8C

**WYOMING UNIV., LARAMIE. WATER RESOURCES RESEARCH INST.**
Water Resource Observatory Climatological Data, Water Year 1973.
W75-11035 7C

**WYZSZA SZKOLA ROLNICZA, SZCZECIN (POLAND). DEPT. OF HYDROZOOLOGY.**
Use of Steelon-Net Veils for Protection of the Hydro-Engineering Works Against Dreissena Polymorphia Pall,
W75-11033 5G

**YALE UNIV., NEW HAVEN, CONN. SCHOOL OF FORESTRY.**
Vegetation, Soil, and Climate on the Green Mountains of Vermont,
W75-11021 2I

**YORK UNIV., DOWNSVIEW (ONTARIO). DEPT. OF BIOLOGY.**
An Investigation of Glycolate Excretion in Two Species of Blue-Green Algae,
W75-11230 5C

**YULE, JORDAN AND ASSOCIATES, CAMP HILL, PA. ENVIRONMENTAL ENGINEERING DIV.**
How Silica Affects Iron Removal from Groundwater,
W75-11016 5F

**ZIMPRO, INC., ROTHSCHILD, WIS.**
Carbon Regeneration by Wet Air Oxidation,
W75-10988 5D

# ACCESSION NUMBER INDEX


-10851 6B
-10852 5C
-10853 3F
-10854 6B
-10855 5B
-10856 5G
-10857 5G
-10858 3F
10859 5G
10860 2C
10861 4A
10862 2I
10863 2A
10864 2A
10865 2A
10866 2A
10867 6B
10868 2G
0869 4C
0870 4D
0871 4A
0872 4B
0873 2G
0874 3F
0875 3F
0876 3F
0877 2G
0878 2G
0879 4A
0880 2H
0881 2J
0882 4A
0883 5A
0884 2J
0885 2G
0886 3B
0887 2L
0888 3F
0889 3F
0890 3F
0891 2H
0892 4D
0893 5C
0894 2K
0895 5B
0896 4A
0897 2I
0898 6E
0899 10C
0900 2L
0901 2H
0902 5C
0903 5G
0904 5B
0905 2I
0906 6F
0907 5F
0908 2H
0909 5B
0910 8G
0911 7C
0912 7C
0913 7C
0914 7C
0915 7C
0916 3F
0917 2E
0918 2I
0919 7B
0920 3B
0921 2F
0922 5B
0923 2K
0924 8D
0925 8B
0926 3F
0927 5B
0928 5A

W75-10929 4A
W75-10930 2F
W75-10931 2E
W75-10932 5B
W75-10933 2E
W75-10934 5B
W75-10935 5B
W75-10936 5B
W75-10937 2K
W75-10938 4A
W75-10939 2E
W75-10940 2F
W75-10941 3B
W75-10942 2J
W75-10943 2E
W75-10944 7C
W75-10945 7C
W75-10946 7C
W75-10947 7C
W75-10948 7C
W75-10949 7C
W75-10950 7C
W75-10951 7C
W75-10952 7C
W75-10953 7C
W75-10954 7C
W75-10955 5D
W75-10956 5D
W75-10957 5D
W75-10958 5D
W75-10959 5D
W75-10960 5D
W75-10961 5D
W75-10962 5D
W75-10963 5D
W75-10964 5D
W75-10965 5D
W75-10966 5D
W75-10967 5D
W75-10968 5D
W75-10969 5D
W75-10970 5D
W75-10971 5D
W75-10972 5D
W75-10973 5D
W75-10974 5D
W75-10975 5D
W75-10976 5D
W75-10977 5D
W75-10978 5D
W75-10979 5D
W75-10980 5D
W75-10981 5D
W75-10982 3A
W75-10983 5G
W75-10984 5D
W75-10985 5D
W75-10986 5D
W75-10987 5G
W75-10988 5D
W75-10989 5D
W75-10990 5F
W75-10991 5D
W75-10992 5D
W75-10993 5D
W75-10994 5D
W75-10995 5A
W75-10996 4A
W75-10997 2L
W75-10998 8B
W75-10999 8B
W75-11000 6G
W75-11001 5G
W75-11002 8C
W75-11003 5G
W75-11004 5D
W75-11005 5F
W75-11006 2I

W75-11007 5G
W75-11008 5G
W75-11009 5C
W75-11010 5F
W75-11011 5B
W75-11012 6G
W75-11013 5F
W75-11014 5D
W75-11015 5F
W75-11016 5F
W75-11017 5D
W75-11018 5B
W75-11019 5B
W75-11020 5B
W75-11021 2I
W75-11022 5B
W75-11023 5G
W75-11024 5A
W75-11025 5C
W75-11026 5C
W75-11027 5C
W75-11028 5C
W75-11029 5B
W75-11030 5C
W75-11031 5C
W75-11032 5C
W75-11033 5G
W75-11034 5C
W75-11035 7C
W75-11036 5C
W75-11037 6F
W75-11038 6F
W75-11039 5B
W75-11040 2B
W75-11041 5D
W75-11042 2F
W75-11043 2H
W75-11044 2D
W75-11045 3F
W75-11046 5C
W75-11047 5G
W75-11048 3F
W75-11049 4A
W75-11050 10B
W75-11051 5C
W75-11052 5C
W75-11053 5A
W75-11054 2G
W75-11055 5B
W75-11056 6D
W75-11057 8B
W75-11058 2F
W75-11059 3D
W75-11060 6F
W75-11061 4A
W75-11062 5F
W75-11063 5A
W75-11064 5D
W75-11065 5F
W75-11066 5D
W75-11067 5D
W75-11068 3A
W75-11069 5D
W75-11070 3A
W75-11071 5G
W75-11072 5F
W75-11073 5D
W75-11074 5F
W75-11075 8A
W75-11076 5D
W75-11077 5D
W75-11078 5A
W75-11079 5A
W75-11080 5C
W75-11081 5C
W75-11082 5B
W75-11083 5B
W75-11084 5C

W75-11085 5B
W75-11086 5B
W75-11087 5C
W75-11088 5C
W75-11089 5B
W75-11090 5C
W75-11091 5C
W75-11092 5G
W75-11093 8B
W75-11094 5D
W75-11095 3F
W75-11096 3F
W75-11097 3F
W75-11098 4A
W75-11099 3F
W75-11100 4D
W75-11101 5D
W75-11102 5G
W75-11103 5D
W75-11104 5B
W75-11105 5B
W75-11106 3F
W75-11107 5D
W75-11108 5D
W75-11109 5D
W75-11110 5D
W75-11111 8C
W75-11112 5G
W75-11113 5D
W75-11114 5D
W75-11115 5D
W75-11116 5D
W75-11117 5D
W75-11118 5D
W75-11119 5F
W75-11120 5D
W75-11121 5D
W75-11122 5D
W75-11123 5D
W75-11124 5D
W75-11125 5B
W75-11126 5D
W75-11127 5D
W75-11128 5D
W75-11129 4A
W75-11130 5B
W75-11131 5C
W75-11132 5G
W75-11133 5D
W75-11134 5D
W75-11135 5C
W75-11136 5C
W75-11137 5B
W75-11138 7C
W75-11139 4A
W75-11140 2G
W75-11141 4A
W75-11142 4B
W75-11143 8B
W75-11144 2L
W75-11145 2F
W75-11146 7B
W75-11147 8B
W75-11148 8B
W75-11149 8B
W75-11150 8B
W75-11151 8B
W75-11152 8B
W75-11153 2J
W75-11154 2J
W75-11155 2C
W75-11156 2E
W75-11157 5C
W75-11158 5B
W75-11159 5B
W75-11160 5B
W75-11161 2J
W75-11162 2J

## W75-11163


W75-11163 2J
W75-11164 2K
W75-11165 5A
W75-11166 2B
W75-11167 5A
W75-11168 2B
W75-11169 5A
W75-11170 5B
W75-11171 5B
W75-11172 8B
W75-11173 5D
W75-11174 6A
W75-11175 4A
W75-11176 5D
W75-11177 5G
W75-11178 4A
W75-11179 2L
W75-11180 5D
W75-11181 5G
W75-11182 4A
W75-11183 4A
W75-11184 5F
W75-11185 4A
W75-11186 4A
W75-11187 5C
W75-11188 5C
W75-11189 2I
W75-11190 5C
W75-11191 5C
W75-11192 5G
W75-11193 5G
W75-11194 5G
W75-11195 4A
W75-11196 5G
W75-11197 5G
W75-11198 5B
W75-11199 5G
W75-11200 5G
W75-11201 5G
W75-11202 5G
W75-11203 4A
W75-11204 5G
W75-11205 5C
W75-11206 5G
W75-11207 4A
W75-11208 5A
W75-11209 5G
W75-11210 4A
W75-11211 5C
W75-11212 4A
W75-11213 5B
W75-11214 5B
W75-11215 5G
W75-11216 4A
W75-11217 5C
W75-11218 5C
W75-11219 5B
W75-11220 2I
W75-11221 5C
W75-11222 5C
W75-11223 5C
W75-11224 5C
W75-11225 5C
W75-11226 2C
W75-11227 5C
W75-11228 5F
W75-11229 5C
W75-11230 5C
W75-11231 5G
W75-11232 5C
W75-11233 5C
W75-11234 5C
W75-11235 5C
W75-11236 5A
W75-11237 2J
W75-11238 5C
W75-11239 5A
W75-11240 2J
W75-11241 5D
W75-11242 6E
W75-11243 5B
W75-11244 5B
W75-11245 5D
W75-11246 5G
W75-11247 5G
W75-11248 6C
W75-11249 5G
W75-11250 5G
W75-11251 3E
W75-11252 3E
W75-11253 6B
W75-11254 5G
W75-11255 4B
W75-11256 5C
W75-11257 8C
W75-11258 8C
W75-11259 8G
W75-11260 8G
W75-11261 8C
W75-11262 4B
W75-11263 8C
W75-11264 8C
W75-11265 5C
W75-11266 5C
W75-11267 5G
W75-11268 2H
W75-11269 8B
W75-11270 8C
W75-11271 8G
W75-11272 8E
W75-11273 8G
W75-11274 8G
W75-11275 8B
W75-11276 8E
W75-11277 8F
W75-11278 8F
W75-11279 8C
W75-11280 4B
W75-11281 8G
W75-11282 8G
W75-11283 8C
W75-11284 8G
W75-11285 8G
W75-11286 8F
W75-11287 8C
W75-11288 7C
W75-11289 4B
W75-11290 4B
W75-11291 8F
W75-11292 8G
W75-11293 8F
W75-11294 8G
W75-11295 8G
W75-11296 8G
W75-11297 8G
W75-11298 8G
W75-11299 8C
W75-11300 2D
W75-11301 2E
W75-11302 7C
W75-11303 2A
W75-11304 2B
W75-11305 2E
W75-11306 2E
W75-11307 2E
W75-11308 2E
W75-11309 2B
W75-11310 5B
W75-11311 5B
W75-11312 2H
W75-11313 4D
W75-11314 5D
W75-11315 5D
W75-11316 5C
W75-11317 5D
W75-11318 4D
W75-11319 3F
W75-11320 5D
W75-11321 5D
W75-11322 5D
W75-11323 5D
W75-11324 5D
W75-11325 5D
W75-11326 5D
W75-11327 5D
W75-11328 5D
W75-11329 5D
W75-11330 5D
W75-11331 5D
W75-11332 5D
W75-11333 5D
W75-11334 5D
W75-11335 5D
W75-11336 5A
W75-11337 5A
W75-11338 5D
W75-11339 5D
W75-11340 5A
W75-11341 5A
W75-11342 5A
W75-11343 5A
W75-11344 5A
W75-11345 5D
W75-11346 5B
W75-11347 5D
W75-11348 5D
W75-11349 5D
W75-11350 5G

# ABSTRACT SOURCES

| SOURCE | ACCESSION NUMBER | TOTAL |
|---|---|---|
| . CENTERS OF COMPETENCE | | |
| Cornell University, Policy Models for Water Resources Systems | W75-11174--11186 | 13 |
| Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology | W75-10955--10996<br>10998--11005<br>11007--11008<br>11010--11020<br>11022--11023<br>11101--11105<br>11107--11134<br>11173 | 99 |
| Illinois State Water Survey, Hydrology | W75-10909--10915<br>10917<br>10919--10925<br>10927<br>11061--11062<br>11137--11156<br>11158--11169 | 50 |
| Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry | W75-11313--11318<br>11320--11350 | 37 |
| National Water Well Association, Water Well Construction Technology | W75-11255<br>11257--11267<br>11269--11299 | 43 |
| University of Arizona, Arid Land Water Resources | W75-10860--10884<br>10886--10892<br>10894--10897<br>11095--11100 | 42 |
| University of Florida, Eastern U. S. Water Law | W75-10856--10857<br>10859 | 3 |
| University of Wisconsin, Eutrophication | W75-11187--11225<br>11227--11240 | 53 |
| University of Wisconsin, Water Resources Economics | W75-11246--11254 | 9 |

## ABSTRACT SOURCES

| SOURCE | ACCESSION NUMBER | TOTAL |
|---|---|---|
| B. STATE WATER RESOURCES RESEARCH INSTITUTES | W75-10851--10853<br>10898--10899<br>10902--10908<br>11035--11057<br>11092--11093<br>11172<br>11241--11245 | 43 |
| C. OTHER | | |
| BioSciences Information Service | W75-10858, 10885<br>10893, 10916<br>10918, 10926<br>10928, 10997<br>11006, 11009<br>11021, 11024<br>11106, 11157<br>11170--11171<br>11226--11256<br>11268, 11312<br>11319 | 21 |
| Commonwealth Scientific and Industrial Research Organization, Australia | W75-11300--11311 | 12 |
| Effects of Pollutants on Aquatic Life (Katz) | W75-11025--11034<br>11078--11091<br>11135--11136 | 2 |
| Ocean Engineering Information Service (Patents) | W75-11063--11077 | 1 |
| Office of Water Research and Technology | W75-10854<br>10900--10901<br>11058--11060 | |
| Rensselaer Polytechnic Institute | W75-11094 | |
| U. S. Geological Survey | W75-10929--10954 | |

U. S. GOVERNMENT PRINTING OFFICE · 1975 C - 210-951 (8)

# CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey and the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

**Supported by the Environmental Protection Agency in cooperation with WRSIC**

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

## Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

## INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

U.S. MAIL

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE
COM-211

AN EQUAL OPPORTUNITY EMPLOYER

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22151

OFFICIAL BUSINESS

PRINTED MATTER

John Littlewood
Documents Division
220 D Library
Champaign IL 61820

16.33391
e48

# SELECTED WATER RESOURCES ABSTRACTS

THE LIBRARY OF THE
DEC 22 1975
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

VOLUME 8, NUMBER 23
DECEMBER 1, 1975

W75-11351 -- W75-11850
CODEN: SWRABW

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

SELECTED WATER RESOURCES ABSTRACTS is available to Federal agencies, contractors, or grantees in water resources upon request to: Manager, Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior, Washington, D. C. 20240.

SELECTED WATER RESOURCES ABSTRACTS is also available on subscription from the National Technical Information Service. Annual subscription rates are: To the SWRA Journal, $75 ($95 foreign); to the Journal & Annual Index, $100 ($125 foreign); to the Annual Index only, $50 ($65 foreign). Certain documents abstracted in this journal can be purchased from the NTIS at prices indicated in the entry. Prepayment is required.

# SELECTED
# WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior

**VOLUME 8, NUMBER 23**
DECEMBER 1, 1975

W75-11351 -- W75-11850

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

# FOREWORD

**Selected Water Resources Abstracts,** a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

**Selected Water Resources Abstracts** is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

## CONTENTS

FOREWORD_____iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

**01** NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

**02** WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

**03** WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

**04** WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

**05** WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

**06** WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

**07** RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

**08** ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

**09** MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education - In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

**10** SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

# SELECTED WATER RESOURCES ABSTRACTS

## 1. NATURE OF WATER

### 1A. Properties

**THE CRYSTAL AND MOLECULAR STRUCTURE OF SELECTED PESTICIDAL WATER POLLUTANTS,**
Rhode Island Univ., Kingston. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-11351

## 2. WATER CYCLE

### 2A. General

**COMPARATIVE ANALYSIS OF ESTIMATION METHODS IN NONLINEAR FUNCTIONAL MODELS OF THE RAINFALL-RUNOFF PROCESS,**
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
V. R. Rao, and R. G. S. Rao.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 147, $5.25 in paper copy, $2.25 in microfiche. Technical Report No 56, December 1974. 107 p, 17 fig, 13 tab, 36 ref, append. OWRT B-025-IND(5).

Descriptors: *Rainfall-runoff relationships, *Mathematical models, *Urban runoff, Drainage, Unit hydrographs, Hydrograph analysis, Model studies, *Indiana, Simulation analysis, Estimating.
Identifiers: *Nonlinear models, *Kernel functions.

The methods of estimation of kernel functions of nonlinear functional models proposed by Brandstetter and Amorocho, Boneh and Diskin, Bidwell, and Roy and Sherman are compared. The rainfall-runoff data from an urban (Ross Ade) watershed in West Lafayette, Indiana were used in the study. The computational complexity, the performance of the estimated kernels in both the regeneration and prediction modes were used for comparing the different methods of estimation of kernal functions. The analysis was conducted to select a method which can be easily used and which is also accurate. The method of kernel function estimation by Brandstetter and Amorocho was selected as the most desirable method on the basis of computational ease, flexibility and accuracy. The second objective was to demonstrate the utility of nonlinear functional series models in simulating the short time increment runoff process. The nonlinear functional models can be used for simulation of runoff provided the kernel functions of these models are accurately estimated.
W75-11354

**A SPACE/TIME COEEFFICIENT METHOD FOR CALCULATION OF RAINWATER RUNOFF (DAS RAUMZEITBEIWERTVERFAHREN FÜR DIE BERECHNUNG VON REGENWASSERABFLUESSEN),**
For primary bibliographic entry see Field 5D.
W75-11384

**SIMULATION OF STREAM-FLOW SERIES,**
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W75-11449

**SEDIMENT TRANSPORT THEORIES: A REVIEW,**
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 2J.
W75-11453

**STORM TIDE FREQUENCY ANALYSIS FOR THE COAST OF PUERTO RICO,**
National Weather Service, Silver Spring, Md. Office of Hydrology.
F. P. Ho.
Available from National Technical Information Service, U.S. Department of Commerce, Sills Building, 5285 Port Royal Road, Springfield, Va 22161. NOAA Technical Memorandum NWS HYDRO-23, May 1975. 43 p.

Descriptors: *Wind tides, *Storm surge, *Computer models, *Coasts, Tides, Storms, Hurricanes, Hydrodynamics, Winds, Oceanography, Climatology.
Identifiers: *Puerto Rico coast, Storm height frequency distributions, National Flood Insurance Program, Tide levels, Coastal floods.

Storm tide height frequency distributions on the coast of Puerto Rico are developed for the National Flood Insurance Program by computing storm tides from a full set of climatologically representative hurricanes, using the National Weather Service hydrodynamic storm surge model adapted to local conditions. Hurricane parameters are analyzed and presented. Tide levels for the southern coast of Puerto Rico are shown in coastal profile between annual frequencies of 0.10 and .002. Similar tide levels for San Juan on the northern coast and Mayaguez on the western coast are also presented, and tentative interpolated tide levels of .01 annual frequency for the remaining coasts. Wave effects on the north coast are discussed. (NOAA)
W75-11561

**IMPROVEMENT OF COMBINED SEWER SYSTEM STORM WATER STORAGE POOL (GORYU-SHIKI GESUIDO NO KAIRYO, TAISUI IKE HOSHIKI),**
For primary bibliographic entry see Field 5D.
W75-11621

**EVAPORATION DATA IN TEXAS,**
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 7C.
W75-11630

**SOIL MOISTURE ACCOUNTING COMPONENT OF THE USDAHL-74 MODEL OF WATERSHED HYDROLOGY,**
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 2G.
W75-11656

**METEOROLOGICAL, TOPOGRAPHICAL, AND CONSTRUCTION INFLUENCE ON THE RAIN RUNOFF IN SEWER SYSTEMS (METEOROLOGISCHE, TOPOGRAPHISCHE UND BAUTECHNISCHE EINFLUESSE AUF DEN REGENABFLUSS IN KANAL-ISATIONSNETZEN),**
For primary bibliographic entry see Field 5D.
W75-11712

**THE VALUE OF THE PEAK RUNOFF COEFFICIENT PSIS (UEBER DEN AUSSAGEWERT DES SPITZENABFLUSSBEIWERTES PSIS),**
J. Keser.
Gas-und Wasserfach-Wasser/Abwasser, Vol 116, No 1, p 17-19, 1975. 4 fig, 6 ref.

Descriptors: *Rainfall-runoff relationships, *Rainfall intensity, Topography, Runoff coefficient, Precipitation(Atmospheric), Mathematical studies, Model studies.

The value and relevance of using the peak runoff coefficient, a ratio of the peak runoff yield to the peak rain yield, is discussed. The peak runoff coefficient indicates that a certain duration of the peak rainfall yield is necessary to generate an increase in the runoff. The peak runoff coefficient is predominantly influenced by precipitation and topographical characteristics; these describes the distribution of the runoff over time. The dependence of the peak runoff coefficient on the rainfall characteristics is influenced by the terrain but it is not conditioned by the precipitation. The peak runoff coefficient is determined from the transfer function that is characteristic for the terrain, and is constant even for prolonged rainfall events. The total runoff coefficient must be consistently greater than the peak runoff coefficient. (Takacs-FIRL)
W75-11713

**MAN ON THE HYDROLOGIC CYCLE,**
Annamalai Univ., Annamalainagar (India).
K. Achuthan.
Water Resources Bulletin, American Water Resources Association, Vol 10, No 4, p 756-758, August 1974. 2 ref.

Descriptors: *Hydrologic cycle, Precipitation, Evaporation, Storage, Conservation, Water utilization, Water balance, Environment.

Man is the one biological factor that can either make environment fit his needs or unknowingly ruin it. The major phases of the hydrologic cycle in which man interfere are: precipitation, storage, and evaporation. A change in any one phase will generally cause modification to the other phases of the cycle: the only certainty is that the water balance will indeed balance. Through conservation practices and careful management and through critical study of cause and effect, the hydrologist can be influential in raising living standards and making his country self-supporting and prosperous. (Bell-Cornell)
W75-11776

**MODELS OF THE STOCHASTIC AND CHRONOLOGIC STRUCTURE, PREDICTION AND SIMULATION OF RUNOFF SEQUENCES - APPLICATION TO THE LOWER OHIO BASIN,**
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-11783

**PROCEEDINGS OF THE WATER HARVESTING SYMPOSIUM, PHOENIX, ARIZONA, MARCH 26-28, 1974.**
Western Regional Research Lab., Berkley, Calif.
For primary bibliographic entry see Field 3B.
W75-11800

**HYDROLOGIC ASPECTS OF WATER HARVESTING IN THE NORTHERN GREAT PLAINS,**
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
C. L. Hanson, E. L. Neff, and D. A. Woolhiser.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 129-140, 9 fig, 3 tab, 7 ref.

Descriptors: *Water harvesting, *Water supply, *Watersheds(Basins), *Water storage, *Rainfall-runoff relationships, *Simulation analysis, Semiarid climates, Stock water, Streaflow, Water tanks, Flow Drainage systems, South Dakota, Runoff, Rainfall, Seepage, Reservoirs, Ponds, Simulated rainfall, Systems analysis, Computer models, Mathematical models, Markov processes, Stochastic processes, *Great Plains.
Identifiers: Northern great plains, Runoff farming.

The systems approach for simulating storage of water in ponds is based on hydrologic information, contributing area, number of cattle, length of grazing season, seepage estimates, and evaporation rates, and has three essential steps: system description, selection of an objective function, and optimization. Daily rainfall can be simulated, using a stochastic model. Pond simulation using an example watershed was done to test this model. The Markov chain-exponential model described daily precipitation, and either of the two stochastic models, exponential or beta, described the relationship between daily precipitation and runoff. Seepage loss was the most difficult to describe. (See also W75-11800) (Robinett-Arizona)
W75-11811

## 2B. Precipitation

**THE RAINFALL RECORDER PROBLEM,**
Birmingham Univ. (England). Dept. of Civil Engineering.
P. S. Kelway.
Journal of Hydrology, Vol 26, No 1/2, p 55-77, July 1975. 3 fig, 6 tab, 20 ref.

Descriptors: *Rainfall, *Radar, *Precipitation gages, *Rain gages, Networks, Computer programs, Sampling, Instrumentation, Time, Charts, Quality control, Data collections.
Identifiers: *Rain recorders, Errors, *Error detection, *England, *Wales, Fault reduction.

Comparison of areal rainfall estimates derived from Radar measurements and ground-based recording rain gages was initiated at the University of Birmingham. To obtain data for various storms to be analyzed during the project, it was necessary to set up a system to collate and process information from rainfall recorders over England and Wales. Three major groups of difficulties were apparent: (1) collation of available data; (2) the wide variety of recorder types and numerous sources of error associated with them, and (3) the difficulty of abstracting data from the recording media. It was not easy to obtain recording gage data due to the number of different authorities that had to be approached. A computer-based schedule, with annotated details with any gage or site shortcomings, was compiled of all recording gages using the Meteorological Office information as a basis. The most common gages found were the weighing gage, the tilting-syphon gage, natural-syphon gage, hyeotgraph, and rate-of-rainfall recorder. Most instrumental errors were found to occur through a lack of effective maintenance. Trouble occurred from the ingress of foreign matter into joints which should be sealed. Most pen faults could have been prevented by use of glass recording pens and plasticized charts or pressure-sensitive chart recorders. The project showed the need for a central collection agency and a comprehensive system of data processing. (Roberts-ISWS)
W75-11448

**COMPARISON OF PRECIPITATION GAGE CATCHES WITH A MODIFIED ALTER AND A RIGID ALTER TYPE WINDSHIELD,**
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
W. J. Rawls, D. C. Robertson, J. F. Zuzel, and W. R. Hamon.
Water Resources Research, Vol 11, No 3, p 415-417, June 1975. 1 fig, 2 tab, 6 ref.

Descriptors: *Precipitation gages, *Storms, *Idaho, Wind velocity, Eddies, Rain, Linear programming, Temperature, Regression analysis, Snowfall, Rain gages, Climatology, Climatic data.
Identifiers: *Alter windshield, *Gage catch, Hamon dual gage.

Precipitation gage catch from two Belfort Model 5-780 standard weighing recording rain gages, one with a modified Alter Windshield and one with a rigid Alter type windshield, were compared for 89 storms with wind speeds ranging from 4 to 32 mph and temperatures ranging from 14 to 69 degrees F. The differences between gage catches were statistically significant at the 1% level for wind speeds of 12 to 16 mph and for temperatures of 23 degrees F. Since on the average the windshields do not produce significantly different catches, either windshields can be used to compute actual precipitation by using the Hamon dual gage approach. (Roberts-ISWS)
W75-11457

**ATMOSPHERIC PHYSICS AND CHEMISTRY LABORATORY: COLLECTED REPRINTS 1973.**
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. November 1974. 174 p.

Descriptors: *Atmospheric physics, *Chemical analysis, Meteorology, Precipitation(Atmospheric), Atmosphere, Radiation, Physical properties, Crystals, Cloud seeding, Climatology.
Identifiers: *Atmospheric composition, Transport mechanisms, Snow crystals, Ice nuclei, Atmospheric aerosols.

This report is a collection of 33 reprints for 1973 on the subject of atmospheric physics and chemistry. Included in this volume are articles on atmospheric composition, transport mechanisms, precipitation, aerosols, radiation, ozone, radiometry, seeding, and snow crystal formation. (NOAA)
W75-11552

**A FEDERAL PLAN FOR NATURAL DISASTER WARNING AND PREPAREDNESS, FIRST SUPPLEMENT FY 1976 - 1980.**
National Oceanic and Atmospheric Administration, Washington, D.C.
Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, for $1.75. June 1975. 101 p.

Descriptors: *Warning systems, *Storms, *Disasters, *Climatic data, *Weather forecasting, *Weather modification, Damages, Safety, Earthquakes, Floods, Tornadoes, Volcanoes, Landslides, Avalanches, Hurricanes, Droughts, Ice, Meteorology, Snow, Weather, Tsunamis, Forecasting.
Identifiers: *Natural disasters warning, Federal plans, Natural hazards, Storm warnings.

The Federal Plan for Natural Disaster Warning and Preparedness, June 1973, presented the Federal action programs and plans for fiscal years 1973 - 78 to satisfy the unmet needs in the existing natural disaster warning system and community preparedness programs. This first supplement to the Plan examines the recent performance of the disaster warning system, reports the progress made toward improving the warning system and community preparedness program, and updates the action plans of the ten participating Federal agencies for fiscal years 1975 - 80 to satisfy identified needs. (NOAA)
W75-11553

**SOME CLIMATOLOGICAL CHARACTERISTICS OF HURRICANES AND TROPICAL STORMS, GULF AND EAST COASTS OF THE UNITED STATES,**
National Weather Service, Silver Spring, Md.
F. P. Ho, R. W. Schwerdt, and H. V. Goodyear.
Available from National Technical Information Service, U.S. Department of Commerce, Sills Building, 5285 Port Royal Road, Springfield, Va 22161. NOAA Technical Report NWS 15, May 1975. 87 p, 33 fig, 5 tab, 27 ref, append.

Descriptors: *Hurricanes, *Tropical cyclon
*Storms, *Climatology, Storm surge, Wi
Meteorology, Charts, Weather data, Data col
tions, Probability, Climatological data.
Identifiers: *Hurricane factors, *Climatolog
characteristics, Landfalling hurricanes,
coast(US), East coast(US), Smoothed freq
cies

A climatology of hurricane factors importar
storm surges is presented for the U.S. gulf and
coasts. A smoothed frequency of tropical st
and hurricanes entering and exiting the coast
storms passing within 150 nautical miles of
coast during the period 1871-1973 is given.
central pressure for hurricanes and tropical st
and the radius of maximum winds and spe
forward motion for hurricanes were obtained
data analysis. Directions of landfalling hurric
and tropical storms at the time they crosse
coast at selected points were also analyzed.
probability distribution of each factor is pl
and analyzed for each 50-n.mi. interval alon
coast. Selected probability levels of each dis
tion are then summarized, and smoothed
tions along the coast are obtained by analysis
speeds of motion for two classes of hurri
(those that entered the coast and those that p
within 150 n.mi. of the coast) are studied sep
ly and a smooth speed analysis is determine
each. The question of joint probability amon
various factors and with latitude is disc
qualitatively. (NOAA)
W75-11556

**FURTHER STUDIES ON THE ORIGIN OF**
**RICANES,**
Colorado State Univ., Fort Collins. Dept.
mospheric Science.
H. Riehl.
Atmospheric Science Paper No. 235, Fe
1975. 23 p, 25 fig, 11 ref. Grant No. N22-31-7

Descriptors: *Hurricanes, *Tropical cyc
*Storms, Meteorology, Weather pa
Weather, Weather data, Climatology, Turbu
Heat.
Identifiers: *West Indies, *Hurricane origi
ricane formation, Tropical storms, Storm
tions.

While there is no question that release o
heat of condensation is a major factor in
mature hurricanes, uncertainty has re
about its role in hurricane formation and th
of large intensity increases sometimes expe
by a hurricane which had persisted o
plateau for several days. It has previous
hypothesized by the author that hurrican
intensification is often related to a one to
prior increase of upper tropospheric baro
500-1000 km around the pre-cyclone distu
This prior increase of upper level baroclin
usually associated with a traveling middle
westerly cyclone. A number of recent yea
ples in the West Indies are presented. (NO
W75-11559

**STORM TIDE FREQUENCY ANALYS**
**THE COAST OF NORTH CAROLINA,**
**OF CAPE LOOKOUT,**
National Weather Service, Silver Spring,
fice of Hydrology.
F. P. Ho, and R. J. Tracey.
Available from the National Technical
tion Service, U.S. Department of Comme
Building, 5285 Port Royal Road, Spring
22161. NOAA Technical Memorandu
HYDRO-21, May 1975. 44 p, 12 fig, 7 tab,

Descriptors: *Wind tides, *Storm
*Computer models, *Coasts, Tides, Sto
ricanes, Hydrodynamics, Winds, Ocean
Climatology.
Identifiers: *North Carolina coast, St
height frequency distributions, National

ance Program, Cape Lookout(NC), Tide levels, astal floods.

rm tide height frequency distributions are veloped on the coast of North Carolina, south of pe Lookout, for the National Flood Insurance gram by computing storm tides from a full set climatologically representative hurricanes, ng the National Weather Service hydrodynamic rm surge model. Tide levels are shown in stal profile between annual frequencies of 0.10 .002. This report is intended for use in estimat- actuarial risk to buildings from coastal floods in land use management. (NOAA)
5-11560

ATELLITE CLASSIFICATION TECHNIQUE R SUBTROPICAL CYCLONES,
ional Weather Service, Fort Worth, Tex. thern Region.
. Hebert, and K. O. Poteat.
AA Technical Memorandum NWS SR-83, July 5. 6 fig, 7 tab, 8 ref.

criptors: *Tropical cyclones, *Cyclones, tellites(Artificial), *Weather forecasting, ather, Weather patterns, Subtropic, Storms, ricanes, Meteorology, Meteorological data, ds, *Remote sensing.
ntifiers: Satellite pictures, *Subtropical ones, *Cyclone types, Weather satellites, lone intensity, Dvorak technique.

Dvorak (1973) technique for estimating the in- ity of tropical (T) cyclones from satellite pic- s is frequently inapplicable for subtropical cyclones. A new technique which gives not the intensity but also the type (tropical, sub- ical) of cyclone has been derived, using elines similar to the Dvorak scheme, so that two systems will intermesh when cyclones ge type. These guidelines were evaluated by ni Satellite Field Services Station (SFSS) orologists for a data sample of 32 cases (27 ropical) for the period May-November 1968- Results indicate mean absolute wind errors parable to those using the Dvorak technique, well as a successful meshing of the two niques, and the ability to distinguish between wo types of cyclones. (NOAA)
-11562

RCES OF WATER QUALITY, LAKE EL, ICE, WATER TEMPERATURE AND EOROLOGICAL DATA FOR THE ST. RENCE GREAT LAKES,
onsin Univ., Milwaukee. Center for Great s Studies.
rimary bibliographic entry see Field 2H.
-11567

RICANE EXPERIENCE LEVELS OF STAL COUNTY POPULATIONS - TEXAS MAINE,
onal Weather Service, Fort Worth, Tex.
Hebert, and G. Taylor.
1975. 161 p.

riptors: *Hurricanes, *Storms, *Tropical nes, Climatology, Meteorology, Coasts, At- Coastal Plain, Gulf Coastal Plain, Weather, ages, Disasters, Floods, Rain, Winds, Human lation.
ifiers: *Coastal hurricanes, *Coastal storms, ricane levels, *Hurricane scales, *Severe s, Coastal populations, Atlantic coast, Gulf storms, Atlantic Coast storms, Saf- mpson hurricane scale.

lation graphs for the period 1900-1970 have prepared for coastal counties from Texas to which could be affected significantly by ane winds and/or tides. The Saffir/Simpson cane Scale (range 1-5) has been used to op a hurricane climatology for each county for the period 1900-1974. The combined statistics graphically illustrate that over 75 percent of all Atlantic and Gulf coastal residents of the United States have never experienced the effects of a direct hit by a major jurricane. (NOAA)
W75-11570

**TROPICAL CYCLONE INTENSITY ANALYSIS AND FORECASTING FROM SATELLITE IMAGERY,**
National Environmental Satellite Service, Washington, D.C.
V. F. Dvorak.
Mariners Weather Log, Vol 19, No 4, p 199-206, July 1975. 5 fig, 5 ref.

Descriptors: *Tropical cyclones, *Weather forecasting, *Satellites(Artificial), *Remote sensing, Analysis, Climatological data, Meteorology, Climatology.
Identifiers: *Tropical cyclone intensity, *Satellite imagery, Cloud characteristics, Modeled curve, Intensity forecast, Intensification process.

This report describes a systematic procedure for estimating tropical cyclone intensities using imagery from meteorological satellites. Two sets of cloud characteristics are analyzed, with guidance from a model of tropical cyclone change derived empirically from satellite data. One set of characteristics is used to estimate cyclone intensity. It is made up of three parameters: the central features which define the cloud system center and its relation to dense-overcast clouds; the outer banding features which curve around the central features; and the vertical depth of the clouds comprising these features. Intensity is considered to be related to the sum of the three parameters. The assessment of intensity is made in three stages. The first yields a modeled estimate of the cyclone's intensity; the second and third use the cloud pattern and feature measurements to verify or adjust the modeled expectation. The second set of cloud features is then analyzed to determine if an extrapolation along the cyclone's particular modeled curve is to be used for the 24-hour intensity forecast. These features are related to the intensification process within the cyclone and to environmental changes that may affect the cyclone during the forecast period. (NOAA)
W75-11577

**WESTERN NORTH PACIFIC TYPHOONS, 1974,**
Fleet Weather Central FPO San Francisco, 96630.
C. R. Holliday.
Mariners Weather Log, Vol 19, No 4, p 207-224, July 1975. 25 fig, 4 tab.

Descriptors: *Typhoons, *Climatological data, *Synoptic analysis, Tropical cyclones, Climatology, Meteorology, Storms, Monsoons, Documentation, Weather data, *Pacific Ocean.
Identifiers: West north Pacific, *Tropical cyclone activity, Supertyphoons, Typhoon days, Philippine Islands, Monsoon westerlies.

There was a sharp reversal, during 1974, from the abnormally light tropical cyclone activity observed during 1973. Named tropical cyclones numbered 32, 10 percent higher than the latest 15-year average. The number of typhoon days, however, numbered only 62, well below the 15-year average of 90 days, reflecting a tendency of this season's tropical cyclones not to develop beyond storm strength. No supertyphoons were observed during 1974, the first such occurrence since documentation began in 1959. One of the unusual synoptic features during August and September was the penetration of monsoon westerlies to more poleward latitudes than normal. By early October, however, the monsoon through became reestablished near its normal position in the Philippine Sea, and triggered development of a series of destructive cyclones that crossed the Philippine Islands. The frequency of repeated onslaughts to the island of Luzon is unparalleled in climatological records available since World War II. (NOAA)
W75-11578

**CENTRAL NORTH PACIFIC TROPICAL CYCLONES, 1974,**
Fleet Weather Central FPO San Francisco, 96630.
C. R. Holliday.
Mariners Weather Log, Vol 19, No 4, p 224, July 1975. 1 fig.

Descriptors: *Tropical cyclones, *Climatological data, *Hurricanes, Synoptic analysis, Climatology, Meteorology, Storms, Documentation, Weather data, *Pacific Ocean.
Identifiers: Central north Pacific, *Tropical cyclone activity, Tropical storm Olive, Hurricane Ione, Hawaiian Islands.

The 1974 hurricane season in the central Pacific followed a pattern similar to that of recent years -- short, but active. In general, there also was a similarity in life cycle and track with previous years' storms. (NOAA)
W75-11579

**CELLULAR SNOW GENERATION--A DOPPLER RADAR STUDY,**
Chicago Univ., Ill. Lab. for Atmospheric Probing.
R. E. Carbone, and A. R. Bohne.
Journal of the Atmospheric Sciences, Vol 32, No 7, p 1384-1394, July 1975. 5 fig, 1 tab, 16 ref, append. ONR N00014-67A-0285-0014, NSF GA-38109.

Descriptors: *Snow, *Radar, *Cloud physics, Convection, Measurement, Crystals, Snowfall, Precipitation(Atmospheric), Velocity, Air circulation, Meteorology.
Identifiers: *Doppler radar, Doppler velocity spectra, Reflectivity, Updrafts.

Snow generating cells were observed by vertically pointing Doppler radar. Analysis was carried out in three distinct regions. The region exhibiting cellular structure was found to consist of convective elements with vertical velocities + or -1.5 m/s in magnitude. A generation region was found to exist beneath the convective region with updrafts of 0.5 m/s sustained over a 7 km path length which originated at a generating level less than 75 m in depth associated with an inversion layer. The trail region below exhibited maximum downdrafts of 0.5 m/s or no net vertical motions. Maximum ice content was estimated to be no larger than 0.24 g/cu m in the convective cells. Growth appeared to take place throughout the rise and fall of the snow crystals in the updraft regions. (Sims-ISWS)
W75-11634

**TROPICAL SHOWERS IN AN AXISYMMETRIC CLOUD MODEL,**
Hawaii Univ., Hilo. Cloud Physics Observatory.
T. Takahashi.
Journal of the Atmospheric Sciences, Vol 32, No 7, p 1318-1330, July 1975. 20 fig, 34 ref. ONR 014-67A-0387-0015, NSF GA-40124.

Descriptors: *Model studies, *Cloud physics, *Rainfall, *Hawaii, Precipitation(Atmospheric), Rainfall intensity, Raindrops, Mathematical models, Computer models, Condensation, Evaporation, Rain, Clouds, Meteorology.
Identifiers: *Cloud models, Warm rains, Tropical showers, Cumulus clouds, Raindrop size.

Tropical showers from warm cumulus-type clouds were studied numerically in an axisymmetric cloud model. Drop sizes were classified into 61 groups and condensation (evaporation), collection, and breakup processes were introduced. The distinctive character of such showers--heavy, short-lived, and localized in nature, without any strong wind speed change near the ground--was simulated successfully. Because of the weak inflow, raindrop size distribution was primarily determined by the vertical trajectory of drops. The calculated

raindrop size distribution agreed relatively well with the Marshall-Palmer size distribution curve. A one-dimensional cylindrical cloud model was also compared with the present symmetric cloud model, and it was found that both rainfall and the life cycle for deep clouds were difficult to stimulate by a simple one-dimensional model. It was also found that the disturbance area due to the cumulus-type cloud is more localized than in the stratocumulus-type cloud. (Sims-ISWS)
W75-11635

**AN ACCELERATION SYSTEM FOR WATER DROPS,**
Toronto Univ. (Ontario). Dept. of Physics.
J. D. McTaggart-Cowan, and R. List.
Journal of the Atmospheric Sciences, Vol 32, No 7, p 1395-1400, July 1975. 6 fig, 12 ref.

Descriptors: *Laboratory equipment, *Cloud physics, *Drops(Fluids), Instrumentation, Equipment, Raindrops, Simulated rainfall, Meteorology, Laboratory tests.
Identifiers: *Raindrop simulation, Acceleration systems, Drop fall velocity.

Linear accelerator systems were described which allow the production of series of homogeneously sized water drops of different diameter and at terminal velocity, with small oscillations, negligible charges, and in air of low turbulence intensity. Combinations of parallel systems and blowers displacing the smaller drops into the path of the larger ones allowed the study of collision and breakup under conditions which essentially duplicate nature. the chances to observe interactions were considerably enhanced by opto-electronic selection devices. (Sims-ISWS)
W75-11636

**COLLISION AND BREAKUP OF WATER DROPS AT TERMINAL VELOCITY,**
Toronto Univ. (Ontario). Dept. of Physics.
J. D. McTaggart-Cowan, and R. List.
Journal of the Atmospheric Sciences, Vol 32, No 7, p 1401-1411, July 1975. 11 fig, 1 tab, 36 ref.

Descriptors: *Cloud physics, *Laboratory tests, *Raindrops, Drops(Fluids), Particle size, Rain, Coalescence, Precipitation(Atmospheric), Meteorology.
Identifiers: *Drop collisions, *Drop breakup.

The collision and subsequent breakup of water drops moving essentially vertically and at terminal velocity has been studied for 5 drop pairs. The diameters of the large drops were 4.8, 3.6, and 3.0 mm; the diameters of the small drops were 1.8 mm and 1.0 mm. 712 collisions were obtained in 25,000 individually recorded attempts. Three distinct types of collision-breakup were found with the following occurrence: necks 27%, sheets 55%, and disks 18%. Bag breakups were insignificant at less than 0.5%. All types are defined and corresponding examples shown. Fragment size and number distributions for the different types and the overall situation gave further reasons for the breakdown into the different types. The disk collision has been found to be the major cause for the depletion in number of large drops, hence the cutoff of large drops in rain. The results also form the first data bank for numerically modelling the evolution of raindrop size spectra and the Langmuir chain process. (Sims-ISWS)
W75-11637

**COLLISION EFFICIENCY OF WATER DROPS IN THE ATMOSPHERE,**
Missouri Univ., Rolla. Dept. of Mechanical and Aerospace Engineering.
C. L. Lin, and S. C. Lee.
Journal of the Atmospheric Sciences, Vol 32, No 7, p 1412-1418, July 1975. 8 fig, 26 ref, 1 append.
ONR N00014-69A-0141-0006.

Descriptors: *Coalescence, *Raindrops, *Cloud physics, Drops(Fluids), Mathematical models, Model studies, Meteorology, Precipitation(Atmospheric), Rainfall.
Identifiers: *Collision efficiency, Drop collisions

A study has been made of the growth of water drops through collision in the atmosphere. The method of superposition of flow fields obtained from the numerical solution of the Navier-Stokes equations was used for the calculations, and only inertia, gravity, and drag force were considered. The calculated linear collision efficiency is significantly less than the geometric collision efficiency between a large collector drop and a small collecting drop because of the effect of hydrodynamic forces. The linear collision efficiency is substantially higher than the geometric collision efficiency between similarly sized drops because of the wake effect. To verify the validity of the calculations, the analytical results were compared with available experimental data. Satisfactory agreement was obtained for most drop sizes. It is concluded that in the absence of electricity and turbulence the dominant factor in the formation of precipitation is the collisional growth of similarly sized drops. (Sims-ISWS)
W75-11638

**ON THE COLLECTION EFFICIENCY OF WATER DROPLETS UNDER THE INFLUENCE OF ELECTRIC FORCES, I: EXPERIMENTAL, CHARGE-MULTIPOLE EFFECTS,**
Hebrew Univ., Jerusalem (Israel). Dept. of Atmospheric Sciences.
N. Dayan, and I. Gallily.
Journal of the Atmospheric Sciences, Vol 32, No 7, p 1419-1429, July 1975. 10 fig, 36 ref, 3 append.

Descriptors: *Cloud physics, *Drops(Fluids), *Electrical properties, Aerosols, Laboratory tests, Precipitation(Atmospheric), Meteorology.
Identifiers: *Collection efficiency, *Electric forces, Electric charge, Drop collisions, Drop growth.

The collection efficiency of water droplets under the influence of electric forces was studied in simulation experiments for the case of a charge-induced multipole interaction. With the aid of an elaborate laboratory apparatus, the size increase of a charged droplet falling through a cloud of neutral, almost uniform small particles was determined, and an average collection efficiency deduced. The experimental results indicated efficiencies of one or two orders of magnitude greater than the values for neutral droplets under otherwise similar conditions. The efficiences were also found to increase with the ratio of collected to collecting droplet sizes and were insensitive to variations of the electric charge of the particles. (Sims-ISWS)
W75-11639

**ESTABLISHING WINDBREAKS IN SEMIARID AREAS BY ALTERING THE MICROCLIMATE OR SUPPLYING ADDITIONAL WATER,**
Agricultural Research Service, Manhattan, Kans.
For primary bibliographic entry see Field 3B.
W75-11827

## 2C. Snow, Ice, and Frost

**SEDIMENT RELATIONS OF SELECTED ALASKAN GLACIER-FED STREAMS,**
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 2J.
W75-11477

**ATMOSPHERIC PHYSICS AND CHEMISTRY LABORATORY: COLLECTED REPRINTS 1973.**
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 2B.
W75-11552

**GREAT LAKES ICE COVER, WINTER 1973-7**
National Oceanic and Atmospheric Administration. Boulder, Colo. Environmental Research L.
R. A. Assel
Available from Superintendent of Documents, Government Printing Office, Washington. 20402, as C55.13:ERL 325-GLERL 1 NO Technical Report ERL 325-GLERL 1, July 19 60 p

Descriptors: *Iced lakes, *Charts, *Ice co *Great Lakes, Hydrologic data, Documentati Data collections, Meteorology, Lakes.
Identifiers: *Ice charts, *Ice floes, Sate imagery, Seasonal trends, Aerial ice reconn sance, Degree days.

Twenty composite ice charts were produced f ice-cover data received at the Lake Survey Ce during the past winter. These charts illustrate mated ice concentrations and distributions of Great Lakes at weekly intervals from December 1973 to the end of April 1974. In a tion, 13 ice charts compiled from data collecte Lake Survey Center ice observers portray sy tic ice conditions on individual lakes and ri Freezing degree-day accumulations indicate 1973-74 winter was near normal over the C Lakes. Extensive ice formation in protected s areas and shallow parts of the Great Lakes wa itiated by below normal temperatures the se half of December and first half of January covers reached their maximum extent in Febr Mild temperatures in early March resulted in loss of ice on southern portions of the Great L so that, by mid-March, they were virtuall free. Last reports of ice were made in late (NOAA)
W75-11572

## 2D. Evaporation and Transpirat

**TRANSPIRATION OF SOME OR EROPHYTES OF THE CENTRAL CAUCA (IN GEORGIAN),**
E. S. Oniani.
Soobshch Akad Nauk Gruz SSR, Vol 75, N 173-176, 1974. Illus.

Descriptors: *Xerophytes, Sto *Transpiration, Humidity, Vegetation.
Identifiers: *USSR(Central Cauc *Oreoxerophytes.

Studies were carried out in the humid sub zone of the Qazbegi (Kazbek) and in the rela dry mid-mountain zone of the Jeirakh (Russian SFSR, USSR). The intensity of tra tion of the same plant species is much higher subalpine zone than in the mid-mountain z contrast to high-mountain meadow plants, st take a fairly active part in the regulation of erophytes transpiration. Hydro-labile as v hydro-stable groups of vegetation were ide in both biotopes.--Copyright 1975, Biologic stracts, Inc.
W75-11442

**GRAIN SORGHUM EVAPOTRANSPIR AND WATER USE EFFICIENCY U TRICKLE IRRIGATION,**
Texas A and M Univ., College Station. D Agricultural Engineering.
For primary bibliographic entry see Field 3I.
W75-11582

**MODIFIED PENMAN EQUATION TO PR THE UPPER BOUNDARY CONDITI COMPUTING EVAPORATION FROM SC**
Department of Agriculture, Ottawa (Ontar Research Inst.

'. J. Staple.
oil Science Society of America Proceedings, Vol 3, No 5, p 837-839, September-October 1974. 2 g, 16 ref.

escriptors: *Evaporation, Vapor pressure, Soil, Soil water movement, Drying, Measurement.
lentifiers: Soil columns, *Penman's equation, otential evaporation.

enman's equation for potential evaporation was odified by including in it the relative vapor pres- re h of partially dried surface soil. The modified juation was used to predict evaporative flux om drying soil as a boundary condition in the nite difference solution of the flow equation. The ethod gave satisfactory agreement in a 20-day st in which evaporation was measured from ort columns of soil in a fallowed plot. kogerboe-Colorado State)
75-11598

ELATION BETWEEN NITRATE ABSORP- ON AND WATER TRANSPIRATION BY ORN,
orth Carolina State Univ., Raleigh. Dept. of Soil ience.
r primary bibliographic entry see Field 3F.
75-11602

VAPORATION DATA IN TEXAS,
xas Water Development Board, Austin.
r primary bibliographic entry see Field 7C.
75-11630

VAPOTRANSPIRATION AND SOIL OISTURE IN UPLAND GRASS ATCHMENTS IN THE EASTERN PENNINES,
eds Univ. (England). Dept. of Geography.
G. Lockwood, and K. Venkatasawmy.
urnal of Hydrology, Vol 26, No 1/2, p 79-94, ly 1975. 5 fig, 4 tab, 7 ref.

scriptors: *Evapotranspiration, *Soil moisture, riculture, *Mathematical models, Pasture nagement, Crops, Precipitation(Atmospheric), noff, Albedo, Regime, Infiltration rates, atersheds(Basins).
ntifiers: *Upland grass catchments, *Pennines, sture catchments, Potential evapotranspiration, nman's method, Soil moisture model, drologic regime, Infiltration capacity.

thematical models were used to investigate the an moisture states and the actual evapotrans- ation from two small pasture catchments in the tern Pennines. Both precipitation and runoff re measured and potential evapotranspiration culated by Penman's method. The only unk- wns were actual evapotranspiration and soil isture, and these were estimated using a two- ge soil moisture model. It was found that the chment covered by typical Pennine rough graz- had an available soil moisture content of about mm and an albedo of 0.18, both lower than the ues for improved pasture. The rough grazing ame quickly saturated after rain and rapidly in summer. It was found on both rough grazing improved pasture with light or moderate rain- amounts that the amount of runoff was con- led by the soil-moisture state and not by the in- ation capacity of the soil. With heavy rainfalls siderable runoff occurred while the soil at th remained moderately dry. (Roberts-ISWS)
5-11648

APORATION SUPPRESSION FOR CON- RVING WATER SUPPLIES,
ricultural Research Service, Phoenix, Ariz. ter Conservation Lab.
primary bibliographic entry see Field 3B.
5-11816

**EVAPOTRANSPIRATION BY SUBIRRIGATED ALFALFA AND PASTURE IN THE EAST CENTRAL GREAT PLAINS,**
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
For primary bibliographic entry see Field 3F.
W75-11841

## 2E. Streamflow and Runoff

**DEMODULATION OF STREAM-FLOW SERIES,**
Bristol Univ. (England). Dept. of Geography.
M. G. Anderson.
Journal of Hydrology, Vol 26, No 1/2, p 115-121, July 1975. 4 fig, 1 tab, 11 ref.

Descriptors: *Fourier analysis, *Frequency, *Time series analysis, *Streamflow, *Methodology, Analytical techniques, Stochastic processes, Mathematics, Rainfall, Precipitation(Atmospheric), Model studies, Discharge(Water).
Identifiers: *Demodulation techniques, *River Blythe(England), Deterministic component.

Demodulation techniques enable changes in the amplitude and phase for a given frequency to be determined. In fitting two component models to hydrologic variables when one component is deterministic (oscillatory) and the other is stochastic, there is a danger of incorrectly assigning the two components should the amplitude of a given frequency of the deterministic component change with time. Two filters of different length are used in demodulation techniques. These techniques have been demonstrated to be a powerful method for identifying changes in the amplitude of an oscillation of a given frequency within precipitation and discharge time-series. As an example, the construction of a dam was verified by analysis of the annual discharge for the river Blythe. (Singh-ISWS)
W75-11449

**A THREE-DIMENSIONAL THEORY OF COASTAL CURRENTS AND UPWELLING OVER A CONTINENTAL SHELF,**
University of East Anglia, Norwich (England). School of Mathematics and Physics.
R. B. Hill, and J. A. Johnson.
Tellus, Vol 27, No 3, p 249-258, 1975. 3 fig, 9 ref, 2 append.

Descriptors: *Ocean circulation, *Continental shelf, *Model studies, *Mathematical models, Circulation, Water circulation, Ocean currents, Coasts, Winds, Continental slope, Upwelling, Boundary layers, Surfaces, Oceanography.
Identifiers: *Ekman layers.

The steady circulation of a homogeneous ocean was investigated in the region where the bottom rises to meet the surface at the coast as over a continental shelf. In this region the bottom Ekman layer becomes important and carries the coastal upwelling from the shelf interior region to the surface Ekman layer. A strong longshore current is produced in the shelf boundary layer and, for certain distributions of wind stress, an offshore deep counter-current is formed. At a given latitude the longshore flow near the coast depends on the local wind, whereas the offshore counter-current and the net northwards transport in the shelf layer are a function of the latitudinal distribution of wind stress. (Sims-ISWS)
W75-11450

**RESISTANCE TO FLOW IN ALLUVIAL CHANNELS,**
East-Central State Soil and Water Resources (Nigeria).
C. G. Ilo.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY6, Proceedings Paper 11352, p 665-679, June 1975. 3 fig, 6 tab, 18 ref, 3 append.

Descriptors: *Alluvial channels, *Flow, *Resistance, *Laboratory tests, *Flumes, Hydraulic models, Hydraulics, Flow characteristics, Open channels, Channels, Streambeds, Beds, River beds, Friction, Shear, Roughness(Hydraulic), Darcy-Weisbach equation, Graded, Regime, Canals, Channel morphology, Canal design, Rivers, Discharge measurement.
Identifiers: *Bed forms, Kinematics.

A direct method of predicting flow resistance and uniform velocity in alluvial channels was developed. The method covered all known bed-form regimes and not only eliminated trial-and-error computations and use of rigid-boundary channel flow formulas but also avoided the difficulties associated with the use of the various existing alluvial channel flow computation techniques. The study showed that the Darcy-Weisbach friction factor can be expressed as a unique function of the ratio of the bed form and grain shear stress components for any anticipated discharge and flow geometry, the bed-form shear component being uniquely determinable from the flow and channel material characteristics. The results confirmed that the friction factors is non-constant but varies with the bed-form regime. The applicability of the method to laboratory flumes, field canals, and natural rivers was illustrated. (Jess-ISWS)
W75-11459

**PREDICTION OF FLOOD VOLUME FROM SMALL HUMID REGION WATERSHEDS,**
Pennsylvania Dept. of Environmental Resources, Harrisburg. Div. of Comprehensive Resources Programming.
For primary bibliographic entry see Field 4A.
W75-11462

**BOUNDARY SHEAR IN CHANNEL WITH FLOOD PLAIN,**
Halcron (William) and Patners, London (England).
For primary bibliographic entry see Field 8B.
W75-11463

**RIVER REGIME WITH SPECIAL REFERENCE TO RIVER NILE,**
Assiut Univ. (Egypt). Dept. of Hydraulics.
For primary bibliographic entry see Field 2J.
W75-11464

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 1. NORTH ATLANTIC SLOPE BASINS.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11479

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11480

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART 3. OHIO RIVER BASIN.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11481

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 6. MISSOURI RIVER BASIN.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.

W75-11482

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 7. LOWER MISSISSIPPI RIVER BASIN.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11483

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART 8. WESTERN GULF OF MEXICO BASINS.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11484

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11485

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 6. MISSOURI RIVER BASIN--VOLUME 3, MISSOURI RIVER BASIN FROM SIOUX CITY, IOWA, TO NEBRASKA CITY, NEBRASKA.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11486

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 8. WESTERN GULF OF MEXICO BASINS--VOLUME 2. BASINS FROM LAVACA RIVER TO RIO GRANDE.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11487

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 9. COLORADO RIVER BASIN--VOLUME 3. LOWER COLORADO RIVER BASIN.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11488

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 10. THE GREAT BASIN.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11489

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 12. PACIFIC SLOPE BASINS IN WASHINGTON--VOLUME 1. PACIFIC SLOPE BASINS IN WASHINGTON EXCEPT COLUMBIA RIVER BASIN.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11490

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 13. SNAKE RIVER BASIN.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11491

**FLOODS IN THE WAIAHOLE-WAIKANE AREA, OAHU, HAWAII,**
Geological Survey, Honolulu, Hawaii.
C. J. Ewart, and R. Lee.
Open-file report, 1973. 10 p, 7 fig, 1 plate, 8 ref.

Descriptors: *Floods, *Flood frequency, *Flood data, *Hawaii, Flood profiles, Flood peak, Flood plains, Flood protection, Hydrologic data, Flood forecasting, Hydrographs, Streamflow.
Identifiers: *Oahu(Hawaii), Waiahole-Waikane area(Oahu).

Hydrologic data show the extent and frequency of flooding in the Waiahole-Waikane area of windward Oahu, Hawaii. The data provide a technical basis for the formulation of flood-plain regulations, building and zoning ordinances, the design and location of flood-control projects, and modification or improvement of the existing drainage system. The three main streams in the study area are Waiahole, Waikane, and a smaller unnamed stream, which is located between these two. Waiahole and Waikane streams head near the crest of the Koolau Range and are perrennial; the unnamed stream heads about the 700-foot elevation and is intermittent. The stream gradients are steep in the upper reaches and fairly flat on the coastal flood plain. Inundation boundaries and water-surface profiles for the 50-year flood were estimated by backwater analyses and represent current channel conditions. (Woodard-USGS)
W75-11495

**PROGRESS REPORT TO THE ARKANSAS STATE HIGHWAY COMMISSION FOR YEAR ENDING JUNE 30, 1975,**
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 8B.
W75-11501

**LOW-FLOW CHARACTERISTICS OF STREAMS IN THE GRAYS HARBOR DRAINAGES, WASHINGTON,**
Geological Survey, Tacoma, Wash.
J. E. Cummans, and E. G. Nassar.
Open-file report, 1975. 27 p, 3 fig, 1 plate, 3 tab, 13 ref.

Descriptors: *Low-flow frequency, *Streamflow, *Hydrologic data, *Washington, Rainfall-runoff relationships, Hydrology, Hydrologic cycle, Analytical techniques, Regression analysis, Seasonal, Flow-rates.
Identifiers: *Grays Harbor drainages(Wash).

Streams in the Grays Harbor drainage area, Washington, are varied in their annual volumes of runoff, and in the amounts of flow available during the low-flow period of middle and late summer. Many small streams are dry in summer. Mean annual precipitation in the area ranges from about 40 inches near Chehalis and Centralia to 220 inches in the headwaters of the Satsop, Wynoochee, and Humptulips River basins. About 10 percent of the precipitation occurs during May to August. Yearly variations in 7-day low flows of the Chehalis River near Grand Mound ranged from about 91 cfs in 1967 to about 261 cfs in 1937. Low-flow-frequency curves plotted from streamflow records at 15 continuous-recording stations having 10 or more years of record were used to determine data for low-flow durations of 7, 30, 60, 90, and 183 days. Regression techniques were used to estimate low flows with frequencies up to 20 years for stations with less than 10 years of record and at miscellaneous sites. Low-flow frequency data are listed for 161 sites. The median of monthly mean flows (monthly mean flow at the 2-year recurrence interval) is presented for selected sites. Factors that influence low flows are described briefly. Truly natural flows--those unaffected by man's activities or diversions--exist in very few streams in the area. (Woodard-USGS)
W75-11502

**GREAT LAKES WATER LEVELS, 1974, DAILY AND MONTHLY AVERAGE WATER SURFACE ELEVATIONS.**
NOAA National Ocean Survey, Washington, D.C.
For primary bibliographic entry see Field 2H.
W75-11554

**CURRENT MEASUREMENTS USING A TILT ING SPAR,**
Scripps Institution of Oceanography, La Jolla, Calif
For primary bibliographic entry see Field 7B.
W75-11564

**TRACING OCEAN CURRENTS,**
Washington Univ., Seattle. Sea Grant Advisory Service.
A. Duxbury.
May 1975, 5 p.

Descriptors: *Currents(Water), *Current meters, *Instrumentation, *Water measurement, Gages, Equipment, Rates, Velocity, Density currents, Ocean currents, Drift bottles, Flow, Flow measurement, Movement, Water circulation, Waves(Water).
Identifiers: Drifters, Weighted drifters, Bottle currents, Geostrophic currents.

This brief article describes techniques and equipment used to determine the movement of water. Techniques touched upon include the use of drift bottles to determine overall surface current patterns including speed and direction; weighted drifters for use in measuring bottom currents; following drifters to establish path fixes; use of current metering devices; use of supplemental techniques such as the determination of geostrophic currents and the use of ship observations and atlases which contain information on the monthly magnitude and direction of the surface current for a given area. (NOAA)
W75-11574

**HYMO FLOOD ROUTING,**
Agricultural Research Service, Temple, Tex.
For primary bibliographic entry see Field 4A.
W75-11647

**APPLICATION OF A GENERALISATION OF WALD'S IDENTITY TO SOLVING CERTAIN MULTI-STREAM STORAGE PROBLEMS,**
Monash Univ., Clayton (Australia). Dept. of Mathematics.
For primary bibliographic entry see Field 4A.
W75-11649

**THE VALUE OF THE PEAK RUNOFF COEFFICIENT PSIS (UEBER DEN AUSSAGEWERT DES SPITZENABFLUSSBEIWERTES PSIS),**
For primary bibliographic entry see Field 2A.
W75-11713

**MODELS OF THE STOCHASTIC CHRONOLOGIC STRUCTURE, PREDICTION AND SIMULATION OF RUNOFF SEQUENCES APPLICATION TO THE LOWER OHIO BASIN,**
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
P. C. Tao, and J. W. Delleur.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-256, $5.75 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center Technical Report No. 60, 1975. 124 p, 24 fig, 9 tab, 40 ref, 4 append. OWRT-B-036-IND(9).

Descriptors: *Streamflow forecasting, *Stochastic processes, *Statistical models, *Rainfall-runoff processes, River forecasting, Time series analysis, Fourier analysis, Indiana, Ohio, Kentucky, Ohio River.
Identifiers: *ARMA Processes, Multivariate analysis, Disaggregation processes.

The principal tools used are harmonic analysis, time series analysis, the ARMA processes, regression and correlation, principal component analysis, multivariate analysis, and disaggregation processes. Data were used from 32 water-sh

he lower Ohio Basin located principally in Indiana, but also in Illinois, Ohio, and Kentucky. The onclusions are (1) the ARMA models with easonally varying coefficients are based upon the easonally varying serial correlation coefficients. he seasonality of the means, variances, and the ross-covariances can be preserved by using this amily of ARMA models with seasonally varying arameters; (2) the parameters of the ARMA odels for the stochastic component of the stream unoffs are correlated with some of the reional ariables. Their correlations depend on the physioraphical regions of the watersheds, are not sigificantly high but not negligible; (3) the ARMA rocesses can not preserve the long-term depenence of the hydrologic processes, therefore, for ata synthesis, the multivariate disaggregation odel should be used. The multivariate disagegation model preserves long-term properties, ithin-the-year cyclicities, serial correlation, oss-correlation between stations, and rainfall-runoff relationships of the hydrologic processes.
75-11783

**YDROCHEMICAL AND HYDROBIOLOGIAL PECULIARITIES OF LIMANS IN THE ANUBE-DNIESTER INTERFLUVE, (IN KRAINIAN),**
kademiya Nauk URSR, Kiev. Instytut drobiologii.
or primary bibliographic entry see Field 2K.
75-11847

## F. Groundwater

**IPROVED APPLICATION OF GEOPHYSICS ) GROUNDWATER RESOURCE INVENTOES IN GLACIATED TERRAINS,**
rdue Univ., Lafayette, Ind. Water Resources search Center.
M. Adams, W. J. Hinze, and L. A. Brown.
ailable from the National Technical Informan Service, Springfield, Va. 22161, as PB-244 9, $4.25 in paper copy, $2.25 in microfiche. chnical Report No 59, July 1975. 62 p, 20 fig, 4 , 18 ref. OWRT A-030-IND(1).

scriptors: *Groundwater, *Bedrock, *Gravity dies, Glacial aquifers, Hydrogeology, ophysics, Geologic control, *Indiana, Geologic pping, Subsurface mapping, *Groundwater ources, Bedrock.
ntifiers: *Induced polarization, Tippecanoe unty(Ind).

ophysical mapping of buried bedrock topogphy plays an important role in groundwater ource inventories. The gravity method is an inensive reconnaissance tool. Where the density trast between the bedrock and the overlying th materials is constant, the bedrock elevation a obtained from drill holes, outcrops, and smic studies combined with gravity data can be d to isolate the gravity effects from bedrock re. A limitation of the method is the number of rock elevation points available to compare h observed gravity data. In the area under dy, 15 control points per township were found e adequate. Preliminary induced polarization P.) studies indicate that measurable I.P. effects ur within glacial sediments. Although the stu were inconclusive in defining the application he I.P. method to determine the hydrologic proies of the sediments, the results suggest that her investigation of the method in this applicais warrented.
5-11355

**LUTION OF A FREE-SURFACE BOUNDARY LUE PROBLEM USING AN INVERSE FORLATION AND THE FINITE ELEMENT THOD,**
fornia Univ., Santa Barbara. Dept. of hanical and Environmental Engineering.
Shaug, and J. C. Bruch, Jr.
Journal of Hydrology, Vol 26, No 1/2, p 141-152, July 1975. 3 fig, 1 tab, 10 ref. UCAL-WRC-W-428.

Descriptors: *Fluid mechanics, *Boundary processes, *Finite element analysis, *Seepage, *Algorithms, Ditches, Potential flow, Flow nets, Mathematics, Digital computers.
Identifiers: *Equipotential lines, Flow lines, Finite difference equations.

An inverse formulation in conjunction with the finite element method was used to solve a two-dimensional free surface problem. The approach is accurate and has several advantages over the finite difference solution approach. The scheme is easily formulated, efficient, and flexible since it can readily handle the boundary conditions and also any variable shaped curve within the rectangular regions in the complex potential plane. The solutions were performed on a digital computer for seepage from a trapezoidal ditch. The algorithm used allowed the streamlines and equipotential lines to be separated by arbitararily selected increments in the stream function and potential function so that these lines and their intersections could be concentrated in high velocity regions. Included were comparisons between finite element, finite difference, and analytical solutions which show the increased accuracy of the finite element method. (Singh-ISWS)
W75-11447

**TRANSPORT MODEL, USER'S MANUAL,**
Battelle-Pacific Northwest Labs., Richland, Wash. Water and Land Resources Dept.
For primary bibliographic entry see Field 5B.
W75-11468

**VARIABLE THICKNESS TRANSIENT GROUNDWATER FLOW MODEL USER'S MANUAL,**
Battelle-Pacific Northwest Labs., Richland, Wash. Systems Dept.
W. V. DeMier, A. E. Reisenauer, and K. L. Kipp.
Avaialble from the National Technical Information Service, Springfield, Va 22161. Battelle Report No BNWL-1704, UC-70, 1974. 94 p, 5 fig, 2 tab, 3 append. ERDA Contract AT9(45-1):1830.

Descriptors: *Groundwater, *Computer models, *Saturated flow, *Unsteady flow, Aquifers, Water table aquifers, Basins, Model studies, *Computer programs, Mathematical models, Flow.
Identifiers: Program listings, *User's manual, *Matrix inversion routine, Relaxation technique.

The Variable Thickness Transient Flow Model is a numerical solution to the partial differential equation describing unconfined saturated transient flow through porous media. The input to the model and two support programs used during a groundwater aquifer simulation were described. In addition to the program listings and user and input instructions, specific features relating to modeling of the Hanford Reservation groundwater regime were described. (Prickett-ISWS)
W75-11469

**REGIONAL CHEMISTRY OF GROUNDWATER IN THE WAINWRIGHT AREA, ALBERTA,**
Research Council of Alberta, Edmonton.
D. A. Hackbarth.
Report 75-6, 1975. 49 p, 26 fig, 2 tab, 28 ref, 1 append. $2.00.

Descriptors: *Canada, *Hydrogeology, *Geochemistry, *Geologic control, Water quality, Bedrock, Glacial drift, Groundwater movement, Water table, Recharge, Discharge(Water), Artesian wells, Geomorphology, Topography, Regional analysis, Maps, Dissolved solids, Hardness(Water), Sodium, Potassium, Ion exchange, Sulfates, Fluorides, Chlorides, Nitrates, Water pollution, Alkalinity, Aquifers.
Identifiers: *Alberta.

The Wainwright map area (about 6000 sq mi) is located southeast of Edmonton between longitudes 110 degrees and 112 degrees west and latitudes 52 degrees and 53 degrees north, lying mostly in the aspen parkland vegetational assemblage. Average precipitation and potential evapotanspiration are 14 inches and 21 inches, respectively. Geologic units of hydrogeological interest include glacial drift, preglacial sands and gravels, and the Horseshoe Canyon, Bearpaw, Belly River, and Lea Park Formations. Contour maps of the following hydrochemical parameters for various depth intervals are presented: total dissolved solids, hardness, Na + K, alkalinity, S04, Cl, and F. Groundwater quality is related to the thickness and nature of the glacial drift and to the character of the underlying bedrock. Areas where the water quality is comparatively good for depths up to 500 feet are usually overlain by 50 to 400 feet of coarse-grained glacial drift. Rapid downward movement of water was hypothesized to account for this good quality. Poorer-quality groundwater is comonly found in areas of thin, fine-grained drift and is apparently the result of slow percolation. Regionally, the area acts as a recharge area for northwestwardly flowing groundwater; while locally, much water is probably discharged in sloughs. (Visocky-ISWS)
W75-11471

**RESPONSE OF UNCONFINED AQUIFER SYSTEMS TO DEEP PERCOLATION,**
California Univ., Davis. Dept. of Water Science and Engineering.
M. A. Marino.
Water Science and Engineering Paper No 2004, July 1975. 32 p, 3 fig, 16 ref. CSRS CA-D*-WSE-3082-H.

Descriptors: *Aquifers, *Groundwater recharge, *Water table, Equations, Mathematical models, Drains, Hydraulic conductivity, Irrigation, Groundwater, Groundwater movement, Porous media, Discharge(Water), Percolation, Seepage, Saturation, Water level.
Identifiers: *Mounds, Depth of saturation.

Solutions were derived which describe the rise and fall of the water table in extensive unconfined aquifers receiving localized vertical accretion and discharging into a surface reservoir in which the water level remains equal to that of the main flow before the incidence of rechange. The rate of accretion was maintained by a spreading area in the form of an infinitely long strip of finite width. Solutions were also derived for the rise, decline, and maximum height of the water table in an unconfined aquifer bounded by two streams or drains. The water levels in the drains were assumed to be at equal elevation. The aquifer received either time-varying or uniform vertical recharge. In each aquifer system considered herein, the aquifer was assumed to be homogeneous, isotropic, and resting on a horizontal impervious base. In addition, the rate of recharge relative to the hydraulic conductivity was considered so small that the vertically downward recharge was almost completely refracted in the direction of the slope of the water table. The solutions were expressed in terms of the head averaged over the depth of saturation. They are applicable to problems of groundwater flow through aquifers and to land drainage problems when the rise of the water table is smaller than 50% of the initial depth of saturation. (Visocky-ISWS)
W75-11474

**HYDROGEOLOGY OF THE WAINWRIGHT AREA, ALBERTA,**
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 4B.
W75-11475

**GEOHYDROLOGIC RECONNAISSANCE OF THE UPPER POTOMAC RIVER BASIN,**
Geological Survey, Reston, Va.

F. W. Trainer, and F. A. Watkins, Jr.
Available from Supt of Documents, GPO, Washington, DC 20402, Price $1.95. Water-Supply Paper 2035, 1975. 68 p, 16 fig, 1 plate, 10 tab, 53 ref.

Descriptors: *Hydrogeology, *Geologic formations, *Water resources development, *Potomac River, *Appalachian Mountain region, Pennsylvania, Maryland, Virginia, West Virginia, Water resources, Water supply, Water utilization, Water quality, Groundwater, Surface waters, Aquifer characteristics, Water yield, Test wells, Streamflow, Low flow, Base flow, Water pollution sources, Watershed management, Hydrologic data.
Identifiers: *Upper Potomac River basin.

The upper Potomac River basin, in the central Appalachian region in Pennsylvania, Maryland, Virginia, and West Virginia, is a humid temperate region of diverse fractured rocks. Three geohydrologic terranes, which underlie large parts of the basin, are described in terms of their aquifer characteristics and of the magnitude and duration of their base runoff: (1) fractured rock having a thin regolith, (2) fractured rock having a thick regolith, and (3) carbonate rock. Crystalline rock in the mountainous part of the Blue Ridge province and shale with tight sandstone in the folded Appalachians are covered with thin regolith. Water is stored in and moves through fairly unmodified fractures. Average transmissivity (T) is estimated to be 150 sq feet per day, and average storage coefficient (S), 0.005. Crystalline and sedimentary rocks in the Piedmont province and in the lowland part of the Blue Ridge province are covered with thick regolith. Estimated average values for aquifer characteristics ar T, 200 sq feet per day, and S, 0.01 . Carbonate rock, in which fractures have been widened selectively by solution, especially near streams, has estimated average aquifer characteristics of T, 500 sq feet per day, and S, 0.03-0.04. This rock is the most effective in the basin in terms of water supply and base runoff. Acidic mine-drainage water, local highly mineralized groundwater, and the high nitrate content of groundwater in some areas would probably have little adverse affect on the use of groundwater for low-flow augmentation. (Woodard-USGS)
W75-11493

**DIGITAL-SIMULATION AND PROJECTION OF WATER-LEVEL DECLINES IN BASALT AQUIFERS OF THE ODESSA-LIND AREA, EAST-CENTRAL WASHINGTON,**
Geological Survey, Reston, Va.
J. E. Luzier, and J. A. Skrivan.
Available from Supt of Documents, GPO, Washington, DC 20402 Price - 75 cents. Water-Supply Paper 2036, 1975. 48 p, 29 fig, 12 ref.

Descriptors: *Groundwater resources, *Model studies, *Aquifer characteristics, *Basalts, *Washington, Water supply, Water utilization, Hydrogeology, Hydrologic data, Groundwater movement, Water yield, Groundwater recharge, Computer models, Forecasting, Water levels, Water resources development.
Identifiers: *Odessa-Lind area(Wash).

A digital computer program using finite-difference techniques simulates an intensively pumped, multilayered basalt-aquifer system near Odessa, Wash. The aquifers now developed are in the upper 1,000 feet of a regionally extensive series of southwesterly dipping basalt flow of the Columbia River Group. Most of the aquifers are confined. Those in the depth range of about 500 to 1,000 feet are the chief source of groundwater pumped from irrigation wells. Transmissivity of these aquifers ranges from less than 2,700 sq. ft. per day to more than 40,000 sq. ft. per day, and storage coefficients range from 0.0015 to 0.006. Shallower aquifers are generally much less permeable, but they are a source of recharge to deeper aquifers with lower artesian heads; vertical leakage occurs along joints in the basalt and down uncased wells, which short circuit the aquifer system. For model analysis, the deeper, pumped aquifers were grouped and treated as a single layer with drawdown-dependent leakage from an overlying confining layer. Verification of the model was achieved by closely matching observed pumpage-related head declines ranging from bout 10 feet to more than 40 feet over the 4-year period from March 1967 to March 1971. Projected average annual rates of decline during the 14-year period from March 1967 to March 1981 are: from 1 to 9 feet per year if pumpage is maintained at the 1970 rate of 117,000 acre-feet per year; or, from 3 to 33 feet per year if 1970 pumpage is increased to 233,000 acre-feet per year, which includes 116,000 acre-feet per year covered by water-right applications held in abeyance. (Woodard-USGS)
W75-11494

**GROUND-WATER DATA FOR BOLIVAR COUNTY, MISSISSIPPI,**
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W75-11496

**GROUND-WATER DATA IN THE HARRISBURG - HALSEY AREA, CENTRAL WILLAMETTE VALLEY, OREGON,**
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 7C.
W75-11498

**GROUND-WATER LEVELS IN LOUISIANA--FOR WELLS MEASURED THROUGH 1974.**
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 7C.
W75-11499

**SIMULATION OF MISCIBLE DISPLACEMENT IN SOILS,**
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
A. G. Smajstrla, D. L. Reddell, and E. A. Hiler.
Presented at 1974 Annual Meeting of the American Society of Agricultural Engineers, June 23-26, 1974. Stillwater, Oklahoma, Paper No 74-2015. 30 p, 9 fig, 27 ref, append.

Descriptors: *Infiltration, *Soil water movement, *Porous media, *Computer programs, Simulation analysis, Model studies.

A simulation model was developed for the miscible displacement of a conservative solute during one-dimensional vertical infiltration into a homogeneous, isotropic porous media. FORTRAN IV computer programs were written in a general form so that various initial and boundary conditions could be specified as input parameters. Unsteady vertical infiltration, steady flow dispersion, and dispersion during unsteady vertical infiltration into unsaturated, homogeneous, and isotropic porous media were accurately described by the simulation model. The shape of the solute distribution curve with depth is relatively insensitive to the magnitude of the dispersion coefficient for porous media to which the functional relationship used apply and for the range of pore water velocities commonly encountered during infiltration into sand and clay loam soils. Dispersion coefficients are much larger and solute curves are very different for nonhomogeneous, anisotropic porous media than for homogeneous media. Data describing the nonhomogeneous nature of soils will be needed to adequately describe experimental field solute distribution curves. (Skogerboe-Colorado State)
W75-11590

**MATHEMATICAL MODELS OF ARTIFICIAL RECHARGE SYSTEMS,**
California Univ., Davis. Dept. of Water Science and Engineering
For primary bibliographic entry see Field 4B
W75-11626

**WELL PUMPING IN UNCONFINED AQUIFERS THE INFLUENCE OF THE UNSATURATED ZONE,**
Technion-Israel Inst. of Tech., Haifa. Faculty of Civil Engineering
For primary bibliographic entry see Field 4B.
W75-11631

**AXISYMMETRIC SEEPAGE FLOW THROUGH SEMI-INFINITE POROUS MEDIA,**
Roorkee Univ. (India). Dept. of Hydrology.
S. Chandra, and H. C. Misra.
Indian Geotechnical Journal, Vol 4, No 4, p 299-311, October 1974. 10 fig, 7 ref.

Descriptors: *Porous media, *Seepage, *Mathematical studies, *Steady flow, *Flow around objects, Groundwater, Confined water, Potential flow, Flow, Groundwater movement, Groundwater potential, Underseepage, Numerical analysis, Laplaces equation, Resistance networks
Identifiers: *Axisymmetric flow, *Semi-infinite flow, Potential distribution.

The potentials due to three-dimensional seepage half space with infinite depth of the medium are higher than those for two-dimensional seepage under the downstream half of the floor. Under the upstream half of the floor the potentials are lower than those for the two-dimensional case. By increasing the length to width ratio, the potentials increase for the downstream half of the floor and decrease for the upstream half. This was confirmed by experiment also. The reduction in dep of the pervious stratum was found to reduce the potentials on the downstream half of the floor and increase on the upstream half of the floor. Two-dimensional seepage was similar. (Prickett-ISWS)
W75-11633

**TWO-DIMENSIONAL SIMILARITY SOLUTION: THEORY AND APPLICATION TO THE DETERMINATION OF SOIL-WATER DIFFUSIVITY,**
Connecticut Agricultural Experimental Station, New Haven. Dept. of Ecology and Climatology.
For primary bibliographic entry see Field 2G.
W75-11640

**GEOCHEMISTRY AND GENSIS OF FLUORIDE-CONTAINING GROUND WATERS IN INDIA,**
Soil Research Lab., Chandigarh (India).
For primary bibliographic entry see Field 2K.
W75-11645

**THEORY OF GROUND-WATER RECHARGE FOR A STRIP BASIN,**
New South Wales Univ., Kensington (Australia). Faculty of Military Studies.
A. C. Amar.
Ground Water, Vol 13, No 3, p 282-292, May-June 1975. 9 fig, 16 ref, 2 append.

Descriptors: *Groundwater recharge, *Recharge, *Groundwater, Groundwater movement, Dupuit-Forchheimer theory, Saturated flow, Recharge ponds, Unsteady flow, Water table, Permeability, Mathematical models.
Identifiers: *Strip basin, *Recharge basin.

Formulation and solution of one-dimensional analytical and computational models, linear as well as nonlinear, pertaining to a typical ground-water recharge pattern were presented. The objective was to direct attention toward an evalua-

and correlation of the various theoretical models based on the Dupuit-Forchheimer (D-F) approximations for the unsteady hydrodynamic behavior of the proposed recharge system under saturated flow conditions. Comparisons with the pertinent experimental data, presented in the form of dimensionless graphs, indicated that the linear D-F theory is valid for relatively small water table rises but for large rises it predicts substantially greater rises than actually occur, particularly beneath and in the vicinity of the recharge basin. For relatively large rises, the range of validity between theory and experiments was considerably improved using the nonlinear theory. (Lee-ISWS)
W75-11646

**DETERMINING OPTIMAL WELL DISCHARGE,**
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4B.
W75-11768

**IDENTIFICATION OF PARAMETERS IN A LINEAR EQUATION OF GROUNDWATER FLOW,**
Department of the Environment, Reading (England). Central Water Planning Unit.
D. A. Nutbrown.
Water Resources Research, Vol 11, No 4, p 581-588, August, 1975. 12 fig, 5 ref, 1 append.

Descriptors: *Groundwater movement, *Hydrologic data, *Systems analysis, *Computer models, *Aquifer systems, Base flow, Model studies, Mathematical studies, Linear programming, Mathematical models, Finite element analysis, Analytical techniques, Transimissivity, Aquifer characteristics, Aquifers, Inflow, Groundwater recharge, Withdrawal.
Identifiers: England, South Downs(England), Linear equations.

An inductive method is presented for evaluating parameters in a two-dimensional linear equation describing groundwater flow. The approach employs finite difference approximations, which can be simply programmed for calculation by computer. Before illustrating the method, which is applicable to both stationary and time-dependent problems, the various types of data required for evaluation in general are systematically enumerated. An assumption is introduced limiting the local variability of T, the tranmissivity, and its relation to apparently similar assumptions used elsewhere is discussed. The particular aquifer chosen for illustration is the chalk of the South Downs between the rivers Adur and Ouse. The parameters are calculated on the basis of cyclic data in which annual abstraction is about 30% of the total infiltration for the year. The method gives a match to the minimum and maximum water levels during the year to within 7%. (Robinett-Arizona)
W75-11799

## 2G. Water In Soils

**SOIL AND HYDROLOGIC FACTORS AFFECTING THE STABILITY OF NATURAL SLOPES IN THE OREGON COAST RANGE,**
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
R. D. Harr, and C. S. Yee.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 178, $7.25 in paper copy, $2.25 in microfiche. Oregon Water Resources Research Institute, Corvallis, Completion Report WRRI-33, July 1975. 204 p, 54 fig, 10 tab, 87 ref, 4 append. OWRT A-023-ORE(1).

Descriptors: *Slope stability, Soil mechanics, Subsurface flow, *Soil aggregates, Oregon, Coasts, Hydrology, Piezometers, Particle size, Tensiometers, Soil properties, Soil strength, Porosity, *Soil stability, Soil density, *Soil physical properties, Cohesionless soils, *Oregon Coast Range.

Soil and hydrologic properties of two major cohesionless soils occupying 55% of the central portion of the Oregon Coast Range were examined. Knowledge of these properties was desired to determine the role each played in the stability of slopes in the region. Bohannon and Klickitat soils often occupy the steep midslopes where the greatest potential for stability problems exists. The Bohannon series is derived from Tyee sandstone and the Klickitat series is derived from intrusive, igneous parent material. Soil samples were obtained from four widely separated sites, two for each of the soil series and were examined for particle-size-distribution, bulk density, porosity, pore-size distribution, aggregate stability, saturated and unsaturated hydraulic conductivity, and shear strength. Both soils, although derived from very different parent materials, exhibited nearly identical ranges of values for soil and hydrologic properties. Both were extremely porous, highly permeable, very well aggregated and graded, sandy to gravelly cohesionless soils. From engineering and hydrology standpoints, the two soil series can be considered as one.
W75-11353

**FIELD TEST OF SOIL WATER FLUX METERS,**
Agricultural Research Service, Riverside Calif. Salinity Lab.
C. Dirksen.
Presented at 1974 Annual Meeting of the American Society of Agricultural Engineers, June 23-26, 1974. Stillwater, Oklahoma, Paper No 74-2039. 12 p, 4 fig, 1 tab, 5 ref.

Descriptors: *Soil water movement, *Drainage, Soil investigations, *Soil moisture, meters, Soil properties, *Instrumentation, *Measurement, *On-site tests.

Soil water flux in a draining soil profile was measured with flux meters featuring variable hydraulic resistances. As the hydraulic conductivity of the soil changes, the meter resistance is adjusted such that the overall hydraulic head loss across the meter matches that measured with tensiometers in undisturbed soil nearby. The soil water flux is then equal to that through the meter and is derived from the calibration of the resistance. If this match is not quite perfect, the remaining small amount of divergence or convergence of flow is calculated with an empirical relationship, independent of the magnitude of the flux and the hydraulic properties of the soil. The soil water fluxes were measured in essentially undisturbed soil, since the meters were installed from a horizontal direction. Such installation is possible by using a compression spring that pushes thin filter plates against the top and bottom of undisturbed soil surfaces excavated to a certain size with a specially designed apparatus. A slanted pin used to constrain the spring permits the meter to be installed and retrieved repeatedly. Two flux meters of different sizes and with different hydraulic resistances were tested side by side in a field plot and gave consistent, satisfactory results. (Skogerboe-Colorado State)
W75-11586

**SIMULATION OF MISCIBLE DISPLACEMENT IN SOILS,**
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W75-11590

**DETERMINING EFFECTIVE SOIL WATER DIFFUSIVITIES FROM ONE-STEP OUTFLOW EXPERIMENTS,**
Minnesota Univ., St. Paul.
S. C. Gupta, D. A. Farrell, and W. E. Larson.
Soil Science Society of America Proceedings, Vol 38, No 5, p 710-716, September-October, 1974. 7 fig, 15 ref, append.

Descriptors: *Diffusivity, Methodology, Soil water, *Soil water movement, Soil properties, Computers, Discharge(Water).

A method is developed whereby effective or weighted mean diffusivity, D, can be estimated by using outflow data. These estimates can further be analyzed for soil water diffusivity, D theta, with the help of a step-wise function and the relationship given by Crank (1956). The suggested procedure for estimating soil water diffusivity is more accurate than previous methods because no assumption of constant diffusivity either over the pressure increment or over the length of the soil core is required. Moreover the procedure does not use the early part of the outflow curve and thus reduces the effect of membrane impedance on the estimates of D theta. The method was tested by simulating outflow experiments on a digital computer, and using data obtained to calculate diffusivities. Estimates of diffusivity were in better agreement with the actual diffusivities than those obtained with the earlier 'one-step' method. (Skogerboe-Colorado State)
W75-11592

**UNSATURATED HYDRAULIC CONDUCTIVITY FROM CUMULATIVE INFLOW DATA,**
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
L. R. Ahuja.
Soil Science Society of America Proceedings, Vol 38, No 5, p 695-699, September-October, 1974. 6 fig, 13 ref.

Descriptors: *Hydraulic conductivity, *Infiltration, *Diffusivity, Soil properties, Clays.

A method of determining the wetting-phase unsaturated hydraulic conductivity K theta from the data of cumulative inflow into a uniform soil core when water enters through a porous plate of high hydraulic resistance is described and evaluated. The method is based on piece-wise application of the Green and Ampt (1911) approach to the above process of infiltration. The K theta determined by this technique from the numerical-solution inflow data of Yolo light clay were within 20% of the K theta values actually used in obtaining the numerical solution in two different cases of hydraulic resistance. Similar analysis of the experimental inflow data of Salkum silty clay loam for four different hydraulic resistances yielded the K theta data which closely agreed with the K theta values determined by detailed analysis of the soil-water content transients. (Skogerboe-Colorado State)
W75-11593

**CHLORIDE AND TRITIATED WATER FLOW IN DISTURBED AND UNDISTURBED SOIL CORES,**
Kentucky Univ., Lexington. Dept. of Agronomy.
M. A. McMahon, and G. W. Thomas.
Soil Science Society of America Proceedings, Vol 38, No 5, p 727-732, September-October, 1974. 6 fig, 4 tab, 13 ref.

Descriptors: *Soil water movement, Soil properties, Water chemistry, *Chlorides, Nitrates, Soil investigations, Soil physics, Anions.
Identifiers: *Tritiated water.

Columns of disturbed and undisturbed Eden, Maury, and Pembroke soils were eluted with CaCl2 in tritiated water. The chloride was used as a substitute for nitrate since it is not affected biologically. The experiments were carried out to investigate the effects of natural soil structure on the flow of water and chloride. In all three soils flow was less stable in the undisturbed cores judging from the shape of the curve and the points of initial tritiated water and chloride breakthrough.

Chloride moved through the undisturbed Eden and Maury soils faster than through the disturbed columns. Both soils exclude anions to a significant extent. In the Pembroke soil, which adsorbs anions, the chloride was retarded in the undisturbed column as compared to the disturbed column. The results suggest that field movement of water and anions is not described very well by columns of disturbed, packed soils. (Skogerboe-Colorado State)
W75-11594

**PREDICTING EXCHANGEABLE SODIUM RATIOS IN IRRIGATED TROPICAL VERTISOLS,**
Hawaii Inst. of Geophysics, Honolulu.
For primary bibliographic entry see Field 3C.
W75-11595

**NITRIFICATION AND DENITRIFICATION DURING MISCIBLE DISPLACEMENT IN UNSATURATED SOIL,**
California Univ., Davis.
For primary bibliographic entry see Field 3F.
W75-11596

**RICE RESPONSE TO NITROGEN AND PHOSPHORUS IN FLOODED AND NON-FLOODED SOILS,**
National Fertilizer Development Center, Muscle Shoals, Ala.
For primary bibliographic entry see Field 3F.
W75-11597

**MODIFIED PENMAN EQUATION TO PROVIDE THE UPPER BOUNDARY CONDITION IN COMPUTING EVAPORATION FROM SOIL,**
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 2D.
W75-11598

**SAMPLING TOOL FOR TAKING UNDISTURBED SOIL CORES,**
Florida Univ., Gainesville.
W. K. Robertson, P. E. Pope, and R. T. Tomlinson.
Soil Science Society of America Proceedings, Vol 38, No 5, p 855-857, September-October 1974. 4 fig, 2 ref.

Descriptors: *Sampling, *Soil investigations, Soil properties, Soil surveys, Soil tests, Leaching.

A tool is described that can be attached to a commercially available soil sampler that will take undisturbed soil cores 15 cm in diameter and 75 cm long in corlon tubes. The tubes were sealed at the bottom with a sheet of plastic in which drainage tubes were inserted. Leaching studies could be made when tubes containing cores were placed on racks in the greenhouse. Further refinements include suction cups at regular intervals in the side of the column for nutrient movement studies and porous plates at the top and/or the bottom to make moisture tension in the profile similar to natural conditions. (Skogerboe-Colorado State)
W75-11599

**KINETIC AND EQUILIBRIUM STUDIES OF BORON DESORPTION FROM SOIL,**
California Univ., Davis. Dept. of Soils and Plant Nutrition.
R. A. Griffin, and R. G. Burau.
Soil Science Society of America Proceedings, Vol 38, No 6, p 892-897, November-December, 1974. 6 fig, 2 tab, 19 ref.

Descriptors: Boron, Adsorption, *Kinetics, Soil texture, *Soil chemistry, Soil tests, Soil investigations, *Equilibrium
Identifiers: *Boron desorption.

Kinetics of boron desorption from soil were determined using 0.05M mannitol solutions to create pseudo first-order reaction conditions. The results showed two separate pseudo first-order reactions and one very slow reaction for which detailed kinetic treatment was not attempted. The relative amount of boron associated with the two fast reactions was independent of soil texture and of initial sample boron content. It was postulated that the two reaction rates were due to desorption from two independent boron retention sites. It was speculated that the two fast reactions were due to desorption from hydroxy iron, magnesium, and aluminum materials in the clay fraction. The third or slowest reaction rate was probably due to diffusion of boron from the interior of clay minerals to solution phase. Equilibrium studies showed that boron desorption followed a 2-site analog of a linear form of a 1-site Langmuir expression. Langmuir adsorption maximum values for each site corroborated those calculated from the kinetic study and supported the multisite interpretation of the kinetic data. (Skogerboe-Colorado State)
W75-11600

**SULFUR AND MANGANESE RELEASE FROM SOILS TREATED WITH PRILLED SULFUR AND SULFUR-BENTONITE,**
Missouri Univ., Clinton. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W75-11604

**TWO-DIMENSIONAL SIMILARITY SOLUTION: THEORY AND APPLICATION TO THE DETERMINATION OF SOIL-WATER DIFFUSIVITY,**
Connecticut Agricultural Experimental Station, New Haven. Dept. of Ecology and Climatology.
N. C. Turner, and J-Y. Parlange.
Soil Science Society of America Proceedings, Vol 39, No 3, p 387-390, May-June 1975. 3 fig, 1 tab, 5 ref.

Descriptors: *Soil water, *Infiltration, *Infiltration rates, Diffusion, Moisture content, Sands.
Identifiers: *Soil water potential, *Moisture profile, *Soil-water diffusivity, Bruce and Klute method, Similarity solution.

A similarity solution exists in two-dimension when a constant flux is imposed along a line source. Following the Bruce and Klute method in one-dimension, this similarity solution can be used to determine the soil water diffusivity. The application of the method was illustrated for a sandy loam. The advantage of the method is that the slope of the moisture profile is finite and easily measured, even close to the source. (Lee-ISWS)
W75-11640

**NUTRIENT TRANSPORT IN SURFACE RUNOFF AS INFLUENCED BY SOIL COVER AND SEASONAL PERIODS,**
Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center.
For primary bibliographic entry see Field 5B.
W75-11641

**EVAPOTRANSPIRATION AND SOIL MOISTURE IN UPLAND GRASS CATCHMENTS IN THE EASTERN PENNINES,**
Leeds Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2D.
W75-11648

**SOIL MOISTURE ACCOUNTING COMPONENT OF THE USDAHL-74 MODEL OF WATERSHED HYDROLOGY,**
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
C. B. England.
Water Resources Bulletin, Vol 11, No 3, p 559-567, June 1975. 3 fig, 1 tab, 7 ref.

Descriptors: *Soil moisture, *Model studies, *Hydrologic data, *Watershed management, *Hydrographs, Soil management, Moisture content, Moisture, Computer models, Streamflow forecasting, Soil water movement, Soil-water plant relationships, Soils, Subsurface waters, Watersheds(Basins), *Oklahoma
Identifiers: *Model sensitivity analysis, *Chickasha(Okla), Layered soils.

Soil moisture in two layers of a soil nea Chickasha, Oklahoma, was simulated using th USDAHL-74 Model of Watershed Hydrology Weekly values computed for both layers com pared well with those observed during a 15-mont period. Certain key parameters required adjus ments in the model which illustrate the need fo accurate input information. The experimen demonstrated that the model, which has prev ously given good results in continuous streamflo prediction on watersheds up to 100 square mile could also compute soil moisture continuously at site. This capability suggested other model use for example, in monitoring the disposition of a plied chemicals. (Prickett-ISWS)
W75-11656

**DISPOSAL OF CHEMICAL SEWAGE SLUDGE ON LAND AND THEIR EFFECTS ON PLANT LEACHATE AND SOIL SYSTEMS,**
Environmental Protection Service, Burlington (Ontario). Waste Water Technology Center.
For primary bibliographic entry see Field 5E.
W75-11721

**SOIL TREATMENT WITH SILICONES FO WATER HARVESTING,**
Dow Corning Corp., Midland, Mich.
For primary bibliographic entry see Field 3B.
W75-11806

**CHEMICAL WATER HARVESTING,**
DeJong and Associates, Tucson, Ariz.
For primary bibliographic entry see Field 3B.
W75-11807

**DESIGN AND CONSTRUCTION OF ROAD CATCHMENTS,**
Western Australia Dept. of Agriculture, Moo Soil Conservation Service.
For primary bibliographic entry see Field 3B.
W75-11810

**PRECIPITATION ENTRAPMENT F EVAPORATION SUPPRESSION,**
Agricultural Research Service, Orono, Ma Soil, Water and Air Sciences.
For primary bibliographic entry see Field 3B.
W75-11822

**DIFFERENT SOIL TREATMENTS FOR H VESTING WATER FOR RADISH PRODUCTI IN THE MEXICO VALLEY,**
Escuela Nacional de Agricultura, Chap (Mexico). Dept. of Soils.
For primary bibliographic entry see Field 3B.
W75-11829

**A STEADY-STATE MODEL OF ISOTO FRACTIONATION ACCOMPANY NITROGEN TRANSFORMATIONS IN SOIL.**
Washington Univ., St. Louis, Mo. Center fo Biology of Natural Systems.
For primary bibliographic entry see Field 5B.
W75-11831

**RATE OF PHOSPHORUS SORPTION BY OKLAHOMA SOILS,**
Robert S. Kerr Environmental Research Ada, Okla. National Water Quality Co Research Program.

For primary bibliographic entry see Field 3F.
W75-11836

## 2H. Lakes

**OLIGOCHAETES IN THE BOTTOM FAUNA AND STOMACH CONTENT OF TROUT, SALMO TRUTTA (L.),**
Zoologisk Museum, Oslo (Norway).
F. Aarefjord, R. Borgstrom, L. Lien, and G. Milbrink.
Norw J Zool, Vol 21, No 4, p 281-288, 1973. Illus.

Descriptors: *Brown trout, *Oligochaetes, Benthic fauna, Lakes, *Fish food organisms, Trout.
Identifiers: *Eiseniella-tetraedra, Enchytraeids, Peloscolex-ferox, Stylaria-lacustris, Stylodrilus-heringianus, Tubifex-tubifex.

The limnic oligochaetes Eiseniella tetraedra, Peloscolex ferox, Stylodrilus heringianus, Tubifex, turifes, Stylaria lacustris and at least 2 Enchytraeids were found in the investigated lakes. E. tetraedra was the only limnic species recorded in the stomach content of trout. The study indicated that oligochaetes may be an important food item to trout during the period March-July.--Copyright 1974, Biological Abstracts, Inc.
W75-11385

**PHYSICOCHEMICAL PROPERTIES OF DREDGE SPOIL,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W75-11465

**GENERATION OF HYDROLOGIC SAMPLES: CASE STUDY OF THE GREAT LAKES,**
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich.
Hydrology Papers No 72, May 1975. 39 p, 58 fig, 8 tab, 8 ref. NSF GK-31521X, DAC-23-72-C0042.

Descriptors: *Time series analysis, *Great Lakes, Synthetic hydrology, *Computers, *Analytical techniques, *Lake Erie, *Lake Ontario, Statistical methods, Flow, Water storage, Frequency, Distribution patterns, Retardance, Channels, Water supply.
Identifiers: *Flow retardation, Autocorrelation, Principal component analysis.

Statistical tests were performed and 20 samples, each 50 years long, were generated in respect to three variables related to water inputs and retardation of flows in connecting channels of the Great Lakes. The three variables were mean monthly net basin water supplies of five lakes, mean quarter-monthly net basin water supplies of lakes Ontario and Erie, and flow retardations in connecting channels because of freezing and weed effects. Periodic parameters in all three variables were found to be the mean and the standard deviation. The autocorrelation coefficients and skewness coefficients were found not to be periodic. The stochastic components, after the periodic mean and standard deviation were identified and removed, were found to be greatly autocorrelated. The simple first- and second-order autoregressive linear models were found sufficient to describe these tendencies. The principal component analysis was used in generating the new samples of the mean monthly net basin supplies. (Singh-ISWS)
W75-11476

**NATURAL AND ACCELERATED PHOSPHATE MOBILITY, (IN DUTCH),**
For primary bibliographic entry see Field 5C.
W75-11520

**PHYTOPLANKTON IN LAKE MASCARDI (RIO NEGRO, ARGENTINA), (IN SPANISH),**
Institute National de Limnologie, Santo Tome (Argentina).
For primary bibliographic entry see Field 5C.
W75-11532

**DETERMINATION OF THE APPARENT COMPLEXING CAPACITY OF LAKE WATERS,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W75-11538

**A FOOD WEB MODEL FOR LAKE MICHIGAN PART 2-MODEL FORMULATION AND PRELIMINARY VERIFICATION,**
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W75-11547

**WATER QUALITY RELATIONSHIPS IN THE GREAT LAKES: ANALYSIS OF A SURVEY QUESTIONNAIRE,**
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-11549

**GREAT LAKES WATER LEVELS, 1974, DAILY AND MONTHLY AVERAGE WATER SURFACE ELEVATIONS.**
NOAA National Ocean Survey, Washington, D.C.
Availability statement for sale by Lake Survey Center, 630 Federal Building and U.S. Courthouse, Detroit, MI 48226, for $2.50. May 1975. 106 p.

Descriptors: *Great Lakes, *Water levels, Water control, *Gaging stations, *Water levels fluctuation, Water level recorders, Flow measurement, Lakes, Water analysis, Gages, Measurement, Elevation, Fluctuations.
Identifiers: Water elevations, *Water level gages, Lake levels, Lake elevations.

This publication contains Lake Survey Center Great Lake water-level gage records and shows in tabular form daily and monthly average levels for each gage in the network for the calendar year. It also contains, in a separate table, the highest and lowest daily average for the month. In addition a frequency distribution table of daily average levels shows the number of times each month the recorded levels were above a specified elevation. The gages record water levels in either analog or a digital form on strip charts that are retained for a period of 10 years. Recorded hourly values were used to compute the daily averages, and the monthly values were compiled from the daily averages. (NOAA)
W75-11554

**SOURCES OF WATER QUALITY, LAKE LEVEL, ICE, WATER TEMPERATURE AND METEOROLOGICAL DATA FOR THE ST. LAWRENCE GREAT LAKES,**
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
A. M. Beeton, and J. W. Strand.
Sea Grant Advisory Rpt. No. 10, January 1975. 193 p.

Descriptors: *Great Lakes, *Water quality, *Data collections, *Hydrologic data, *Hydrography, *Meteorological data, *Meteorology, *Lakes, Water analysis, Water chemistry, Water levels, Water level fluctuations, Height, Measurement, Limnology, Hydrologic aspects, Climatic data, On-site data collections, On-site investigations, Regional analysis, Hydrologic properties, Ice cover, Lake ice, Water temperature, Aquatic environment, Physical properties, Monitoring.
Identifiers: Data sources, Water quality data, Lake levels, Hydrographic records, Meteorological records, Ice measurement.

Data sources included in this and the proceeding report (Powers, Jones, and Ayers, 1959) are municipal, industrial, power plant and a few military water treatment plants. Published water quality data from academic, governmental or private sources were not included. The data sources have not been used by many investigators because of the inaccessibility of the data or many people were not aware of its existence. This report provides information on sources of raw numerical data. It gives qualitative not quantitative information. The report is divided into two parts; hydrographic and meteorological. The hydrographic section deals with water intakes in one of the five Great Lakes or their interconnecting waterways. The St. Lawrence River was not included as part of the study. The meteorological section includes those weather stations around the Great Lakes up to a distance of 125 miles inland. (NOAA)
W75-11567

**THE COASTS OF WISCONSIN,**
Wisconsin Univ., Madison. Sea Grant Program.
J. Napoli.
March 1975. 38 p. WIS-SG-75-122.

Descriptors: *Coasts, *Great Lakes, *Lake Superior, *Lake Michigan, Lakes, Bodies of water, Land management, Conservation, Land use, *Wisconsin.
Identifiers: *Coastlines, *Coastal zones, Coastal zone management.

This brief report takes a look at the Great Lakes coast of Wisconsin. The physical characteristics of Lakes Superior and Michigan are described as are the history and development of their coasts. A section is also devoted to current uses and problems encountered in coastal areas. A special section is devoted to the management of Wisconsin's coasts and what the future may hold in store for the coasts development. (NOAA)
W75-11569

**GREAT LAKES ICE COVER, WINTER 1973-74,**
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 2C.
W75-11572

**ANALYSIS OF INTERNATIONAL GREAT LAKES SHIPPING AND HINTERLAND,**
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 6C.
W75-11576

**APPLICATION OF A GENERALISATION OF WALD'S IDENTITY TO SOLVING CERTAIN MULTI-STREAM STORAGE PROBLEMS,**
Monash Univ., Clayton (Australia). Dept. of Mathematics.
For primary bibliographic entry see Field 4A.
W75-11649

**ANALYSIS OF PLUNGING PHENOMENA IN WATER RESERVOIRS,**
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 4A.
W75-11655

**DEVELOPMENT PLANNING OF LAGUNA DE BAY--PHILIPPINES,**
Laguna Lake Development Authority, Manila (Philippines)
For primary bibliographic entry see Field 4A.
W75-11770

## Group 2I—Water In Plants

**DIURNAL PATTERNS OF WATER POTENTIAL IN ABIES CONCOLOR AND PINUS PONDEROSA,**
Canterbury Univ., Christchurch (New Zealand). School of Forestry.
J. E. Barker.
Can J For Res, Vol 3, No 4, p 556-564, 1973. Illus.

Descriptors: *Diurnal distribution, *Ponderosa pine trees, Coniferous trees, *White fir trees, Soil moisture, Stomata.
Identifiers: Stomatal aperture.

Diurnal patterns of water potential for A. concolor and P. ponderosa were studied in relation to concurrent environmental conditions. Up to 86% of variation in water potential was accounted for using irradiance, square root of vapor pressure deficit, height and stomatal aperature as independent variables in A. concolor while up to 76% was accounted for in P. ponderosa using the same variables. Under comparable environmental conditions, A. concolor experienced lower water potentials than P. ponderosa due to its relative lack of stomatal control and its greater sensitivity to changes in vapor pressure deficit. Height effects were very nearly identical to those predicted by the cohesion theory. A procedure for estimating available soil moisture is suggested.--Copyright 1974, Biological Abstracts, Inc.
W75-11382

**CONTRIBUTION TO THE ECOLOGY OF INDIAN AQUATICS: IV. RATE OF DRY MATTER PRODUCTION OF THE LEAVES OF SEVERAL COMMON AQUATIC PLANTS OF GORAKHPUR (INDIA),**
Saint Andrews Coll., Gorakhpur (India). Dept. of Botany.
A. B. Sinha, and R. Sahai.
Photosynthetica (Prague), Vol 8, No 2, p 127-129, 1974.

Descriptors: Ecology, *Aquatic plants, Cultures, *Leaves, Respiration, *Plant physiology, Stomata, Production.
Identifiers: Aponogeton-natans, *Dry matter production, Eichhornia-crassipes, *India(Gorakhpur), Marsiles-minuta, Nymphaea-stellata, Nymphoides-cristatum, Salvinia-natans.

Dry matter accumulation per unit area of leaves of 6 common aquatic plants of Gorakhpur (India), viz., Eichhornia crassipes, Salvinia natans, Nymphaea stellata, Nymphoides cristatum, Aponogeton natans and Marsilea minuta was determined under laboratory conditions by the leaf disc method. Maximum rate of net production (1.43 g dry matter m-2 h-1) was found in E. crassipes, while M. minuta has the minimum rate (0.81 g dry matter m-2 h-1). The respiratory loss of dry matter was greatest in E. crassipes (0.56 g dry matter m-2 h-1) and minimum (0.16 g dry matter m-2 h-1) in A. natans. The stomatal frequency of the leaves has no definite influence on the rate of dry matter accumulation in these plants.--Copyright 1974, Biological Abstracts, Inc.
W75-11386

**A WATER POTENTIAL THRESHOLD FOR THE INCREASE OF ABSCISIC ACID IN LEAVES,**
New York State Cooperative Extension Service, Penn Yan.
T. J. Zabadal
Plant Physiol, Vol 53, No 1, p 125-127, 1974. Illus.

Descriptors: *Leaves, Acids, Dehydration, Stomata, *Plant physiology.
Identifiers: *Abscisic acid, *Ambrosia-artemisifolia, *Ambrosia-trifida.

A relationship between abscisic acid concentration and leaf water status is reported. Water potentials were measured in leaves of Ambrosia artemisiifolia L. and A. trifida L. throughout a period of dehydration of intact plants. Tissues from the same leaves were analyzed for abscisic acid. For both species, abscisic acid began to increase in a critical water potential range (-10 to -12 atmospheres). These data suggest a threshold water potential that stimulates abscisic acid synthesis. The data support the hypothesis that a small change in water potential could affect stomatal resistance to water loss by means of very sensitive chemical feedback control mechanism.--Copyright 1974, Biological Abstracts, Inc.
W75-11394

**HABITAT HETEROGENEITY AND AVIAN COMMUNITY STRUCTURE IN NORTH AMERICAN GRASSLANDS,**
Oregon State Univ., Corvallis. Dept. of Zoology.
J. A. Wiens.
Am Midl Nat. Vol 91, No 1, p 195-213, 1974, Illus.

Descriptors: *Birds, *Habitats, *Wildlife habitats, *Populations, *Environmental effects, Food and cover crops, Brushlands, *Grasslands, Analysis.
Identifiers: Steppe, *Bird populations, Vegetational heterogeneity.

In a variety of environments, patchiness of habitat structure appears related to faunal diversity. The relations between vegetational heterogeneity and several attributes of avian communities over a range of North American grassland and shrub steppe situations were examined. Habitat heterogeneity was measured by assessing the variability in vertical density of vegetation within clustered point samples and an index to express this horizontal patchiness was derived. Heterogeneity was directly related to the areal coverage of bare ground and woody vegetation and to patchiness in litter distribution of sample plots and inversely related to grass coverage and litter depth. Heterogeneity generally increased with decreasing annual precipitation and primary production, tall grass-prairie sites being the least and western shrub steppe the most heterogeneous. Analysis of breeding bird population censuses from these plots revealed no apparent relationships between habitat heterogeneity and the diversity of breeding avifaunas or the extent of spatial (territorial) overlap between species. The density of breeding bird populations decreased slightly with increasing vegetation patchiness; the standing crop biomass of the avian community, however, decreased markedly as heterogeneity increased. This pattern appeared to result from a replacement of large-sized species by medium-sized species in the transition from tall grass to short grass areas and an increasing dominance of small-sized species in the western Palouse and shrub steppe sites.--Copyright 1974, Biological Abstracts, Inc.
W75-11425

**TRANSPIRATION OF SOME OREOXEROPHYTES OF THE CENTRAL CAUCASUS, (IN GEORGIAN),**
For primary bibliographic entry see Field 2D.
W75-11442

**A METHOD OF INVESTIGATING POPULATIONS OF DIATOMS IN FLOWING WATERS, (IN GERMAN),**
A. Mueller-Haeckel.
Oikos, Vol 25, No 3, p 331-334, 1974. Illus.

Descriptors: *Diatoms, Methodology, Plankton, Standing crops, *Systematics, Seasonal, Analytical techniques, *Microscopy.
Identifiers: Cuvettes, *Synedra-ulna.

A constant flow of stream water was maintained through a modified plankton microscope cuvette. Cells of Synedra ulna Ehr. were counted over a 20 mm2 area of the cuvette each day. Populatio development was similar to that occurring streams. Standing crop depended on driftin colonizing cells and cell division, but was i fluenced by seasonal factors.--Copyright 197 Biological Abstracts, Inc
W75-11445

**STUDIES OF FLOODPLAIN VEGETATIO AND WATER LEVEL FLUCTUATION IN TH KISSIMMEE RIVER VALLEY,**
Central and Southern Florida Flood Control D trict, West Palm Beach. Resources Planning Dep
For primary bibliographic entry see Field 4A.
W75-11628

**SPAWNING GROUNDS OF THE EUROPEA WALLEYE LUCIOPERCA LUCIOPERCA AND VOLGA WALLEYE LUCIOPERCA VO GENSIS (GMELIN) IN THE URAL RIVER ( RUSSIAN),**
Akademiya Nauk SSSR, Moscow. Inst. of Evo tionary Morphology and Animal Ecology.
E. N. Dmitrieva.
Vopr Ikhtiol. Vol 13, No 5, p 934-937, 1973, Illus

Descriptors: *Walleye, *Fish behavior, Fish eg *Spawning, *Fish reproduction, Rivers, Euro Asia.
Identifiers: Lucioperca-lucioperca, Lucioper volgensis, *USSR, Volga River, Ural Riv Kazakh SSR, European walleye, Volga walleye

In the Ural River (Kazakh SSR, USSR) the Vo walleye (Lucioperca volgensis) spawns simulta ously with the European walleye (L. lucioper on the same spawning grounds. The lar spawning grounds of both walleyes are locate the region of the Inderborskii and Krasnye Y they are located along sandy shoals near banks. The females of the Ural European wal make nests and guard and aerate the deposited on root hairs. The females of the V walleye also make nests and their behavior du the period of protection of the eggs is similar to behavior of the female European walleye.--C right 1975, Biological Abstracts, Inc.
W75-11668

**EFFECT OF WATER STRESS, TEMPE TURE, AND LIGHT ON PHOTOSYNTHESIS ALDER SEEDLINGS,**
Helsinki Univ. (Finland). Dept. of Silviculture
P. Hari, and O. Luukkanen.
Physiol Plant, Vol 29, No 1, p 45-53, 1973. Illus

Descriptors: Carbon dioxide, *Se *Photosynthesis, Temperature, Plant man ment, Light, Mathematical models.
Identifiers: *Alderseedlings, Alnus-incana.

Seedlings of Alnus incana (L.) Moench were died in controlled environmental conditions. photosynthetic capacity of 4 plants simultane as well as light, temperature, and atmosp water pressure deficit were continuously rec during approximately 2 mo. The potted were continuously given known quantitie water. Two different effects of water stress found in the experimental plants. When suff amounts of water had been available to photosynthetic CO2 fixation rates largely foll the variation in temperature and light. On the hand, after prolonged water stress, higher peratures caused a large decrease in net CO take even if the plant apprently had suff water during the actual measurements. Po mechanisms for this effect are discussed. E of water stress on photosynthesis were studie constant temperature as well as in cond where temperature, light, soil water conten atmospheric water vapor pressure were allo vary in a complex pattern. Mathematical m for expressing net CO2 uptake as a function vironmental variables were constructed fo

these experimental situations. However, only
latter approach clearly domonstrated the fun-
mental role of temperature in controlling the
otosynthesis of plants under water stress.--
pyright 1974, Biological Abstracts, Inc.
5-11691

## . Erosion and Sedimentation

**IL AND HYDROLOGIC FACTORS AFFECT-
G THE STABILITY OF NATURAL SLOPES
THE OREGON COAST RANGE,**
egon State Univ., Corvallis. Dept. of Forest En-
eering.
primary bibliographic entry see Field 2G.
5-11353

**RBULENT ENTRAINMENT ACROSS STA-
E DENSITY STEP STRUCTURES,**
ns Hopkins Univ., Baltimore, Md. Dept. of
ography.
. Wolanski, and L. M. Brush, Jr.
lus, Vol 27, No 3, p 259-268, 1975. 8 fig, 1 tab,
ef. NSF Grant GK-18780.

scriptors: *Density, *Thermocline
trainment, *Mixing, Interfaces, Fluid
chanics, Sediments, Sediment transport,
yancy, Suspended solids, *Turbulence,
pension, Internal waves, Atmosphere, Model
lies, Density stratification, Laboratory tests,
anography, Meteorology, Energy.
ntifiers: *Turbulent entrainment, *Density
rs.

earch was summarized on the properties of the
ulent entrainment across stable density-
tified layers, a phenomenon commonly ob-
ed in geophysical fluid dynamics. A turbulent
ironment was created by oscillating grids in
si-homogeneous layers of slightly different
sity separated by thin sheets of fluid containing
trong density gradient. The buoyancy flux
ss thin stable layers was found to be a func-
of the Richardson and Prandtl numbers.
oretical and experimental studies were made,
ing to a determination of the order of mag-
de of the four terms expressing the balance of
gy in physical space. It was shown that the
ulent energy flux is of the same order of mag-
de as the viscous dissipation of kinetic energy
e quasi-homogeneous layers where the slight
sity gradient is not altogether negligible
use a small but measurable fraction of the tur-
nt energy flux goes into maintaining the
yancy flux. Data taken in the stable layer
ved the simultaneous existence of large inter-
waves and patchy turbulence. Some properties
hese waves as functions of the Richardson
ber were determined. (Sims-ISWS)
-11451

**IMENT TRANSPORT THEORIES: A
IEW,**
raulics Research Station, Wallingford
gland).
. White, H. Milli, and A. D. Crabbe.
Institution of Civil Engineers Proceedings,
2, Research and Theory, Vol 59, p 265-292,
1975. 12 fig, 5 tab, 48 ref.

criptors: *Sediment transport, *Sediment
harge, *Sedimentation rates, Sediments,
raulics, Bed load, Stream erosion, Stream-
, Streams, Width, Shear, Velocity, Particle
*Reviews.
tifiers: *Sediment transport theories.

t sediment transport theories were examined
reference to flume and field data. The com-
on was based on over 1000 flume experiments
rtz and lightweight materials) and 260 field
surements. Froude numbers greater than 0.8
excluded and no allowance was made for wall effects and bank friction. The available data were classified in terms of the dimensionless parameters of grain size, mobility number, flow depth, and relative density. The characteristics of the flume and field data very considerably in terms of the breadth/depth ratio. Depth/diameter ratios for flume data are generally much lower than those for the field data for similar dimensionless particle size. There is a significant lack of field data in the range of 1.5-20 mm sand sizes. Using the criterion proposed by Engelund, most of the available data in the range of sand diameters greater than 0.6 mm consist of bed load measurements. The most reliable equation applicable over a wide range of flow conditions and particle characteristics is the general function of Ackers and White. The Engelund and Hansen method was also very reliable but errors were marginally higher. The Rottner bed load equation can be used with confidence as a total load theory. The behavior of several of the theories which are based on excess shear velocities or excess mobility numbers, together with observations of sediment movement for coarse sediments apparently below the threshold conditions defined by Shields, showed a clear need for further work in this area. Threshold conditions for coarse uniform and nonuniform sediments should be studied. (Lee-ISWS)
W75-11453

**CLOSURE CONDITIONS MOUTH OF THE RUSSIAN RIVER,**
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 2L.
W75-11454

**A GEOMORPHIC SHORELINE INVENTORY WITH MANAGEMENT CONSIDERATIONS FOR WHATCOM COUNTY, WASHINGTON,**
Western Washington State Coll, Bellingham. Coastal Studies Group.
For primary bibliographic entry see Field 2L.
W75-11455

**RIVER REGIME WITH SPECIAL REFERENCE TO RIVER NILE,**
Assiut Univ. (Egypt). Dept. of Hydraulics.
M. B. Khalil.
Journal of Hydraulic Research, Vol 13, No 2, p 149-170. 8 fig, 32 ref.

Descriptors: *Channel morphology, *Alluvial channels, *Sediment transport, *Floods, *Roughness(Hydraulic), Sediment distribution, Boundary processes, Irrigation canals, Gradients(Streams), Gaging stations, Regime.
Identifiers: *Nile River, *Regime theory, Lacey's equations, Egypt.

Regime theory concept of independent adjustment of slope, depth, and bed width was found irrelevent when applied to River Nile. Slope, depth, and width of the river are intercorrelated and are mutually adjusted to attain regime conditions. Two relations were expressed to describe the geometry of River Nile channel, namely silt equations and flow equation. The silt equation relates the discharge, depth, and slope in non-dimensional form to the silt concentration. The flow equation expresses the mean velocity as a function of depth, slope, and the median grain size of the bed. The factor of proportionality of the flow equation, a numerical constant, confirms that of Swiss rivers and is probably a universal constant. In the absence of a theoretical approach to regime of channels in alluvium, the Nile flow and silt equation, based on actual observations, seem to provide a suitable tool for rational calculations of current problems such as resettling the reach of the Main Nile disturbed by the construction of Aswan High dam and in designing of Jonglei canal. (Singh-ISWS)
W75-11464

**PHYSICOCHEMICAL PROPERTIES OF DREDGE SPOIL,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W75-11465

**SEDIMENT RELATIONS OF SELECTED ALASKAN GLACIER-FED STREAMS,**
Alaska Univ., College. Inst. of Water Resources.
G. L. Guymon.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-245 014, $3.25 in paper copy, $2.25 in microfiche. Report No IWR-51, June, 1974, 17 p. OWRT A-042-ALAS(4).

Descriptors: *Sediment transport, *Sediment yield, *Alaska, Model studies, Equations, Water supply, Glaciology, *Glacial sediments, Suspended load, Suspended solids, Sediment discharge.
Identifiers: Glacial streams.

This research contributes to the general scientific study of sediment processes in Alaska by establishing baseline sediment-related, environmental conditions; initiating support studies related to other glaciology studies; collecting qualitative as well as quantitative knowledge of glacial runoff sediment processes; and providing additional information for water supply studies. Two equations are developed--one models the transport of suspended sediments in glacier-fed streams by calculating suspended sediment concentration in the glaciers melt water outflow; and a second model for estimating regional suspended sediment yield in streams.
W75-11477

**GEOCHEMISTRY OF SURFACE SEDIMENTS IN AN ACID STREAM ESTUARY,**
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
P. Foster, and D. T. E. Hunt.
Marine Geology, Vol 18, No 2, p M13-M21, February, 1975. 2 fig, 1 tab, 14 ref.

Descriptors: *Estuary, *Chemical analysis, *Trace elements, Acid streams, Heavy metals, X-ray fluorescence, *Deposition(Sediments, Zinc, Copper, Manganese, Iron, *Path of pollutants.
Identifiers: *North Wales, Transition elements, Bulk sediment.

Selective chemical attack has been used to separate recent surface marine sediments into organic, non-detrital and detrital components, and the concentration of iron, manganese, copper and zinc in each fraction determined. The non-detrital fraction controlled the overall elemental concentrations and relationships apparent in the bulk sediment, particularly in the case of copper, manganese and zinc. Copper was found associated with the organic fraction. The predominant processes of primary deposition are precipitation of hydrated ferric oxide and adsorption of copper and zinc onto this material. (Delfiner-Vanderbilt)
W75-11531

**CHEMICAL COMPOSITION OF AEGEAN SEA SEDIMENTS,**
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
P. A. Smith, and D. S. Cronan.
Marine Geology, Vol 18, No 2, p M7-M11, February, 1975. 1 fig, 2 tab, 6 ref.

Descriptors: *Trace elements, *Heavy metals, *Sediment distribution, Mining, Oceans, Sea water, Aluminum, Magnesium Calcium, Tin, Iron, Manganese, *Pollutant identification.
Identifiers: *Aegean Sea, *Mafic rocks, Mineralization.

The partial composition of 241 sediment samples from the Aegean Sea, analyzed for Ca, Mg, Al, Ti, Fe, Mn, Ni, Cr, Pb, Cu, and Zn, can be largely explained by admixture of terrigenous components of variable composition and biogenic components poor in minor elements. Cr and Pb appear to be enriched owing to the occurrence of mafic rocks and minor Pb mineralization onshore. Variations in elemental abundances within the Aegean Sea can generally be accounted for by differences in depositional environment, except at Sounion where anomalous concentrations of Pb and Zn are probably associated with onshore mining activity. (Litoff-Vanderbilt)
W75-11533

**NUTRIENT TRANSPORT IN SURFACE RUNOFF AS INFLUENCED BY SOIL COVER AND SEASONAL PERIODS,**
Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center.
For primary bibliographic entry see Field 5B.
W75-11641

**SEDIMENTATION RATES IN A LONG ISLAND MARSH DETERMINED BY PB210 DATING,**
Brookhaven National Lab., Upton, N.Y.
For primary bibliographic entry see Field 2L.
W75-11643

**SOLID PARTICLE SETTLEMENT IN OPEN-CHANNEL FLOW,**
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-11652

**WALL SHEAR MEASUREMENT IN SAND-WATER MIXTURE FLOWS,**
Middle East Technical Univ., Ankara (Turkey). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-11653

**SIMULATION OF DISPERSION OF SUSPENDED PARTICLES,**
Technical Univ. of Istanbul (Turkey). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-11782

**PARAMETERS FOR ESTIMATING ANNUAL RUNOFF AND SOIL LOSS FROM AGRICULTURAL LANDS IN RHODESIA,**
Agricultural Engineering Centre, Salisbury (Rhodesia).
For primary bibliographic entry see Field 4A.
W75-11830

## 2K. Chemical Processes

**THE CRYSTAL AND MOLECULAR STRUCTURE OF SELECTED PESTICIDAL WATER POLLUTANTS,**
Rhode Island Univ., Kingston. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-11351

**DETECTOR OF TRACE SUBSTANCE IN WATER,**
Shibata Kagaku Kikai Kogyo Kabushiki, Tokoyo (Japan). (assignee).
For primary bibliographic entry see Field 5A.
W75-11388

**INTERLABORATORY STUDY OF METHODS FOR CHEMICAL ANALYSIS OF WATER,**
National Swedish Environment Protection Board, Stockholm. Research Lab.
For primary bibliographic entry see Field 5A.
W75-11409

**SPECTROPHOTOMETRIC DETERMINATION OF FLUORINE IN WATER, (IN RUSSIAN).**
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Chelyabinsk (USSR).
For primary bibliographic entry see Field 5A.
W75-11433

**SPECTROPHOTOMETRIC DETERMINATION OF SUGARS IN NATURAL WATERS, (IN RUSSIAN),**
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analititicheskoi Khimii.
For primary bibliographic entry see Field 5A.
W75-11437

**REGIONAL CHEMISTRY OF GROUNDWATER IN THE WAINWRIGHT AREA, ALBERTA,**
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 2F.
W75-11471

**WATER QUALITY REPORT: THE COLUMBIA RIVER BELOW LONGVIEW, WASHINGTON, DECEMBER 1971 - NOVEMBER 1972,**
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 5B.
W75-11472

**GYPSUM SOLUBILITY AND SCALING LIMITS IN SALINE WATERS,**
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 3A.
W75-11473

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 1. NORTH ATLANTIC SLOPE BASINS.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11479

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11480

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART 3. OHIO RIVER BASIN.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11481

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 6. MISSOURI RIVER BASIN.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11482

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 7. LOWER MISSISSIPPI RIVER BASIN.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11483

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART 8. WESTERN GULF OF MEXICO BASINS.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11484

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11485

**SELENIUM IN WATERS IN AND ADJACENT TO THE KENDRICK PROJECT, NATRONA COUNTY, WYOMING,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W75-11492

**GROUND-WATER DATA FOR BOLIVAR COUNTY, MISSISSIPPI,**
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W75-11496

**GROUND-WATER DATA IN THE HARRISBURG - HALSEY AREA, CENTRAL WILLAMETTE VALLEY, OREGON,**
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 7C.
W75-11498

**QUANTITATIVE INORGANIC ANALYSIS BY GAS CHROMATROGRAPHY, A REVIEW,**
Birmingham Univ. (England). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-11528

**CHEMICAL COMPOSITION OF AEGEAN SEA SEDIMENTS,**
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
For primary bibliographic entry see Field 2J.
W75-11533

**ATOMIC-ABSORPTION SPECTROMETRIC DETERMINATION OF CADMIUM, LEAD, AND ZINC IN SALTS OR SALT SOLUTIONS BY HANGING MERCURY DROP ELECTRODEPOSITION AND ATOMIZATION IN A GRAPHITE FURNACE,**
Oslo Univ. (Norway). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-11536

**DETERMINATION OF THE APPARENT COMPLEXING CAPACITY OF LAKE WATERS,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W75-11538

**THE DETERMINATION OF TRACES OF LEAD (II) BY SOLID-STATE LUMINESCENCE,**
Dalhousie Univ., Halifax (Nova Scotia). Trace Analysis Research Centre.
For primary bibliographic entry see Field 5A.
W75-11541

**LOSS OF TRACE ELEMENTS FROM NATURAL WATER DURING STORAGE. BEHAVIOR OF 203 HG AND 65 ZN ADDED TO POND WATER,**
Tokyo Univ. (Japan). Dept. of Agricultural Chemistry.
For primary bibliographic entry see Field 5A.

V75-11543

**A COMPARISON OF 15N-DEPLETED AND 15N-ENRICHED FERTILIZERS AS TRACERS,**
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 3F.
W75-11591

**CHLORIDE AND TRITIATED WATER FLOW IN DISTURBED AND UNDISTURBED SOIL CORES,**
Kentucky Univ., Lexington. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W75-11594

**KINETIC AND EQUILIBRIUM STUDIES OF BORON DESORPTION FROM SOIL,**
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 2G.
W75-11600

**FORMATION AND COLLAPSE OF SURFACE FILMS,**
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
R. Wheeler.
Limnology and Oceanography, Vol 20, No 3, p 338-342, May 1975. 7 fig, 20 ref.

Descriptors: *Films, *Surface tension, *Air-water interfaces, This films, Pressure, Proteins, Collapse, Sea water, Organic matter, Particle size, Hydrocarbon chain, Laboratory tests, On-site investigations, Bubbles, Lakes, Water.
Identifiers: *Organic films, *Sargasso Sea.

Films that accumulate from lake water, coastal seawater, and Sargasso Sea water with low concentrations of added portein can collapse when subjected to increased surface pressure. Collapse is accompanied by the transformation of some film organic material to particulate material that cannot spread at the interface; these particles are formed from filter-passing organic material previously in the bulk liquid. Film collapse and accompanying particle formation in nature may be a part of a process that, in some areas, removes filter-passing surface-active material from water and precipitates it as particles back into the water column. Such particles tend to sink and could provide particulate food to organisms in the surface waters and perhaps at greater depths. (Lardner-ISWS)
W75-11642

**GEOCHEMISTRY AND GENSIS OF FLUORIDE-CONTAINING GROUND WATERS IN INDIA,**
Soil Research Lab., Chandigarh (India).
S. K. Handa.
Ground Water, Vol 13, No 3, p 275-281, May-June 1975. 3 fig, 3 tab, 18 ref.

Descriptors: *Geochemistry, *Groundwater, Fluorides, Mineralogy, Mineral water, Geologic control, Correlation analysis, Thermodynamics, Aqueous solutions, Equilibrium, Saturation, Solutions, Ions, Ion exchange, Calcium, Bicarbonates, Nitrates, Evaporation.
Identifiers: *India, *Fluorite, *Apatite, Mineralization, Genesis, Mass law, Integral equation.

The fluoride content of groundwater in India varies considerably. Among factors which control the concentration of fluoride are the climate of the area and the presence of the accessory minerals, fluorite, and/or apatite in the rock mineral assemblage through which groundwater is circulating. Regional and tectonic factors also play some part in affecting the fluoride concentration of groundwaters. In general, there is a negative correlation between calcium and fluoride concentrations and a positive correlation between fluoride and bicarbonate concentration in groundwaters with high fluoride content. Thermodynamic calculations show that some of these high fluoride groundwaters are supersaturated with respect to fluorite. In water sources from Rajasthan, high fluoride concentrations are generally accompanied by high nitrate concentrations. A solution-evaporation-base exchange hypothesis was put forward to explain the genesis of these groundwaters. In some parts of India, the fluoride content of groundwaters is below 0.5 mg/l, indicating that fluoridation of water supplies may be desirable in these places. (Visocky-ISWS)
W75-11645

**STUDIES OF THE AROMATIC COMPOUNDS CONTENT IN SEA WATER BY LOW-TEMPERATURE LUMINESCENT SPECTROSCOPY, (IN RUSSIAN),**
Vysshee Inzheneroe Morskoe Uchilishche, Odessa (USSR).
For primary bibliographic entry see Field 5A.
W75-11786

**HYDROCHEMICAL AND HYDROBIOLOGICAL PECULIARITIES OF LIMANS IN THE DANUBE-DNIESTER INTERFLUVE, (IN UKRAINIAN),**
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
I. H. Yenaki, O. I. Ivanov, V. V. Polishchuk, and O. I. Serhyeyev.
Dopov Akad Nauk Ukr RSR Ser B Heol Heofiz Khim Biol, Vol 35, No 9, p 843-847, 1973.

Descriptors: *Hydrobiology, *Benthos, Phytoplankton, Zooplankton, Canals, Marshes, Lagoons.
Identifiers: *Danube-Dniester irrigation canal, *Hydrochemical conditions, Interfluve, *Limans(Interfluve), *Black Sea.

Hydrochemical regime and peculiarities in development of phytoplankton, zooplankton and zoobenthos in the Danube-Dniester interfluve limans was studied during 1966-1972. Hydrochemical regime and development of flora and fauna in these limans, except for the Dniester liman, depend on the regime of the north-western part of the Black Sea, marine and eurihaline freshwater-subsaline water flora and fauna develop in them. Freshwater-subsaline water prevails in the composition of the flora and fauna. The data may be used to predict changes in hydrochemical and hydrobiological regimes of the Danube interfluve limans in connection with long-term plans for the Danube-Dnieper irrigation canal.--Copyright 1975, Biological Abstracts, Inc.
W75-11847

## 2L. Estuaries

**A THREE-DIMENSIONAL THEORY OF COASTAL CURRENTS AND UPWELLING OVER A CONTINENTAL SHELF,**
University of East Anglia, Norwich (England). School of Mathematics and Physics.
For primary bibliographic entry see Field 2E.
W75-11450

**TURBULENT ENTRAINMENT ACROSS STABLE DENSITY STEP STRUCTURES,**
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W75-11451

**THE REDUCTION OF ARTIFICIAL BOUNDARY REFLEXIONS IN NUMERICALLY MODELLED ESTUARIES,**
Institute of Oceanographic Sciences, Birkenhead (England).
S. J. Pinless.
The Institution of Civil Engineers Proceedings, Part 2, Research and Theory, Vol 59, p 255-264, June 1975. 5 fig, 5 ref.

Descriptors: *Estuaries, *Tides, *Numerical analysis, *Tidal effects, Mathematical models, Hydrodynamics, Water level fluctuations, Boundaries(Surfaces), Model studies.
Identifiers: *Boundary conditions, *Thames Estuary(England), Tidal barriers.

The tidal input at the seaward boundary of an estuary model has usually been made to conform to the existing tidal curves. If the model was used to investigate the effects of major physical changes in the estuary, it did not show any effect of these changes on the water levels at the seaward boundary of the model. This difficulty was overcome by locating the model boundary sufficiently far from the sources of any disturbance in the estuary to be unaffected by it. Since observed data were not always available for input at the suitable boundary, a method was developed for computing input for the numerical model from observations at a tide gage within the estuary. The method of seaward extension of a one-dimensional numerical model was described and results from its application to the Thames Estuary were presented. (Adams-ISWS)
W75-11452

**CLOSURE CONDITIONS MOUTH OF THE RUSSIAN RIVER,**
Army Engineer District, Jacksonville, Fla.
M. P. Rice.
Shore and Beach, Vol 42, No 1, p 15-20, April 1974. 6 fig, 6 ref.

Descriptors: *Rivers, *Inlets(Waterways), *Shores, *Channels, *Tidal streams, *California, Sand bars, Waves(Water), Navigable waters, Jetties, Hydraulics, Littoral drift, Tidal energy.
Identifiers: *Russian River(Calif), *Shorelines, *Waterways, Wave energy, Closure.

Sixty miles north of San Francisco on the north central coast of California the Russian River enters the Pacific Ocean near the small community of Jenner. Since the mid-19th century, there have been attempts to create and maintain a navigable channel between the river and ocean. In 1941, the construction of a single jetty at Jenner was completed. The jetty failed in its original purpose; however, it was realized later that it was of considerable importance in providing a channel for the ingress and egress of fish to and from spawning grounds in the river. For about 2 months (October and November) a year, a sand bar forms across the Russian River mouth allowing little or no water to flow from the river to the sea. In late spring, the mouth is usually open to some degree. However, as wave power increases in early August, the onshore movement of sand increases. The result of this movement is that a sand bar forms across the river mouth and closes it. With the exception of short periods of intermittent breaches in the sand barrier, the mouth usually does not reopen unitl the occurrence of heavy stream flow, usually starting in early December. (Bhowmik-ISWS)
W75-11454

**A GEOMORPHIC SHORELINE INVENTORY WITH MANAGEMENT CONSIDERATIONS FOR WHATCOM COUNTY, WASHINGTON,**
Western Washington State Coll, Bellingham. Coastal Studies Group.
S. D. Phillabaum, and M. L. Schwartz.
Shore and Beach, Vol 42, No 1, p 21-24, April 1974. 4 fig, 2 ref.

Descriptors: *Geomorphology, *Shores, *Coastal engineering, *Dynamics, *Washington, Beaches, Marine geology, Embankments, Slopes, Sedimentation, Shore protection, Waves(Water), Erosion, Currents(Water), Management, Sand spits.
Identifiers: *Shorelines, *Whatcom County(Wash), Longshore currents.

Washington State's Shoreline Management Act of 1971 required that all counties prepare master plans for the use of their shorelines. These plans were based on information obtained from inventories of several coastal characteristics, including present land use, land ownership, and natural characteristics. This study was an inventory of the geomorphology of the marine shoreline of Whatcom County, and it included a discussion of those aspects of the geomorphology that needed to be considered in managing shoreline use. The inventory, undertaken between March and July 1972, was carried out by traveling along the coast and recording relevant data on an inventory form. Using the data collected, the shoreline was divided into 22 homogeneous segments, and problems which might arise should the morphology and dynamics of the segments be ignored were identified. (Bhowmik-ISWS)
W75-11455

**GEOCHEMISTRY OF SURFACE SEDIMENTS IN AN ACID STREAM ESTUARY,**
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 2J.
W75-11531

**CHEMICAL COMPOSITION OF AEGEAN SEA SEDIMENTS,**
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
For primary bibliographic entry see Field 2J.
W75-11533

**THE ECOLOGY OF THE CUMBERLAND ISLAND NATIONAL SEASHORE CAMDEN COUNTY, GEORGIA,**
Georgia Univ., Savannah. Marine Extension Center.
H. O. Hillestad, J. R. Bozeman, A. S. Johnson, and C. W. Berisford.
Technical Report No 75-5, May 1975. 299 p, 24 fig, 48 tab, 112 ref, 6 append. SG 04-5-158-4, NPS 1910P21157.

Descriptors: *Georgia, *Atlantic Coastal Plains, Ecology, *Ecological distribution, *Balance of nature, Biology, Geology, *Biogeography, Environment, History, Wildlife, Vegetation, *Seashores, Microbiology, Habitats, Natural resources, Insects, Mammals, Aquatic life, Marine animals, Islands, Soil surveys, National parks.
Identifiers: *Cumberland Island seashore(Geo), Camden County(GA), Terrestrial communities, Fauna surveying, Vegetation sampling.

This study was initiated in 1973 to contribute to the understanding of the ecology of the island. The objectives were to inventory and describe the natural resources within the boundaries of the Cumberland Island National Seashore and to generally describe their functions and relationships. The study area was defined to exclude mainland properties of the National Park Service; it was bounded by the Intracoastal Waterway on the west, the St. Marys River on the south, St. Andrews Sound on the north, and the Atlantic Ocean on the east. Emphasis was on the terrestrial communities of Cumberland (primarily) and Little Cumberland Islands. The offshore and inshore waters were excluded; their structure and function have been summarized previously (Johnson et al. 1975). The approach included detailed sampling, analysis and mapping of vegetation, and extensive surveying of the general fauna with intensive sampling of certain groups. The U.S. Soil Conservation Service cooperated by conducting a soil survey, and other cooperators contributed results of their studies on history, geology, and small mammals. (NOAA)
W75-11546

**COASTAL ZONE LEGAL REFERENCES (SELECTED) 1975.**
State Univ. of New York, Buffalo. Faculty of Law and Jurisprudence.
NYSG Law Center Reference 1, June 1975, 169 p. Robert I. Reis (editor). NYSSGP-LS-75-014.

Descriptors: *Coasts, *Legal aspects, *Documentation, Water law, Data collections, Regions, Natural resources, Bibliographies.
Identifiers: *Legal references, Reference lists.

This collection of legal references was initiated to give ten Sea Grant Law Fellows a beginning point for their research. It became evident as materials were being collected that a more extensive effort might profit others as well. Such an effort would serve as a basis for reorganizing research patterns to allow substantial additions to the next edition and a finer definition of functional categories. The resulting publication contains an expanded list of legal references applicable to various aspects of the coastal zone. Broad categories include the Make Up of the Coastal Zone, Competing Interests, Impact on Coastal Zone Dynamics, Coastal Zone Regulations, and The Coastal Zone - States. At the back is a section of miscellanea. (NOAA)
W75-11548

**PROCEEDINGS OF ALABAMA COASTAL LEADERS CONFERENCE ON COASTAL ZONE MANAGEMENT.**
Alabama Development Office, Montgomery. State Planning Div.
For primary bibliographic entry see Field 6E.
W75-11555

**A BIBLIOGRAPHY OF BISCAYNE BAY, FLORIDA MONITORING AND RESEARCH PROGRAMS,**
Miami Univ., Fla. Sea Grant Institutional Program.
For primary bibliographic entry see Field 10C.
W75-11557

**STORM TIDE FREQUENCY ANALYSIS FOR THE COAST OF NORTH CAROLINA, SOUTH OF CAPE LOOKOUT,**
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 2B.
W75-11560

**MERCURY CYCLING IN A SMALL HAWAIIAN ESTUARY,**
Geological Survey, Honolulu, Hawaii. Water Resources Div.
For primary bibliographic entry see Field 5C.
W75-11563

**STATE REGULATION OF COASTAL WATER AREA PRESERVES,**
Miami Univ., Fla. School of Law.
For primary bibliographic entry see Field 6E.
W75-11568

**HURRICANE EXPERIENCE LEVELS OF COASTAL COUNTY POPULATIONS - TEXAS TO MAINE,**
National Weather Service, Fort Worth, Tex.
For primary bibliographic entry see Field 2B.
W75-11570

**AN INVENTORY AND STUDY OF THE VERMILION BAY-ATCHAFALAYA BAY COMPLEX; AREA DESCRIPTION, BIOLOGY, HYDROLOGY AND CHEMISTRY, AND SEDIMENTOLOGY,**
Louisiana Wildlife and Fisheries Commission, New Orleans. Div. of Oysters, Water Bottoms and Seafoods.
C. L. Juneau, Jr., and B. Barrett.
Tech Bulletin No 13, April 1975, 158 p. Project No 2-168-R.

Descriptors: *Louisiana, *Gulf Coastal Plain, *Estuarine fisheries, Brackish water, Freshwater, Brackish water fish, Freshwater fish, Fish, Fishing, Fish populations, Zooplankton, Water, Hydrology, Hydrologic data, Water chemistry, Water supply, Flood data, Flood plains, Sedimentology, Lake sediments, Sediments, Temperature, Saline water, Biology, Geology.
Identifiers: *Vermilion Bay, *Vermilion River, *Atchafalaya River, River discharge, Coastal population statistics, Area description.

The VermilionBay-Atchagalaya Bay estuarine complex is a vast open water brackish system whose primary sources of freshwater are the Atchafalaya and Vermilion Rivers. There are approximately 475, 000 surface acres within the system. Vegetation in the complex varies from fresh to brackish, depending on nearness to the mouth of the Atchafalaya River. Vegetation near the River is almost totally fresh while vegetation farther to the west consists mainly to brackish plant species. Also presented are tabular data on river discharge, coastal population statistics, and sources and quantities of induxtrial waste discharged into the system. This report is divided into four phases; Phase I is an area description Phase II is concerned with the biology of the area Phase III provides hydrology and water chemistry information, and Phase IV describes the sedimentology. (NOAA)
W75-11571

**COASTAL RESOURCE USE: DECISIONS ON PUGET SOUND,**
Washington Univ., Seattle.
For primary bibliographic entry see Field 6B.
W75-11573

**TRACING OCEAN CURRENTS,**
Washington Univ., Seattle. Sea Grant Advisory Service.
For primary bibliographic entry see Field 2E.
W75-11574

**THE MANAGEMENT OF LAND AND WATER USE IN THE COASTAL ZONE: A NEW LAW ENACTED IN NORTH CAROLINA,**
North Carolina Univ., Chapel Hill. School of Law
For primary bibliographic entry see Field 6E.
W75-11575

**SHELL DISEASE IN CRABS AND LOBSTER FROM NEW YORK BIGHT,**
National Marine Fisheries Service, Highland N.J. Sandy Hook Lab.
For primary bibliographic entry see Field 5C.
W75-11606

**PHYTOPLANKTON DIVERSITY AND CHLOROPHYLL-A IN A POLLUTED ESTUARY,**
Montclair State Coll., Upper Montclair, N.J. Dept of Biology.
For primary bibliographic entry see Field 5C.
W75-11607

**DECOMPOSITION OF UREA ASSOCIATED WITH PHOTOSYNTHESIS OF PHYTOPLANKTON IN COASTAL WATERS,**
Nagoya Univ. (Japan). Water Research Lab.

For primary bibliographic entry see Field 5C.
W75-11612

HYDROCARBONS ASSOCIATED WITH SUSPENDED PARTICULATE MATTER IN SAN FRANCISCO BAY WATERS,
Naval Biomedical Research Lab., Oakland, Calif.
For primary bibliographic entry see Field 5A.
W75-11614

THE CASCO BAY OIL SPILL: PROBLEMS OF CLEANUP AND DISPOSAL,
Environmental Protection Agency, Boston, Mass. Div. of Surveillance and Analysis.
For primary bibliographic entry see Field 5G.
W75-11615

FORMATION AND COLLAPSE OF SURFACE FILMS,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
For primary bibliographic entry see Field 2K.
W75-11642

SEDIMENTATION RATES IN A LONG ISLAND MARSH DETERMINED BY PB210 DATING,
Brookhaven National Lab., Upton, N.Y.
J. V. Armentano, and G. M. Woodwell.
Limnology and Oceanography, Vol 20, No 3, p 452-456, May 1975. 2 fig, 1 tab, 14 ref.

Descriptors: *Radioactive dating, *Sedimentation rates, *Lead radioisotopes, *New York, Tidal marshes, Coastal marshes, Deposition(Sediments), Sediments, Organic matter, Measurement, On-site investigations.
Identifiers: *Flax Pond, *Long Island(NY), Spartina alteniflora.

Mean rates of vertical accretion of from 0.47 to 0.53 cm/yr have been determined for the past century from two widely separated sites at Flax Pond, Spartina alterniflora marsh on the north shore of Long Island. The chemical processes and experimental results from the Pb activity, which was used to date the sediments, was discussed. The rates were equivalent to deposition of 325 to 436 g of dry organic matter per square meter per year or about 146 to 196 g of carbon per square meter per year. Although the two sites differed in salt peat thickness, the basal layer of the peat was deposited about 100 years ago at both. (Lardner-ISWS)
W75-11643

THE GROWTH OF POSIDONIA AND THE URBAN POLLUTION IN THE GULF OF GIENS, (IN FRENCH),
Institut Scientifique et Technique des Peches Maritimes, Nantes (France). Service de Pollution.
For primary bibliographic entry see Field 5C.
W75-11761

VELOCITIES ABOVE ROUGH BED IN OSCILLATORY FLOW,
Cambridge Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 8B.
W75-11763

LAND USE AND ENVIRONMENTAL PLANNING: AN APPLICATION IN THE SOUTH CAROLINA COASTAL ZONE,
Battelle-Columbus Labs., Ohio.
For primary bibliographic entry see Field 6G.
W75-11766

DESIGN CRITERIA FOR SINGLE-POINT MOORING TERMINALS,
Shell Internationale Research Maatschappij N.V., The Hague (Netherlands).
For primary bibliographic entry see Field 8C.
W75-11771

INFLUENCE OF CURRENT ON STATISTICAL PROPERTIES OF WAVES,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
C. C. Tung, and N. E. Huang.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 100, No WW4, Proceedings paper No 10922, p 267-278, November 1974. 15 fig, 9 ref.

Descriptors: *Coastal engineering, *Currents(Water), Waves(Water), Analytical techniques, Deep water, Gravity waves, Frequency, Wind velocity, Probability, Equations, *Statistics.
Identifiers: *Inflextion points(Mathematics), Minimax technique, Random processes, Specular reflection, Surface waves, Sea surface, Density function.

The influence of wave-current interactions on various wave statistics is examined analytically. The statistics considered are those of peak magnitude, numbers of zero crossings and maxima, velocities of zeros, specular points, and points of inflexion of sea surface. The sea surface is considered both as a function of space and time. The random wave field is assumed to be unidirectional, zero mean, Gaussian, stationary and homogeneous, and in deep water. The current is considered to be steady in time, nonuniform in space, uniformly distributed in depth, and in or opposite to the direction of the waves. Numerical results are obtained and presented graphically. Results indicate that the interactions phenomena have a relatively mild influence on the maxima of sea surface but the rate of zero crossings and maxima of sea surface, treated as function of space, and the velocity of zeros, specular points, and points of inflextion, are affected by the presence of current to an appreciable extent and can be utilized effectively for current measurements by remote sensing devices. (Bell-Cornell)
W75-11772

WAVE ENERGY TRANSFER MECHANISMS IN WIND-WAVE TUNNELS,
Amoco Production Co., Tulsa, Okla.
For primary bibliographic entry see Field 8B.
W75-11774

OCEAN ENGINEERING--SELECTED REFERENCES,
American Society of Civil Engineers, New York. Task Committee on Selected References of the Technical Council on Ocean Engineering.
For primary bibliographic entry see Field 8B.
W75-11779

# 3. WATER SUPPLY AUGMENTATION AND CONSERVATION

## 3A. Saline Water Conversion

GYPSUM SOLUBILITY AND SCALING LIMITS IN SALINE WATERS,
California Univ., Los Angeles. School of Engineering and Applied Science.
M. S. Adler, J. Glater, and J. W. McCutchan.
UCLA-ENG-7503, and Water Resources Center Desalination Report No 59, January 1975. 93 p, 15 fig, 11 tab, 35 ref, 6 append.

Descriptors: *Gypsum, *Solubility, *Scaling, *Calcium sulfate, *Saline water, Inorganic compounds, Sulfur compounds, Physical properties, Saturation, Salinity, Water quality, Chemistry, Membrane processes, Sea water, *Desalination, Heat exchangers, Brackish water, Magnesium, Heat transfer.
Identifiers: *Scaling limits, *Calcium sulfate scale, *Scaling thresholds, Modeling solubility, Marshall program, Magnesium augmentation.

Reliable data on gypsum solubility and scaling thresholds are required to establish maximum concentration limits for membrane desalting processes. The solubility of gypsum in natural sea water and agricultural drainage waters was measured at temperatures between 25 and 70 degrees C. Scaling thresholds were evaluated from experimental solubility data by graphical methods. These data were compared with calculated values based on various computation models. Quantitative analysis of water samples provided input data for the computer programs used. A computation scheme based on extended Debye-Huckel theory and experimentally derived constants was used as the basis for this work. The computer program finally developed provides readout of solubilities as well as scaling thresholds for gypsum. The program is practical for engineering use showing a variation of less than 5% from experimentally derived values. The effect of magnesium augmentation on gypsum solubility enhancement was also studied. Magnesium ion is known to significantly increase the solubility of calcium sulfate at elevated temperatures by complexing a portion of dissolved sulfate ion. Routine application of magnesium augmentation to agricultural drainage waters would be limited by economic considerations. (Henley-ISWS)
W75-11473

CALICUM SULFATE SCALING IN REVERSE OSMOSIS (HYPER-FILTRATION) OF BRACKISH WATERS BY HOLLOW-FIBER AND SPIRAL-WOUND MODULES,
Oak Ridge National Lab., Tenn.
R. E. Minturn.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-227 767, $3.75 in paper copy, $2.25 in microfiche. Research and Development Progress Report, Int-OSW-RDPR-73-897, Oct 1973, 163 p, 30 fig, 13 tab, 19 ref, append. DI-14-30-2535.

Descriptors: *Reverse osmosis, *Scaling, Brackish water, *Desalination processes, Filtration, *Membranes, Polarity, *Calcium sulfate, Chemical precipitation, Thermodynamics, Electrolytes, Separation techniques, Waste water treatment.
Identifiers: Hyper-filtration, Polarization, Hollow fiber membranes, Spiral wound membranes.

The objective was to operate hollow-fiber and spiral-wound modules in reverse osmosis of synthetic waters in order to establish a correlation between the practical solubility limits of calcium sulfate as a function of operating conditions and the equilibrium solubility limits that were determined in concurrent work. A subsidiary objective was to organize existing literature data on the free energies of solutions of electrolytes common in natural waters in a manner allowing convenient estimation of osmotic pressures. The results of the experimental program directed to reverse osmosis tests of commercial modules are given, thermodynamic data and procedures for its use are presented and a theoretical discussion of concentration polarization in multicomponent systems is presented.
W75-11505

DESALINATION OF WATER.
Australian Patent 459,735. Issued April 10, 1975. Official Journal of Patents, Trade Marks and Designs, Vol 45, No 11, p 1172, April, 1975.

Descriptors: *Patents, *Desalination, Water treatment, Equipment, Saline water, *Waste water treatment, *Evaporation.

# Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

## Group 3A—Saline Water Conversion

A patent was issued for a method of desalination of water. Steps include the feeding of saline water to an evaporator, the feeding of hot waste water to the evaporator, so that the waste water is in a heat exhange relationship with the saline water, the maintaining of a vacuum in the evaporator, and the extraction of condensate from a condenser. The latter is accomplished by means which extract the condensate while maintaining the vacuum in the evaporator through the condenser. The saline water boils in the evaporator and dense saline water is then extracted from the evaporator to maintain the desired level. (Prague-FIRL)
W75-11515

**THE APPLICATION OF MEMBRANE PROCESSES IN THE TREATMENT OF SEWAGE,**
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 5D.
W75-11666

**DESALINATION,**
J. D. Coogan, D. Hastings, and C. K. Toohey.
Australian Patent 460,623. Issued May 1, 1975. Official Journal of Patents, Trade Marks and Design, Vol 45, No 14, p 1566, May 1, 1975.

Descriptors: *Desalination, *Desalination apparatus, *Condensation, *Patents, Saline water.
Identifiers: Coils.

A method of desalination has been patented. Saline water is driven through each of a series of flat helical coils of tube, connected in tandem by a conduit. The direction of the water flow in each coil is from the outside towards the center. Sufficient heat is applied to the coils to form a water/steam mixture having a velocity in excess of 20 ft/sec at the center of the last coil. The water is separated from the steam, and the steam is condensed. (Murphy-FIRL)
W75-11675

**CENTRIFUGAL COMPRESSOR-MELTER FOR DESALINATION OF WATER.**
Australian Patent 460,714. Issued May 1, 1975. Official Journal of Patents, Trade Marks and Design, Vol 45, No 14, p 1587, May 1, 1975.

Descriptors: *Desalination apparatus, *Desalination, Potable water, Brackish water, Saline water, Evaporators, *Patents, Crystallization.
Identifiers: *Centrifugal compressor-melter.

A patent has been issued for a device to prepare potable water from brackish- or salt-water. The device consists of a precooler, an evaporator-crystallizer operatively interconnected with the precooler, an ice-brine separating vessel connected with the evaporator-crystallizer, and a compressor, melter-condenser, and auxiliary cooler. The compressor and melter-condenser are combined into a single unit formed by means of a centrifugal fluid vanes compressor. The compression chamber of the fluid vanes compressor is a melting chamber, and the fluid vanes themselves are formed from a mixture of ice particles and a fluid guided by the jets of the fluid vanes compressor rotor. (Murphy-FIRL)
W75-11676

**SEA WATER SOFTENING WITH THE LIME-MAGNESIUM CARBONATE (LMC) PROCESS,**
Burns and Roe Construction Corp., Fountain Valley, Calif.
For primary bibliographic entry see Field 5F.
W75-11699

**SIDROTHERM DESALINATION,**
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Chemical Technology.
For primary bibliographic entry see Field 5D.
W75-11707

## 3B. Water Yield Improvement

**UTILIZATION OF WATER IN A SEMI-ARID REGION,**
New Mexico State Univ., Clovis. Plains Branch Agricultural Experiment Station.
For primary bibliographic entry see Field 3F.
W75-11356

**INFILTRATION AND RUNOFF FOR SMALL FIELD PLOTS UNDER CONSTANT INTENSITY RAINFALL,**
Hebrew Univ., Rehovoth (Israel). Dept. of Soil and Water Science.
D. Swartzendruber, and D. Hillel.
Water Resources Research, Vol 11, No 3, p 445-451, June 1975. 6 fig, 1 tab, 8 ref, 1 append.

Descriptors: *Infiltration, *Runoff, *Field crops, *Rainfall, Infiltrometers, Soil surfaces, Rainfall intensity, Simulated rainfall.
Identifiers: Field plots, Infiltration flux time curves, Rehovot loamy sand.

A relatively simple infiltration equation was used to express the family of infiltration flux time curves that occurred under constant rate water application (sprinkling or rain) from the time that excess water appeared at the soil surface. The equation was easily integrated for cumulative water excess as a function of time, which in turn allowed taking into account a simplified static surface storage volume to calculate cumulative water runoff. The runoff equation so obtained was tested by means of a sprinking infiltrometer used on plots of 1 sq m and was found to express with good accuracy the measured cumulative plot runoff as a function of time. The field data, taken with a modified Purdue-Wisconsin sprinkling infiltrometer on Rehovot loamy sand, were then utilized successfully for obtaining the ultimate steady infiltration flux, even when the period of measuring transient runoff was less than 1 hour and the total runoff less than 1 cm of water. The value of steady flux so obtained was in good agreement with that found under the condition of continuous ponding of water on the soil surface. (Roberts-ISWS)
W75-11458

**ATMOSPHERIC PHYSICS AND CHEMISTRY LABORATORY: COLLECTED REPRINTS 1973.**
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 2B.
W75-11552

**EVAPOTRANSPIRATION AND SOIL MOISTURE IN UPLAND GRASS CATCHMENTS IN THE EASTERN PENNINES,**
Leeds Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2D.
W75-11648

**PROCEEDINGS OF THE WATER HARVESTING SYMPOSIUM, PHOENIX, ARIZONA, MARCH 26-28, 1974.**
Western Regional Research Lab., Berkley, Calif.
USDA Report ARS W-2, February, 1975. 329 p.

Descriptors: *Water harvesting, *Arid climates, *Water yield improvement, *Water supply, *Water storage, *Rainfall-runoff relationships, Water yield, Semiarid climates, Stock water, Water tanks, Surface sealing, Soil compaction, Evaporation control, Storage tanks, Seepage control, Water resources development, Rainfall, Runoff, Computer models, Crop production, *Watersheds(Basins).
Identifiers: Runoff farming, Roaded catchments.

Water harvesting is used to develop local water supplies in remote areas for livestock, wildlife, runoff farming, and domestic use. Various water harvesting and storage techniques along with applications to farming are described in the 30 technical reports herein. The majority of papers discuss results of large scale field experiments and describe different applications to render the runoff area or storage pond impermeable, including economic aspects and practicability of the treatment. (See W75-11801 thru W75-11829) (Robinett-Arizona)
W75-11800

**WATER HARVESTING FOR LIVESTOCK IN WESTERN AUSTRALIA,**
Western Australia Dept. of Agriculture Katanning. Soil Conservation Service.
W. J. Burdass.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service Berkeley, California, Western Region, p 8-26, fig, 1 tab, 1 append, 26 ref.

Descriptors: *Water harvesting, *Arid climates, *Water yield, *Water yield improvement, *Water supply, Semiarid climates, Stock water, Surface water, Subsurface waters, Soil types, Streamflow, Saline water, Water tanks, Drainage system, Flow, Subsurface drainage, Watersheds(Basins), Paving runoff, Channels, Surface sealing, Sealants, Soil sealants, *Australia.
Identifiers: Roaded catchments, Flat batter tanks, Runoff farming.

As groundwater is frequently saline on many farms in Western Australia, agricultural practices often necessitate use of diversions to intercept surface and subsurface flow, or physical or chemical surface treatments to harvest available water. Many farmers rely entirely on harvested water in excavated tanks for cattle. The main methods for water harvesting are contour drains, roaded catchments, and flat batters. Farm catchments deteriorate because of surface weathering and erosion, vegetation growth, and livestock trampling. The roaded catchment is the cheapest of the surface treatments, and is likely to remain the standard surface treatment for water harvest on farms in Western Australia. (See also W75-11801) (Robinett-Arizona)
W75-11801

**ENGINEERING ASPECTS OF WATER HARVESTING RESEARCH AT THE UNIVERSITY OF ARIZONA,**
Arizona Water Resources Research Center, Tucson.
C. B. Cluff.
In: Water Harvesting Symposium, March 26-1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service Berkley, California, Western Region, p 27-39, fig, 3 tab, 16 ref.

Descriptors: *Water harvesting, *Drainage systems, *Linings, *Water storage, *Arid climates, Compaction, Soil compaction, Sodium, Gravels, Channels, Channel flow, Flow, Plastics, Asphalt, Water tanks, Semiarid climates, Reservoir storage, Storage tanks, Evaporation control, Seepage control, Surface sealing, Sealants, Soil sealants, Arizona.
Identifiers: Roaded catchments, Runoff farming.

Water harvesting research indicates that the method of land treatment is determined by the use. Large scale testing of better methods include compacted earth, compacted earth sodium treated

gravel covered plastic, and asphalt-plastic-asphalt-chipcoated. Percent efficiency for each method was found to range from 30-60 for compacted earth, 40-70 for compacted earth sodium treated, 50-80 for gravel covered plastic, and 85-95 for Asphalt-plastic-asphalt-chipcoated. The compacted earth and compacted earth sodium treated are soil dependent and should not be built where soils are difficult to compact. A gravel covered plastic catchment should be considered where soil is not suitable for a compacted earth or compacted earth sodium treated. The Asphalt-plastic-asphalt-chipcoated system would be used where soil is unsuitable for compacted earth, compacted earth sodium treated and gravel covered plastic, or where high efficiency is required. (See also W75-11800) (Robinett-Arizona)
W75-11802

**WATER HARVESTING FOR LIVESTOCK, WILDLIFE, AND DOMESTIC USE,**
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
G. Frasier.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 40-49, 6 fig, 3 tab, 7 ref.

Descriptors: *Water harvesting, *Water storage, Water requirements, *Cost analysis, Precipitation(Atmospheric), Runoff, Costs, Reservoir storage, Rainfall, Stock water, Water supply, Domestic water, Surface sealing, Sealants, Soil sealants, Rainfall-runoff relationships, Watersheds(Basins).
Identifiers: Runoff farming.

Water harvesting catchment efficiency is discussed together with the threshold quantity of precipitation required to produce runoff. The efficiency, usually expressed as a percentage of the precipitation as measured by a rain gage, depends on factors such as antecedent soil moisture, storm intensity, and storm duration. Water harvesting costs, a function of unit catchment cost, catchment runoff efficiency, total precipitation and life of the treatment, are tabulated for nine water harvesting treatments. Catchment and storage size relations, which depend on the type of rainfall, are discussed. Suggestions are presented for determination of the relative sizes of catchment and storage, a major problem in designing a useful and economical water harvesting system. (See also W75-11800) (Robinett-Arizona)
W75-11803

**WATER DEVELOPMENT IN MANAGEMENT OF LIVESTOCK AND WILDLIFE ON MOUNTAIN WILDLANDS,**
Wasatch National Forest, Salt Lake City, Utah. Range, Wildlife and Watershed Management.
C. C. Williams.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkeley, California, p 50-59, 6 fig, 1 tab, 4 ref.

Descriptors: *History, *Planning, *Water sources, *Water resources development, *Water management(Applied), Livestock, Arid climates, Semiarid climates, Sheep, Cattle, Watersheds(Basins), National forests, Grazing, Range management, Water utilization, Precipitation(Atmospheric), Water law, Water harvesting, Water demand, Surface sealing, Saelants, Soil seals.

A brief history of livestock development on U.S. western rangelands is given. Water problems associated with livestock management are made more complex by extreme precipitation differences from location to location, for example, a range from a dry valley to a wet mountain side. A natural or developed water supply is one of the most important requirements of grazing a mountain watershed, and intensive management is necessary. The critical need for good management is planning development techniques is stressed. (See also W75-11800) (Robinett-Arizona)
W75-11804

**BITUMEN, OIL, AND CLAY SURFACES ON A DEEP SAND TO INCREASE RUNOFF FROM CATCHMENTS FOR EXCAVATED TANKS IN WESTERN AUSTRALIA,**
Western Australia Dept. of Agriculture, South Perth. Soils Div.
I. A. F. Laing, and A. L. Prout.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 63-75, 2 fig, 6 tab, 6 ref.

Descriptors: *Stock water, *Water supply, *Water yield improvement, *Water harvesting, *Soil sealants, Storage tanks, Water storage, Soil types, Sands, Semiarid climates, Precipitation(Atmospheric), Surface runoff, Surface sealing, Infiltration, Water proofing, Coatings, Sealants, Soil treatment, *Australia.
Identifiers: Western Australia, Runoff farming.

In the southern coastal areas of Western Australia groundwater is rarely potable and stock water supplies rely on runoff from pastured areas or roaded catchments. Experimentation on runoff improvement was done with eight different soil treatments using bitumen, oil, and clay: Data showed that oil primed plots were significantly better than bitumen, and oil and bitumen together were better than clay treatments. Clay treated surfaces were least affected by stock trampling. Runoff from fuel oil treated catchments was found apparently safe for livestock use. Considerations of cost and runoff percentages show the clay catchments to be most practical. (See also W75-11800) (Robinett-Arizona)
W75-11805

**SOIL TREATMENT WITH SILICONES FOR WATER HARVESTING,**
Dow Corning Corp., Midland, Mich.
E. P. Plueddemann.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 76-83, 1 fig, 3 tab, 4 ref.

Descriptors: *Water harvesting, *Arid climates, *Water yield improvement, *Surface sealing, *Soil sealants, Water yield, Coatings, Water supply, Semiarid climates, Soil types, Water tanks, Sealants, Rain water, Runoff, Sands, Rainfall-runoff relationships, Water storage, Rainfall, Polymers, Waterproofing, Costs.
Identifiers: Runoff farming.

Effective treatment of a sandy soil was done with an aqueous spray containing a polymer latex and water repellent. The polymer latex bound the soil and the water repellent caused water to run off. An acrylic and a styrene-butadiene resin looked most promising among commercial polymers tested. A sodium methylsiliconate and a silicone emulsion were effective as water repellents, but the emulsion gave better results and was easier to use. A mixture of styrene-butadiene resin latex and silicone emulsion is stable at 50% solids, and can be diluted with water to about 3% solids for soil application. (See also W75-11800) (Robinett-Arizona)
W75-11806

**CHEMICAL WATER HARVESTING,**
DeJong and Associates, Tucson, Ariz.
R. L. A. DeJong, and T. J. Wallace.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 84-92, 3 fig, 1 ref.

Descriptors: *Water harvesting, *Water yield improvement, *Soil sealants, *Surface sealing, *Waterproofing, Water yield, Rainfall-runoff relationships, Runoff, Sealants, Soil surfaces, Seepage control, Arizona, Rainfall, Soil chemical properties, Soil physics, Coatings, Costs.
Identifiers: Runoff farming.

The primary chemical used was F125, a soil sealant manufactured by Trans-continental Research and Development Corporation, Tucson, Arizona. The effect of formula F125 on 13 soil properties was studied along with 12 technical properties of chemical F125. At the end of testing there was no recorded loss of waterproofing, nor any erosion of soil. The water sealing function of the chemical was 100 percent. Using F125 at a ratio of 44 to 1 and application rate of 1 gallon per square yard, cost per acre was calculated to be 1,087.80 dollars. Construction involved in site preparation and application of the chemicals require work of only average complexity and sophistication, which enhances the possibilities of application in remote areas. (See also W75-11800) (Robinett-Arizona)
W75-11807

**PERFORMANCE AND DURABILITY OF SHEET METAL, BUTYL RUBBER, ASPHALT ROOFING AND BENTONITE FOR HARVESTING PRECIPITATION,**
Agricultural Research Service, Akron, Colo. Central Great Plains Field Station.
R. H. Mickelson.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 93-102, 3 fig, 2 tab, 11 ref.

Descriptors: *Water harvesting, *Arid climates, *Water yield improvement, *Rainfall-runoff relationships, *Linings, Water yield, Water supply, Surface sealing, Sealants, Soil sealants, Rain water, Runoff, Rain-fall, Rubber elastomers, Coatings, *Asphalt, Soil asphalt, *Bentonite, Colorado, Regression analysis, *Rubber.
Identifiers: Runoff farming, Akron(Colo).

Climate, soils, and topography are important factors to consider when selecting materials for harvesting water in any given area. Climate is the most critical, because materials used on the catchment area must withstand annual variations in climate conditions. Asphalt compounds with and without protective coatings have been used more successfully in the arid Southwestern United States than in the Semiarid west, central and northern Great Plains regions, due to extreme temperature variations in the Great Plains which accellerate deterioration. Five experimental harvesting techniques using sheet metal, butyl rubber, asphalt roofing, soil bentonite mixture and native grass were tested. Average annual volume of water harvested from sheet metal butyl rubber, and asphalt roofing was about 50-55 percent of rainfall whereas the bentonite plot was 19 percent and the check plot was 5 percent. Regression analysis was made on rainfall-runoff relationships. (See also W75-11800) (Robinett-Arizona)
W75-11808

**WATER HARVESTING CATCHMENTS ON INDIAN LANDS IN THE SOUTHWEST,**
Bureau of Indian Affairs, Phoenix, Ariz.
J. V. Chiarella, and W. H. Beck.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 104-114, 1 ref.

Descriptors: *Water harvesting, *Arid climates, *Water yield improvement, *Performance, *Stock water, Water yield, Water supply, Surface sealing, Sealants, Soil sealants, Rainfall, Runoff, Rainfall-runoff relationships, Linings, Rubber, Elastomers, Coatings, Asphalt, *Arizona, Maintenance, Water storage, Soil compaction, Seepage, Indian reservations, Livestock, Southwest US, Watersheds(Basins).
Identifiers: Phoenix(Ariz), Runoff farming.

Performance of thirty-two catchments built in the Phoenix, Arizona area is discussed. General procedures for construction of these catchments is presented, explaining techniques for removing the vegetation, smoothing and treating the ground with a soil sterilant, and building the catchment. In most instances, success with the catchments on Indian lands was limited, the blame being placed on some technicians reluctant to accept the practicability of the basins. Maintenance on catchments was often negligible unless actually done by the tribe. (See also W75-11800) (Robinett-Arizona)
W75-11809

**DESIGN AND CONSTRUCTION OF ROADED CATCHMENTS,**
Western Australia Dept. of Agriculture, Moora. Soil Conservation Service.
J. L. Frith.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 122-127, 4 fig, 7 ref.

Descriptors: *Water harvesting, *Arid climates, *Water yield, *Water yield improvement, *Water supply, Semiarid climates, Water tanks, Drainage systems, Flow, Surface sealing, Runoff, Surface sealing, Soil types, Rainfall-runoff relationships, Rainfall, Soil surfaces, Soil compaction, Clays, *Australia.
Identifiers: *Roaded catchments, Runoff farming, Western Australia.

Roaded catchments in Western Australia are areas of formed, compacted, parallel ridges of earth made in similar fashion to earth roads. Sites should contain clay soil or subsoil and have a surface slope that allows catchment drains to be alined on correct grades and should not be more than 400 meters above dam. Individual roads vary from 5 to 12 meters wide and 50 to 300 meters long. The depth to clay subsoil and selection of road width and side slope, which will expose adequate amounts of clay to cover the catchment, are very important factors. Catchment surface slope is progressively decreased whereas road side slopes are made as steep as possible. Compaction and smoothing produced by rolling during construction impede weed growth and increase runoff and durability. The period during which catchments can be constructed in Western Australia is restricted to Autumn and spring when moisture conditions are optimum for soil compaction. (See also W75-11800) (Robinett-Arizona)
W75-11810

**DESERT STRIP FARMING--COMPUTER SIMULATION OF AN ANCIENT WATER HARVESTING TECHNIQUE,**
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
G. C. A. Morin, and W. G. Matlock.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 141-150, 3 fig, 4 tab, 7 ref.

Descriptors: *Water harvesting, *Water yield, *Strip cropping, *Crop response, *Soil moisture, Runoff, Rainfall-runoff relationships, *Arizona, Rainfall, Water yield improvement, Computer models, Mathematical models, Sorghum, Crop production, Semiarid climates, Dry farming, Analytical techniques.
Identifiers: Runoff farming, Tucson(Ariz), Desert strip farming.

A field study of grain sorghum was made in southern Arizona, using only direct precipitation and precipitation from adjacent untreated water collection areas. A mathematical model of a crop growing under desert strip farming conditions was solved and results compared to actual yields. Rainfall data for 1900-1972 were used in the model to predict long term success of desert strip farming. Model predictions for crop yield were slightly low when soil moisture conditions were good and high when moisture conditions were poor. Data for the Tucson Basin indicate that for a collector area to farmed area ratio of 12 there will be significant production of short-season grain sorghum in 4 out of 5 years with field data supporting the validity of the model. The model also indicates that distribution of rainfall in time and space may be more important than total rainfall. *See also W75-11800) (Robinett-Arizona)
W75-11812

**A COMPUTER MODEL FOR OPTIMIZING DESIGN OF IMPROVED CATCHMENT,**
Western Australia Dept. of Agriculture, Moora. Soil Conservation Service.
J. L. Frith, R. A. Nulsen, and H. I. Nicol.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 151-157, 3 fig, 1 tab, 5 ref.

Descriptors: *Water harvesting, *Arid climates, *Water supply, *Water storage, Systems analysis, Stock water, Water tanks, Rainfall-runoff relationships, *Australia, Runoff, Rainfall, Ponds, Simulation analysis, Mathematical models, Analytical techniques, Sheep, Watersheds(Basins), *Computer models.
Identifiers: Runoff farming, Western Australia.

In western Australia, 60 years of daily rainfall records were used to compute daily additions to storage. Combinations of catchment area, dam capacity, and sheep flock size were set up and the application of isocosts to isoquants to determine least cost combinations of dam capacity and catchment area for 1,000 sheep was applied. The value of 7.5 millimeters was chosen to represent the threshold of well-constructed, clay-covered roaded catchments. Results indicate that in the region of Jerramungup, it is likely that sheep could be supplied with water from dams and roaded catchments for about 0.65 dollars per sheep. (See also W75-11800) (Robinett-Arizona)
W75-11813

**SEALING LEAKING EXCAVATED TANKS ON FARMS IN WESTERN AUSTRALIA,**
Western Australia Dept. of Agriculture, South Perth. Soils Div.
I. A. F. Laing.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, p 159-174, 1 fig, 7 tab, 12 ref, 1 append.

Descriptors: *Water harvesting, *Arid climates, *Water supply, *Water tanks, *Soil sealants, Water yield, Water yield improvement, Semiarid climates, Soil types, Ponds, Watersheds(Basins), Surface sealing, Sealants, Runoff, Water storage, Clays, Sodium, Seepage, Rainfall, *Australia, Leakage, Bentonite.
Identifiers: Runoff farming Western Australia.

Runoff seldom occurs during summer and autumn months, and tanks must hold water for at least 200 days. Farm water supply surveys show that in most districts less than 5 percent of all excavated tanks leak, whereas in some districts over 40 percent leak. Sealing a large tank is cheaper per cubic meter than for a small tank and the following treatments were used: Rivaseal (a thin polyester film and fiberglass mat laminated together), polyethylene sheeting, bentonite, and sodium tripolyphosphate. Maximum tolerable seepage loss was 600 millimeters per 200 days. From water loss data and experience in installation, the Rivaseal offered best prospects for seepage control, although it was most expensive. (See also W75-11800) (Robinett-Arizona)
W75-11814

**STORAGE SYSTEMS FOR HARVESTED WATER,**
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
A. R. Dedrick.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 175-191, 3 fig, 39 ref.

Descriptors: *Water harvesting, *Water supply, *Water tanks, *Water storage, *Seepage control, Water yield, Water yield improvement, Soil types, Ponds, Surface sealing, Sealants, Soil sealants, Runoff, Soil surfaces, Soil compaction, Rainfall, Bentonite, Asphalt, Coatings, Elastomers, Rubber, Linings, Storage tanks.
Identifiers: Runoff farming.

Requirements of the water storage system, genera storage considerations, and various modes o water storage are discussed along with specific materials used to produce efficient water storag systems. The best mode or material is dependen on local conditions such as: soils, accessibility re garding personnel, equipment, and materials availabaility of materials, costs, and system lif requirement. Storage requirements must b balanced against quantity of precipitation and re liability of receiving this precipitation. Thirtee different methods of sealing ponds are described Compacted earth, bentonite, chemical additives chemical sealants, membrane and film prefabricated asphaltic plank, hot applied asphal tic membrane, reinforced asphaltic membran plastic film, synthetic rubber, hard surface lining storage bags, and storage tanks. (See also W7 11800) (Robinett-Arizona)
W75-11815

**EVAPORATION SUPPRESSION FOR CON SERVING WATER SUPPLIES,**
Agricultural Research Service, Phoenix, Ari Water Conservation Lab.
K. R. Cooley.
In: Water Harvesting Symposium, March 26-2 1974, Phoenix, Arizona, U.S. Department Agriculture, Agricultural Research Servic Berkeley, California, p 192-200, 2 tab, 18 ref.

Descriptors: *Water harvesting, *Arid climate *Evaporation control, *Reservoir evaporatio *Water conservation, *Reflectance, Water yiel Water yield improvement, Water supply, Semiar climates, Water tanks, Ponds, Water storag Rainfall, Water properties, Albedo, Radiatio Energy transfer, Costs.
Identifiers: Water coloring, Shading, Wind ba fles, Rafts.

A large increase in reflectance by making wa surfaces as light colored as possible can signi cantly reduce evaporation. Four main categor of energy-reducing treatments are discusse coloring the water, floating materials on the wat shading the water, and wind baffles. Contin wax, polystyrene rafts, and butyl rubber are most readily available and practical of the lo cost materials, although wind protection may necessary in some cases. Cost of water saved co

pared favorably with costs of alternative sources. (See also W75-11800) (Robinett-Arizona)
W75-11816

**THE DESIGN OF ROADED CATCHMENTS FOR MAXIMUM RUNOFF,**
Western Australia Univ., Nedlands. Dept. of Civil Engineering.
M. Hollick.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 201-220, 17 fig, 2 tab, 7 ref.

Descriptors: *Water harvesting, *Arid climates, *Water yield improvement, *Water supply, *Rainfall-runoff relationships, Water yield, Semiarid climates, Soil types, Surface sealing, Soil sealants, Sealants, Runoff, Clays, Seepage, Rainfall, Australia, Costs, Computer, Computer models, Mathematical models, Channels, Analytical techniques.
Identifiers: *Roaded catchments, Runoff farming, Western Australia.

Development of a method for calculating maximum nonerosive gradients for channels, is presented, as well as computer model studies to find the best catchment shape. Results in Western Australia show that: (1) The best width for plane-sided roads varies from about 1 to 6 meters. (2) Corrugations, or miniroads, on sides of roads are valuable, and in this case, optimum width ranges from about 6 meters to the limits of economical construction. (3) Roads should never by shorter than the length tat gives a square catchment layout, and in many cases should be longer. The best prospects for improving the performance of roaded catchments seems to be in the development of techniques for forming miniroads which increase runoff and give a wide range of acceptable widths to allow the use of standard roadmaking equipment and to enable a subsoil blanket to be obtained. (See also W75-11800) (Robinett-Arizona)
W75-11817

**WATER HARVESTING BY RUNOFF INDUCEMENT FOR IRRIGATION OF AN ALMOND ORCHARD IN A SEMIARID CLIMATE,**
United Nations Development Program, New Delhi (India).
E. Rawitz, and D. Hillel.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 223-232, 9 fig, 1 tab, 10 ref.

Descriptors: *Water harvesting, *Sermiarid climates, *Water yield improvement, *Soil sealants, *Crop production, Water yield, Water supply, Surface sealing, Sealants, Runoff, Rainfall, Rainfall-runoff relationships, Sodium, Soil compaction, Aspalt, Crop response, Dry farming, Soil moisture, Water conservation, Soil surfaces.
Identifiers: Runoff farming, *Israel(Negev).

Techniques used to increase runoff include land smoothing and compaction, formation of a sodic crust, and the spraying of asphaltic materials. Crop production and soil moisture measurements show that runoff-farming is possible in this 200 to 250 millimeter(mm) rainfall area of the northern Negev in Israel. Area ratios between contributing and receiving areas of 3:1 to 6:1 provide seasonal accretion in a deep soil profile of well over 600 mm. (See also W75-11800) (Robinett-Arizona)
W75-11818

**YIELD EVALUATION OF MICROWATERSHED AND VERTICAL MULCH SYSTEMS,**
Agricultural Research Service, Fort Collins, Colo.
M. L. Fairbourn.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 233-243, 8 fig, 3 tab, 6 ref.

Descriptors: *Water harvesting, *Water yield improvement, *Mulching, *Water conservation, *Soil moisture, Colorado, Runoff, Water yield, Soil sealants, Soil types, Surface sealing, Runoff, Rainfall, Rainfall-runoff relationships, crop response, Crop production, Dry farming, Soil-water-plant relationships, Soil surfaces, *Great Plains, Watersheds(Basins).
Identifiers: Runoff farming.

An experiment on the semiarid Great Plains using 3 main treatments, (vertical mulched, non-mulched, and flat surface microwatershed), is described for improvement of water use efficiency by crops. Water infiltrated readily on the vertical mulched microwatershed, and the treated surface soil stayed dry causing a marked increase in soil water storage. Water saved on vertical mulched treatment appeared to cause an increase in yields ranging from 37 to 150 percent compared with the control treatment. A microwatershed system with a contributing slope to crop area ratio of 3 to 1 appeared to be suitable for the soil type and precipitation at Akron, Colorado. (See also W75-11800) (Robinett-Arizona)
W75-11819

**AN ANALYSIS OF THE EFFICIENCY OF MICROWATERSHED SYSTEMS,**
Agricultural Research Service, Fort Collins, Colo.
H. R. Gardner.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 244-250, 4 fig, 1 tab, 3 ref.

Descriptors: *Water harvesting, *Water yield improvement, *Mulching, *Water conservation, *Evaporation control, Colorado, Runoff, Rainfall, Water yield, Soil moisture, Soil water movement, Evaporation, Infiltration, Soil surfaces, Soil water, Plant growth, Soil-water-plant relationships, Great Plains, Watersheds(Basins).
Identifiers: Runoff farming.

A vertical mulched slot placed at the bottom of a watershed slope, caused deeper penetration of water and reduction of evaporation at the Central Great Plains Field Station at Akron, Colorado. Cumulative evaporation was predicated and also determined by initial and final water contents in the soil profile, showing a decrease in evaporative loss of 2.9 centimeters due to the mulch system. There appears to be a potential for decreasing evaporation up to 50 percent. (See also W75-11800) (Robinett-Arizona)
W75-11820

**USING PARAFFIN AND POLYTHYLENE TO HARVEST WATER FOR GROWING SHRUBS,**
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
E. F. Aldon, and H. W. Springfield.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultral Research Service, Berkeley, California, Western Region, p 251-257, 3 fig, 1 tab, 8 ref.

Descriptors: *Water harvesting, *Water yield improvement, *Semiarid climates, Soil sealants, Plant growth, Runoff, Rfall, Rainfall-runoff relationships, Water yield, Surface sealing, Sealants, *Plastics, Soil moisture, Soil-water-plant relationships, Plant physiology, Soil temperature, New Mexico.
Identifiers: Runoff farming, *Wax.

The experiment, conducted at Santa Fe, New Mexico, consisted of installing sheets (9 square feet), of black polyethylene around the stem of the plant, or waterproofing the soil around the plant using paraffin wax. Seventy five days after planting, shrubs grown in plots treated with polyethylene were largest, while those in untreated plots were smallest. Soil temperatures 1 inch deep were higher under paraffin than under polyethylene, and soil moisture was higher under both the paraffin and polyethylene than the untreated plots. A half-pound of ground paraffin per square foot harvested as much water as higher rates of paraffin. (See also W75-11800) (Robinett-Arizona)
W75-11821

**PRECIPITATION ENTRAPMENT FOR EVAPORATION SUPPRESSION,**
Agricultural Research Service, Orono, Maine. Soil, Water and Air Sciences.
J. R. Hoover.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, P 259-268, 4 fig, 6 tab, 18 ref.

Descriptors: *Crop production, *Water harvesting, *Evaporation control, *Water yield improvement, *Soil moisture, Rainfall, Water conservation, Arid climates, Water yield, Water supply, Semiarid climates, Soil sealants, Plant growth, Runoff, Rainfallrunoff relationships, Surface sealing, Sealants, Plastics, Soil-water-plant relationships, Evaporation, Crop response, Crop production, South Dakota, Soil profiles, Soil stabilization.
Identifiers: Runoff farming, Dust control agents, Soil stabilizers.

Soil moisture storage can be increased by precipitation runoff inducement to a concentration level where the rainfall is conducted to a point deep in the soil where it can infiltrate the experiment objective was to determine the amount of moisture from both small and large storms that could be saved by entrapment in the soil profile and used for plant production. Deep placement of precipitation was effective when coupled with a plastic surface sealant while the chemical DCA-70 soil stabilizer and dust control agent was not consistently effective for inducing runoff or for evaporation suppression. (See also W75-11800) (Robinett-Arizona)
W75-11822

**CROP PRODUCTION BY WATER HARVESTING,**
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
D. D. Fangmeier.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research service, Berkeley, California, Western Region, p 269-276, 7 tab, 2 ref.

Descriptors: *Water harvesting, *Water yield improvement, *Arid climates, *Water supply, *Crop production, Runoff, Rainfall, Rainfall-runoff relationships, Water yield, Semiarid climates, Soil sealants, Plant growth, Surface sealing, Sealants, Plastics, Soil-water-plant relationships, Crop response, *Arizona, Soil moisture, Water requirements.
Identifiers: Runoff farming.

The feasibility of using runoff water for crop production in southeastern Arizona without water storage facilities is studied. Plots were planted with grain sorghum and four water treatments were used providing each basin with 3, 4, 5, or 6 times the measured rainfall. Planting on the flat or in small furrows appears preferable to deep furrows or beds, and soil leveling can be very critical as low spots will receive more water and give more

growth. Yield data for 4 years indicate that it is possible to produce a crop in this area using water harvesting, however, dry years or years with above-average late-season precipitation can result in little or no production. (See also W75-11800) (Robinett-Arizona)
W75-11823

**RUNOFF UTILIZATION FOR GRAIN PRODUCTION,**
Agricultural Research Service, Bushland, Tex. Southwestern Great Plains Research Center.
O. R. Jones, and V. L. Hauser.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 277-283, 4 fig, 1 tab, 10 ref.

Descriptors: *Water harvesting, *Water yield improvement, *Crop production, *Bench leveling, *Contour farming, Terracing, Erosion control, Sorghum, Runoff, Water yield, Rainfall, Rainfall-runoff relationships, Semiarid climates, Plant growth, Sail-Water-Plant relationships, Crop response, *Texas, Soil moisture, Land forming, Soil conservation.
Identifiers: Runoff farming, Conservation bench terraces.

Results are reported of 14 years of research at Bushland, Texas, on conservation bench terraces and bench leveling, and comparison of yields with those from other cropping systems to determine effects of runoff on grain yields. Bench leveling to prevent runoff increased sorghum yields 43%, and conservation bench terraces increased yields 80% over yields obtained on sloping plots that had runoff. Bench leveling had greater farm production than conservation bench terraces because all the land area was cropped continuously but also had an increased probability of poor yields. Only one-third of the conservation bench terraces area needs to be leveled whereas all land area is leveled for bench leveling. (See also W75-11800) (Robinett-Arizona)
W75-11824

**WATER HARVESTING FOR BARLEY IN A 30-CM WINTER RAINFALL AREA,**
California Univ., Riverside.
R. E. Luebs, and A. E. Laag.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 284-291, 3 tab, 8 ref.

Descriptors: *Water harvesting, *Rainfall-runoff relationships, *Water yield improvement, *Crop production, *Water supply, Runoff, Rainfall, Water yield, Soil moisture, Soil-water-plant relationships, Plant growth, Water requirements, Plastics, Soil sealants, Surface sealing, Sealants, California, *Barley.
Identifiers: Runoff farming.

In an experimental area with a 1:1 ratio of polyethylene covered runoff surface to collection area, an annual average of 62% of runoff was retained on cropped areas which increased available soil water throughout the growing season. Barley grain production was increased significantly in 1 year of 3 and production with water harvesting was greater 2 or 3 years when compared with the fallow-crop system, which used the same land area. (See also W75-11800) (Robinett-Arizona)
W75-11825

**OPPORTUNITY FOR HARVESTING WATER FROM AND ALONG HIGHWAYS IN RANGELAND AREAS OF WYOMING,**
Agricultural Research Service, Fort Collins, Colo.
C. E. Evans, D. A. Woolhiser, and F. Rauzi.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 293-301, 5 fig, 6 ref.

Descriptors: *Water harvesting, *Rainfall-runoff relationships, *Water yield improvement, *Crop production, *Computer models, Runoff, Rainfall, Water yield, Soil moisture, Plant growth, Mathematical models, Analytical techniques, *Wyoming, Highways, Land management.
Identifiers: Runoff farming.

Forage yield observations along a particular highway showed substantially greater production than was observed from adjacent native rangelands. Areas along the highway were harvested with yield estimates ranging from 3 to 8 tons of quality has per mile. Herbage yields could probably be increased susbstanitally with fertilization, land leveling and shaping, better adapted plant species, and improved management. (See also W75-11800) (Robinett-Arizona)
W75-11826

**ESTABLISHING WINDBREAKS IN SEMIARID AREAS BY ALTERING THE MICROCLIMATE OR SUPPLYING ADDITIONAL WATER,**
Agricultural Research Service, Manhattan, Kans.
J. D. Dickerson, and N. P. Woodruff.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agricilture, Agricultural Research Service, Berkeley, California, Western Region, p 302-309, 3 tab, 36 ref.

Descriptors: *Microclimatology, *Water harvesting, *Water yield improvement, *Surface sealing, *Plant growth, Runoff, Rainfall, Rainfall-runoff relationships, Soil sealants, Sealants, Water requirements, Kansas, Solar stills, Mulching, *Scotch pine trees, Wind breaks, *Juniper trees.
Identifiers: Runoff farming, Drip irrigation, Recedar, Shading.

Seven methods were used to supply additional water or alter the microclimate of redcedar (Juniperus virginiana) and Scotch pine (Pinus sylvestris) trees to induce faster growth and higher survival rates. Two water harvest treatments for redcedars produced 32% and 31% more total growth than did a control, and drip irrigation and snow-fence-protected treatments produced 25% and 24% more total growth, respectively. Shaded treatment did not increase growth but resulted in 100% survival compared with 70% for the control. Scotch pines tended to have better survival and total growth in a protected or shaded environment. (See also W75-11800) (Robinett-Arizona)
W75-11827

**MULTIPURPOSE SALT TREATED WATER HARVESTING SYSTEM,**
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
G. R. Dutt, and T. W. McCreary.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 310-314, 1 fig, 4 tab.

Descriptors: *Water harvesting, *Water yield improvement, *Semiarid climates, *Water supply, *Water conservation, Runoff, Rainfall, Rainfall-runoff relationships, Water yield, Arizona, Soil-water-plant relationships, Plant growth, Crop production, Crop response, Soil moisture, Soil sealants, Surface sealing, Sealants, Sodium chloride, Soil compaction, Seepage, Water tanks, Ponds, Water storage, Evaporation control.
Identifiers: Runoff farming, Tucson(Ariz), Rafts, *Grapes.

The requirements of this system are to collect water for use inside or outside the system, increase the desired production of the land within the system, and provide an esthetically pleasing environment. A salt treated catchment planted with grape vines, with a storage pond for drought periods is discussed. Since December 1971, the tank, which receives about 52% of the rainfall over the catchment has never been dry. Grape vines receive water from the pond during dry periods and have shown good growth. The salt content of the water in the tank at different dates shows that after initial establishment the salt content declines, indicating added chloride is remaining on the catchment. (See also W75-11800) (Robinett-Arizona)
W75-11828

**DIFFERENT SOIL TREATMENTS FOR HARVESTING WATER FOR RADISH PRODUCTION IN THE MEXICO VALLEY,**
Escuela Nacional de Agricultura, Chapingo (Mexico). Dept. of Soils.
M. G. Anaya, and J. S. Tovar.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 315-320, 3 tab, 8 ref.

Descriptors: *Water harvesting, *Water yield improvement, *Surface sealing, *Crop production, *Water supply, Runoff, Rainfall, Rainfall-runoff relationships, Water yield, Soil-water-plant relationships, Plant growth, Sealants, Soil sealants, Crop response, Soil moisture, Soil compaction, Plastics, *Mexico, *Soil treatment.
Identifiers: Runoff farming, Straw, *Radishes.

Five treatments were applied on runoff surfaces: Polyethylene, straw, compacted-earth, compacted-earth-diesel-treated 250 ml per sq m, and compacted-earth-diesel-treated 125 ml per sq m. No significant differences in radish yields were obtained with the 5 treatments and therefore the cheapest of these methods; compacted-earth or compacted-earth-diesel-treated is recommended. The more surface used for runoff, the higher the production of radish obtained on the 3 levels studied. (See also W75-11800) (Robinett-Arizona)
W75-11829

## 3C. Use Of Water Of Impaired Quality

**DEVELOPMENT OF SALINITY CONTRO TECHNOLOGY IN GRAND VALLEY,**
Colorado State Univ., Fort Collins. Dept. Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W75-11585

**PREDICTING EXCHANGEABLE SODIU RATIOS IN IRRIGATED TROPICAL VE TISOLS,**
Hawaii Inst. of Geophysics, Honolulu.
S. Sinanuwong, and S. A. El-Swaify.
Soil Science Society of America Proceedings, V 38, No 5, p 732-737, September-October, 1974. fig, 7 tab, 12 ref.

Descriptors: *Sodium, *Hawaii, Soil properti Soil chemical properties, Soil properties, S chemistry, Soil tests, Forecasting.
Identifiers: Sodium exchange, Sodium adsorptio Vertisols.

Batch equilibrium studies were used to investig Na divalent exchange and to derive Gapon c stants for three Hawaii Vertisols. Obtained regr sion coefficient values indicated that a linear re tionship exists between exchangeable sodi ratios (ESR) and sodium adsorption ratios (SA for tropical Vertisols. ESR values obtained for t

of the soils were slightly lower than the values predicted by Bower's equation and higher than those predicted by the U.S. Salinity Laboratory's equation. ESR values obtained for the third soil were lower than those predicted by either equation. Generally, the higher preference of surface than of subsurface horizons for Na was confirmed. Prevailing electrolyte concentration levels were found more important than any other experimental variable in affecting the precision of ESR estimates for a given SAR. Although ESR values were generally higher at 0.1N than at 0.01N, the valence-dilution effect was reversed for the surface horizon of one Vertisol during Mg-Na exchange. While little difference was noted between Ca-Na and Mg-Na exchange in one of the soils, in the other two significantly smaller ESR values were obtained for the first than for the second reaction. An unexpected type of hysteresis effect was noted, whereby divalent-soils exhibited greater preference for Na than did Na-soils. Possible reasons for this effect are discussed. (Skogerboe-Colorado State)
W75-11595

**RICE RESPONSE TO NITROGEN AND PHOSPHORUS IN FLOODED AND NON-FLOODED SOILS,**
National Fertilizer Development Center, Muscle Shoals, Ala.
For primary bibliographic entry see Field 3F.
W75-11597

**COMPARATIVE EFFICIENCY OF SOLUBLE AND CONTROLLED-RELEASE SULFUR-COATED UREA NITROGEN FOR CORN IN TROPICS,**
University of the West Indies, St. Augustine (Trinidad).
For primary bibliographic entry see Field 3F.
W75-11601

**RELATION BETWEEN NITRATE ABSORPTION AND WATER TRANSPIRATION BY CORN,**
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W75-11602

**SALT TOLERANCE OF MEXICAN WHEAT: II. RELATION TO VARIABLE SODIUM CHLORIDE AND LENGTH OF GROWING SEASON,**
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
C. T. Bernal, F. T. Bingham, and J. Oertli.
Soil Science Society of America Proceedings, Vol 38, No 5, p 777-779, September-October, 1974. 7 fig, 2 tab, 15 ref.

Descriptors: *Wheat, Crop response, Crop production, Germination, *Salinity, *Salt tolerance, Sodium chloride.
Identifiers: *Mexican wheat.

Germination, seedling growth, and grain production of four short-season, one intermediate-season, and three long-season varieties of Mexican wheat were studied in relation to variable NaCl salinity. Germination counts after 7 days exposure to NaCl solutions in petri dishes revealed that the wheats as a group are relatively tolerant, germinating freely in the presence of -16 to -20-atm osmotic potential. Tolerance at germination was not associated with any obvious properties such as length of growing season or seed hardness. The eight wheat varieties were grown from seedling stage to maturity in sand cultures with a complete nutrient solution containing sufficient NaCl to produce total osmotic potentials of 0.5, -2.5, and -5.5 atm. Plots of relative grain yield in relation to osmotic potential of substrate revealed two general relationships, one for the short-season varieties and one for the long-season varieties. (Skogerboe-Colorado State)
W75-11603

**SULFUR AND MANGANESE RELEASE FROM SOILS TREATED WITH PRILLED SULFUR AND SULFUR-BENTONITE,**
Missouri Univ., Clinton. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W75-11604

**MULTIPURPOSE SALT TREATED WATER HARVESTING SYSTEM,**
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3B.
W75-11828

**RATE OF PHOSPHORUS SORPTION BY FIVE OKLAHOMA SOILS,**
Robert S. Kerr Environmental Research Lab., Ada, Okla. National Water Quality Control Research Program.
For primary bibliographic entry see Field 3F.
W75-11836

**PERFORMANCE OF RICE VARIETIES IN A HIGHLY SALINE SODIC SOIL AS INFLUENCED BY PLANT POPULATION,**
Central Soil Salinity Research Inst., Karnal (India). Div. of Soils and Agronomy.
K. S. Dargan, I. P. Abrol, and D. R. Bhumbla.
Agronomy Journal, Vol 66, No 2, p 279-280, March-April, 1974. 2 tab, 3 ref.

Descriptors: *Salinity, *Saline soils, *Crop response, *Rice, Plant populations, Germination, Alkalinity, Reclamation, *Sodic soils.

It is generally recognized that increased initial plant population or increased seeding rate in saline sodic soils would compensate for decreased germination, and seeding mortality. However, there is little or no experimental evidence of the gains obtained from such a practice. In present investigation, the performance of seven rice varieties at three plant populations in a highly saline sodic soil was studied in the field at the Central Soil Salinity Research Institute, Karnal, India. Varieties tested were the tall indica types 'Jhona 349'; 'Jhona 351,' 'Basmati 217,' and 'Basmati 370' and the semidwarf types 'IR 8,' 'IR8-68' and 'Jaya'. Plant populations used were 2, 4, and 6 transplants/hill. Variety IR 8-68, a local selection from IR 8, with 6 transplants/hill gave the significantly highest grain yield at 57.33 quintals/ha. Variety IR 8 at 6 transplants/hill and Jhona 349 at 4 transplants/hill yielded next in order. Increase in plant population from 2 to 4 and 6 transplants/hill resulted in significantly higher grain yield in all varieties except Jhona 349 where there was a decrease at 6 transplants/hill. Increased yield resulted from increased survival of hills and greater number of panicle-bearing tillers per hill. (Skogerboe-Colorado State)
W75-11838

**IRRIGATION MANAGEMENT FOR SALT CONTROL,**
Agricultural Research Service, Riverside, Calif. Salinity Lab.
J. van Schilfgaarde, L. Bernstein, J. D. Rhoades, and S. L. Rawlins.
Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol 100, No IR3, p 321-338, September, 1974. 8 fig, 5 tab, 27 ref, 2 append.

Descriptors: *Salinity, *Saline soils, Saline water, Irrigation effects, Irrigation practices, Irrigation operation and maintenance, Irrigation water, *Water management(Applied).

Combination of a reevaluation of established crop salt tolerance data, recent advances in understanding of soil chemistry and application of soil physics principles leads to a proposed management system for irrigation that can result in significant reductions in the amount of salt discharged for irrigation projects. These concepts can play a major part in advancing irrigation agriculture, while meeting the challenge of minimizing water quality degradation. Adoption will require changes in irrigation management that call for far closer control of amount and uniformity of water applied than is customary. (Skogerboe-Colorado State)
W75-11845

## 3D. Conservation In Domestic and Municipal Use

**URBAN DRAINAGE AND FLOOD CONTROL PROJECTS. ECONOMIC, LEGAL AND FINANCIAL ASPECTS,**
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W75-11352

**COUNTY COMBATS URBAN STORM WATER RUNOFF PROBLEMS,**
Mecklengurg County, Engineer's Office, Charlotte, N.C.
For primary bibliographic entry see Field 5G.
W75-11390

**STORM AND COMBINED SEWER ABATEMENT TECHNOLOGY IN THE UNITED STATES--AN OVERVIEW,**
Environmental Protection Agency, Washington, D.C. Municipal Pollution Control Div.
For primary bibliographic entry see Field 5D.
W75-11414

**ROLE OF COMPUTER SIMULATION IN ADMINISTERING AN URBAN DRAINAGE ORDINANCE,**
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 6E.
W75-11669

**WATER RESOURCES PLANNING IN URBAN AREAS,**
Office of the Chief of Engineers (Army), Washington, D.C. Urban Studies Branch.
For primary bibliographic entry see Field 5D.
W75-11769

**FORECASTING URBAN WATER USE: COMMERCIAL ESTABLISHMENTS,**
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6D.
W75-11795

## 3E. Conservation In Industry

**FLOAT-WASH FRACTIONATOR SAVES FIBRE AND WATER AT GRAND'MERE,**
Consolidated-Bathurst Ltd., Grand'Mere (Quebec).
For primary bibliographic entry see Field 5D.
W75-11363

**NEW EFFLUENT TREATMENT PLANT OPENED AT BRISTOL FOR BOARD MILLS.**
For primary bibliographic entry see Field 5D.
W75-11364

**WATCH THAT WATER,**
For primary bibliographic entry see Field 5D.

W75-11368

**TREATMENT OF WASTE WATER FROM TEXTILE DYEING PROCESS (SENSHOKU HAISUI SHORI),**
For primary bibliographic entry see Field 5D.
W75-11374

**PLATING AND CYANIDE WASTES (LITERATURE REVIEW),**
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5D.
W75-11545

**REPORT OF ANALYSES FOR INDUSTRIAL WASTE WATER IN TWENTY-EIGHT FACTORIES, (IN JAPANESE),**
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5A.
W75-11671

**AN INTEGRATED POWER PROCESS MODEL OF WATER USE AND WASTE WATER TREATMENT IN CHLOR-ALKALI PRODUCTION,**
Houston Univ., Tex. Dept. of Quantitative Management Science.
For primary bibliographic entry see Field 5D.
W75-11765

## 3F. Conservation In Agriculture

**UTILIZATION OF WATER IN A SEMI-ARID REGION,**
New Mexico State Univ., Clovis. Plains Branch Agricultural Experiment Station.
H. D. Fuehring.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 880, $3.75 in paper copy, $2.25 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report 059, September 1975, 35 p, 23 tab. OWRT B-029-NMEX(1).

Descriptors: *Antitranspirants, *Rain water, Surface runoff, Water conservation, Small watersheds, Moisture stress, *Sorghum, Nitrogen, *Water utilization, Droughts, Dry farming, Arid lands, *Crop production, Southwest US, New Mexico, Wheat.
Identifiers: *Atrozine, Rain-water efficiency, *Southern High Plains(NMex), Sunflower.

A five-year study in the Southern High Plains (annual rainfall of 16 inches) using combinations of bare micro-watershed and growing bed widths resulted in increased crop yields on the growing beds as the proportion of micro-watershed was increased. However, yields for the entire area (including both bed and shed) decreased. Limited work indicated the possibility of also cropping the shed areas and it was concluded that this would be a more practical way of utilizing micro-watersheds. Grain sorghum and sunflowers were successful dryland crops on both beds and sheds while wheat was more suitable as a crop on the sheds rather than on the beds. The use of an antitranspirant (atrazine) gave promising results on grain sorghum but further work is needed. (Hain-New Mexico State)
W75-11356

**EFFECTS OF SOIL TEMPERATURE AND SOIL MOISTURE IN PODDING ZONE ON POD DEVELOPMENT OF PEANUT PLANTS, (IN JAPANESE),**
Ministry of Agriculture and Forestry, Konosu (Japan). Central Agricultural Experiment Station.
Y. Ono, K. Nakayama, and M. Kubota.
Proc Crop Sci Soc Jpn, Vol 43, No 2, p 247-251, 1974. Illus.

Descriptors: *Soil temperature, *Soil moisture, *Peanuts, Plant physiology.
Identifiers: Podding zone, *Pods(Peanuts).

To examine the effects of soil temperature and soil moisture in the podding zone on the pod development of a peanut variety. Chiba-handachi (large seed, semi-erect type), 3 experiments were carried out under the condition separating the podding zone from that in which the roots were grown. In experiment-I, the mean soil temperatures in the podding zone were 38.6 C, 30.6 C, 22.9 C and 15.3 C. Experiment-II was performed under 4 soil moisture conditions, namely 57.3, 40.3, 21.5 and 7.8% of total soil volume. In experiment-III, the effects of the treatments combining high soil temperature (37-39 C) and low soil moisture (6-8%) in the podding zone; every 10 days after the peg penetration, development was examined. The inception and rate of the pod development were affected remarkably by soil temperature. In the podding zone, optimum soil temperature was 31-33 C; minimum soil temperature was 15-17 C; and maximum soil temperature was 37-39 C. The optimum soil moisture content in the podding zone was about 40% of total soil volume, regardless of the soil moisture content in the rooting zone. When the soil moisture content was lower than 40%, the podding percentage and the thickening growth of the pod were reduced, and when it was higher than 40%, only the thickening growth of the pod was reduced. The most critical period in the pod stage is the 1st 30 days, especially 20-30 days after peg penetration.--Copyright 1975, Biological Abstracts, Inc.
W75-11456

**INFILTRATION AND RUNOFF FOR SMALL FIELD PLOTS UNDER CONSTANT INTENSITY RAINFALL,**
Hebrew Univ., Rehovoth (Israel). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 3B.
W75-11458

**RIVER REGIME WITH SPECIAL REFERENCE TO RIVER NILE,**
Assiut Univ. (Egypt). Dept. of Hydraulics.
For primary bibliographic entry see Field 2J.
W75-11464

**GRAIN SORGHUM EVAPOTRANSPIRATION AND WATER USE EFFICIENCY UNDER TRICKLE IRRIGATION,**
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
T. A. Howell, and E. A. Hiler.
Presented at 1974 Annual Meeting of the American Society of Agricultural Engineers, June 23-26, 1974. Stillwater, Oklahoma. Paper No 74-2046. 23 p, 5 fig, 3 tab, 38 ref.

Descriptors: *Grain sorghum, *Evapotranspiration, *Irrigation practices, Irrigation systems, Irrigation, Water utilization.
Identifiers: *Trickle irrigation, *Drip irrigation.

Water use efficiency of grain sorghum may be increased by tulizing trickle irrigation to apply frequent, but small irrigation quantities and limiting these applications according to the stage of plant development. Water deficits which occur before the milk to soft dough stage of grain sorghum development can reduce yield and water use efficiency. However, careful regulation of the irrigation quantity to minimize water deficits during those periods can increase water use efficiency. Stage II (boot to bloom) is the most critical period. Utilizing an existing soil water balance model to determine plat transpiration futher reinforced this conclusion when the yield per unit of transpired water was computed. (Skogerboe-Colorado State)
W75-11582

**MOISTURE AVAILABILITY AND CROP PRODUCTION,**
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
G. H. Hargreaves.
Presented at 1974 Annual Meeting of the American Society of Agricultural Engineers, June 23-26, 1974. Stillwater, Oklahoma, Paper No 74-4010. 13 p, 1 fig, 2 tab, 7 ref.

Descriptors: *Crop production, *Moisture availability, Moisture deficit, Evapotranspiration, Irrigation, Irrigation design, Methodology.

Although yield data are available for agricultural crops at many locations, there is a scarcity of data relating yield to moisture availabilty. Improved evaluation of the effect of moisture could be accomplished through improved standaridization and more uniformity in reporting procedures. Many interacting factors result in various levels of crop yields. However, there is a surprising degree of uniformity in response to level of moisture availability when data from various experiments are analyzed in a standardized manner. General acceptance of more complete and thorough methods for the quantitative evaluation of moisture deficiencies will improve the valuation of climate as a resource to be considered in development. The methodology given also provides a useful tool for irrigation development planning, irrigation design and the scheduling of irrigation applications. (Skogerboe-Colorado State)
W75-11583

**'CHAMBER METHOD' FOR DRIP IRRIGATION SYSTEM DESIGN AND INSTALLATION PROCEDURES,**
Massachusetts Univ., Amherst. Dept. of Food and Agricultural Engineering.
E. S. Pira.
Presented at 1974 Annual Meeting of the American Society of Agricultural Engineers, June 23-26, 1974. Stillwater, Oklahoma. Paper No 74-2047. 12 p, 6 fig, 2 tab, 6 ref.

Descriptors: *Irrigation design, *Head loss, *Design criteria, Irrigation methods, Flow rate, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

High pressure water is supplied through a 'quick fill' and pressure reducing means to a low pressure distribution chamber. Relatively uniform pressure along the length of the chamber produces relatively uniform flow from the drippers. System designs, components, and installation procedures based on laboratory and field tests are discussed. Darcy's pressure loss equation and Bernoulli's flow equation provide a basis for design. The chamber method irrigation systems. Drippers with tubing segments attached as described eliminate dripper failure problems. The chamber must be charged rapidly for efficient system operation. The diameter of the chamber is a determining factor which limits the number of drippers that can be used and the maximum chamber length. Relatively uniform pressures can be maintained from the beginning to the end of a chamber, at low flow rates. Consequently, flow from the drippers is relatively uniform. Flow rate from the drippers can be adjusted by changing the pressure in the chamber. (Skogerboe-Colorado State)
W75-11584

**FIELD TEST OF SOIL WATER FLUX METER,**
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 2G.
W75-11586

**OPTIMIZING WATER UTILIZATION THROUGH MULTIPLE CROPS SCHEDULING,**
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.

W. Huang, T. Liang, and I. Wu.
Presented at 1974 Annual Meeting of the American Society of Agricultural Engineers, June 23-26, 1974. Stillwater, Oklahoma, Paper No 74-2043. 26 , 8 fig, 6 tab, 19 ref.

Descriptors: *Water utilization, *Scheduling, Optimization, Linear programming, Model studies, Crops, *Hawaii, *Reservoir operation.

A deterministic linear programming model is developed for optimal use of water resources in a small Hawaiian reservoir system. Results from the application of the model show that through multiple cropping schemes, efficient use of water can be achieved and production acreage can be expanded. (Skogerboe-Colorado State)
W75-11587

**IMULATION OF CROP RESONSE TO ENERY INPUTS,**
irginia Polytechnic Inst. and State Univ., lacksburg. Dept. of Agricultural Engineering.
. W. Williams, and W. J. Chancellor.
resented at 1974 Annual Meeting of the American ociety of Agricultural Engineers, June 23-26, 974. Stillwater, Oklahoma, Paper No 74-5019. 39 11 fig, 8 tab, 11 ref, 3 append.

escriptors: *Mathematical models, Crop production, *California, Simulation analysis, Energy, omputer.
entifiers: Energy shortages.

athematical models of crop yields as a function five energy-related inputs were developed for alifornia Agriculture. The models were used in a mputer simulation to determine the effects of ortages of the inputs upon total crop production. kogerboe-Colorado State)
75-11588

**OMPARING TRICKLE, SUBSURFACE AND PRINKLER IRRIGATION SYSTEMS,**
outh Dakota State Univ., Brookings. Water esources Inst.
D. Brosz, and J. L. Wiersma.
esented at 1974 Annual Meeting of the American ociety of Agricultural Engineers, June 23-26, 74. Stillwater, Oklahoma, Paper No 74-2045. 16 5 fig, 7 tab, 4 ref.

escriptors: *Subsurface irrigation, *Sprinkler irrigation, Irrigation systems, Crop response, rn(Field), Potatoes, Irrigation efficiency.
entifiers: *Trickle irrigation, Drip irrigation.

ree years of data were collected on yield sponses of potato and hybrid corn crops irated by trickle, subsurface, and sprinkler irrigan systems. The study was conducted on field ots which included six irrigation system design atments that were replicated three times. The sign treatments included every row and every ter row trickle and subsurface irrigation, small quent sprinkler application, and larger, less quent sprinkler applications. Potato and corn oduction could be increased by 5 to 15 percent h 20 percent less water applied through the use trickle and subsurface irrigation. A water ings of 30 to 40 percent could possibly be hieved with trickle and subsurface irrigation for lds that are essentially the same as those obed with sprinkler irrigation. Trickle and subface irrigation systems allow for a more effint water management operation. Tensiometers talled in the research plots showed that the soil ter tension was higher for the trickle and subface plots. The irrigation system design treatnts had no effect on potatoe crop maturity or lity. The sprinkler irrigation system design that plied small, frequent water depths did have an ect on the grain quality of a corn crop in that ck masses of spores appeared on the ears of the n plant. (Skogerboe-Colorado State)
5-11589

**A COMPARISON OF 15N-DEPLETED AND 15N-ENRICHED FERTILIZERS AS TRACERS,**
California Univ., Davis. Dept. of Soils and Plant Nutrition.
J. L. Starr, F. E. Broadbent, and P. R. Stout.
Soil Science of America Proceedings, Vol 38, No 2, p 266-267, March-April, 1974. 1 fig, 1 tab, 3 ref.

Descriptors: Fertilization, *Nitrogen, Isotope studies, Crop response, Nitrates, *Tracers, Absorption, *Fertilizers.
Identifiers: *Ryegrass.

((14)NH4)2SO4 from which virtually all (15)N had been removed was compared as a tracer with (NH4)2SO4 containing 8.95% (15)N excess in a plant uptake experiment using soil columns maintained at 1/3 bar tension and conventional greenhouse pots. Uptake of fertilizer nitrogen in three cuttings of ryegrass was identical with the two fertilizers. Estimates of residual fertilizer N in the pots agreed less closely, owing to the high dilution factor. (Skogerboe-Colorado State)
W75-11591

**PREDICTING EXCHANGEABLE SODIUM RATIOS IN IRRIGATED TROPICAL VERTISOLS,**
Hawaii Inst. of Geophysics, Honolulu.
For primary bibliographic entry see Field 3C.
W75-11595

**NITRIFICATION AND DENITRIFICATION DURING MISCIBLE DISPLACEMENT IN UNSATURATED SOIL,**
California Univ., Davis.
C. Kirda, J. L. Starr, C. Misra, J. W. Biggar, and D. R. Nielsen.
Soil Science Society of America Proceedings, Vol 38, No 5, p 772-776, September-October, 1974. 5 fig, 1 tab, 15 ref.

Descriptors: *Nitrification, *Denitrification, *Leaching, Diffusion, Soil water, Soil properties, Soil chemistry, Unsaturated flow.
Identifiers: Microbial growth, Nitrogen transformations.

Nitrification and denitrification during the leaching of a pulse of NH4NO3 applied to the surface of soil columns are analyzed experimentally and theoretically. Experimentally, unsaturated soil columns of two lengths were leached steadily with a trace solution containing NH4NO3 while the air-filled portions of the columns were being flushed simultaneously with air. During these steady state conditions, a pulse of tracer solution containing either 15NH4(+) or 15NO3(-) was leached through the columns. The words tracee and tracer signify that both solutions were chemically identical with the latter containing a greater proportion of 15N. Steady-state tracee concentration distributions within the columns as well as the transient tracer concentration distributions in the effluent were analyzed assuming first-order kinetics. Values of both the rate coefficients and the concentration distributions stemming from the tracee and tracer measurements were in general agreement. The agreement between the measured and theoretical results are discussed in terms of soil water properties and the kinetics of microbial populations. (Skogerboe-Colorado State)
W75-11596

**RICE RESPONSE TO NITROGEN AND PHOSPHORUS IN FLOODED AND NONFLOODED SOILS,**
National Fertilizer Development Center, Muscle Shoals, Ala.
G. L. Terman, and S. E. Allen.
Soil Science Society of America Proceedings, Vol 38, No 5, p 780-784, September-October, 1974. 3 fig, 5 tab, 12 ref.

Descriptors: *Rice, *Nitrogen, Nitrification, *Phosphorus, *Crop response, Greenhouse, Flood irrigation, Flooding.

Pot experiments were conducted in a greenhouse to study nutrition of rice under flooding and upland conditions. Yields of rice grown in one experiment on Mountview silt loam increased rectilinearly with 0-, 400-, and 800-mg rates of N/pot (5 kg of soil). Concentrations of N in grain + straw at maturity were uniformly low. Multiple rates of N from 250 to 2,000 mg/pot and P from 0 to 1,000 mg/pot (6.25 kg of soil) were applied for Nato rice grown on Mountview silt loam and Sango silty clay loam in a second experiment. Marked yield responses to N and P were obtained. Yields of straw and of grain + straw, N uptake, and N recovery were higher on nonflooded than on flooded soils. Grain yields, however, were slightly higher with flooding. Uptake of N, P, Ca, Mg, Mn, and Zn increased with yield response to N and P, while K uptake decreased on the Mountview soil. Concentrations of N and P increased with applied N and P, respectively, while concentrations of other nutrients were diluted in most situations with yield response to N or P on both flooded and nonflooded soils. These results indicate that with adequate applied nutrients, especially N, yields of rice with adequate water but without flooding can equal or even exceed those under flooding. (Skogerboe-Colorado State)
W75-11597

**MODIFIED PENMAN EQUATION TO PROVIDE THE UPPER BOUNDARY CONDITION IN COMPUTING EVAPORATION FROM SOIL,**
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 2D.
W75-11598

**COMPARATIVE EFFICIENCY OF SOLUBLE AND CONTROLLED-RELEASE SULFUR-COATED UREA NITROGEN FOR CORN IN TROPICS,**
University of the West Indies, St. Augustine (Trinidad).
R. C. Dalal.
Soil Science Society of America Proceedings, Vol 38, No 6, p 970-974, November-December, 1974. 3 fig, 5 tab, 11 ref.

Descriptors: *Nitrogen, *Urea, *Nitrification, *Corn(Field), Crop response, Nutrients, Absorption.
Identifiers: Ammonium sulfate, Urea-ammonium phosphate, Nitrogen uptake.

The efficiency of the soluble-N sources, ammonium sulfate (AS), urea-ammonium phosphate (UAP) and urea and controlled-release-N source, sulfur-coated urea (SCU-8.9, SCU-1.1, and SCU-0.9) of differing N-release rates applied at 50, 100, and 200 kg/ha of N to an acidic soil, were compared in terms of N uptake and grain yield of corn. The apparent N recovery of added N, calculated by uptake differences from the control plots, was evaluated from N uptake by the two successive crops, one in the wet season and the other in the following dry season. In general, N uptake, grain yield, and apparent N recovery were increased by added N; which was opposite to the nitrification of these N sources except that the performance of urea was better than the other soluble-N sources, primarily because it had a smaller effect on soil pH and exchangeable Al. The inclusion of microbicide in the S-coatings of SCU had no influence on N efficiency or grain yield. More N was recovered from SCU with slower N-release characteristics irrespective of coating weight. Apparent recovery of added N was almost complete from urea, SCU-8.9, SCU-1.1 and SCU-0.9 when applied at the rate of 50 kg/ha of N, although the recovery at 200 kg/ha of N was about 50%. (Skogerboe-Colorado State)
W75-11601

**RELATION BETWEEN NITRATE ABSORPTION AND WATER TRANSPIRATION BY CORN,**
North Carolina State Univ., Raleigh. Dept. of Soil Science.
C. F-H. Liao, and W. V. Bartholomew.
Soil Science Society of America Proceedings, Vol 38, No 3, p 472-477, May-June, 1974. 5 tab, 17 ref.

Descriptors: *Nitrates, *Absorption, *Transpiration, Leaching, Corn(Field), Crop response, Evapotranspiration, Diffusion.

The relationship between the absorption of NO3-N by young corn plants and the quantity of water transpired was studied in solution and soil culture. Tracer N was employed to measure NO3 absorption. Gravimetric methods were used to monitor evapotranspiration. From solution culture, NO3 was absorbed at rates relatively greater than water. From soil culture, NO3 was absorbed at a relative rate close to that of water when the soil was not pretreated. However, when the soil material was wetted and leached of soluble N before planting corn, NO3 was absorbed at a relative rate 1.5 to 2.0 times that of water. In soil situations where water was not being absorbed by plants, NO3-N likewise was not absorbed. Mass flow and diffusion both were involved in NO3 transport to roots. Prior cultural conditions had a marked influence on active uptake of NO3 presumably through an influence on specific rates of N absorption. (Skogerboe-Colorado State)
W75-11602

**SALT TOLERANCE OF MEXICAN WHEAT: II. RELATION TO VARIABLE SODIUM CHLORIDE AND LENGTH OF GROWING SEASON,**
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 3C.
W75-11603

**AGRICULTURAL DRAINAGE RESEARCH NEEDS AND PRIORITIES, 1974,**
Agricultural Research Service, Baton Rouge, La.
For primary bibliographic entry see Field 4A.
W75-11632

**PROCEEDINGS OF THE WATER HARVESTING SYMPOSIUM, PHOENIX, ARIZONA, MARCH 26-28, 1974.**
Western Regional Research Lab., Berkley, Calif.
For primary bibliographic entry see Field 3B.
W75-11800

**WATER HARVESTING FOR LIVESTOCK IN WESTERN AUSTRALIA,**
Western Australia Dept. of Agriculture, Katanning. Soil Conservation Service.
For primary bibliographic entry see Field 3B.
W75-11801

**WATER DEVELOPMENT IN MANAGEMENT OF LIVESTOCK AND WILDLIFE ON MOUNTAIN WILDLANDS,**
Wasatch National Forest, Salt Lake City, Utah. Range, Wildlife and Watershed Management.
For primary bibliographic entry see Field 3B.
W75-11804

**WATER HARVESTING CATCHMENTS ON INDIAN LANDS IN THE SOUTHWEST,**
Bureau of Indian Affairs, Phoenix, Ariz.
For primary bibliographic entry see Field 3B.
W75-11809

**HYDROLOGIC ASPECTS OF WATER HARVESTING IN THE NORTHERN GREAT PLAINS,**
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 2A.
W75-11811

**DESERT STRIP FARMING--COMPUTER SIMULATION OF AN ANCIENT WATER HARVESTING TECHNIQUE,**
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3B.
W75-11812

**A COMPUTER MODEL FOR OPTIMIZING DESIGN OF IMPROVED CATCHMENT,**
Western Australia Dept. of Agriculture, Moora. Soil Conservation Service.
For primary bibliographic entry see Field 3B.
W75-11813

**SEALING LEAKING EXCAVATED TANKS ON FARMS IN WESTERN AUSTRALIA,**
Western Australia Dept. of Agriculture, South Perth. Soils Div.
For primary bibliographic entry see Field 3B.
W75-11814

**WATER HARVESTING BY RUNOFF INDUCEMENT FOR IRRIGATION OF AN ALMOND ORCHARD IN A SEMIARID CLIMATE,**
United Nations Development Program, New Delhi (India).
For primary bibliographic entry see Field 3B.
W75-11818

**FIELD EVALUATION OF MICROWATERSHED AND VERTICAL MULCH SYSTEMS,**
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 3B.
W75-11819

**CROP PRODUCTION BY WATER HARVESTING,**
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3B.
W75-11823

**RUNOFF UTILIZATION FOR GRAIN PRODUCTION,**
Agricultural Research Service, Bushland, Tex. Southwestern Great Plains Research Center.
For primary bibliographic entry see Field 3B.
W75-11824

**WATER HARVESTING FOR BARLEY IN A 30-CM WINTER RAINFALL AREA,**
California Univ., Riverside.
For primary bibliographic entry see Field 3B.
W75-11825

**OPPORTUNITY FOR HARVESTING WATER FROM AND ALONG HIGHWAYS IN RANGELAND AREAS OF WYOMING,**
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 3B.
W75-11826

**DIFFERENT SOIL TREATMENTS FOR HARVESTING WATER FOR RADISH PRODUCTION IN THE MEXICO VALLEY,**
Escuela Nacional de Agricultura, Chapingo (Mexico). Dept. of Soils.
For primary bibliographic entry see Field 3B.
W75-11829

**PARAMETERS FOR ESTIMATING ANNUAL RUNOFF AND SOIL LOSS FROM AGRICULTURAL LANDS IN RHODESIA,**
Agricultural Engineering Centre, Salisbury (Rhodesia)
For primary bibliographic entry see Field 4A.
W75-11830

**EFFECTS OF WATER MANAGEMENT AND SOIL AGGREGATION ON THE GROWTH AND NUTRIENT UPTAKE OF RICE,**
California Univ., Davis. Dept. of Agronomy and Range Science.
A. J. Obermueller, and D. S. Mikkelsen.
Agronomy Journal, Vol 66, No 5, p 627-632, September-October, 1974. 5 tab, 20 ref

Descriptors: *Water management(Applied), *Soil aggregates, Crop response, *Nutrients, Nutrient requirements, *Rice, *Crop production, *Flood irrigation, Surface irrigation, Irrigation practices, Root distribution, *Absorption.

Flooding is considered essential for the optimum growth and yield of rice (Oryza sativa). The benefits of flooding are not well understood, even though they have been associated with a reduction in soil moisture stress, alteration of root development, increased availability of plant nutrients, control of weeds, and a modified micro-climate environment. Since modification of soil aggregation may also influence some of the same plant responses as flooding, these effects were examined. The growth and development of rice, cv 'Calrose,' was closely observed from seedling stage to maturity in a controlled greenhouse environment. At harvest the yield components, total yield of grain and straw, root production and distribution, and total uptake of N, P, K, Ca, Mg, Mn, An, Fe, and Si were determined. Rice plants grown under flooded conditions were superior to nonflooded plants except for the first 40 days after planting. Soil aggregation had little effect on the growth and development of flooded rice, but normal flooded rice was benefited by the puddled soil. (Skogerboe-Colorado State)
W75-11832

**BASIC PRINCIPLES OF PULSE IRRIGATION,**
Technion-Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
D. Karmeli, and G. Peri.
Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol 100, No IR3, p 309-319, September, 1974. 2 fig, 3 tab, append.

Descriptors: *Irrigation systems, *Irrigation practices, Irrigation effects, Irrigation design, Sprinkler irrigation, *Application methods, Water conservation.
Identifiers: High frequency irrigation, *Pulse irrigation, Trickle irrigation, Drip irrigation.

The term pulse irrigation was defined qualitatively and quantitatively. This irrigation technique is described in terms of its main purpose which is achievement of low application rate with the help of an irrigation device having a higher application rate. The present analysis based on mathematical and engineering considerations enables the determination of the characteristics of pulse irrigation (e.g., length of operating and resting time in a single pulse and the number of pulses). (Skogerboe-Colorado State)
W75-11833

**EFFECT OF BACKFILL ON DRAIN FLOW IN LAYERED SOILS,**
California Univ., Davis.
For primary bibliographic entry see Field 8D.
W75-11834

**ATE OF PHOSPHORUS SORPTION BY FIVE KLAHOMA SOILS,**
bert S. Kerr Environmental Research Lab., a, Okla. National Water Quality Control search Program.
G. Enfield.
l Science Society of America Proceedings, Vol No 3, p 404-407, May-June, 1974. 7 fig, 1 tab, ref.

scriptors: *Fertilizers, Fertilization, osphorus, Equations, *Sorption, *Oklahoma, ils, Absorption.

o equations are evaluated in relation to their ability as rate equations for phosphorus sorp- by selected Oklahoma soils. The rate equation ch best fits experimental data was ds/dt = a(C he b power) (S to the c power) where S is the ed concentration (mass per unit weight of the s), C is solution concentration (mass per unit ght of the solution), t is time and a, b, and c are stants. (Skogerboe-Colorado State)
5-11836

**MPARISON OF FOG IRRIGATION WITH RFACE IRRIGATION IN CORN PRODUC-N,**
icultural Research Service, Auburn, Ala.
). Doss.
onomy Journal, Vol 66, No 1, p 105-107, uary-February, 1974. 3 tab, 8 ref.

criptors: *Mist irrigation, *Furrow irrigation, rface irrigation, Crop response, *Corn(Field), gation systems, Irrigation practices, Irrigation cts, *Crop production.
tifiers: *Fog irrigation.

er stress by plants during silking and ear elopment often affects the yield of corn. Water ss sometimes occurs during midday even with latively high soil water content. Field experi- ts were conducted for 3 years to determine the ct of fogging or mist irrigation alone, surface ation alone, and fogging plus surface irrigation lant characteristics and grain and stover yields rn. Plants received mist irrigation daily from until 1600 during silking and ear development. ace irrigation was applied to maintain soil r at or above the 50% available level (0.8 bar) e surface 60 cm of soil. An increase in grain was obtained in each of the 3 years with sur- irrigation and in 2 of the 3 years with fogging ist irrigation, but fogging in addition to sur- irrigation did not increase grain yields above e for surface irrigation alone. Average grain s for the 3 years were 6,200, 8,400, 9,200, and ) kg/ha for no irrigation, fogging, surface, and ng plus surface irrigation, respectively. gerboe-Colorado State)
-11837

**FORMANCE OF RICE VARIETIES IN A HLY SALINE SODIC SOIL AS IN-ENCED BY PLANT POPULATION,**
ral Soil Salinity Research Inst., Karnal a). Div. of Soils and Agronomy.
rimary bibliographic entry see Field 3C.
11838

**NTITY AND FREQUENCY OF TRICKLE FURROW IRRIGATION FOR EFFICIENT BAGE PRODUCTION,**
ultural Research Services, Phoenix, Ariz. r Conservation Lab.
Bucks, L. J. Erie, and O. F. French.
nomy Journal, Vol 66, No 1, p 53-57, Janua- bruary, 1974. 4 fig, 3 tab, 9 ref.

riptors: *Crop production, Crop response, sumptive use, Evapotranspiration, Irrigation ices, Irrigation systems, Irrigation efficiency, tion, Agriculture.
ifiers: *Trickle irrigation, *Drip irrigation, page.

Trickle irrigation, with its capability of small, frequent irrigation applications, has aroused considerable interest because of possible increased production and decreased water requirements. For this reason, a replicated field investigation was conducted to evaluate quantity and frequency of trickle, modified-furrow, and standard-furrow irrigations on the growth of cabbage, using a moderately saline water on a fine-textured soil. Trickle and modified-furrow irrigation were scheduled to supply various quantities of water based on ratios of the plant's estimated consumptive use at frequencies of 3, 6, and 12 days. Recorded data included yield, quality of production, and water-use efficiency. Results indicate that the consumptive-use requirement (38 cm of water in 1972) for high production of cabbage was about the same for all irrigation methods. Trickle and modified-furrow irrigation, however, did reduce furrow irrigation, showing that higher irrigation efficiencies can be attained with these new irrigation methods as opposed to conventional methods. (Skogerboe-Colorado State)
W75-11839

**CHOICE OF IRRIGATION TIMING INDICATOR FOR NARROW ROW COTTON,**
Kansas State Univ., Colby. Colby Branch Experiment Station.
D. G. Bordovsky, W. R. Jordan, E. A. Hiler, and T. A. Howell.
Agronomy Journal, Vol 66, No 1, p 88-91, January-February, 1974. 4 fig, 3 tab, 17 ref.

Descriptors: *Soil moisture, Soil-water-plant relationships, Water management(Applied), Irrigation efficiency, *Irrigation practices, Irrigation, Soil water potential, *Cotton.

This irrigation study was undertaken to compare water use efficiencies (WUE) resulting from three methods of timing water applications on narrow-row cotton. Irrigation timing during the 1971 and 1972 growing seasons was accomplished using the soil water potential (SWP)-fixed level, leaf water potential (LWP)-fixed level, and stress day index (SDI)-variable level of LWP, based on crop sensitivities, as indicators. Specific levels of each indicator were selected so that nearly identical yields would result for all three timing indicators, thus making possible the valid comparison of WUE. With the SWP indicator as a basis for comparison, higher WUE were obtained with the LWP and SDI indicators in both years. At a plant population of 150,000 plants/ha average increases in WUE (seed cotton yield divided by irrigation plus rainfall amounts) were 17 and 38% for the LWP and SDI indicators, respectively. These results demonstrate that significant benefits in stretching irrigation water supplies are possible when using plant-based measurements and when plant sensitivities at different growth stages are quantitatively considered in timing irrigations. (Skogerboe-Colorado State)
W75-11840

**EVAPOTRANSPIRATION BY SUBIRRIGATED ALFALFA AND PASTURE IN THE EAST CENTRAL GREAT PLAINS,**
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
B. L. Blad, and N. J. Rosenberg.
Agronomy Journal, Vol 66, No 2, p 248-252, March-April, 1974. 4 fig, 4 tab, 14 ref.

Descriptors: *Evapotranspiration, *Subsurface irrigation, *Alfalfa, Pastures, Irrigation practices, Irrigation, Nebraska, Latent heat, Advection, Energy budget, *Great Plains.

Evapotranspiration (ET) rates from subirrigated alfalfa pasture were obtained to provide an estimation of the upper and lower limits of water demand for crops growing in climatic regions characterized by strong advection of sensible heat. Results of this study showed that ET rates were 20 to 25% lower in pasture than in alfalfa. These differences are much larger than any previously reported in the literture. Advected sensible heat supplied about 20% of the total energy consumed in the latent heat flux (LE) from alfalfa for the entire study and as much as 40% on certain days. In the pasture, however, with few exceptions, sensible heat was generated rather than consumed. (Skogerboe-Colorado State)
W75-11841

**EFFECT OF PREPLANT-ONLY IRRIGATION ON COTTON YIELDS,**
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
J. D. Bilbro.
Agronomy Journal, Vol 66, No 6, p 833-834, November-December, 1974. 1 fig, 4 ref.

Descriptors: *Plant growth, *Crop response, *Cotton, Irrigation practices, Planting management, Irrigation, Dry farming, Irrigation effects.

Irrigation practices for cotton are changing on the Texas High Plains because the irrigation water supply is declining. The objectives of this study were to calculate yield probabilities for cotton planted on both early and late dates and grown with only a preplant irrigation, and then to compare these yield probabilities with those previously calculated for dryland conditions. Yields from early and late plantings that had received only a preplant irrigation for the period 1960 through 1971 were used for calculating probabilities for various yield levels. The expected average yields (50% probability) of the early and late plantings of preplant-irrigated cotton are 530 and 503 kg/ha, respectively; and about 70% of the time the respective yields will differ by less than 50 kg/ha. Thus, the yield potential of preplant-irrigated cotton was not greatly affected by a wide range of planting dates. Also, 50% of the time preplant-irrigated land can be expected to yield about twice as much as comparable dryland and to vary much less in year-to-year yields. (Skogerboe-Colorado State)
W75-11842

**VARIATION IN EFFECTIVENESS OF SUPPLEMENTAL IRRIGATION ON SWEET CORN YIELD COMPONENTS,**
Wisconsin Univ., Madison. Dept. of Agronomy.
R. H. Andrew, and G. G. Weis.
Agronomy Journal, Vol 66, No 3, p 345-350, May-June, 1974. 1 fig, 7 tab, 14 ref.

Descriptors: *Supplemental irrigation, *Crop response, *Sweet corn, Irrigation efficiency, Moisture availability, Moisture tension, Crop production, *Central US.

Supplemental irrigation is of increasing importance in the production of processing sweet corn in the humid Midwest. However, wide variation exists for efficiency of irrigation as related to uniformity and quality as well as yield of this crop. The present study was planned to measure the response of major sweet corn yield components to, and their interaction with, irrigation level as related to genotype, plant competition, and season and to provide guidelines for optimum production practice. Six hybrids were grown at three populations (39,000 49,000 and 59,000 plants/ha) under low and high irrigation levels on droughty sand in central Wisconsin over a 9-year period. Measurements were made of snapped weight, weight and number of usable husked ears, and percent of usable ears expressed on a weight and a number basis. (Skogerboe-Colorado State)
W75-11844

**IRRIGATION MANAGEMENT FOR SALT CONTROL,**
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 3C.

W75-11845

ANALYSIS OF CANAL SEEPAGE TO INTERCEPTOR DRAIN,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
For primary bibliographic entry see Field 8A.
W75-11846

# 4. WATER QUANTITY MANAGEMENT AND CONTROL

## 4A. Control Of Water On The Surface

URBAN DRAINAGE AND FLOOD CONTROL PROJECTS. ECONOMIC, LEGAL AND FINANCIAL ASPECTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W75-11352

THE SPACE/TIME COEEFFICIENT METHOD FOR CALCULATION OF RAINWATER RUNOFF (DAS RAUMZEITBEIWERTVERFAHREN FUER DIE BERECHNUNG VON REGENWASSERABFLUESSEN),
For primary bibliographic entry see Field 5D.
W75-11384

COST BENEFIT ANALYSIS AS DIMENSIONING BASIS OF FLOOD CONTROL MEASURES: AN EMPIRICAL REPORT (NUTZEN-KOSTEN-ANALYSE ALS GRUNDLAGE DER DIMENSIONIERUNG VON HW-SCHUTZMASSNAHMEN- EIN ERFAHRUNGSBERICHT),
For primary bibliographic entry see Field 6B.
W75-11415

HABITAT HETEROGENEITY AND AVIAN COMMUNITY STRUCTURE IN NORTH AMERICAN GRASSLANDS,
Oregon State Univ., Corvallis. Dept. of Zoology.
For primary bibliographic entry see Field 2I.
W75-11425

INFILTRATION AND RUNOFF FOR SMALL FIELD PLOTS UNDER CONSTANT INTENSITY RAINFALL,
Hebrew Univ., Rehovoth (Israel). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 3B.
W75-11458

PREDICTION OF FLOOD VOLUME FROM SMALL HUMID REGION WATERSHEDS,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Div. of Comprehensive Resources Programming.
S. L. Chiang.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Proceedings Paper 11466, p 817-828, July 1975. 5 fig, 1 tab, 13 ref, 2 append.

Descriptors: *Runoff forecasting, *Flood flow, *Surface runoff, *Small watersheds, *Hydrograph analysis, *Antecedent moisture content, *Ohio, *Pennsylvania, Hydrology, Humid areas, Hydraulics, Soil conservation.
Identifiers: Watershed parameters, Number of wetness curve.

The Soil Conservation Service approach of soil-cover complex concept was modified and refined for predicting runoff volumes from individual storms. Two definitions of runoff volume were examined. For each definition two approaches were investigated: (1) predicting runoff volume with soil-cover information and the SCS rainfall-runoff model, and (2) correlating runoff volumes with climatic and watershed parameters. The first approach required calibration of watershed wetness while the second used a direct correlation. Prediction equations were developed with 210 events from 15 Pennsylvania and Ohio watersheds less than 20 sq miles. Both approaches were tested on the 5 reserved watersheds with satisfactory results. The first approach was found superior to the second. The frequency distribution of watershed wetness associated with flood events was also presented. (Lardner-ISWS)
W75-11462

GENERATION OF HYDROLOGIC SAMPLES: CASE STUDY OF THE GREAT LAKES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W75-11476

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 6. MISSOURI RIVER BASIN--VOLUME 3, MISSOURI RIVER BASIN FROM SIOUX CITY, IOWA, TO NEBRASKA CITY, NEBRASKA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11486

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 8. WESTERN GULF OF MEXICO BASINS--VOLUME 2. BASINS FROM LAVACA RIVER TO RIO GRANDE.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11487

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 9. COLORADO RIVER BASIN--VOLUME 3. LOWER COLORADO RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11488

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 10. THE GREAT BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11489

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 12. PACIFIC SLOPE BASINS IN WASHINGTON--VOLUME 1. PACIFIC SLOPE BASINS IN WASHINGTON EXCEPT COLUMBIA RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11490

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 13. SNAKE RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11491

FLOODS IN THE WAIAHOLE-WAIKANE AREA, OAHU, HAWAII,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 2E.
W75-11495

DATA REQUIREMENTS FOR THE OPTIMIZ
TION OF RESERVOIR DESIGN AND OPERA
ING RULE DETERMINATION,
Geological Survey, Reston, Va.
I. C. James, II
In: Proceedings of Sumposium on the Design
Water Resources Projects with Inadequate Da
Volume 1, Madrid, June 1973, sponsored
UNESCO-WMO-IAHS Comite Espanol para
H I, p 211-224, 1973. 2 fig, 3 tab, 16 ref.

Descriptors: *Reservoir design, *Reservoir op
tion, *Data collections, *Hydrologic data,
timization, Cost-benefit analysis, Econom
Systems analysis

Estimates are given for the optimal length of
sequences for reservoir design where opera
rules are fixed, for operating rule determina
where reservoir design is fixed, and for the
bined determination of operating rules and re
voir size for a multipurpose reservoir where
benefit is a piecewise-linear function of sto
and release. A strategy is developed for
economically efficient design of the combined
gram of additional data collection and pr
deferment. The shape of the benefits foregone
sus time function is such that project deferme
usually optimal only where very short hydro
records exist, and the effect on an uncertain
ject inception data is to increase the optimal-l
of the data sequence. (Knapp-USGS)
W75-11500

LOW-FLOW CHARACTERISTICS
STREAMS IN THE GRAYS HAR
DRAINAGES, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2E.
W75-11502

PREDICTIVE MODELING OF EFFECTS
THE PLANNED KINDRED LAKE ON GRO
WATER LEVELS AND DISCHA
SOUTHEASTERN NORTH DAKOTA,
Geological Survey, Bismarck, N.Dak.
J. S. Downey, and Q. F. Paulson.
Water-Resources Investigations 30-74, O
1974. 22 p, 4 fig, 7 plate, 38 ref.

Descriptors: *Pre-impoundment, *Reservoi
*Model studies, *Water levels, *North D
Groundwater movement, Discharge(W
Aquifer characteristics, Planning, Forec
Evaluation, Dam construction, Hydroge
Water level fluctuations, Computer models.
Identifiers: *Groundwater discharge forec
*Groundwater levels.

A digital model was used to describe a g
water system in glacial deltaic deposits ne
dred, North Dakota, and to predict the effe
planned lake on groundwater levels and g
water discharge. A digital computer was
solve the finite-difference equations for
water flow. The model analysis delineated
of about 140 square miles (363 square kilo
that would be affected by rising water lev
result of the lake. The rise of water levels
on time and hydraulic properties of the
The maximum projected rise in water
should occure in about 50 years. Evapotr
tion from the water table is presently ne
imum and therefore the projected water-l
will not be controlled by evapotranspirati
isting aftificial drains will be effective in
the extent of water-level rise. (Woodard-U
W75-11503

HYDROLOGY FOR LAND-USE PLA
THE HILLSIDE AREA, ANCHO
ALASKA,
Geological Survey, Anchorage, Alaska.
L. L. Dearborn, and W. W. Barnwell.
Open-file report 75-105, 1975. 46 p, 31 fig,
ref, 6 append.

escriptors: *Water resources development, roundwater resources, *Land use, *Planning, laska, Aquifer characteristics, Hydrogeology, ater quality, Water pollution sources, Sewage luents, Streams, Water wells, Water supply, ater utilization, Surface waters, Hydrology, ell data, Drillers logs, Lithologic logs, Hydrolog-data.
ntifiers: *Anchorage(Alaska).

pid residential growth of the Hillside area, chorage, Alaska, may cause depletion of uifers and a change in quality of water resources a result of extensive development of small-lot cts. Groundwater yields are low and may be lo-ly inadequate for single family requirements ere wells produce from bedrock in the eastern lside region. At lower altitudes single family er requirements of 3 to 10 gallons per minute ally can be obtained, but aquifers capable of ng pumped at larger yields for public supplies uncommon. However, in a few localities, wells produce 40 to 300 gallons per minute from sand gravel aquifers lying within thick sequences of cial till. Streamflow within the Hillside area is lequate as a significant source of water for lic supply. The relative vulnerability of ams, lakes, and groundwater to pollution sed by the discharge of liquid waste, particu-y from onsite sewage-disposal systems, is lerate to high in about half the study area. At ner altitudes contamination of bedrock aquifers occur if discharge of liquid wastes is not regu-d. The deep sedimentary aquifers at lower al-les are less susceptible to contamination. odard-USGS)
5-11504

TLANDS - RELATED LEGISLATION IN E UNITED STATES,
mi Univ., Fla. School of Law.
primary bibliographic entry see Field 6E.
-11550

ASTAL RESOURCE USE: DECISIONS ON ET SOUND,
hington Univ., Seattle.
primary bibliographic entry see Field 6B.
-11573

MANAGEMENT OF LAND AND WATER IN THE COASTAL ZONE: A NEW LAW IS CTED IN NORTH CAROLINA,
h Carolina Univ., Chapel Hill. School of Law.
primary bibliographic entry see Field 6E.
-11575

ELOPMENT OF SALINITY CONTROL HNOLOGY IN GRAND VALLEY,
rado State Univ., Fort Collins. Dept. of cultural Engineering.
rimary bibliographic entry see Field 5G.
11585

MIZING WATER UTILIZATION OUGH MULTIPLE CROPS SCHEDULING,
ii Univ., Honolulu. Dept. of Agricultural En-ring.
rimary bibliographic entry see Field 3F.
11587

CER COUNTY SURFACE WATER URCES,
s Dept. of Conservation, Springfield. Div. of ries.
Pulley.
ary 1972. 83 p, 14 fig, 13 tab, 27 ref, 8 ap-

iptors: *Water resources, *Surface waters, ois, *Data collections, Lakes, Ponds, Reser-Recreation, Streams, Reservoir sites, Geomorphology, Climatic data, Geology, Soil texture.
Identifiers: *Mercer County(Ill).

Mercer County, located in northwestern Illinois along a 23.2 mile stretch of the Mississippi River, has an area of 555 square miles and a population of 17,294 (1970 census). The drainage pattern is composed of 4 major and 2 minor stream systems that flow directly into the Mississippi River. The natural drainage system has been altered only along the Mississippi River floodplain where ditches and levees have been constructed and several streams have been dredged and straightened. Including the Mississippi River, there are 167.5 miles of flowing water. The county has 502 impoundments larger than 0.1 acre, for a total of 1198.4 acres. Of these, 415 have been artificially created while 87 are of natural origin. The largest body of public water is the 1400 acres of interlocked sloughs, marshes, and pools of the Kethsburg Wildlife Refuge. New water is added at a rate of 8.3 impoundments per year averaging 2.5 acres each. Nine potential reservoir sites have been identified which would have impoundment surface areas ranging from 90 to 5000 acres. (Humphreys-ISWS)
W75-11622

**VERMILION COUNTY SURFACE WATER RESOURCES,**
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
R. W. Horner, and K. L. Brummett.
August 1972. 68 p, 18 fig, 7 tab, 25 ref.

Descriptors: *Water resources, *Surface waters, *Illinois, *Data collections, Water quality, Water pollution, Streams, Rivers, Lakes, Reservoirs, Nitrates, Hardness(Water), Recreation, Geomorphology, Climatic data, Geology, Soil texture, Fishing, Ponds, Boating, Fish.
Identifiers: *Vermilion county(Ill).

Vermilion County, with a population of 97,047 (1970 census), is located on the eastern border of Illinois about 140 miles south of the Illinois-Wisconsin line and has an area of 898 square miles. Natural streams and drainage lines are well established, although a number of flat areas had to be artificially drained before they could be farmed. The county is drained for the most part by the Vermilion River and its tributaries. The southern one-fifth of the county drains directly to the Wabash River via the Little Vermilion River. The total impoundment acreage is 1668.35 acres. In addition, there are 164.2 miles of major streams, with a surface area of 1002.8 acres. Of the total impoundment acreage, 11.0% is state owned, 3.3% is public, 34.2% is organizational, 0.7% is fee fishing, and 50.8% is private water. The most important recreational lakes of the county are those of Kickapoo State Park. There are 8 potential impoundment sites. If the proposed Middle Fork Reservoir project is completed, its will expand the impounded water area of the county 200% and the amount of publicly-available water by 1000%. Water pollution is severe and in certain instances parts of some streams are so degraded that they no longer support fish life. Sources of pollution in the county are agricultural, industrial, and municiple. (Humphreys-ISWS)
W75-11623

**LAWRENCE COUNTY SURFACE WATER RESOURCES,**
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
R. E. Fisher, and H. P. Brown.
November 1971. 54 p, 13 fig, 8 tab, 24 ref.

Descriptors: *Water resources, *Surface waters, *Illinois, *Data collections, Streams, Water quality, Climatic data, Soil texture, Fishing, Ponds, Fish, Recreation, Geology, Water pollution.
Identifiers: *Lawrence County(Ill).

Lawrence County is 239,360 acres in size and located on the southeastern edge of Illinois. The estimated population is 18,000 people (1971). There are currently 633 artificial impoundments comprising a total of 530.45 surface acres of water. Approximately 64% of the water acreage is classified as ponds (under 6.0 acres in size). Seven areas classified as either 'State', 'Public', or 'organizational' waters total 117.7 surface acres. In addition to the artificial impoundments, there are 11 natural or oxbow lakes totaling 62.90 acres. There are three major streams which are considered to have a fishing resource: Raccoon Creek, Embarras River, and Wabash River. They comprise a total of 2196 surface acres or 64 stream miles. There are several locations for impoundments up to 10 acres in size that could be developed for public or private use, but there is only one area that will impound over 100 surface acres of water. (Humphreys-ISWS)
W75-11624

**DE KALB COUNTY SURFACE WATER RESOURCES,**
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
G. J. Tichacek, and H. L. Wight.
December 1971. 72 p, 16 fig, 20 tab, 66 ref, 1 append.

Descriptors: *Water resources, *Surface waters, *Illinois, *Data collections, Water quality, Water pollution, Streams, Lakes, Ponds, Hardness(Water), Recreation, Geomorphology, Climatic data, Geology, Soil texture, Fishing, Boating.
Identifiers: *De Kalb County(Ill).

De Kalb County, covering a total of 636 square miles, is on the extreme south-western fringe of the 'Northeastern Illinois Metropolitan Area'. It has a population of 71,654 (1970 census). Surface drainage is divided between the Rock and Illinois River basins by the Cropsey lobe of the Bloomington-Cropsey Morainal System. There are a total of 11 lakes 6.0 acres and larger (including the proposed Shabbona Lake) and 143 ponds, inundating a total of 550.3 acres. There are also 17 permanent streams, the surface area of which covers 617.4 acres. The combined impoundments and stream data provide a grand total of 171 water areas covering 1167.7 acres. The combined length of all named streams is 247.8 miles. The soils were derived from parent materials which were distributed by three agents: ice, water, and wind. Of the parent materials, glacial till was by far the more important in the formation of the present soils. Till of various origins is within 20 feet of the surface over 90% of the county. Most of the tills are quite distinctive, having definite color and texture. Because of surface relief patterns and farming very close to the stream bank, siltation is a major problem in the county streams. Water areas are not grossly polluted at this time; however, there have been numerous reports of pollution occurrences in the county streams over the past 20 years. The limited data available for chemical quality of surfaces waters show that alkalinities averaged 307.4 ppm for the 17 streams sampled and 161.0 ppm for the impoundments. Hardness concentrations ranged from 478.0 ppm to 649.4 ppm and averaged 556.6 ppm for 11 of the streams. (Humphreys-ISWS)
W75-11625

**STUDIES OF FLOODPLAIN VEGETATION AND WATER LEVEL FLUCTUATION IN THE KISSIMMEE RIVER VALLEY,**
Central and Southern Florida Flood Control District, West Palm Beach. Resources Planning Dept.
R. L. Goodrick, and J. F. Milleson.
Technical Publication 74-2, March 1974. 60 p, 10 fig, 3 tab, 8 ref, 2 append.

Descriptors: *Channel improvement, *Vegetation, *Water level fluctuations, *Florida, Vegetation ef-

fects, Vegetation regrowth, Vegetation establishment, Germination, Canals, Channeling, Structures, Drawdown, Environmental effects, Herbicides, Burning, Aquatic plants, Marsh plants, Aquatic weed control, Environment, Flood control.
Identifiers: *Kissimmee River(Fla).

The Central and Southern Florida Flood Control Project in the Kissimmee River Basin consisted of enlarging existing canals connecting the upper chain of lakes, installing water control structures in several of these canals, and channelizing and providing control structures in the river proper (which extends from Lake Kissimmee to Lake Okeechobee). One major canal, designated C-38, was constructed within the Kissimmee River floodplain. Six regulatory structures were situated along the canal to control the drop in elevation. Stabilization of the water level in the impoundment area behind the regulatory structures since January 1969 has had a pronounced impact on the vegetational composition of the marshes. The lack of seasonal fluctuation has resulted in the dominance of terrestrial plants in the north end of the impoundment, the dominance of aquatic plants in the south end of the impoundment, and the inhibition of growth for most aquatic annuals. When competition was eliminated or reduced substantially and the underlying substrate was exposed during a drawdown, many additional species of both annual and perennial plants germinated and flourished. (Sims-ISWS)
W75-11628

**AGRICULTURAL DRAINAGE RESEARCH NEEDS AND PRIORITIES, 1974,**
Agricultural Research Service, Baton Rouge, La.
C. E. Carter, W. W. Donnan, I. G. King, and G. O. Schwab.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 3, p 529-534, May-June 1975. 1 fig, 3 tab.

Descriptors: *Research priorities, *Drainage, *Agriculture, Surface drainage, Subsurface drainage, Channels, Outlets, Humid areas, Arid lands, Surveys, Planning.

Drainage research has played an important role in increasing food and fiber production in the United States. In the future its importance is expected to increase as farmers attempt to increase crop yield per acre to meet the increased demands for food and fiber both at home and abroad. Results of a survey made during 1973 to 1974 to determine drainage research needs in the United States was reported. Agencies in each state within the United States were contacted and requested to list drainage research needs. The agencies included the Soil Conservation Service, Agricultural Research Service, Water Resource Research Institutes, Agricultural Experiment Stations, Cooperative Extension Service, and Bureau of Reclamation. Responses were compiled separately for humid and arid (irrigated) states for three categories: (1) subsurface drainage, (2) surface drainage, and (3) channels and outlets. Responses were further subdivided within each of these categories for 13 different research needs. The research needs cited most frequently in the survey (in decreasing order of priority) were: water quality, design, materials, and economics for the subsurface drainage category; water quality, environment, design, and economics for the surface drainage category; and design, environment, water quality, economics, and minatenance for the channels and outlets category. (Sims-ISWS)
W75-11632

**HYMO FLOOD ROUTING,**
Agricultural Research Service, Temple, Tex.
J. R. Williams.
Journal of Hydrology, Vol 26, No 1/2, p 17-27, July 1975. 7 fig, 2 tab, 7 ref.

Descriptors: *Flood routing, *Rainfall-runoff relationships, *Synthetic hydrology, Flood forecasting, Flood control, Flood protection, Hydrographs, Floods, Computer programs.
Identifiers: *HYMO computer program, *Variable Travel Time(VTT) flood routing.

The Variable Travel Time (VTT) flood routing method was developed to account for the variation in travel time with stage and water-surface slope. The VTT method is suited for HYMO, a problem-oriented computer language for building hydrologic models, because it requires little computer storage, routes both channel and floodplain flows, performs reliably under widely varied conditions, and given consistent results over a wide range of routing intervals and reach lengths. Although the solution is iterative, the VTT method requires little computer time and is free of convergence problems often encountered in more complex routing methods. By accounting for the variation in water-surface slope, the VTT method yields results that are comparable to the accurate results obtained with an implicit solution of the unsteady flow equations of continuity and motion. Yet the VTT method has the general applicability of storage methods. The use of the VTT method makes HYMO a useful and versatile model for water resources planning, water quality modeling, and hydrologic research. (Jess-ISWS)
W75-11647

**APPLICATION OF A GENERALISATION OF WALD'S IDENTITY TO SOLVING CERTAIN MULTI-STREAM STORAGE PROBLEMS,**
Monash Univ., Clayton (Australia). Dept. of Mathematics.
N. S. Barnett.
Journal of Hydrology, Vol 26, No 1/2, p 95-113, July 1975. 27 ref, 2 append.

Descriptors: *Stochastic processes, *Reservoir operation, *Markov processes, Synthetic hydrology, Systems analysis, Mathematical studies, Operations research, Reservoir storage, Reservoir releases, Streamflow, Dams, Flow control.
Identifiers: *Wald's identity, Random walk process.

The development of Wald's identity was traced with special reference to its application in solving storage problems. Research was specifically concerned with the problem of regulating the flow of water below the confluence of two streams by means of a dam built across one of them. Considering a model in which flows in the streams form independent Markov chains, expressions for the probability of emptiness and for p.g.f. of the time to first emptiness were obtained using a Markovian extension of Wald's identity. (Jess-ISWS)
W75-11649

**ANALYSIS OF PLUNGING PHENOMENA IN WATER RESERVOIRS,**
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
S. B. Savage, and J. Brimberg.
Journal of Hydraulic Research, Vol 13, No 2, p 187-205, 1975. 9 fig, 9 ref.

Descriptors: *Density currents, *Froude number, *Flow profiles, *Gradually varied flow, Energy, Hydraulics, Analysis, Reservoirs, Density, Open channel flow, Equations, Underflow, Shear stress, Slopes, Interfaces, Depth.
Identifiers: *Plunging flow, One-dimensional analysis, Two-layer flow, Plunge line.

The plunging of denser inflow water into a reservoir was analyzed by two approaches. A simple energy conserving flow analysis yielded the depth at the plunge point. A gradually varied two-layer flow analysis gave the depth at the plunge point and predicted the interfacial profile for cases with resistance and sloping beds. Both analyses were compared with experimental results reported by other investigators. (Adams-ISWS)
W75-11655

**BALANCING RESERVOIR--A KEY ELEMEN IN WATER SUPPLY PLAN,**
Freese and Nichols, Fort Worth, Tex.
I. B. Freese
Public Works, Vol 106, No 5, p 104-105, Ma 1975. 1 fig.

Descriptors: *Water supply, *Pipeline *Reservoirs, Rivers, Water treatment, Facilitie Construction materials, Synthetic rubber, *Texa
Identifiers: *Balancing reservoirs, Cedar Cre Project(Tex), Ft. Worth(Tex).

The water supply of Fort Worth, Texas has co from impounded river sources for over fifty yea A long term plan, the Cedar Creek Project, w developed to increase the quantity and treatm of water impounded. The plan involved the Ce Creek Reservoir, 80 miles southeast of Fo Worth; an intake pump station at the reserv 68.2 miles of 72-inch pipeline and associated pu stations, which reach from the reservoir intake a balancing reservoir at the end of the 72-inch s tion of the pipeline; a balancing reservoir wit future capacity of 300 million gallons; and, miles of 84 inch pipeline, connecting the balanc reservoir to the site of Fort Worth's Rolling H Treatment Plant. This $9.5 million plant designed so that total capacity could be dou without adding chemical facilities or increasing number of administrative or laboratory buildi and with the instrumentation for future comp control. The balancing reservoir, located six m from the water treatment station, is situated hilltop so that a gravity line could be run wit energy loss. Because this balancing pond is loc so close to the city, a fail-sage lining was nece ry. The large--620 feet square at the base and feet square at the perimeter--reservoir was with impermeable membrane of nylon-reinfo 'Hypalon' synthetic rubber. The material is forced with a single layer of nylon scrim, o improved strength and dimensional stability, i adversely affected by soil chemicals, microor isms, and is resistant to ozone and uv light. costs of the project was $850,000, with $250,0 this for the liner. (Prague-FIRL)
W75-11687

**THE VALUE OF THE PEAK RUNOFF COE CIENT PSIS (UEBER DEN AUSSAGEWERT SPITZENABFLUSSBEIWERTES PSIS),**
For primary bibliographic entry see Field 2A.
W75-11713

**POLLUTION DETECTION AND RIVER QU TY MANAGEMENT,**
For primary bibliographic entry see Field 5A.
W75-11753

**LAND USE AND ENVIRONME PLANNING: AN APPLICATION IN THE S CAROLINA COASTAL ZONE,**
Battelle-Columbus Labs., Ohio.
For primary bibliographic entry see Field 6G
W75-11766

**DEVELOPMENT PLANNING OF LAGUN BAY--PHILIPPINES,**
Laguna Lake Development Authority, (Philippines).
R. H. Gedney.
Journal of the Hydraulics Division, Proceed the American Society of Civil Engineers, No HY12, Proceedings paper No. 10227, 2380, December 1973. 7 fig, 1 tab, 5 ref.

Descriptors: *Lakes, *Planning, *Enviro engineering, *Flood control, *Water *Water quality, Hazards, Regions, Hyd Hydraulics, Lake morphology, Ecology,

es, Irrigation, Control, United Nations, International commissions, Economics.
lentifiers: *Laguna de Bay(Philippines), Lake evation control.

aguna de Bay is one of the largest lakes in utheast Asia and is already in the path of urban pansion of Manila. At present, the lake is ackish and is being studied for transformation to a fresh water supply. Development planning cludes water supply, flood control, fisheries, irgation, and land reclamation. Water quality nagement is a key factor in the lake develop-nt planning. A coordinated effort is being made the Philippine Government and its development n--the Laguna Lake Development Authority--to dertake the necessary research, assisted by a ad array of international bilateral and multibieral agencies. Major findings of studies already mpleted and a description of work underway are esented. The overall program is aimed at the liest possible development of the lake ources. (Bell-Cornell)
75-11770

OPERATION IN WATER RESOURCES PROAMS: ALASKA'S EXAMPLE,
ld Regions Research and Engineering Lab., irbanks, Alaska.
r primary bibliographic entry see Field 6B.
75-11775

DELS OF THE STOCHASTIC AND RONOLOGIC STRUCTURE, PREDICTION D SIMULATION OF RUNOFF SEQUENCES - PLICATION TO THE LOWER OHIO BASIN,
rdue Univ., Lafayette, Ind. School of Civil Eneering.
primary bibliographic entry see Field 2E.
5-11783

OOD PLAIN INFORMATION: LEY CREEK, LINA AND DEWITT TOWNSHIPS, ONONGA COUNTY, NEW YORK.
ny Engineer District, Buffalo, N.Y.
pared for Eastern Oswego Basin-Regional ter Resources Planning Board, June, 1971. 44 8 fig, 5 plates, 5 tab.

criptors: *Floods, *Flood control, *Flood ns, *Legislation, *Water management, Flood-Flood protection, *New York.
ntifiers: *Ley Creek(NY), Syracuse(NY), na Township(NY), Dewitt(NY), Onondaga nty(NY), Intermediate Regional Flood, Stanl Project Flood.

4.4 mile study reach of Ley Creek flows in a terly direction from the junction of its North South branches to its mouth at Onondaga e in Syracuse, New York. Its drainage area of square miles includes 5 major tributaries. ambed gradients are mild and flood plains erally flat. Nearly 3.4 of the flood plain is eloped in commercial and residential properas well as sanitary fill operations. Increasing ulation is encouraging more development. oding can occur any time of the year, but most re floods occur during late winter and early ng when heavy precipitation is augmented by ing snow. Conditions are made worse by en saturated soil. Flood damage prevention sures include enlargement of creek channels, truction of riprapped channel walls, channel ring and acquisition of rights-of-way. No flood regulations exist although New York state several applicable water conservation acts h deter encroachment on the flood plain. A nt flood occurred in 1969 with estimated age of $99,000. An Intermediate Regional d would be more damaging than the 1969 d, cresting at 3.9 feet above stream bank. A dard Project Flood would crest at 8.2 feet e bank level. This report aids in the unanding of local flood problems and provides use guidance. (Salzman-North Carolina)
W75-11785

**FLOOD PLAIN INFORMATION: FLOOD HAZARD REPORT OF 4-7 JULY 1969 FLOOD, HURON RIVER, NORWALK CREEK, OHIO.**
Army Engineer District, Buffalo, N.Y.
May, 1970. 23 p, 28 fig, 12 plates, 3 tab.

Descriptors: *Flood damage, *Flood profiles, *Flood stages, *Floodways, *Historic floods, Flood data, Flood plains, Flood plain utilization, Planning, Reservoirs, Flood proofing, *Ohio.
Identifiers: *Hurnon River(Ohio), *Norwalk Creek(Ohio), Norwalk(Ohio), Flood plain management.

This report details flood conditions and damages of the July 1969 flood on the lower 26 miles of Huron River in northern Ohio and 3.5 miles of a tributary, Norwalk Creek. Although the gaging station on Huron River has been in operation since 1950, data for the peak of the stage-hydrograph for the July 1969 flood was established by indirect survey methods because the gage chart was damaged during the flood. The 1969 flood on Huron River has an estimated discharge of 48,900 cfs and an average recurrence interval of 126 years. The stage at the gage site was 31.1 feet, 7 feet higher than the next highest recorded flood which occurred in January, 1959. Extensive flood damage was estimated at greater than $4 million. Damages from Norwalk Creek through the city of Norwalk were approximately at $1.5 million. During the flood, the collapse of a reservoir wall resulted in closed highways, no domestic water supply and no power supply. The description of the flood and the numerous photographs show that damages will continue to increase if unwise development increases. Flood profiles indicate the amount of fill or elevation of flood proofing required to prevent future damage. The flood plain management program recommends control of future development of the establishment of a floodway. (Diefendorf-North Carolina)
W75-11787

**FLOOD PLAIN INFORMATION: PLUM CREEK, BRUNSWICK HILLS AND MEDINA TOWNSHIPS, MEDINA COUNTY, OHIO.**
Army Engineer District, Buffalo, N.Y.
Prepared for Ohio Department of Natural Resources, Division of Planning, Flood Plain Management Section, June, 1973. 26 p, 25 fig, 7 plates, 3 tab.

Descriptors: *Flood plains, *Flood damage, *Land use, *Planning, Flood plain utilization, Flood data, Flood profiles, Obstruction to flow, Flood stages, *Ohio.
Identifiers: *Plum Creek(Ohio), Medina County(Ohio), Brunswick(Ohio), Brunsick Hills Township(Ohio), Medina Township(Ohio), Sleepy Hollow Lake(Ohio), Lake Brunswick(Ohio), Flood plain management, Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

There is little development within the 5-mile study reach of Plum Creek which flows through Brunswick Hills and Medina Townships in northern Ohio averaging a fall of 21.4 ft/mi over its total 7.1 mile course. Most of the development is in the City of Brunswick or near man-made Sleepy Hollow Lake and Lake Brunswick. There has been little encroachment by man other than highway crossings, but natural obstructions such as dense growth and trees occur along the banks. Local government should establish a floodway to define and maintain the channel. Floods may occur at any time during the year, but are most numerous in late winter and early spring when snowmelt accompanied by moderate precipitation causes flooding. Information pertaining to past floods on Plum Creek is extremely scarce. Since there are no gaging stations within the study area, information from newspaper files and interviews was collected. There was no report of high water marks except in July, 1972 at the sewage treatment plant. The peak discharge of an Intermediate Regional Flood (IRF) within the study reach would range from 1660 to 3000 cfs with channel velocities of 2.2 to 4 ft/sec.; discharge of a Standard Project Flood (SPF) would range from 5630 to 9590 cfs with channel velocities of 3.2 to 4.9 ft/sec. The IRF is recommended by the State of Ohio Department of Natural Resources as the minimum flood level to define the limits of the regulatory flood plain. Brunswick Hills Township trustees are currently working on flood plain regulations. (Diefendorf-North Carolina)
W75-11788

**FLOOD PLAIN INFORMATION: NORTHEAST STREAM GROUP, STOCKTON, CALIFORNIA.**
Army Engineer District, Sacramento, Calif.
Prepared for San Joaquin County; January 1974, 56 p, 11 tab, 23 fig, 37 plates.

Descriptors: *Flood plains, *Flood protection, *Flood damage, *Flood control, Flood forecasting, Flood data, Land use, Planning, Historic floods, Obstuction to flow, Flood plain zoning, Levees, *California.
Identifiers: *Calaveras River(Calif), *Bear Creek(Calif), Stockton(Calif), San Joaquin County(Calif), New Hogan Lake(Calif), Intermediate Regional Flood, Standard Project Flood, Flood plain management.

The Calaveras River and Bear Creek systems flood primarily agricultural land in San Joaquin County northeast of Stockton, California, during winter and spring rainfloods and summer cloudbursts. Protection in the study area is provided by New Hogan Dam on the Calaveras River, which also provides irrigation water. Levees built along the lower reaches of most of the streams also help minimize flood damage. Protection is provided against floods expected to occur at the 50-to-60 year frequency, but larger floods which would exceed channel capacity can be expected to occur. Peak flows estimated for a Standard Project Flood are 1,700 cfs on Calaveras River and 8,000 cfs on Bear Creek, according to calculations derived from the data collected at 8 gaging stations, combined with meteorological data. The greatest flood of record on the Calaveras River occurred in 1911, but far more damage was done in the study area in the floods of 1955 and 1958 because more of the area had been developed by then. In the 1958 flood, about 22,000 acres of the study area were flooded and damage was estimated at $1,400,000. Several levees were breached, and flood waters reached a maximum depth of 3 feet and remained on the land for as long as 3 weeks in the Bear Creek drainage area. The report provides a basis for planning optimum use of flood-prone areas. (Diefendorf-North Carolina)
W75-11789

**FLOOD PLAIN INFORMATION: VENTURA RIVER, VENTURA COUNTY, CALIFORNIA.**
Army Engineer District, Los Angeles, Calif.
Prepared for the County of Ventura, June, 1974. 38 p, 25 fig, 22 plates, 7 tab.

Descriptors: *Floods, *Flood plains, *Flood profile, *Flow, *Obstructions to flow, *Flood damage, River, Flooding, Maximum probable flood, Historic flood, *California.
Identifiers: *Ventura River(Calif), Coyote Creek(Calif), Ventura County(Calif), Ventura(Calif), Intermediate Regional Flood, Standard Project Flood.

Along the Ventura River, major floods have been caused by winter storms of the polar Pacific type which occur November through April and account for 75% of the runoff. Mean seasonal precipitation is 16 inches near the mouth at the Pacific and 40 inches in the mountains at the upper end of the drainage area. Flash floods are typical of the Ventura River Basin; peak flows are attained within a

few hours of rainfall, last for a short time, and subside quickly. High velocities erode and carry large quantities of debris through the canyons and deposit the material on the more developed, gentler slopes of the valley. A levee along the east bank provides major flood protection from floods up to the Standard Project Flood for the City of San Buenaventura. Lake Casitas has a reservoir storage capacity which will substantially reduce peak discharges on Coyote Creek. Ventural County requires new development to be protected against flooding from major streams and its tributaries. Major floods of record occurred in January, 1969, with peak discharge of 58,000 cfs, and February, 1969, with 40,000 cfs peak discharge recorded near Ventura. High velocity flood waters and severe erosion occurred in both floods. Projected floods include the Intermediate Regional Flood (IRF) and the Standard Project Flood (SPF) with peak discharges at Ventura of 78,000 and 89,000 cfs respectively. These floods and resultant erosion would be hazardous to utilities and commercial and residential development in the floodplains in Ventura, Live Oak Acres, Oak View, and neighboring cities. (Park-North Carolina)
W75-11790

**FLOOD PLAIN INFORMATION: CONTRARY CREEK, ST. JOSEPH, MISSOURI.**
Army Engineer District, Kansas City, Mo.
Prepared for the City of St. Joseph, Missouri, October, 1973. 23 p, 11 fig, 15 plates, 3 tab.

Descriptors: *Floods, *Flooding, *Flood plains, *Flood data, *Flood profiles, *Levees, Flood forecasting, Flood discharge, Maximum probable flood, Obstructions to flow, *Missouri.
Identifiers: *Contrary Creek(Mo), St. Joseph(Mo), Intermediate Regional Flood, Standard Project Flood.

Contrary Creek, so called because it flows north contrary to the course of the Missouri River, drains 26 sq/mi adjacent to St. Joseph of which 17.7 sq/mi is above the upper study limit. The flood plain land is used primarily for agricultural production with a few roads and rail lines crossing the Creek. The channel has been widened and straightened and is bounded on both sides by levees. Short duration thunderstorms with high intensity rain, falling mostly in May through September, cause floods of high peaks, high velocities, short duration and relatively small volumes of runoff. Realignment of the lower reach of the Creek causes floodwaters overflowing banks or levees to flow into low lands north or south of the basin. Large floods occured in 1919, 1921, 1942, 1952, 1959, and 1960 but data is unavailable due to lack of stream gages. Expansion of St. Joseph will create pressure for development along Contrary Creek plus the possibility of larger floods. Peak flows for two projected major floods, an Intermediate Regional Flood (IRF) and a Standard Project Flood (SPF), would be 12,000 cubic feet/second (cfs) for an IRF and 21,000 cfs for the SPF and would compare to the estimated 14,600 cfs flow of the 1960 flood. In an IRF some floodwater will overflow the basin and flow north into the low-lying areas of St. Joseph. 'Floodwater overflowing the south levee will be contained between the levee and the road south of the levee. Water overflowing the north levee will remain along the toe of the levee.' Standing water will remain until the stream level falls and the drainage gates are opened. Severe erosion to stream banks and around bridge abutments are expected. The SPF would rise about 3 ft/hr peaking in 13 hours. (Park-North Carolina)
W75-11791

**FLOOD PLAIN INFORMATION: CHITTENANGO CREEK, BRIDGEPORT, ONONDAGA AND MADISON COUNTIES, NEW YORK.**
Army Engineer District, Buffalo, N.Y.
Prepared for Eastern Oswego Basin Regional Water Resources Planning Board, June, 1971. 38 p, 17 fig, 5 tab, 5 plates.

Descriptors: *Floods, *Flooding, *Flood protection, Flood control, Water management, Flood plains, Legislation, *New York, Flood forecasting, Flood plains.
Identifiers: *Chittenango Creek(NY), Bridgeport(NY), Onondaga County(NY), Madison County(NY), Limestone Creek(NY), Butternut Creek(NY), Intermediate Regional Flood, Standard Project Flood.

Chittenango Creek, a part of Oswego River watershed in western New York state, has two main tributaries, Limestone and Butternut Creeks. Draining an area of 288 square miles, the creek's gradient varies from 5 ft/mi to almost 50 ft/mi at its headwaters. Presently, the 7-mile study area near its mouth is used for agricultural or rural purposes, although increasing population of Syracuse area may create pressure for development. Floods occur all times of the year resulting from melting snow with moderate amounts of precipitation in the winter or intense summer precipitation. Natural vegetation as well as two bridges obstruct flood flow. No effective flood plain regulation exists in the area although New York State legislation supports such statutes and attempts to prevent encroachment by mandatory review of any stream disturbance. The greatest known flood occurred in August 1898 although insufficient information exists to determine its exact magnitude. A recent flood in 1960 had a peak discharge of 2,690 cfs. An Intermediate Regional Flood and Standard Project Flood would have peak discharges of 9500 cfs and 35,200 cfs respectively. Designated flood areas will assist local officials in regulating flood plain use. (Salzman-North Carolina)
W75-11792

**HYGIENIC EVALUATION OF SPRING CAPPINGS USED ON THE SOUTHERN SHORE OF CRIMEA, (IN RUSSIAN),**
Yalta Sanitary-Epidemiology Station (USSR).
For primary bibliographic entry see Field 5G.
W75-11793

**AN ECONOMIC AND ENVIRONMENTAL RECONNAISSANCE OF THE POSSIBILITIES FOR SMALL WATERSHED DEVELOPMENT IN CHENANGO COUNTY,**
Jones (Barclay) and Associates, Ithaca, N.Y.
For primary bibliographic entry see Field 4D.
W75-11796

**PROCEEDINGS OF THE WATER HARVESTING SYMPOSIUM, PHOENIX, ARIZONA, MARCH 26-28, 1974.**
Western Regional Research Lab., Berkley, Calif.
For primary bibliographic entry see Field 3B.
W75-11800

**ENGINEERING ASPECTS OF WATER HARVESTING RESEARCH AT THE UNIVERSITY OF ARIZONA,**
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 3B.
W75-11802

**WATER DEVELOPMENT IN MANAGEMENT OF LIVESTOCK AND WILDLIFE ON MOUNTAIN WILDLANDS,**
Wasatch National Forest, Salt Lake City, Utah.
Range, Wildlife and Watershed Management.
For primary bibliographic entry see Field 3B.
W75-11804

**SOIL TREATMENT WITH SILICONES FOR WATER HARVESTING,**
Dow Corning Corp., Midland, Mich.
For primary bibliographic entry see Field 3B.
W75-11806

**SEALING LEAKING EXCAVATED TANKS ( FARMS IN WESTERN AUSTRALIA,**
Western Australia Dept of Agriculture. So
Perth. Soils Div.
For primary bibliographic entry see Field 3B
W75-11814

**STORAGE SYSTEMS FOR HARVEST WATER,**
Agricultural Research Service, Phoenix, A
Water Conservation Lab.
For primary bibliographic entry see Field 3B.
W75-11815

**EVAPORATION SUPPRESSION FOR C SERVING WATER SUPPLIES,**
Agricultural Research Service, Phoenix, A
Water Conservation Lab.
For primary bibliographic entry see Field 3B.
W75-11816

**THE DESIGN OF ROADED CATCHME FOR MAXIMUM RUNOFF,**
Western Australia Univ., Nedlands. Dept. of
Engineering.
For primary bibliographic entry see Field 3B.
W75-11817

**USING PARAFFIN AND POLYTHYLENE HARVEST WATER FOR GROWING SHRU**
Forest Service (USDA), Albuquerque, N.
Rocky Mountain Forest and Range Experi
Station.
For primary bibliographic entry see Field 3B.
W75-11821

**PARAMETERS FOR ESTIMATING AN RUNOFF AND SOIL LOSS FROM AGRI TURAL LANDS IN RHODESIA,**
Agricultural Engineering Centre, Sal
(Rhodesia).
H. A. Elwell, and M. A. Stocking.
Water Resources Research, Vol 11, No 4, 605, August, 1975. 2 fig, 4 tab, 12 ref.

Descriptors: *Runoff, *Rainfall-runoff re ships, *Runoff forecasting, *Soil er *Semiarid climates, Africa, Subtropic, A tural runoff, Rainfall, Rainfall dispositio conservation, Rainfall intensity, Vegetati fects, Impact(Rainfall), Grasslands, Culti Arid climates.
Identifiers: Precipitation depth, Rainfall e Rainfall momentum, *Rhodesia.

Cumulative values of rainfall energy, mom and depth were investigated as predictors nual soil loss and runoff from selected ara grazing land field trial plots. Energy para were the most accurate predictors of soil lo bare soils, explaining 96.4% of the varia results from a clay loam and 80.0% from soil. Momentum, energy, and precipitatio parameters were all close in their predictio loss from the vegetated plots or as predi runoff from both bare and vegetated cor and consequently, precipitation depth par were selected as being the most practical loss and runoff estimation under the condi vestigated. Percentage vegetal cover was s be an additional important variable on g (Robinett-Arizona)
W75-11830

**EFFECT OF BACKFILL ON DRAIN F LAYERED SOILS,**
California Univ., Davis.
For primary bibliographic entry see Field
W75-11834

NVIRONMENTAL ASPECTS OF AQUATIC
LANT CONTROL,
ireau of Reclamation, Denver, Colo. Div. of
esearch.
r primary bibliographic entry see Field 5G.
75-11843

## 3. Groundwater Management

IPROVED APPLICATION OF GEOPHYSICS
O GROUNDWATER RESOURCE INVENTO-
ES IN GLACIATED TERRAINS,
rdue Univ., Lafayette, Ind. Water Resources
search Center.
r primary bibliographic entry see Field 2F.
75-11355

CASE OF SUBTERRANEAN WATER POLLU-
ON CAUSED BY THE PUBLIC REFUSE
SPOSAL GROUND, (IN JAPANESE),
ihiro Zootechnical Univ. (Japan). Dept. of
terinary and Public Health.
r primary bibliographic entry see Field 5B.
75-11432

GIONAL SEWERING AND GROUNDWATER
ALITY IN THE SOUTHERN SAN JOAQUIN
LLEY,
r primary bibliographic entry see Field 5D.
5-11446

RIABLE THICKNESS TRANSIENT
OUNDWATER FLOW MODEL USER'S
NUAL,
telle-Pacific Northwest Labs., Richland,
sh. Systems Dept.
r primary bibliographic entry see Field 2F.
5-11469

GIONAL CHEMISTRY OF GROUNDWATER
THE WAINWRIGHT AREA, ALBERTA,
earch Council of Alberta, Edmonton.
primary bibliographic entry see Field 2F.
5-11471

SPONSE OF UNCONFINED AQUIFER
STEMS TO DEEP PERCOLATION,
ifornia Univ., Davis. Dept. of Water Science
Engineering.
primary bibliographic entry see Field 2F.
5-11474

DROGEOLOGY OF THE WAINWRIGHT
EA, ALBERTA,
earch Council of Alberta, Edmonton.
A. Hackbarth.
ort 75-1, 1975. 16 p, 2 fig, 1 tab, 2 maps, 50 ref.
0.

criptors: *Canada, *Hydrogeology,
ohydrologic units, *Geologic mapping, Water
d, Water quality, Water pollution, Nitrates,
undwater availability, Mapping, On-site in-
igations, Geochemistry, Bedrock, Aquifers,
ial drift, Groundwater movement, Water
e, Springs, Artesian wells, Recharge, Potable
er.
ntifiers: *Alberta, Flowing wells.

Wainwright map area lies southeast of Ed-
nton between longitudes 110 degrees and 112
rees west and latitudes 52 degrees and 53
rees north. It covers about 6000 square miles of
tly aspen parkland. Precipitation is about 14
es annually, while potential evapotranspira-
is about 21 inches. Hydrogeological informa-
is abundant for depths less than about 500
. At depths greater than 500 feet, the hydrolog-
nvironment has been inferred from geological
rmation. Geologic units of hydrogeological in-terest include the glacial drift, preglacial sands and gravels, Horseshoe Canyon Formation, Bearpaw Formation, Belly River Formation, and Lea Park Formation. The latter four are Late Cretaceous in age. Groundwater yields are generally between 0 and 25 igpm, with certain areas having much greater yields. Groundwater quality is not exceptionally good; one third to one half of the samples analyzed exceeded provincial standards for total dissolved solids, sulfate, alkalinity, or sodium. Nitrate represents a local pollution problem. In addition to a groundwater availability map, maps are presented showing hydrochemistry of bedrock waters for the depth intervals 0 to 150 feet, 150 to 350 feet, and 350 to 500 feet. Hydrochemistry of drift waters from 0 to 150 feet of depth is also presented. (Visocky-ISWS)
W75-11475

**SELENIUM IN WATERS IN AND ADJACENT TO THE KENDRICK PROJECT, NATRONA COUNTY, WYOMING,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W75-11492

**GEOHYDROLOGIC RECONNAISSANCE OF THE UPPER POTOMAC RIVER BASIN,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-11493

**DIGITAL-SIMULATION AND PROJECTION OF WATER-LEVEL DECLINES IN BASALT AQUIFERS OF THE ODESSA-LIND AREA, EAST-CENTRAL WASHINGTON,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-11494

**GROUND-WATER DATA FOR BOLIVAR COUNTY, MISSISSIPPI,**
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W75-11496

**WATER QUALITY CHANGES RELATED TO THE DEVELOPMENT OF ANAEROBIC CONDITIONS DURING ARTIFICIAL RECHARGE,**
Geological Survey, Lubbock, Tex.
For primary bibliographic entry see Field 5B.
W75-11497

**GROUND-WATER LEVELS IN LOUISIANA--FOR WELLS MEASURED THROUGH 1974.**
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 7C.
W75-11499

**PREDICTIVE MODELING OF EFFECTS OF THE PLANNED KINDRED LAKE ON GROUNDWATER LEVELS AND DISCHARGE, SOUTHEASTERN NORTH DAKOTA,**
Geological Survey, Bismarck, N.Dak.
For primary bibliographic entry see Field 4A.
W75-11503

**HYDROLOGY FOR LAND-USE PLANNING: THE HILLSIDE AREA, ANCHORAGE, ALASKA,**
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W75-11504

**UNSATURATED HYDRAULIC CONDUCTIVITY FROM CUMULATIVE INFLOW DATA,**
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 2G.
W75-11593

**MATHEMATICAL MODELS OF ARTIFICIAL RECHARGE SYSTEMS,**
California Univ., Davis. Dept. of Water Science and Engineering.
M. A. Marino.
Water Science and Engineering Paper No 2005, July 1975. 50 p, 17 fig, 1 tab, 34 ref. CSRS CA-D*-WSE-3082-H.

Descriptors: *Mathematical models, *Artificial recharges, *Groundwater recharge, Water table, Equations, Groundwater movement, Hydraulic conductivity, Aquifers, Numerical analysis, Digital computers, Graphical analysis, Recharge wells, Hydraulic properties, Hydraulics, Dupuit-Forchheimer theory, Percolation, *Methodology.
Identifiers: Predictor-corrector method, Alternating-direction implicit methods, Runge-Kutta method, Lagrange interpolation method, Dimensionless variables, Nonlinear solutions, Linear solutions, Circular recharge area, Rectangular recharge area, Nonuniform grid spacing, Mounds.

The nonlinear, partial differential equation characterizing the unsteady flow in an unconfined aquifer beneath a circular recharging area was solved numerically using a predictor-corrector method. The results obtained were compared with available linearized solutions. The predictor-corrector method resulted in a tridiagonal set of simultaneous equations which could be solved rapidly by computers. Furthermore, the method was computationally stable. A rectangular artificial groundwater-recharge system was analyzed by use of the alternating-direction implicit scheme with a nonuniform grid spacing. Values of the maximum height of the water table obtained from the numerical scheme were always higher than those calculated from an available linearized solution. A recharge well-unconfined aquifer system was analyzed by coupling the fourth-order Runge-Kutta method with the Lagrange interpolation method. The method was computationally inherently stable for any times. Dimensionless graphical solutions of water table profiles at different times were presented for various conditions. A closed-form solution based on the linearized equation was developed that closely approximates the flow system under consideration. Dimensionless graphical solutions for volume and average rate of recharge were presented for conditions commonly encountered in practice. (Visocky-ISWS)
W75-11626

**SUBSURFACE WASTE INJECTION IN THE UNITED STATES: FIFTEEN CASE HISTORIES,**
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 5D.
W75-11627

**WELL PUMPING IN UNCONFINED AQUIFERS: THE INFLUENCE OF THE UNSATURATED ZONE,**
Technion-Israel Inst. of Tech., Haifa. Faculty of Civil Engineering.
U. I. Kroszynski, and G. Dagan.
Water Resources Research, Vol 11, No 3, p 479-490, June 1975. 7 fig, 1 tab, 18 ref. USDA FG-Is-287.

Descriptors: *Groundwater, *Water table aquifers, *Unsaturated flow, *Unsteady flow, *Mathematical studies, Capillary conductivity, Hydraulic conductivity, Soil water movement, Aquifer characteristics, Aquifer testing, Numerical analysis, Finite element analysis, Drawdown, Equations, Approximation method, Wells.
Identifiers: Partially penetrating wells, Delayed yield, *Aquifer response, Type curves.

An approximate analytical solution describing transient flow toward a partially penetrating well pumped at a constant discharge in a rigid, homogeneous, anisotropic, unconfined aquifer of

infinite radial extension and finite depth, considering flow in the unsaturated zone above the free surface, was presented. The characteristic hydraulic properties of the unsaturated zone, namely the retention and hydraulic conductivity curves, were described by analytical expressions that depended on a parameter which roughly represented the effective thickness of the unsaturated zone. To check the validity of the approximate analytical solution, the problem, free of such approximations, was solved numerically by a finite element scheme for a representative particular case. Comparison between analytical and numerical solutions showed excellent agreement. The influence of the unsaturated zone was found to be negligible for most common cases encountered. In the marginal cases of very shallow rigid aquifers and of soils with particularly large unsaturated effective thickness, the influence of the unsaturated zone upon drawdown was found to be significant only at relatively short times, close to the pumping well and close to the free surface. (Prickett-ISWS)
W75-11631

**A TOPOGRAPHIC-HYDROGEOLOGIC MODEL FOR SOLID WASTE LANDFILL SITING,**
Iowa State Univ., Ames. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W75-11644

**GEOCHEMISTRY AND GENSIS OF FLUORIDE-CONTAINING GROUND WATERS IN INDIA,**
Soil Research Lab., Chandigarh (India).
For primary bibliographic entry see Field 2K.
W75-11645

**THEORY OF GROUND-WATER RECHARGE FOR A STRIP BASIN,**
New South Wales Univ., Kensington (Australia). Faculty of Military Studies.
For primary bibliographic entry see Field 2F.
W75-11646

**HYDRAULIC DESIGN OF VERTICAL STILLING WELLS,**
Bureau of Reclamation, Denver, Colo. Div. of Research.
For primary bibliographic entry see Field 8B.
W75-11650

**DETERMINING OPTIMAL WELL DISCHARGE,**
Colorado State Univ., Fort Collins.
O. J. Helweg.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol 101, No IR3, Proceedings paper No. 11566, p 201-208, September 1975. 5 fig, 6 ref, 3 append.

Descriptors: *Wells, *Discharge(Water), *Pumping, *Groundwater, *Irrigation, *Geohydrologic units, Optimization, Methodology, Cost-benefit analysis, Water supply, Drainage, Design, Cost-benefit ratio, Computers, Equations, Drawdown, Project planning, Systems analysis, Evaluation.
Identifiers: *Well yield, *Optimum use, Benefit maximization, Operating policy, Economic analysis, Well spacing.

The cost of pumping groundwater is a major factor in water supply; it is necessary to pump a given well at the discharge that maximizes the net benefit of the operation. Previous criteria have ignored the economic aspects of the analysis of this problem. This paper presents a method for determining the optimum operating policy of a well, i.e., at which discharge a well owner receives the most water for his money. A computer code, QOPTIM, is included along with an example of the analysis. The case treated is pumping an existing well at the optimum discharge, where drilling the well is a sunk cost. The real world example shows the importance of considering well losses in any analysis. An appendix lists QOPTIM, which can be easily used by most engineering offices to find the optimal discharge of a given well. The choice of criterion for finding the optimal well discharge is important. Application results of the cost-benefit, optimization method developed herein show power costs for a well to be $2,350/yr greater if the well is pumped at two thirds drawdown rather than at the optimal discharge as found using QOPTIM. (Bell-Cornell)
W75-11768

**IDENTIFICATION OF PARAMETERS IN A LINEAR EQUATION OF GROUNDWATER FLOW,**
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 2F.
W75-11799

## 4C. Effects On Water Of Man's Non-Water Activities

**COMPARATIVE ANALYSIS OF ESTIMATION METHODS IN NONLINEAR FUNCTIONAL MODELS OF THE RAINFALL-RUNOFF PROCESS,**
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 2A.
W75-11354

**COUNTY COMBATS URBAN STORM WATER RUNOFF PROBLEMS,**
Mecklengurg County, Engineer's Office, Charlotte, N.C.
For primary bibliographic entry see Field 5G.
W75-11390

**PROGRESS REPORT TO THE ARKANSAS STATE HIGHWAY COMMISSION FOR YEAR ENDING JUNE 30, 1975,**
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 8B.
W75-11501

**METEOROLOGICAL, TOPOGRAPHICAL, AND CONSTRUCTION INFLUENCE ON THE RAIN RUNOFF IN SEWER SYSTEMS (METEOROLOGISCHE, TOPOGRAPHISCHE UND BAUTECHNISCHE EINFLUESSE AUF DEN REGENABFLUSS IN KANAL-ISATION-SNETZEN),**
For primary bibliographic entry see Field 5D.
W75-11712

**THE GROWTH OF POSIDONIA AND THE URBAN POLLUTION IN THE GULF OF GIENS, (IN FRENCH),**
Institut Scientifique et Technique des Peches Maritimes, Nantes (France). Service de Pollution.
For primary bibliographic entry see Field 5C.
W75-11761

## 4D. Watershed Protection

**PREDICTION OF FLOOD VOLUME FROM SMALL HUMID REGION WATERSHEDS,**
Pennsylvania Dept. of Environmental Resources, Harrisburg. Div. of Comprehensive Resources Programming.
For primary bibliographic entry see Field 4A.
W75-11462

**SEDIMENT RELATIONS OF SELECT ALASKAN GLACIER-FED STREAMS,**
Alaska Univ., College Inst of Water Resources
For primary bibliographic entry see Field 2J.
W75-11477

**SOIL MOISTURE ACCOUNTING COMPONE OF THE USDAHL-74 MODEL OF WATERSH HYDROLOGY,**
Agricultural Research Service, Beltsville, Hydrograph Lab
For primary bibliographic entry see Field 2G.
W75-11656

**AN ECONOMIC AND ENVIRONMEN RECONNAISSANCE OF THE POSSIBILIT FOR SMALL WATERSHED DEVELOPMEN CHENANGO COUNTY,**
Jones (Barclay) and Associates, Ithaca, N.Y.
B. G. Jones.
Prepared in cooperation with New York State fice of Planning Services, Interim re December, 1973. 336 p, 24 fig, 11 tab, 46 ref.

Descriptors: *Flood damage, *Watershed ma ment, *Impoundments, *Flood control, Flood tection, Surface runoff, Water storage, Rese sites, Dams, Multiple purpose projects, Env mental effects, *New York.
Identifiers: *Chenango County(NY), wich(NY), Ostelic River(NY), Che River(NY), Unadilla River(NY), Susque River.

Chenango County in the Eastern Susque River Basin Northeast of Binghamton, New has experienced severe damage from past fl Agricultural and non-agricultural damage cos shown for the 52 reaches along pri watersheds (Ostelic, Chenango, Unadilla R and some small drainage area directly tribut the Susquehanna River. Average annual damage in the county is estimated at $41 85% non-agricultural, 15% agricultural. Esti show that the record flood of 1935 occurr 1969 would cause over $1 million in damag far more severe floods and possible. Since extensive channelization, levee constructio other flood control work has been complete report considers 68 proposed impoundmen local and downstream flood control, a t 25,000 acres of reservoir surface area (con to 1,280 acres, or 0.22% of the county. pr covered). Information is given for each showing location, description, disrupted lan wildlife impact, development potential economic costs and benefits, where av County-wide policies and a comprehensiv are urged which will consider impoundmen focus for development as well as flood c Thus all proposed projects, including th jected in project-by-project review, are in State and federal funding sources are des (Herr-North Carolina)
W75-11796

**FIELD EVALUATION OF MICROWATE AND VERTICAL MULCH SYSTEMS,**
Agricultural Research Service, Fort Collins
For primary bibliographic entry see Field 3
W75-11819

# 5. WATER QUALITY MANAGEMENT AND PROTECTION

## 5A. Identification Of Pollutan

**THE CRYSTAL AND MOLECULAR TURE OF SELECTED PESTICIDAL POLLUTANTS,**
Rhode Island Univ., Kingston. Dept. of try.

Cheer.
ilable from the National Technical Informa- Service, Springfield, Va. 22161, as PB-244 $3.75 in paper copy, $2.25 in microfiche. de Island Water Resources Center, Kingston, pletion Report, (1975). 41 p, 3 fig, 7 tab, 21 OWRT A-051-RI(1), 14-31-001-5040.

criptors: *Molecular structure, stallography, *X-ray diffraction, *Pesticides, cide kinetics, Chemical properties, Organic pounds, *Pollutant identification.
tifiers: *Padan, Nereistoxin, Cholinergic ac-, Hydrochloride compounds.

solution of the crystal and molecular structure adan by single crystal x-ray diffraction con- d that the compound under investigation is is(thiocarbamoyl)-2-N,N- thylaminopropane hydrochloride. The results ate that the structure of Padan is very similar at of acetylcholine. The similarity may be nsible for its activity in cholinergic systems. -11351

**ECTOR OF TRACE SUBSTANCE IN TER,**
ita Kagaku Kikai Kogyo Kabushiki, Tokoyo n). (assignee).
jinaga, and K. Miura.
d States Patent 3,883,414. Issued May 13, Official Gazette of the United States Patent e, Vol 934, No 2, p 733-734, May, 1975. 1 fig.

riptors: *Analytical techniques *Pollutant ification, *Electrolytes, *Patents, Waste ification, Monitoring, Trace elements.

tem for detecting trace amounts of impurities ter has been patented. The system comprises ollowing: means for supplying supporting olyte; first flow electrolyte cell means cou- o the supply means for purifying the support- ectrolyte; sample injector means including a le reservoir coupled to the first cell means for ing the contaminated sample; at least two ad- al flow electrolyte means including a second oupled to the sample injector means and a cell coupled to the second cell; depolarizer olyte supply means coupled to the casing of cell means; and, recorder coupled to the tiostats of the additional cell means. Each of ectrolyte cells contains a casing and a poten- t means. The casings include an auxiliary ode. The deploarizer electrolyte flows gh the casing to contact the auxiliary elec- . The recorder records the output of the tistats of the electrolyte cells; the output is tive of the amount of impurities in the sam- Orr-FIRL)
11388

**RUMENTAL INVESTIGATION OF OGICAL WASTE WATER TREATMENT SZENNYVISEK BIOLOGIAI TISZ- SANAK MUSZERES VIZSGALATA),**
rimary bibliographic entry see Field 5D.
11407

**AUTOMATED SPECTROPHOTOMETRIC ENDED SOLIDS ANALYSIS FOR AC- TED SLUDGE,**
cipality of Metropolitan Seattle, Renton, Renton Treatment Plant.
rimary bibliographic entry see Field 5D.
11408

**RLABORATORY STUDY OF METHODS CHEMICAL ANALYSIS OF WATER,**
nal Swedish Environment Protection Board, holm. Research Lab.
edahl, P. Junker, and B. Rondell.
al Water Pollution Control Federation, Vol 4, p 858-866, April, 1975. 5 fig, 1 tab, 12 ref.

Descriptors: *Nutrients, *Pollutant identification, *Chemical analysis, Laboratory tests, *Water analysis, Nitrogen, Phosphorus, Analytical techniques.
Identifiers: *Sweden, Intercalibration, Interlaboratory studies.

A program for the intercalibration of methods for chemical analysis of nutrients was conducted in Sweden. Artifical samples with accurately calculated concentrations of known constituents were used for water analysis. Samples were preserved by acidification and distributed in sealed glass ampoules. These samples were then distributed to 76 laboratories where individual methods of analysis were used. Discussion and evaluation of results focused on methods and instrumentation; preservation, stability and pre-treatment of samples; and quality of work in different laboratories. For all parameters studied (such as phosphate phosphorus, total phosphorus, nitrate nitrogen) the Nordic Standard Methods yielded the best results. Most laboratories tested performed the analytical work with acceptable precision. (Prague-FIRL)
W75-11409

**THE USE OF COMPUTERS FOR FORECASTING THE SANITARY SYSTEMS OF WATER BODIES (PRIMENENIYE EVM DLYA PROGNOZIROVANIYA SANITARNOGO SOSTOYANIYA VODOYEMOV),**
For primary bibliographic entry see Field 5D.
W75-11410

**CONTINUOUS DETERMINATION OF TOXICITY OF EFFLUENTS.**
French Patent 13200W/08. Issued January 3, 1975. Derwent French Patents Report, Vol W, No 8, p 9, January, 1975.

Descriptors: *Toxicity, *Sewage, Waste water treatment, Analytical techniques, *Patents, *Microorganisms, Effluents, Liquid wastes, Measurement, Turbidity, *Bioindicators.

The toxicity of liquids in waste water and sewage may be determined by means of microorganisms. A patent was issued whereby these are continuously cultivated in a circulation recipient with a very concentrated nutritive medium and mixed with the dilution liquid. The mixture flows continuously into a small measuring recipient which is sealed against the inflow of air and has a magnetic stirrer, then leaves via an overflow. The oxygen content of the liquid is measured continuously by an oxygen electrode. The liquid to be analyzed is saturated with oxygen in a second recipient where it is simultaneously treated with the nutrient solution. The mixture flows into the recipient then mixes with the mixture from the first chamber; and the two flow out through the overflow. Alteration in the microorganisms due to the toxicity is determined by the measurement of one of the parameters such as turbidity or color changes, which are a function of the vital activities of the organisms. (Prague-FIRL)
W75-11431

**SPECTROPHOTOMETRIC DETERMINATION OF FLUORINE IN WATER, (IN RUSSIAN).**
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Chelyabinsk (USSR).
V. P. Ufimtseva, and L. F. Flejsher.
Gig Sanit, 3 p 72-73, 1974.

Descriptors: *Pollutant identification, *Spectrophotometry, Analytical techniques, *Fluorine, *Colorimetry, Chemical analysis, Water analysis.
Identifiers: Alizarin, Zirconium.

A method for spectrophotometric determination of fluorine (F) in surface and sewage waters is described. It is based on Scott's zirconium alizarin colorimetric method and its modification according to Meyer. The zirconium alizarin compound color is weakened by F in acid medium, and also a colorless more stable zirconium and F compound is formed. F content is determined by comparing photocolorimeter or spectrophotometer readings with a series of standard solutions. For 0.1-1.25 mg/l F concentrations, the values of the optical density range from 0.01-0.08. The method allows determination of higher concentrations of F, up to 3.5 mg/l. The error does not exceed 0.9-2.8%.--Copyright 1975, Biological Abstracts, Inc.
W75-11433

**APPARATUS FOR PROVIDING A STATISTICAL COUNT OF PARTICULATE MATERIAL IN A FLUID,**
Protron Associates, Palo Alto, Calif. (assignee).
H. M. Ogle.
United States Patent 3,858,851. Issued January 7, 1975. Official Gazette of the United States Patent Office, Vol 930, No 1, p 326, January, 1975. 1 fig.

Descriptors: *Patents, *Samples, *Suspended solids, Analytical techniques, Liquids, Statistical analysis, *Pollutant identification.
Identifiers: Particulate material, Light beams.

A method of measuring particulate material in a sample volume of particulate material suspended in a liquid was patented. The liquid is contained within a sealed transparent container. A liquid inspection apparatus consists of means for: generating a well-defined beam of light; directing the well-defined light beam through the container; and, scanning the light beam over at least one path located entirely within a confined area transverse to the direction of the light beam. This sequentially illuminates particulate material in the portion of liquid from which bursts of light are scattered. Additionally, means for detecting the scattered bursts of light produce a sequence of electrical signals. Means responsive to the electrical signals occurring within a selected interval of time provide a measure of the particulate material within the sample volume. (Prague-FIRL)
W75-11434

**IS THE MALACHITE GREEN BROTH ACCORDING TO HABS AND KIRCHNER SUITABLE FOR SERVING AS AN ISOLATION MEDIUM FOR PSEUDOMONAS AERUGINOSA FROM WATER, (IN GERMAN),**
Frankfurt Univ. (West Germany). Hygiene-Institut.
For primary bibliographic entry see Field 5B.
W75-11435

**SPECTROPHOTOMETRIC DETERMINATION OF SUGARS IN NATURAL WATERS, (IN RUSSIAN),**
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analititicheskoi Khimii.
G. M. Varshal, N. K. Shcherbinina, and I. S. Sirotkina.
Gidrobiol Zh, Vol 10, No 1, p 94-98, 1974. Illus.

Descriptors: *Natural watercourses, *Analytical techniques, *Spectrophotometry, Chemicals, *Pollutant identification, Copper, Water pollution, Water analysis.
Identifiers: *Picramine-epsilon, *Sugars.

The proposed method of determining microquantities of sugars in natural waters is based on the selective and highly sensitive reaction of Cu using the reagent picramine-epsilon. Determination of sugars is possible without preliminary separation of the bulk of the concomittant components. The method is sensitive to 0.1 micro-g/sample. The method can be used for direct determination of sugars in waters with markedly different composi-

tions of inorganic and organic components and degrees of pollution.--Copyright 1975, Biological Abstracts, Inc.
W75-11437

**REGIONAL CHEMISTRY OF GROUNDWATER IN THE WAINWRIGHT AREA, ALBERTA,**
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 2F.
W75-11471

**WATER QUALITY REPORT: THE COLUMBIA RIVER BELOW LONGVIEW, WASHINGTON, DECEMBER 1971 - NOVEMBER 1972,**
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 5B.
W75-11472

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 1. NORTH ATLANTIC SLOPE BASINS.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11479

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11480

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART 3. OHIO RIVER BASIN.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11481

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 6. MISSOURI RIVER BASIN.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11482

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 7. LOWER MISSISSIPPI RIVER BASIN.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11483

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART 8. WESTERN GULF OF MEXICO BASINS.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11484

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11485

**GROUND-WATER DATA FOR BOLIVAR COUNTY, MISSISSIPPI,**
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W75-11496

**GROUND-WATER DATA IN THE HARRISBURG - HALSEY AREA, CENTRAL WILLAMETTE VALLEY, OREGON,**
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 7C.
W75-11498

**GROUND-WATER LEVELS IN LOUISIANA--FOR WELLS MEASURED THROUGH 1974.**
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 7C.
W75-11499

**BILIARY EXCRETION OF PHENYL AND METHYL MERCURY CHLORIDES AND THEIR ENTEROHEPATIC CIRCULATION IN RATS,**
Institut Hygieny a Epidemiologie, Prague (Czechoslovakia).
For primary bibliographic entry see Field 5C.
W75-11525

**RADIOACTIVE - TRACER DISPLACEMENT METHOD FOR THE DETERMINATION OF SMALL QUANTITIES OF NICKEL,**
Savannah State Coll., Ga. Dept. of Chemistry.
R. A. German, D. L. Hamilton, and M. P. Menon.
Analytical Chemistry, Vol 47, No 4, p 658-661, April, 1975. 2 fig, 4 tab, 12 ref.

Descriptors: *Nickel, *Heavy metals, *Pollutant identification, *Analytic techniques, Radioactivity, Neutron activation analysis.
Identifiers: *Interference studies, *Transition metals.

The displacement reaction between nickel and zinc ethylene-diaminetetraacetate labeled with Zn65 can be used to determine traces of nickel as low as 0.05 ppm in interference - free samples. This method is based on the extraction of radioactive zinc displaced by nickel from the zinc chelate which is labeled with 245-d Zn65 into a dithizone-carbon tetrachloride solution and the subsequent measurement of the activity of an aliquot of the extract. The transition metals do interfere with the analysis, but the interferences of many may be removed by suitable masking reagents. For the analysis of samples containing significant concentration of transition metals, nickel has to be separated by the dimethyl glyoxime method prior to the addition of the radioreactent. This method is more sensitive than most of the spectrophotometric methods as well as the neutron activation technique. (Delfiner-Vanderbilt)
W75-11526

**QUANTITATIVE INORGANIC ANALYSIS BY GAS CHROMATROGRAPHY, A REVIEW,**
Birmingham Univ. (England). Dept. of Chemistry.
J. A. Rodriguez-Vazquez.
Analytica Chimica Acta, Vol 73, No 1, p 1-32, November, 1974, 1 tab, 35 ref.

Descriptors: *Gas chromatography, *Heavy metals, *Metals, Analytical techniques, Ions, Anions, Cations, Thermal conductivity, Flame photometry, Mass spectrometry, Chelation, *Reviews, Pollutant identification.
Identifiers: *Quantitative inorganic analysis, Metal halides, Flame ionization, Electron capture, Mass balance, Beta-diketones, England.

This review of the literature on quantitative procedures for inorganic gas chromatography includes general remarks about gas chromatographic columns, detection systems, calibration techniques, quantitative gas chromatography with metal halides, determination of anions, trace analysis of beta-diketone chelates, miscellaneous methods for the determination of metals, and comparison with other techniques such as atomic absorption spectrometry, fluorescence spectromety. The detection of 31 different ionic species (including heavy metals, metals and nonmetals) is touched upon. (Delfiner-Vanderbilt)
W75-11528

**UPTAKE, DISTRIBUTION AND FATE OF 2 HG-ETHYLMERCURIC CHLORIDE IN T GUPPY AND THE COONTAIL,**
Oregon State Univ., Corvallis. Dept. of Agric tural Chemistry
For primary bibliographic entry see Field 5C.
W75-11529

**THE OCCURRENCE OF MERCURY IN A PHIBIA,**
Ljubljana Univ. (Yugoslavia). J. Steffan Inst.
A. R. Byrne, L. Kosta, and P. Stegnar.
Environmental Letters, Vol 8, No 2, p 147-1 1975. 4 tab, 7 ref

Descriptors: Aquatic environment, *Amphibi *Mercury, Mine wastes, Neutron activation an sis, Gas chromatography, Trace eleme *Pollutant identification, Distribution.
Identifiers: *Methylmercury, Background lev Muscle tissue, Mercury distribution.

Studies have been made of the distribution of cury and its occurrence as methylmercury in organs of amphibia collected from different mainly in Slovenia, Yugoslavia, including the near the mercury mine at Idrija. Liver accumu the highest amounts of mercury, up to 2 ppm i parent background areas, with values up to ppm in muscle, where virtually all mercu present in the methyl form. Results are repo for some other trace elements in liver. Mea ments were made of I, Br, As, Se, Cu, and Zn total mercury was determined by neutron ac tion analysis with volatilization separation of cury from an irradiated sample. The other element concentrations were determined b same method. Methylmercury was measure gas chromatography after its isolation fro sample by a new technique. Amphibia may vide useful monitors of the occurrence and s of mercury contamination. (Litoff-Vanderbilt
W75-11534

**ATOMIC-ABSORPTION SPECTROME DETERMINATION OF CADMIUM, LEAD, ZINC IN SALTS OR SALT SOLUTIONS HANGING MERCURY DROP E TRODEPOSITION AND ATOMIZATION GRAPHITE FURNACE,**
Oslo Univ. (Norway). Dept. of Chemistry.
F. O. Jensen, J. Dolezal, and F. J. Langmyhr.
Analytica Chemica Acta, Vol 72, No 2, p 24 Oct, 1974. 2 fig, 2 tab, 7 ref.

Descriptors: *Analytical techniques, * metals, Sea water, Electrolysis, Volumetric sis, Spectrophotometry, Cadmium, Lead, *Pollutant identification.
Identifiers: *Hanging mercury drop elec *Stripping voltammetry, Salt solutions.

Atomic absorption spectrometric metho described for the determination of trace a of Cd, Pb, Zn in salts or salt solutions. The are separated from the salt matrix by elect on a hanging mercury drop electrode, the m is transferred to a graphite boat and remo evaporation, and the metals are determi atomization. The feasibility of the techniq tested by analysis of sea water and of r grade potassium chloride. For comparis three metals were also determined in the se by stripping voltammetry; good agreeme found. (Delfiner-Vanderbilt)
W75-11536

**A COMPARATIVE STUDY ON METHOD CADMIUM ANALYSIS OF GRAIN WI APPLICATION TO POLLUTION EV TION,**
Karolinska Institutet, Stockholm (Sweden of Environmental Hygiene.
T. Kjellstrom, B. Lind, L. Linnman, and G Nordberg.

ronmental Research, Vol 8, No 1, p 92-106, st, 1974. 4 fig, 7 tab, 11 ref.

riptors: *Cadmium, *Heavy metals, lytical techniques, *Pollutant identification, ctrophotometry, *Grain(Crops), Radioactivi- echniques, Neutron activation analysis, imetry, Wheat, Oats, Barley.
ifiers: Pollution evaluation, Atomic absorp- spectrophotometry, Food stuffs, Dithizone metric method, Sweden.

dy was performed to compare three varia- of atomic absorption spectrophotometry ): the conventional flame technique, the con- nal technique involving ammonium-pyr- ne extraction, and a flameless technique in- g a heated graphite atomizer in the analysis lmium in wheat. Radioactive 109 Cd was util- n order to study the losses in the various ical procedures. The heated graphite zer method gave the best recovery (95%) and allest difference between duplicate samples. nparison was also made between the atomic ption methods and a neutron activation d, as well as a dithizone colorimetric d. The heated graphite atomizer method was to study the cadmium concentration in , oats, and barley in polluted and nonpol- areas. Higher cadmium concentrations were in the polluted areas. A discussion of ob- differences is given. (Delfiner-Vanderbilt) 1539

LYTIC-COULOMETRIC DETERMINA- OF COPPER AT MICROGRAM AND GRAM LEVELS,
and Univ., College Park. Dept. of Chemis-

McGlothlin, and W. C. Purdy.
tica Chimica Acta, Vol 73, No 1, p 216-219, nber, 1974, 2 fig, 12 ref.

ptors: *Copper, *Analytical techniques, tant identification, *Volumetric analysis.
iers: *Catalytic-coulmetric determination, gen peroxide, Calibratum curves.

evelopment of a coulometric procedure for r, based on its activity in the decomposition rogen peroxide is described. The procedure ful for microgram and nanogram quantities per. Reactions are quite fast and proceed to etion in a few seconds. (Delfiner-Vanderbilt) 1540

DETERMINATION OF TRACES OF LEAD SOLID-STATE LUMINESCENCE,
sie Univ., Halifax (Nova Scotia). Trace is Research Centre.
Ryan, J. Holzbecher, and H. Rollier.
ica Chimica Acta, Vol 73, No 1, p 49-52, nber, 1974. 1 fig, 6 ref.

ptors: *Heavy metals, *Lead, *Chemical tation, *Fluorometry, Leaves, Analytical ques, *Pollutant identifcation.
iers: *Lead(II), Solid-state luminescence, cipitation, Dry and wet ashing, Synthetic Inorganic phosphorus, Para-magnetic metal iological materials, Traces of heavy metals, tion, Calcium oxalate.

od is outlined for the determination of lead he range 5-2,000 ng per ml, after dissolution tical samples, by co-precipitation with cal- xalate and ignition at 850-900C to CaO:Pb or, and measurement of its solid state lu- ence at 530 nm. In this manner, trace quan- f lead were directly determined in leaves, ry and wet ashing, and in synthetic blood. er-Vanderbilt) 1541

**LOSS OF TRACE ELEMENTS FROM NATURAL WATER DURING STORAGE. I. BEHAVIOR OF 203 HG AND 65 ZN ADDED TO POND WATER,**
Tokyo Univ. (Japan). Dept. of Agricultural Chemistry.
Y. Dokiya, S. Yamazaki, and K. Fuwa.
Environmental Letters, Vol 7, No 1, p 67-81, 1974. 7 fig, 3 tab, 8 ref.

Descriptors: Adsorption, *Spectroscopy, *Heavy metals, *Trace elements, *Standing waters, *Chemical properties, Stability, Ponds, *Pollutant identification.
Identifiers: *Atomic absorption spectroscopy, *203 Hg, *65 Zn, Biological Activity, Preservatives.

Dilute solutions (1 ppb-1 ppm) of inorganic mercury and zinc were prepared using distilled water and pond water, labelled with 203 Hg and 65 Zn. The rapid loss of 203 Hg at the level of ppb from distilled water is caused by adsorption to the surface of containers and vaporization to the atmosphere. In pond water some biological activity additionally participates in the loss. In 65 Zn solution, the biological activity alone is the main cause of loss from the solution. Some preservatives are examined. Among the preservatives examined, one millimole-cysteine seems to be the most satisfactory. The acids, long assumed as the most common preservatives, do not work against the vaporization of Hg. For the natural water, addition of 0.1 Normal HCl together with one millimole cysteine appears to be the best to preserve the ionic mercury as the microbes' growth is prevented at lower pH. The direct determination of mercury in natural water at the level of ppb was made by flameless atomic spectroscopy. (Litoff-Vanderbilt)
W75-11543

**LEAD AND ARSENIC LEVELS OF DAIRY CATTLE IN PROXIMITY TO A COPPER SMELTER,**
Washington Univ., Seattle. Dept. of Environmental Health.
R. M. Orheim, L. Lippman, C. J. Johnson, and H. H. Bovee.
Environmental Letters, Vol 7, No 3, p 229-236, 1974. 2 fig, 5 tab, 4 ref.

Descriptors: *Heavy metals, *Lead, *Spectrophotometry, *Arsenic compounds, Analytic techniques, *Cattle, *Copper, Milk, Soil analysis, Water pollution, *Pollutant identification, Air pollution, Washington.
Identifiers: *Atomic absorption spectrophotometry, Smelter, Refinery, *Puget sound(Wash), Blood, Hair, Dairy cattle, Delves cup modification.

Blood and milk from two groups of dairy cows were analyzed for lead and arsenic by atomic absorption spectrophotometry; hair samples from the same cows were analyzed for arsenic only. Those cows within 15 miles of the copper smelter showed a twenty fold increase of arsenic in hair over those more than 35 miles removed. The investigation took place on the eastern shoreline of the southern part of Puget Sound where a copper smelter and refinery are located. The ore that is refined contains large amounts of lead and arsenic. There are two inhabited islands two miles north of the smelter. The results indicated no health problems from drinking water or from dairy products, at least during the summer months. The soil and hair samples did show a build-up or storage of lead and arsenic in the fallout area. (Delfiner-Vanderbilt)
W75-11544

**THE SOLUBILITY BEHAVIOUR OF NO. 2 FUEL OIL IN SEA WATER,**
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W75-11565

**SUBMICROGRAM PER GRAM CONCENTRATIONS OF MERCURY IN ORCHARD LEAVES DETERMINED BY ISOTOPE DILUTION AND SPARK-SOURCE MASS SPECTROMETRY,**
National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
R. Alvarez.
Analytica Chimica Acta, Vol 73, No 1, p 33-38, 1974, 1 fig, 2 tab, 11 ref.

Descriptors: *Heavy metals, *Mercury, *Analytical techniques, *Leaves, *Isotope studies, *Mass spectrometry, Electrolysis, *Pollutant identification.
Identifiers: Orchard leaves, Isotope dilution, Spark source mass spectrometry, Sub-microgram concentrations, Wet ashing, Microphotometers.

A method was developed for determining submicrogram per gram concentrations of mercury in orchard leaves by use of a stable isotope dilution procedure in conjunction with the spark source mass spectrograph. A 5 gram sample was spiked with a solution of mercury, isotopically enriched in 201 Hg and 198 Hg. The 198 Hg served as a carrier. After wet-ashing the sample with nitric and perchloric acids under reflux and distilling most of the acid, the isotopically equilibrated mercury was electrodeposited onto high-purity gold wires for sparking in the mass spectrograph. The concentration was calculated from the altered isotope ratio, 201 Hg/202 Hg, and other data. The results were compared with those obtained by atomic absorption spectrometry and neutron activation, leading to a certified value of 0.155 plus or minus 0.015 microgram per gram for the mercury content of orchard leaves, SRM 1571 of the National Bureau of Standards. (Delfiner-Vanderbilt)
W75-11581

**HIGH COPPER CONCENTRATIONS IN SQUID LIVERS IN ASSOCIATION WITH ELEVATED LEVELS OF SILVER, CADMIUM AND ZINC,**
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 5C.
W75-11609

**THE ESTIMATION OF THE AMOUNT OF EMPIRE MIX CRUDE OIL IN MULLET, SHRIMP, AND OYSTERS BY LIQUID CHROMATOGRAPHY,**
Mississippi State Univ., Mississippi State. Dept. of Chemistry.
D. H. Miles, M. J. Coign, and L. R. Brown.
In: 1975 Conference on Prevention and Control of Oil Pollution Proceedings; American Petroleum Institute, EPA and U.S. Coast Guard, March 1975, p 149-154, 5 fig, 2 tab, 26 ref.

Descriptors: *Chromatography, Gas chromatography, *Oil pollution, Methodology, *Analytical techniques, *Bioassay, *Mullets, *Shrimp, *Oysters, Aquatic life, Animal physiology, *Pollutant identification.
Identifiers: Liquid chromatography, Empire mix crude oil, Tissue analysis, Bioaccumulation, Comparative techniques.

A method for rapidly estimating the amount of oil taken up by small (0.1g) samples of specific tissues from mullet, shrimp and oysters which were exposed to empire mix crude oil under controlled laboratory conditions was presented. The results obtained by utilizing the liquid chromatographic (LC) method described were compared to results obtained using conventional gas chromatographic (GC) techniques. Either method was valid for large samples of tissues. Data from routine bioassay experiments showed that 50% of the samples of shrimp tissue, 23% of the mullet tissue samples, and 49% of the oyster tissue showed the presence of oil only by the LC method. The LC method also afforded a greater amount of replications and conduction of multiple analyses on a given tissue. (Katz)
W75-11613

**HYDROCARBONS ASSOCIATED WITH SUSPENDED PARTICULATE MATTER IN SAN FRANCISCO BAY WATERS,**
Naval Biomedical Research Lab., Oakland, Calif.
L. H. DiSalvo, and H. E. Guard.
In: 1975 Conference on Prevention and Control of Oil Pollution Proceedings; American Petroleum Institute, EPA and U.S. Coast Guard, March 1975, p 169-173. 2 fig, 5 tab, 19 ref.

Descriptors: *Mussels, *Oil pollution, *Suspended solids, *Suspended load, *Sampling, *Organic compounds, *Water sampling, *Methodology, Chromatography, Sediments, Water pollution sources, Summer, *California.
Identifiers: *Bay mussels, *Mytilus edulis, Double settling tube, Biosamples, *San Francisco Bay(Calif), Thin-layer chromatography, Biological agents.

Suspended sediments were obtained at seven stations in San Francisco Bay during the summer of 1974 using a double settling tube. Bay mussels Mytilus edulis were used as biological agents for the active entrapment and deposition of suspended particulates occurring in the water. Total alkane and aromatic hydrocarbons were determined in the recovered sediments. Calculations suggested that 13.5 or more tons of presumably pollutant hydrocarbons were present in association with suspended particulate matter in the bay system at any given time during the sampling period. (Katz)
W75-11614

**KINETICS OF THE FLUORINATION OF ZINC,**
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
P. M. O'Donnell.
Available from the National Technical Information Service, Springfield, Va 22161 as NASA-TND-7931, $3.25 in paper copy, $2.25 in microfiche. NASA TN D-7931, March 1975. 13 p, 8 fig, 1 tab, 12 ref.

Descriptors: *Zinc, *Fluorine, *Halogens, *Kinetics, *Thermodynamics, Inorganic compounds, Temperature, Physical properties, Pressure, Analysis, Fluorides, Halides, Fluoridation, Salts, Properties, Thermal properties, Metals, Rates, Microscopy, X-ray analysis, Chemical reactions.
Identifiers: *Fluorination reactions, *Zinc fluoride, Fluorination apparatus, Rate constants, Parabolic rate constant, Zinc vaporization, Vaporization reactions, Pressure sensitive, Temperature sensitive.

The reaction between zinc metal and fluorine gas was studied over the temperature range of 100 to 400 degrees C and at pressures from 6 to 83 kilonewtons per square meter. At all temperatures and pressures the rate followed a parabolic equation. The parabolic rate constant was markedly pressure dependent. Above 300 degrees C, simple kinetics were complicated by zinc vaporization. At low temperatures an activation energy of 11.7 kilojoules per mole was calculated; however, a break was observed in the Arrhenius plot at about 300 degrees C. There was a clear change in the nature of the temperature dependence due to a change in mechanism between the low temperature region and the high temperature region. (Henley-ISWS)
W75-11629

**THE CONTINUOUS MONITORING OF WATER QUALITY,**
Clyde River Purification Board, Glasgow (Scotland).
G. A. Best.
The Public Health Engineer, No 15, p 73-84, May 1975. 9 fig, 6 tab, 11 ref.

Descriptors: *Water quality, *Monitoring, *Warning systems, *Water supply, Bodies of water, Dissolved oxygen, Suspended solids, Phenols, Oil, Metals, Pesticides, Installation costs, Biodegradation, Decomposing organic matter, Potable water.
Identifiers: Clyde River(Gt. Brit), Biodegradable organic matter, Cyanide.

The Clyde River Purification Board recently installed two continuous water quality monitors to assess changes and to provide warning when water supply is unsuitable for potable use. The two stations were built at Glasgow Green on the lowest reach of the River Clyde and at Orbiston Park, just upstream of a proposed lake. Installation costs were high, and the stations require regular maintenance by a technician with some knowledge of electronics. Three additional stations have not been built because the Board feels that the available monitoring equipment is not reliable enough. Accurate long-term measurements can be made of dissolved oxygen, suspended solids, pH, conductivity, and temperature. However, better sensors are needed for measuring biodegradable organic matter, phenols, oil, cyanide, metals, and pesticides. Such monitoring stations are useful when they are connected directly to the headquarters' laboratory, so that immediate warnings may be given in cases of water quality deterioration. (Kramer-FIRL)
W75-11667

**REPORT OF ANALYSES FOR INDUSTRIAL WASTE WATER IN TWENTY-EIGHT FACTORIES, (IN JAPANESE),**
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
Y. Asada, T. Masaki, Y. Takamura, S. Shirasaka, and M. Kubota.
Sci Rep Fac Agric Ibaraki Univ, 21 p 65-74, 1973. Illus.

Descriptors: *Industrial wastes, *Japan, *Water pollution sources, Industrial water, Waste water, *Water quality standards, *Analysis, Coliforms, Bacteria, Chemical oxygen demand, Suspended solids, Alkalinity, Phenols, *Industrial plants, Food processing industry, Chemical wastes, Urban drainage, Nitrogen, Cement goods factories, Metal products plants.

Factories (28) were classified into 3 categories: factories of hard ware (metal goods), of food goods, of cement goods and others. To determine whether industrial waste water fulfilled the water quality standards of Tsuchiura city (Japan), analytical experiments were carried out from April 1972-April 1973 for: pH, chemical oxygen demand (COD), suspended solids (SS), phenol, alkalinity, NH4+-N, NO+2-N, Cl-, CN-, Cu2+, Pb2+, Fe3+, Mn2+, Cd2+, Cr6+, ions, total Cr and number of coliform bacteria. Excessive CN-, Zn2+, Cr6+, OH- ions and SS were often in the drainage from some metal product plants. Excess number of coliform bacteria, COD and SS were in the industrial waste water from food product plants. Cr6+ ion was detected in samples from cement goods factories. River pollution was caused mainly by industrial waste waters from metal product plants and food product plants, and urban sewage drainage.--Copyright 1975, Biological Abstracts, Inc.
W75-11671

**CONTINUOUS MONITORING, AUTOMATED ANALYSIS AND SAMPLING PROCEDURES, (LITERATURE REVIEW),**
Florida Univ., Gainesville.
P. L. Brezonik.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1241-1249, June, 1975. 92 ref.

Descriptors: *Automation, *Sampling, *Monitoring, *Water quality, Inorganic compounds, Effluents, Water, Sea water, *Reviews, Bibliographies
Identifiers: Organic pollutants, Autoanalyzers, Rainfall collection, Oil extraction.

Recent literature on continuous monitoring au
mated analysis and sampling procedures for wa
quality was reviewed. Inorganic substances n
be measured by electrometric methods such
ion-selective electrodes for continuous monitor
of water and wastes. Autoanalyzers and modif
tions of these were discussed in terms of sp
trometry procedures. Additionally, oxygen
mand, organic matter, and bioassays w
described. River and effluent sampling progr
need to define objectives in order to optimize c
effectiveness. Preservation of samples may
achieved chemically; several storage solution
mulae are given. Samplers for rainfall collec
and for oil extraction are also being develo
Also, concentration-extraction methods are b
used to measure organic pollutants in nat
waters as well as to analyze mercury levels in
water. (Kramer-FIRL)
W75-11711

**COPPER AND ZINC IN CANCER IRRORA
COMPARATIVE METABOLISM OF
MOLT CYCLE, LE CUIVRE ET LE ZINC C
CANCER IRRORA
(CRUSTACE:DECAPODE): METABOLI
COMPARE AU COURS DU CY
D'INTERMUE,**
CEA Centre de la Hague, Cherbourg (Fra
Laboratoire de Radioecologie Marine.
For primary bibliographic entry see Field 5C.
W75-11752

**POLLUTION DETECTION AND RIVER QU
TY MANAGEMENT,**
G. M. Woodward.
Water Treatment and Examination, Vol 24, P
p 3-22, 1975. 2 tab, 8 ref.

Descriptors: *Pollutant identification, Wate
lution effects, Water pollution control, Wate
lution sources, *Water quality, Water ma
ment(Applied), *Rivers, *Estuaries, S
waters, *Groundwater, Environmental effec
Identifiers: *United Kingdom.

Various aspects of the detection and measur
of pollution in surface waters, groundwat
estuaries in relation to water quality manag
in the United Kingdom were discussed. Sho
long term water pollution effects, remedia
sures and water quality improvement action
also discussed in the continuing effort to
and monitor pollution. (Katz)
W75-11753

**A METHOD FOR INTERMITTENT CHL
DOSING IN CONTINUOUS-FLOW TOX
TESTS,**
Virginia Polytechnic Inst. and State
Blacksburg. Dept. of Biology; and
Polytechnic Inst. and State Univ., Blac
Center for Environmental Studies.
B. C. Gregg, and A. G. Heath.
Bulletin of Environmental Contaminat
Toxicology, Vol 13, No 5, p 588-592, May
fig, 1 tab, 5 ref.

Descriptors: *Design, Construction, *T
*Methodology, *Chlorine, Waste water,
pollution sources, Pollutant identification.
Identifiers: *Intermittent dosing, *Cont
flow through tests, Steam electric ge
plants.

The composition and operation of an inte
delivery system used to perform chlorine
tests on macroinvertebrates were describ
system was used to simulate the co
downstream from electric (steam) ge
plants which discharged a chlorine solu
treating organisms attached to cooling line
W75-11754

RCURY LEVELS IN FISH IN THE LA ANDE RIVER AREA, NORTHERN QUEBEC,
Gill Univ., Montreal (Quebec).
. Smith, F. Berkes, and J. A. Spence.
etin of Environmental Contamination and icology, Vol 13, No 6, p 673-677, June 1975. 1 7 ref.

criptors: *Pollutant identification, *Mercury, es, *Salmonids, *Lake trout, *Brook trout, seline studies, Water quality standards, lytical techniques, Laboratory studies, nada.
tifiers: *Tissue analysis, Bioaccumulation, thern pike, Esox lucius, Lake trout, Salvelinus aycush, Yellow walleye, Stizostedion v vitre- Brook trout, Salvelinus fontinalis, Lake tefish, Coregonus clupeaformis.

ural background levels of mercury in an un- aminated environment were determined for re baseline establishment and assessment of strial pollution. Highest levels of mercury entrations in the muscle tissue of various fish the La Grande area are: one northern pike x lucius) and one lake trout (Salvelinus aycush) 1.21 ppm; one yellow walleye ostedion v. vitreum) 0.78 ppm. Arithmetical ns for pike and lake trout were 0.65 and 0.60 respectively; brook trout (Salvelinus fon- is) averaged 0.25 ppm and lake white fish egonus clupeaformis) 0.16-0.09 ppm. (Katz) -11756

BROWN PELICAN AND CERTAIN EN- ONMENTAL POLLUTANTS IN LOUI- NA,
au of Sport Fisheries and Wildlife, Laurel, Patuxent Wildlife Research Center.
Blus, T. Joanen, A. A. Belisle, and R. M. ty.
tin of Environmental Contamination and city, Vol 13, No 6, p 646-655, June 1975. 1 fig, 23 ref.

riptors: *Metals, *Metabolism, *Organic ounds, *Birds, *Nests, *Growth stages, orinated hydrocarbons, On-site investiga- Laboratory tests, Mercury, Zinc, Copper, nium, Lead, Nickel, Environmental effects, isiana, *Polychlorinated biphenyls, utant identification.
ifiers: *Pelicans, *Eastern Brown Pelican, anus occidentalis, PCB, Polychlorinated enyls.

cting eggs, counting nests and young, and planting the young were involved in the field of the eastern brown pelican (Pelecanus oc- talis) in Louisiana. Thirty-six eggs were zed for organochlorine pesticide residues, ell thickness, metabolism, and hlorinated biphenyls (PCB's). Mercury, zinc, er, cadmium, lead and nickel levels were mined. (Katz) 11757

DIES OF THE AROMATIC COMPOUNDS TENT IN SEA WATER BY LOW-TEM- ATURE LUMINESCENT SPECTROSCOPY, USSIAN),
nee Inzheneroe Morskoe Uchilishche, Odes- SSR).
. Red'kin, A. M. Voitenko, and P. A. akov.
nologiya, Vol 13, No 5, p 908-913, 1973. Illus.

riptors: *Sew water, *Coasts, Oceans, er pollution sources, *Aromatic compounds, nic compounds, *Analytical techniques, troscopy, *Bottom sediments, Sediments, Pollutant identification.
fiers: *Black Sea, *Luminescent spectrosco- Hydro carbons, Polynuclear aromatic carbons, PAH, Shpolsky's effect, Chro- graphic fractionation, *Tissue(Animal),

Pollution of the Coastal water of the Black Sea with polynuclear aromatic hydrocarbons (PAH) was studied using the fine-structure liminescent spectroscopy method based on Shpolsky's effect at the temperature of liquid nitrogen (77K) with previous chromatographic fractionation. Fluorescent and phosphoresent methods were developed for quantitative determination of PAH in sea water, bottom sediments and animal (fish) tissue with photoelectric and photographic recording of the spectrum for the straight-chain paraffins (acenapthene: 321 nm and 478.4 nm; phenanthrene: 345.7 nm and 463 nm; 3,4-benzpyrene: 403 nm; fluoranthene: 407.8 nm). Measures are proposed for preventing pollution of the sea with hydrocarbons.--Copyright 1975, Biological Abstracts, Inc.
W75-11786

METHODS OF DETECTING THE FLUORINE ION IN AIR AND WATER, (IN RUSSIAN),
G. S. Salyamon, and M. V. Popelkovskaya.
Gig Sanit, Vol 38, No 4, p 65-67, 1973.

Descriptors: *Chemical analysis, *Air pollution, Water, *Fluorine, Fluorides, *Analytical techniques, *Pollutant identification, Cesium.
Identifiers: Alizarin, Cyanine, Eriochrome, Sulfonic-acid, Sulfophenylazo-1, Zirconium, Chelating agents.

To select the most sensitive and specific methods for analyzing HF and fluorides in air and water, 16 methods recommended for this purpose and 9 for determination of the F ion in other media (solutions, biomaterials, etc.) were tested. From these 25 methods, 3 were selected: using Zr-ECC (Zr-eriochromcyanine), Zr-SPADNS (Zr complex of 4-sulfophenylazol1,18-dihydroxynaphthalene-31,61-disulfonic acid), and Ce-alizarin chelating agent. The first 2 methods have advantages with respect to the range of determination and simplicity of reagent preparation. All 3 indicators react selectively with F- in the presence of 10 to the 2nd power-10 to the 4th power microgram of many substances. Zr-SPADNS should be used primarily for analyzing HF and fluorides in the atmosphere and air of work zones, bodies of water and waste waters, without the separation of F- from admixtures in many cases. The other 2 methods, Ce-alizarin chelating agent and Zr-ECC, are recommended for analyzing air and bodies of water but not waste waters.--Copyright 1975, Biological Abstracts, Inc.
W75-11794

THE BEHAVIOUR OF METAL TETRAMETHYLENEDITHIOCARBAMATES IN THE GRAPHITE-TUBE FURNACE FOR ATOMIC ABSORPTION SPECTROMETRY,
Ljubljana Univ. (Yugoslavia). Inst. of Chemistry.
S. Gomiscek, Z. Lengar, J. Cernetic, and V. Hudnik.
Analytics Chimica Acta, Vol 73, No 1, p 97-106, November, 1974, 7 fig, 3 tab, 12 ref.

Descriptors: *Heavy metals, *Chelation, *Spectrophotometry, *Chemical analysis, Cadmium, Cobalt, Copper, Iron, Nickel, Lead, Vanadium, Argon, Oxygen, *Pollutant identification, Separation techniques.
Identifiers: *Atomic absorption spectroscopy, Graphite tube furnace, *Metal chelates, *Metal carbamates, Organic reagents, Atomization, Oxidative decomposition, Metal tetramethylenedithio carbamates.

Some phenomena occurring during the atomization of metal tetramethylenedithiocarbamates (MeTMDTC) in the graphite tube furnace were observed. Explanations based on studies of the behavior of MeTMDTC in argon and oxygen at higher temperatures and on the results of x-ray diffraction, differential thermal and thermogravimetric studies were proposed. The metals used were Cd, Co, Cu, Fe, Ni, Pb, and V. Curves show the dependence of the absorption peaks on the destruction temperature. These curves are characterized by tendencies toward decreased absorption signals for temperatures of 60C and 100C and by the relative constancy of the signals for destruction for temperatures from 200C to 1100C. Cadmium and lead TMDTC deviate from this behavior. (Delfiner-Vanderbilt)
W75-11797

THE DETERMINATION OF CADMIUM IN SEA WATER BY RADIOACTIVATION,
Naval Undersea Center, San Diego, Calif.
H. V. Weiss, K. Chew, M. Guthman, and A. Host.
Analytica Chimica Acta, Vol 73, No 1, p 173-176, November, 1974, 1 fig, 1 tab, 2 ref.

Descriptors: *Cadmium, *Cadmium radioisotopes, *Heavy metals, *Neutron activation analysis, *Crystallization, Assay, Separation techniques, Analytical techniques, Neutron absorption, Mercury, *Pollutant identification.
Identifiers: Beta-ray activity, Indium, Oxine, 8-hydroxyquinoline.

A method is described of isolating cadmium from sea water by co-crystallization with 8-hydroxyquinoline (oxine). The technique involved neutron activation analysis. Beta-ray activity measurements were made of 115 Cd-115In. Results of the assay of cadium in two different volumes of stock sea water are as follows. Eight analyses of 0.5 liter samples and five of 1 liter samples averaged 0.737 plus or minus 0.041 and 1.451 plus or minus 0.044 micrograms, respectively. The overall standard deviation is 4.7%. The determination of mercury in sea water is inherently compatible with the analytical scheme described. (Delfiner-Vanderbilt)
W75-11798

## 5B. Sources Of Pollution

SANITARY AND BACTERIOLOGICAL EVALUATION OF THE RAW MATERIAL, AIR AND WASTEWATERS OF SOME BAST FIBER PLANTS IN THE UZBEK SSR, (IN RUSSIAN),
Uzbekskii Nauchno-Issledovatelskii Institut Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
M. S. Artykov, and N. P. Masharipov.
Gig Sanit, 4 p 101-102, 1974.

Descriptors: *Fibers(Plant), Industrial wastes, Waste water, Pollutants, *Water pollution sources, *Microorganisms, Bacteria, Aerobic bacteria, *Streptococchus, USSR, Public health, *Air pollution.
Identifiers: *Ambari, *Bast, Hibiscus-cannabinus, Kenaf, Occupational disease, Staphylococcus, Uzbek-SSR.

The Uzbek SSR ranks 1st in the USSR in the cultivation and production of ambari (kenaf, Hibiscus cannabinus). The bacterial contamination of industrial wastewaters, raw materials, air of shops, and washings from the upper air passages of workers at 2 bast fiber plants in the Tashkent region producing ambari was studied. The air at 1 plant contained 40 pathogenic strains of Staphylococcus and Streptococcus and at the other plant, 58 strains in 1 m to the third power; in the raw material, 43 and 15 strains were isolated, respectively. Bacterial contamination of the upper air passages by pathogenic microflora was higher at 1 plant than the other.--Copyright 1975, Biological Abstracts, Inc.
W75-11406

SANITARY AND HYGIENIC EVALUATION OF SEEPAGE WATERS OF STRUCTURES PROTECTING RESERVOIRS (IN RUSSIAN),
Gorkovskii Meditsinskii Institut (USSR).
T. S. Yurasova.
Gig Sanit. 4. p 96-97, 1974.

Descriptors: *Potable water, *Reservoirs, *Drainage systems, *Seepage, Analysis, *Water pollution sources, Filtration, Filters, Soil filters, Screens, Structures, Hydraulic structures, Barriers, Reservoir leakage, Reservoir construction, Bacteria, Sanitary engineering, Public health.

The drainage systems of a number of hydro developments discharge a considerable amount of seepage waters into reservoirs which supply the drinking water of cities. A sanitary and hygienic evaluation of seepage waters at the Gorki reservoir (USSR) showed that seepage waters can be used for drinking. However, the chemical composition and bacterial indices of seepage waters depend not only on the composition and quality of the groundwaters, filtering soils and filters of protective structures, but also on the sanitary state of the territory surrounding them. Low quality seepage waters were observed in cases of polluted surrounding territory.--Copyright 1975, Biological Abstracts, Inc.
W75-11412

**STORM AND COMBINED SEWER ABATEMENT TECHNOLOGY IN THE UNITED STATES--AN OVERVIEW,**
Environmental Protection Agency, Washington, D.C. Municipal Pollution Control Div.
For primary bibliographic entry see Field 5D.
W75-11414

**A CASE OF SUBTERRANEAN WATER POLLUTION CAUSED BY THE PUBLIC REFUSE DISPOSAL GROUND, (IN JAPANESE),**
Obihiro Zootechnical Univ. (Japan). Dept. of Veterinary and Public Health.
T. Nishi, S. Miyagacho, Y. Sugiura, K. Shibamori, and S. Sawajiri.
Res Bull Obihiro Zootech Univ Ser I, Vol 8, No 3, p 345-353, 1974. Illus.

Descriptors: *Water pollution sources, *Subsurface waters, *Waste dumps, *Garbage dumps, Asia, Pollutant identification, Sampling, Rural areas, Municipal wastes, *Domestic wastes, Coliforms, Nitrogen compounds, Iron, Wells, Water wells, Ammonia, Nitrites.
Identifiers: *Japan(Obihiro City).

In Aug., 1969, in 1 area in Obihiro City, the well water of 5 farm houses (No. 1, 2, 3, 4 and 5) was polluted, and the polluting source was suspected to be the public refuse disposal area which was 550 m from the nearest house. To determine any connection, 2 driven pump wells were prepared at distances of approximately 10 m (No. 6) and 500 m (No 7) in the intermediate zone. As a control, 2 normal wells nearby (No. 8 and 9) and 3 surface water river samples (No. 10, 11 and 12) were tested. These 12 water samples were collected and tested, covering about 24 items. The main causes of the unsuitableness for drinking were combinations of high coliform count, high content of iron, and concurrent detection of nitrogen of ammonia and nitrite. The degree of pollution of the examined wells was in order: No. 7, No. 4, and No. 1, corresponding to their distance from the refuse disposal area to the downstream. In each of the examined items of pollution, high values were noted at the 500 m point (No. 7) than at the 10 m point (No. 6) in both of the experimentally driven pump wells. The pollution spread along the underground water vein as bed water.--Copyright 1975, Biological Abstracts, Inc.
W75-11432

**IS THE MALACHITE GREEN BROTH ACCORDING TO HABS AND KIRCHNER SUITABLE FOR SERVING AS AN ISOLATION MEDIUM FOR PSEUDOMONAS AERUGINOSA FROM WATER, (IN GERMAN),**
Frankfurt Univ. (West Germany). Hygiene-Institut.
R. Schubert, and U. Blum.
Zentralbl Bakteriol Parasitenkd Infektonskr Hyg Erste Abt Orig Reihe B Hyg Praev Med, Vol 158, No 6, p 583-587, 1974.

Descriptors: *Analytical techniques, *Pollutant identification, Water pollution sources, *Cultures, Plant tissues, *Pseudomonas, *Bacteria, Aerobic bacteria, Microorganisms.
Identifiers: Isolation, Malachite green, Mediums, *Pseudomonas-aeruginosa, Culture mediums.

The addition of malachite green (1:100000) to the culture medium is a simple and efficient method for the isolation of P. aeruginosa from the water. In the case of 6 P. aeruginosa strains the addition of malachite green did not decrease initial growth rate. The other Pseudomonas species normally occurring in the water are to a great extent inhibited in their growth following the addition of malachite green.--Copyright 1975, Biological Abstracts, Inc.
W75-11435

**SOME PROBLEMS OF THE CIRCULATION OF ENTEROVIRUSES IN ENVIRONMENTAL OBJECTS, (IN RUSSIAN),**
Kuybyshevskii Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny (USSR).
E. V. Rabyshko.
Gig Sanit, 4 p 105-106, 1974.

Descriptors: Pollution, Water pollution, *Water pollution sources, Water treatment, *Viruses, Waste water treatment, Waste treatment.
Identifiers: *Enteroviruses, Picornaviruses.

Enteroviruses were found in water with different degrees of contamination in many cases: in wastewaters in 40.7% of the samples (222 strains of enteroviruses), in river water in 14.9% of the samples (59 strains) and in tap water in 9 of 64 samples (12 strains). The presence of enteroviruses in these waters indicated that they pass through the barriers of treatment plants and are resistant to the decontamination regimes used.--Copyright 1975, Biological Abstracts, Inc.
W75-11438

**PHYSICOCHEMICAL PROPERTIES OF DREDGE SPOIL,**
Canada Centre for Inland Waters, Burlington (Ontario).
A. Mudroch, and A. J. Zeman.
Journal of the Waterways, Harbors and Coastal Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No WW2, Proceedings Paper 11317, p 201-216, May 1975. 10 fig, 7 tab, 22 ref, 2 append.

Descriptors: *Cation exchange, *Dredging, *Harbors, *X-ray diffraction, *Physicochemical properties, *Great Lakes, *Lake Erie, *Lake Ontario, Plasticity, Spoil banks, Sediment load, Infrared radiation, Electron microscopy, Mineralogy, Sediments, Retention.
Identifiers: Citrates, Dredges, Mineral content, Infrared absorption, Postglacial sediments, Clycol.

Physicochemical changes resulting from the subaerial exposure of dredge spoil during land disposal were investigated using 5 fine-grain bottom sediment samples from the lower Great Lakes. Air-drying of unoxidized postglacial sediments increased cation exchange capacity and decreased plasticity. Air-drying of a Pleistocene oxidized sediment did not affect these parameters appreciably. The difference was attributed to an irreversible collapse of weathered swelling minerals and the oxidation of ferrous and manganous ions in postglacial sediments. Mineralogical composition and changes caused by citrate-dithionite extraction were examined by X-ray diffraction, infrared absorption, electron-optical, and surface area measurements. (Roberts-ISWS)
W75-11465

**TRANSPORT MODEL, USER'S MANUAL,**
Battelle-Pacific Northwest Labs., Richland Wash. Water and Land Resources Dept.
S. W. Ahlstrom, and R. G. Baca.
Battelle Report, Number BNWL-1716, UC-70 1974. 114 p, 3 fig, 5 append. ERDA Contrac AT(45-1):1830.

Descriptors: *Path of pollutants, *Groundwate *Computer models, *Water quality, *Chemic reactions, *Ion exchange, Dispersion, Diffusio Groundwater movement, Digital computer Aquifers, Model studies, *Computer program Mathematical models, Convection.
Identifiers: Method of characteristics, Particle-i a-cell method, User's manual, *Transport model

The numerical solution of the Transport Mod equation is based on the technique known as t 'particle-in-a-cell' method. The numerical gorithm is contained in three main program TRACK, MICRO, and MACRO. The execution program TRACK established the desired probl size, boundaries, and grid networks, and compu a movement history for the computational pa cles. A numerical solution to the micro ion tra port equation is provided by the execution of p gram MICRO. Program MACRO calculates a merical solution to the macro ion transport eq tion. (Prickett-ISWS)
W75-11468

**SCALE EFFECTS ON COOLING TOW MODEL STUDIES,**
Iowa Inst. of Hydraulic Research, Iowa City.
For primary bibliographic entry see Field 8B.
W75-11470

**WATER QUALITY REPORT: THE COLUM RIVER BELOW LONGVIEW, WASHINGT DECEMBER 1971 - NOVEMBER 1972,**
Washington State Dept. of Ecology, Olympia.
P. Lee.
Technical Report No 74-7, February 1974. 45 fig, 11 tab, 8 ref, 6 append.

Descriptors: *Water quality, *Data collecti *Columbia River, *Washington, Water pollut Water pollution sources, Pollutants, Colifo Water temperature, Dissolved oxygen, Munic wastes, Pulp wastes, Discharge(Water), Samp Water analysis, Water quality standards.
Identifiers: *Longview.

The Washington State Department of Ecology lected water quality data from the Columbia R at a point 12 miles below Longview, Washin (at Port Westward, Oregon) from December to November 1972. The data were collected continuously operating automatic water qu data acquisition system. The Columbia Riv this point is designated by Washington State W Quality Standards as Class A waters. The rive ceeded maximum allowable coliform stan during most of the year. During the low period in late summer and early fall, the sporadically did not meet water quality stan for temperature and dissolved oxygen. Columbia River was also monitored for diss oxygen and temperature by the National M Fisheries Service near Prescott, Oregon, ab miles upstream from Longview. No app water quality violations were observed duri year at this location. It was concluded that t dustrial and municipal discharges in the Long Kelso area significantly contribute to the ap water quality violations recorded at Port ward. These conclusions support the resul tained by the U.S. Environmental Prot Agency in 1970 and 1971 on water quality tions in the lower Columbia River. (Rob ISWS)
W75-11472

**ELENIUM IN WATERS IN AND ADJACENT O THE KENDRICK PROJECT, NATRONA OUNTY, WYOMING,**
eological Survey, Reston, Va.
A. Crist.
ailable from Supt of Documents, GPO, ashington, DC 20402 $2.85. Water-Supply Paper 23, 1974. 39 p, 3 fig, 3 plate, 3 tab, 17 ref.

scriptors: *Water pollution sources, *Path of llutants, *Groundwater, *Surface waters, Vyoming, Inorganic compounds, Hydrogeology, ater chemistry, Geochemistry, Rocks, Chemical operties, Water wells, Sampling, Chemical anal-s, Geologic time.
ntifiers: *Selenium, *Natrona County(Wyo).

enium in concentrations exceeding the max-im limit, 0.01 milligrams per liter or 10 micro-ms per liter, recommended by the U.S. Public alth Service in 'Drinking-Water Standards, 2,' is present in waters in areas near Casper, o. Some streams containing selenium flow into North Platte River upstream from several mu-ipalities that obtain water from the river and the ivium along the river. The area of investigation ludes about 725 square miles in Natrona County central Wyoming. Geologic formations in the a contain selenium that may have been derived m deposits of seleniferous material or from vol-ic emanations brought down by rain. The enium concentration in 82 samples of taceous rocks ranged from less than 10 to 4,200 rograms per kilogram. Of four samples of Ter-y rocks analyzed, three contained no selenium one had a selenium concentration of 40 micro-ms/kg. The selenium concentration in 93 sam-s of Quaternary rocks ranged from less than 10 20 micrograms/kg. The selenium concentration he groundwater in these areas have not reached ate of equilibrium in the aquifer. Irrigation un-btedly has accelerated movement of selenium in and from irrigated areas. (Woodard-USGS)
5-11492

**OHYDROLOGIC RECONNAISSANCE OF E UPPER POTOMAC RIVER BASIN,**
logical Survey, Reston, Va.
primary bibliographic entry see Field 2F.
5-11493

**TER QUALITY CHANGES RELATED TO E DEVELOPMENT OF ANAEROBIC CONDI-NS DURING ARTIFICIAL RECHARGE,**
logical Survey, Lubbock, Tex.
W. Wood, and R. L. Bassett.
er Resources Research, Vol 11, No 4, p 553-August 1975. 6 fig, 3 tab, 15 ref.

criptors: *Artificial recharge, *Water spread-*Chemical reactions, *Anaerobic bacteria, xas, Groundwater recharge, *Water quality, tration rates, Gravitational water, Soil proper-Sulfates, Bicarbonates, Hydrogen ion con-ration, Geology, Data collections, Chemical ysis, *Water reuse.
tifiers: *Lubbock(Tex).

ficial recharge basins or spreading sites com-ly exhibit reductions in infiltration rates after onged periods of submergence. This loss in in-ation rate has often been shown to be as-ated with a large population of anaerobic or ltative anaerobic bacteria in the material un-ying the basin floor. An artificial recharge ex-ment in a spreading basin at Lubbock, Texas, wed a significant change in the chemical quali-f recharged water that was associated with the wth of anaerobic bacteria. Sulfate-reducing eria reduced the sulfate concentration of the arge water at this location by 80 mg/liter. The rbonate concentration was increased by more 150 mg/liter, and the pH decreased 1 unit dur-he same time period. The change in chemical ity occurred suddenly and corresponded to a natic decrease in the infiltration rate in the basin. These observations on the chemical changes in recharged water make it possible to differentiate between anaerobic bacteria and other causes of reduced hydraulic conductivity in this recharge basin. The anaerobic conditions appear to start at depth and work toward the surface, thereby suggesting a process that involves adsorption of organic material and consumption of dissolved oxygen with depth. (Woodard-USGS)
W75-11497

**HYDROLOGY FOR LAND-USE PLANNING: THE HILLSIDE AREA, ANCHORAGE, ALASKA,**
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W75-11504

**NATURAL AND ACCELERATED PHOSPHATE MOBILITY, (IN DUTCH),**
For primary bibliographic entry see Field 5C.
W75-11520

**GEOCHEMISTRY OF SURFACE SEDIMENTS IN AN ACID STREAM ESTUARY,**
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 2J.
W75-11531

**KINETICS OF LEAD RETENTION AND DISTRIBUTION IN SUCKLING AND ADULT RATS,**
Yugoslav Academy of Sciences and Arts, Zagreb. Inst. for Medical Research and Occupational Health.
B. Momcilovic, and K. Kostial.
Environmental Research, Vol 8, No 2, p 214-220, October 1974. 1 fig, 3 tab, 18 ref.

Descriptors: *Kinetics, *Lead, *Heavy metals, *Metabolism, Animal physiology, Gamma Ray, Radioactivity, Rodents, *Path of pollutants, *Absorption.
Identifiers: Suckling rats, Adult rats, Intraperitoneal injection, Scintillation counter, Brain, Blood, Kidneys, Liver, Teeth.

The kinetics of lead distribution was studied in suckling and adult rats eight days after a single intraperitoneal injection of 203 Pb. Marked differences were observed in the kinetics of lead retention and distribution in suckling as compared to adult rats. Most striking was the eightfold concentration of lead in the brain of sucklings as compared to adults. The rate of 203 Pb disappearance was lower in the whole body, blood and kidneys, but higher in the liver, while the deposition processes predominated in the brain, femur and teeth of sucklings as compared to adult animals. The activity of 203 Pb was determined in a scintillation counter. (Delfiner-Vanderbilt)
W75-11537

**DETERMINATION OF THE APPARENT COMPLEXING CAPACITY OF LAKE WATERS,**
Canada Centre for Inland Waters, Burlington (Ontario).
Y. K. Chau, R. Gachter, and K. Lum-Shue-Chan.
Journal of the Fisheries Research Board of Canada, Vol 31, No 9, p 1515-1519, September 1974. 3 fig, 1 tab, 18 ref.

Descriptors: *Heavy metals, *Trace elements, *Water chemistry, *Lakes, Pollutants, *Copper, Canada, Lake Erie, Lake Ontario.
Identifiers: *Stripping voltammetry(Anodic), *Lignands, Hamilton Harbor(Ont.).

A sensitive and accurate method is described for the measurement of the apparent complexing capacity of lake waters. It is based on the measurement of labile copper by differential pulse anodic stripping voltammetry after a number of ionic copper spikes have been allowed to equilibrate with the complexing materials in a water sample. Coefficients of variation for the determination of EDTA at a level of 0.50 micro mole per liter in Hamilton Harbor water were 6 and 8%. Analysis of 7 replicates of a Hamilton Harbor water sample gave an apparent complexing capacity of 0.52 micro mole per liter Cu equivalent with a relative standard deviation of 7.7%. Analyses of a number of samples from Lake Erie and from lakes near Sudbury, Ontario gave a range from nondectable to 0.70 micro mole per liter Cu equivalent of complexing capacity. (Delfiner-Vanderbilt)
W75-11538

**LEAD AND ARSENIC LEVELS OF DAIRY CATTLE IN PROXIMITY TO A COPPER SMELTER,**
Washington Univ., Seattle. Dept. of Environmental Health.
For primary bibliographic entry see Field 5A.
W75-11544

**WATER QUALITY RELATIONSHIPS IN THE GREAT LAKES: ANALYSIS OF A SURVEY QUESTIONNAIRE,**
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
J. W. Bulkley, and A. P. Mathews.
Technical Report No 42, Septemb4r 1974. MICHU-SG-75-200. Grant No 04-4-158-23.

Descriptors: Water quality, *Water conservation, *Water quality control, *Water management(Applied), Water pollution, *Water utilization, Shores, *Shore protection, *Great Lakes, *Lakes, Governments, Water districts, Water resources development, Surveys, Sewage treatment, Land use, Industrial effluents, Population density.
Identifiers: Shore quality, Shoreline quality, Great Lakes shoreline, Shoreline maintenance, Shoreline management, Environmental surveys.

A questionnaire survey conducted among 650 govermental units in the Great Lakes area has identified the levels of water quality in the respective areas, the perceived factors contributing to the destruction of water resources and possible solutions to the problem of deteriorating water quality. One-way frequency distributions obtained, based on the 300 responses to the questionnaires, indicate that the water quality is medium or lower in 92% of the cases, while it is low or very low in 35% of the cases. Inadequate municipal sewage treatment and inadequate industrial effluent treatment were identified to be the most common factors causing the destruction of water resources. Analysis of two-variable relationships have been made with a view to link the chain of causal factors influencing water in the Great Lakes. Water quality is found to vary with the type of land use and population density, decreasing with increasing degree of industrialization and decreasing with increasing population density. (NOAA)
W75-11549

**MERCURY CYCLING IN A SMALL HAWAIIAN ESTUARY,**
Geological Survey, Honolulu, Hawaii. Water Resources Div.
For primary bibliographic entry see Field 5C.
W75-11563

**THE SOLUBILITY BEHAVIOUR OF NO. 2 FUEL OIL IN SEA WATER,**
Rhode Island Univ., Kingston. Graduate School of Oceanography.
P. D. Boehm, and J. G. Quinn.
Reprint from Marine Pollution Bulletin, Volume 5, Number 7, p 101-105, July 1974. 2 fig, 1 tab, 18 ref. EPA Grant T-900140, Grant No. 04-3-158-3.

Descriptors: *Oil-water interfaces, *Fuels, *Oil, *Oil pollution, *Oil spills, *Gas chromatography, Oily water, Fossil fuel, Water pollution, Oil wastes, *Solubility, Organic compounds, Chromatography, Sea water, Petroleum, Pollutant identification.
Identifiers: Fuel oil solubility, Fuel oil, Oil solubility, Oil/water mixtures, No. 2 fuel oil, Crude oil, Hydrocarbon components, Marine pollution.

The solubility of No. 2 fuel oil in sea water is studied using gas chromatographic techniques. Evidence is presented for the existence of accommodated (particulate or droplet), solubilized (colloidal micelles) and soluble hydrocarbon components in fuel oil-sea water mixtures. (NOAA)
W75-11565

**NITRIFICATION AND DENITRIFICATION DURING MISCIBLE DISPLACEMENT IN UNSATURATED SOIL,**
California Univ., Davis.
For primary bibliographic entry see Field 3F.
W75-11596

**KINETIC AND EQUILIBRIUM STUDIES OF BORON DESORPTION FROM SOIL,**
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 2G.
W75-11600

**COMPARATIVE EFFICIENCY OF SOLUBLE AND CONTROLLED-RELEASE SULFUR-COATED UREA NITROGEN FOR CORN IN TROPICS,**
University of the West Indies, St. Augustine (Trinidad).
For primary bibliographic entry see Field 3F.
W75-11601

**SULFUR AND MANGANESE RELEASE FROM SOILS TREATED WITH PRILLED SULFUR AND SULFUR-BENTONITE,**
Missouri Univ., Clinton. Dept. of Agronomy.
D. L. Lindell, and R. C. Sonsen.
Soil Science Society of America Proceedings, Vol 38, No 2, p 368-372, March-April, 1974. 3 fig, 2 tab, 10 ref.

Descriptors: Fertilization, *Fertilizers, Sulfates, *Sulfur, Hydrogen, Soil properties, Soils, *Manganese, *Nebraska, *Soil treatment, Bentonite.
Identifiers: *Sulfur-bentonite.

Seven Nebraska soils were used to compare prilled sulfur and sulfur-bentonite formulation in regard to the amount of sulfate-sulfur, manganese and hydrogen released to a leaching solution after successive incubations. Also the effects of sulfur fertilizer granule concentrations in the soil were studied. Generally, the amount of sulfate-sulfur and manganese and the pH values in leachates from the columns containing sulfur-bentonite were not different from those from columns containing prilled sulfur. Differences among soils could not be explained on the basis of measured soil properties. The relationships between the amounts of sulfate-sulfur or manganese released and percentage sulfur or sulfur-bentonite in the soil were generally quadratic with the maximum release occurring in the range 30 to 60% sulfur. The greatest amount of sulfur released per gram sulfur added occurred at the lowest sulfur to soil ratio studied. (Skogerboe-Colorado State)
W75-11604

**ORGANOCHLORINE COMPOUNDS IN SEVERAL MARINE ORGANISMS FROM THE NORTH SEA AND THE DUTCH WADDEN SEA,**
Nederlands Instituut voor Onderzoek der Zee, Texel.
Ten, W. F. Berge, and M. Hillebrand.
Netherlands Journal of Sea Research, Vol 8, No 4, p 361-368, 1974. 1 fig, 4 tab, 5 ref.

Descriptors: Aquatic animals, *Organic compounds, *Halogenated pesticides, *Lipids, Pesticides, Herrings, Cod, Shrimp, Mussels, Phytoplankton, Zooplankton, DDD, DDE, DDT, Endrin, Dieldrin, Laboratory studies.
Identifiers: *Bioaccumulation, *Tissue analysis, Gadus morhua, Plaice, BHC, PCB, HCB, Clupea harengus, Pleuronectes platessa, Crangon crangon, Mytilus edulis, North Sea, Dutch Wadden Sea.

The content of organochlorine compounds (Dieldrin, Endrin, DDE, DDD, DDT, BHC, HCB) was determined in several marine organisms (herring, Clupea harengus; plaice, Pleuronectes platessa; cod, Gadus morhua; shrimp, Crangon crangon; mussels, Mytilus edulis, phytoplankton and zooplankton) from the North Sea and the Dutch Wadden Sea. The most striking result was the small difference, on lipid weight basis, in the content of organochlorine compounds between the different species. (Katz)
W75-11608

**BARNACLES: POSSIBLE INDICATORS OF ZINC POLLUTION,**
Natural Environmental Research Council, Anglesey (Wales). Unit of Marine Invertebrate Biology.
G. Walker, P. S. Rainbow, P. Foster, and D. J. Crisp.
Marine Biology, Vol 30, No 1, p 57-65, 1975. 2 fig, 3 tab, 26 ref.

Descriptors: *Bioindicators, *Heavy metals, *Zinc, Aquatic animals, *Animal physiology, Water pollution sources, Path of pollutants.
Identifiers: Balanus balanoides, Elminius modestus, Lepas anatifera, *Barnacles, Gut tissues, Tissue analysis, Bioaccumulation.

Barnacles (Balanus balanoides, Eliminius modestus, Lepas anatifera) from several different sites accumulate the heavy metal zinc. The majority of the zinc was deposited in the tissues associated with the gut, and the level of zinc in soft body tissue generally reflected well the level of zinc in the immediate sea-water environment. The zinc accumulated in the gut tissues was in the form of discrete granules, mainly within the parenchyma cells which surround the gut. These granules probably exist as an isoluble zinc salt. A comparison of the zinc level in barnacles with those recorded for some other marine organisms indicated the possible usefulness of barnacles as indicators of zinc pollution. (Katz)
W75-11611

**HYDROCARBONS ASSOCIATED WITH SUSPENDED PARTICULATE MATTER IN SAN FRANCISCO BAY WATERS,**
Naval Biomedical Research Lab., Oakland, Calif.
For primary bibliographic entry see Field 5A.
W75-11614

**IMPROVEMENT OF COMBINED SEWER SYSTEM STORM WATER STORAGE POOL (GORYU-SHIKI GESUIDO NO KAIRYO, TAISUI IKE HOSHIKI),**
For primary bibliographic entry see Field 5D.
W75-11621

**SUBSURFACE WASTE INJECTION IN THE UNITED STATES: FIFTEEN CASE HISTORIES,**
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 5D.
W75-11627

**NUTRIENT TRANSPORT IN SURFACE RU NOFF AS INFLU ENCED BY SOIL COVER ANI SEASONAL PERIODS,**
Agricultural Research Service, Morris, Minn North Central Soil Conservation Research Center
R. E. Burwell, D. R. Timmons, and R. F. Holt
Soil Science Society of America Proceedings, Vo 39, No 3, p 523-528, May-June 1975. 5 tab, 14 ref.

Descriptors: *Nutrients, *Runoff, *Sediments Nitrogen, Phosphorus, Potassium, Snowmelt Precipitation(Atmospheric), Erosion, Agriculture Chemistry of precipitation, Seasonal, Fertilizers Surface runoff, Crops, On-site investigations *Minnesota.
Identifiers: *Nutrient transport, Nutrient losses Soil cover.

Nitrogen (N), phosphorus (P), and potassium (K losses in surface runoff water and sediment wer determined for five soil cover conditions on Barnes loam soil in west-central Minnesota. Th five soil cover conditions studied were: (1) co tinuous clean-cultivated fallow, (2) continuou corn, (3) corn in rotation, (4) oats in rotation, an (5) hay in rotation. Losses of water, sediment, an nutrients were determined for three season periods: (1) critical runoff period caused by me ing snow and ice, (2) critical erosion period fro corn planting to 2 months later, and (3) noncritic runoff-erosion period exclusive of periods 1 and Much of the annual sediment and nutrient loss occurred during the critical erosion period. Sno melt runoff accounted for much of the annu water and soluble nutrient losses. Average annu quantities of NH4-N and NO3-N contributed precipitation exceeded the annual losses in surfa runoff, but ortho-P losses in surface runoff we greater than the amount contributed by precipi tion. (Sims-ISWS)
W75-11641

**FORMATION AND COLLAPSE OF SURFA FILMS,**
Dalhousie Univ., Halifax (Nova Scotia). Inst. Oceanography.
For primary bibliographic entry see Field 2K.
W75-11642

**A TOPOGRAPHIC-HYDROGEOLOGIC MOD FOR SOLID WASTE LANDFILL SITING,**
Iowa State Univ., Ames. Dept. of Earth Science L. V. A. Sendlein, and R. C. Palmquist.
Ground Water, Vol 13, No 3, p 260-268, May-J 1975. 10 fig, 18 ref.

Descriptors: *Landfills, *Water pollut *Hydrogeology, *Solid wastes, *Waste dispo Geomorphology, Topography, Land classifi tion, Water quality, Groundwater, Surface wat Permeability, Groundwater movement, races(Geologic), Ravines, Valleys, Flood pla Water table, *Model studies.
Identifiers: *Contamination enclaves, Upland Crest.

Geomorphic and hydrogeologic studies shown that the material, topographic, gro water, and surface-water characteristics of a ticular landscape position are all related. Bec of this, an analysis of the topography should a the prediction of the material, groundwater, surface-water characteristics of a disposal within the local area. Topographic consider of potential solid waste disposal sites thus vides insight about the physical characteristi the site and shape of the resulting contamin enclave. Possible topographic positions disposal sites are floodplain, valley terrace, v side, upland crest, upland ravine, upland v and upland flat interfluve. Upland sites are ch terized by the outward flow of both ground and surface water, whereas valley sites are ch terized by the through flow of both ground surface water. Upland sites are consi preferable over valley sites because of the g

likelihood of the refuse remaining dry. An analysis of groundwater flow patterns indicates that the greatest potential for extensive groundwater contamination exists for upland sites, which are in groundwater recharge areas. The least potential for extensive contamination exists for properly placed valley sites, which are in groundwater discharge areas. (Visocky-ISWS)
W75-11644

**SOLID PARTICLE SETTLEMENT IN OPEN-CHANNEL FLOW,**
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R-M. Li, and H. W. Shen.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Paper 11460, p 917-931, July 1975. 7 fig, 1 tab, 13 ref, 2 append. NSF ENG 74-03037.

Descriptors: *Computer models, *Sedimentation rates, *Settling velocity, *Stochastic processes, Turbulent flow, Hydraulics, Water pollution, Open channel flow.
Identifiers: *Random walk model, *Eulerian length scale.

A random walk was formulated to describe the settlement of solid particles in open-channel flows. Both uniform and mixed-size sediment particles were tested. Results from simulations indicated that the probability density function of the settling length can be a lognormal distribution. The mean settling length can be estimated by the ratio of the unit-width discharge to the fall velocity of particles. The coefficient of variation was determined to be a power function of the ratio between flow shear velocity and fall velocity of solid particles. The simulation results were generally in agreement with measured data. The procedure for the design of settling basins was presented. (Lardner-ISWS)
W75-11652

**SANITARY-VIROLOGICAL STUDY OF THE EFFECTIVENESS OF DECONTAMINATION OF WASTE WATERS ON IRRIGATED FARM FIELDS, (IN RUSSIAN),**
Uzbekskii Nauchno-Issledovatelskii Institut Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
I. S. Artykov.
Gig Sanit, Vol 38, No 4, p 110-111, 1973.

Descriptors: Irrigation, *Irrigation water, Crop production, Vegetables, Soils, Water reuse, Path of pollutants, Soil treatment, Viruses, Waste water(Pollution), *Waste water treatment.
Identifiers: Coxsackievirus, *Enteroviruses, Coronaviruses, *USSR(Uzbekistan).

The degree of enterovirus contamination of soil and vegetables grown under the hot climatic conditions of Uzbekistan (USSR) on fields irrigated with a mixture of household and industrial waste waters that underwent biological treatment was investigated. The irrigation waste water, soil and ash water from vegetables grown on the fields were studied. Virological investigations showed contamination by enteroviruses of all objects studied. Titration of the isolated cytopathic agents showed that the objects were contaminated by Coxsackie B virus. Waste water should not be used for crop irrigation.--Copyright 1975, Biological Abstracts, Inc.
W75-11674

**DISTRIBUTION OF LIGNIN IN THE WATERS OF LOURIZAN INLET, AS A MEASUREMENT OF CONTAMINATION DUE TO DUMPING OF LIGNINSULFONIC LYES, RESULTING FROM PRODUCTION OF CELLULOSE PULP, (IN SPANISH),**
Instituto Espanol de Oceanografia, Madrid (Spain).
Antonio Fernandez Del Riego.
Bol Inst Esp Oceanogr, 172 p 1-38, 1973. Illus.

Descriptors: Pulp and paper industry, *Water pollution sources, *Pulp wastes, Europe, Effluents, Industrial wastes, Waste water disposal, *Water purification, Treatment, *Water pollution treatment, Waste treatment, Flocculation, Filteration, Separation techniques, Carbonation, Sea water, Lignins, Mullets.
Identifiers: Cardium-edule, Ligninsulfonic, Lyes, Mytilus-edulis, Platichthys-flesus, *Spain, Lourizan inlet.

Pollution caused by the dumping of Kraft pulp lyes near the Playa de Placeres (Spain) make bathing impossible, produce a strong pungent odor and cause fish to avoid the large abiotic zone in this area. Conditions could be improved by recovering cellulose fibers in suspension and implementing improved biochemical purification in reservoirs. Lime treatment would change the color of effluents from their present dark brown to a clear yellow. Large scale dilution of these treated effluents in sea water and consequent flocculation of organic material would greatly decrease the biological oxygen demand of the water. Alkalinity caused by the lime would be eliminated through carbonation by a previous aeration and by the enormous diluting capacity of the sea water. Marine organisms observed in the polluted areas included eels, oysters, Cardium (=Cerastoderma) edulis, Mytilus edulis, Platichthys flesus and mullet.--Copyright 1975, Biological Abstracts, Inc.
W75-11678

**URBAN RUNOFF AND COMBINED SEWER OVERFLOW, (LITERATURE REVIEW),**
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-11710

**CONTINUOUS MONITORING, AUTOMATED ANALYSIS AND SAMPLING PROCEDURES, (LITERATURE REVIEW),**
Florida Univ., Gainesville.
For primary bibliographic entry see Field 5A.
W75-11711

**AGRICULTURAL USE OF SLUDGE,**
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 5C.
W75-11720

**COPPER UPTAKE AND EXCRETION BY BUSYCON CANALICULATUM L.,**
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W75-11755

**A STEADY-STATE MODEL OF ISOTOPIC FRACTIONATION ACCOMPANYING NITROGEN TRANSFORMATIONS IN SOIL,**
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
G. Shearer, J. Duffy, D. H. Kohl, and B. Commoner.
Soil Science Society of America Proceedings, Vol 38, No 2, p 315-322, March-April, 1974. 3 fig, 17 ref.

Descriptors: *Mathematical studies, Nitrification, Ammonification, *Nitrogen, *Model studies, Soils, *Isotope fractionation, *Path of pollutants.

A steady-state mathematical model of isotopic fractionation accompanying certain nitrogen transformations in soil is developed. The model takes into account ammonification, nitrification, and immobilization; and predicts that the 15N/14N ratios of nitrate and ammonium ion depend in part upon the ratio of the rates of immobilization to nitrification under field conditions is unlikely to be the same as under the conditions of laboratory incubation experiments. Therefore, this prediction provides a possible explanation for differences observed between the 15N/14N ratio of nitrate extracted from soil cores and that of nitrate released during laboratory incubation of the same soils. The model described is ammenable to experimental test. If verified, an expanded version of the model may be a useful aid in the study of nitrogen transformations in the field. (Skogerboe-Colorado State)
W75-11831

## 5C. Effects Of Pollution

**FISH TOXICANTS IN KRAFT EFFLUENTS,**
British Columbia Univ., Vancourver. Dept. of Zoology.
I. H. Rogers, J. C. Davis, G. M. Kruzynski, H. W. Manhood, and J. A. Servizi.
Tappi, Vol 58, No 7, p 136-140, July, 1975. 6 fig, 18 ref, 1 tab.

Descriptors: *Pulp wastes, *Toxins, *Fish, Biological treatment, *Toxicity, Biochemical oxygen demand, Lethal limit, Freshwater, Saline water, Salmon, Bioassay, Aeration, Water pollution sources, Industrial wastes, Wastes, Waste water treatment, Effluents, Water pollution treatment, Water pollution control, Sockeye salmon, Chum salmon, Water quality standards, Water pollution effects, Pine trees, Softwood.
Identifiers: Resin acids, Lodgepole pine, Wood extractives, Dehydroabietic acid, Abietic acid, Kraft mills.

Biologically treated effluent from a bleached kraft mill was studied in a bench-model aeration system to determine whether additional biological treatment would consistently detoxify combined effluents. Comparison of 29, 58, and 99-hour treatment periods indicated that toxicity, BOD, and resin acids were most consistently reduced during the lengest treatment time and met current Canadian guidelines for kraft mill effluent. The neutral components of the effluent, derived mainly from the unsaponifiable fraction of lodgepole pine wood extractives, frequently caused fish mortalities, and were shown to be related to wood furnish. L.D.(50) values of 0.67 mg/liter (o.554-0.670, 95% confidence limits) in freshwater and 0.19 mg/liter (o.156-0.234, 95% confidence limits) in saltwater were determined in tests with the pinewood extract against chum salmon fry. Flowthrough freshwater bioassays with dehydroabietic acid against yearling sockeye salmon yielded an estimated 96-hour L.D.(50) of 0.5 mg/liter. In another test, yearling sockeye salmon exposed to a 1.5 mg/liter dehydroabietic acid concentration suffered 50% mortality in 94.5 hours in saltwater. The same fish stock, exposed to an equal resin acid concentration in freshwater, experienced 50% mortality in 14.7 hours. Thus, toxicity of the resin acid was greater in freshwater than in saltwater, which is the reverse of results obtained with the neutral fractions. (Sykes-IPC)
W75-11358

**SANITARY AND BACTERIOLOGICAL EVALUATION OF THE RAW MATERIAL, AIR AND WASTEWATERS OF SOME BAST FIBER PLANTS IN THE UZBEK SSR, (IN RUSSIAN),**
Uzbekskii Nauchno-Issledovatelskii Institut Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
For primary bibliographic entry see Field 5B.
W75-11406

**SOME PROBLEMS OF THE CIRCULATION OF ENTEROVIRUSES IN ENVIRONMENTAL OBJECTS, (IN RUSSIAN),**
Kuybyshevskii Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny (USSR).
For primary bibliographic entry see Field 5B.

W75-11438

**RESPONSE OF COMPLETELY MIXED ACTIVATED SLUDGE SYSTEMS TO CHANGES IN THE ENVIRONMENT,**
Oklahoma State Univ., Stillwater. Center for Water Research in Engineering.
For primary bibliographic entry see Field 5D.
W75-11478

**EVALUATION OF THE QUALITY OF SURFACE WATER FOR DEVELOPING RECOMMENDATIONS OF NONSPECIFIC PROPHYLAXIS OF INTESTINAL INFECTIONS, (IN RUSSIAN),**
Kuybyshevskii Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny (USSR).
S. N. Bukovskaya.
Gig Sanit, 2 p 103-104, 1974.

Descriptors: Water sampling, Water quality, Water supply, Domestic water, Industrial water, Public health, Water quality standards, Bacteria, Bioindicatior, Microorganisms, Surface water.
Identifiers: *Human infections(Intestinal), Pathogens, Prophylaxis.

Water samples (266) obtained in a study of microbial contamination of a body of water used as a domestic and industrial water supply source and as an effluent receiving body were analyzed. Pathogenic bacteria of the intestinal group were found in 16.7% of the samples. No correlation was found between indirect sanitary-bacteriological indices of water quality and direct isolation of pathogens. Consequently, both determination of the indirect indices and direct methods of isolating pathogens should be used when evaluating the epidemiological role of water in the occurrence of intestinal infections.--Copyright 1975, Biological Abstracts, Inc.
W75-11512

**NATURAL AND ACCELERATED PHOSPHATE MOBILITY, (IN DUTCH),**
H. L. Golterman.
Geol Mijnbouw, Vol 53, No 4, p 205-206, 1974.

Descriptors: Lakes, *Phosphates, *Water pollution sources, Sewage, Detergents, Chemical wastes, *Domestic wastes, *Cyanophyta, Europe, Water pollution effects, *Eutrophication.
Identifiers: *Netherlands.

High phosphate levels in Dutch lakes resulted from the incursion of phosphates into sewage at a faster rate than it could be removed by natural processes. Excessive phosphate in the lakes caused the outgrowth of toxic blue-green algae which may eventually make the drinking water unsafe. The replacement of phosphate detergents by NTA (nitrilotriacetic acid) and the artifical removal of phosphates from sewerage are advocated.--Copyright 1975, Biological Abstracts, Inc.
W75-11520

**INFLUENCE OF LEAD ON CALCIUM AND STRONTIUM TRANSFER THROUGH THE DUODENAL WALL IN RATS,**
Yugoslav Academy of Sciences and Arts, Zagreb. Inst. for Medical Research and Occupational Health.
N. Gruden, M. Stantic, and M. Buben.
Environmental Research, Vol 8, No 2, p 203-206, October, 1974, 2 tab, 7 ref.

Descriptors: *Lead, *Heavy metals, *Animal physiology, *Calcium, Diets, Mammals, Rodents, *Strontium
Identifiers: Rats, Duodenal wall, Everted gut sac method, Lead acetate, Oral doses, Gastric intubation

Five-week-old female albino rats were given daily doses for 1 or 2 weeks of lead as acetate ranging from 2 micrograms to 40 milligrams by gastric intubation and sacrificed on the 8th or 15th day of the experiment. Calcium-45 and 85Sr were used as markers to assess the calcium and strontium transfer through the duodenal wall by the everted gut sac method of Wilson and Wiseman (1954). Doses of lead acetate greater than 20 micrograms per day decreased the transfer of both calcium and strontium across the duodenal wall and these transfers decreased further with increased doses of lead, an effect which was independent of whether the rats were killed on the 8th or 15th day of the experiment. Doses of lead acetate greater than 200 micrograms per day, however, did not produce a further decrease in these transfers. The retention of both calcium and strontium in the intestinal wall was unaffected by the lead treatment. (Delfiner-Vanderbilt)
W75-11523

**EMBRYOPATHIC EFFECTS OF DIFFERENT ROUTES OF ADMINISTRATION OF MERCURIC ACETATE IN THE HAMSTER,**
Darmouth Medical School, Hanover, N.H. Dept. of Anatomy.
T. F. Gale.
Environmental Research, Vol 8, No 2, p 207-213, October, 1974, 1 tab, 29 ref.

Descriptors: *Mercury, Animal physiology, *Environmental effects, *Heavy metals, Transfer, Biological membranes, Mammals, Rodents.
Identifiers: *Mercury acetate, Hamster, *Embryopathic effects, Embrotoxicity, Intraperitoneal, Intravenous, Oral, Subcutaneous.

A comparison was made between 4 modes of administration of mercuric acetate into the pregnant golden hamster on Day 8 of gestation, i.e., intrapertoneal (ip), intravenous (iv), oral (0) and subcutaneous (sc) in respect to induced embryonic damage. The embryos were recovered either 4 or 6 days later and the number of resorption sites and abnormal embryos were recorded. The major manifestations of embryoic damage included an increased resorption rate, and small retarded edematous embryos. Several miscellaneous congenital malformations were also detected. In general, these embryopathic effects as well as indicators of maternal toxidity were dose dependent for each mode of administration. Primarily on the basis of equivalent resorption rates the following sequence of decreasing efficacy in producing harmful effects was demonstrated; ip greater than iv greater than sc greater than 0. The results are discussed within the general context of the known deleterious effects of mercury on biological systems and the controversy regarding the transmission in inorganic mercury from the pregnant animal to the developing embryo. (Delfiner-Vanderbilt)
W75-11524

**BILIARY EXCRETION OF PHENYL AND METHYL MERCURY CHLORIDES AND THEIR ENTEROHEPATIC CIRCULATION IN RATS,**
Institut Hygieny a Epidemiologie, Prague (Czechoslovakia).
M. Cikrt, and M. Tichy.
Environmental Research, Vol 8, No 1, p 71-81, August, 1974, 2 fig, 4 tab, 20 ref.

Descriptors: *Mercury, Animal physiology, *Kinetics, *Toxocity, Radioactivity techniques, Fungicides, *Pollutant identification, Rodents.
Identifiers: *Biliary excretion, *Phenyl mercury chloride, *Methyl mercury chloride, *Enterohepatic circulation in rats, Inorganic mercury scintillation counter.

The kinetics of biliary excretion of mercury applied as phenyl mercury (203) chloride (PMC) or methylmercury (203) chloride (MMC) were studied in rats during the first 24 hours after intravenous administration. The content of total mercury in the bile, plasma, liver, kidneys, gastrointestinal tract, urine, and feces was determined. The enterohepatic circulation of mercury after administration of PMC in rats was compared with that after administration of MMC or inorganic mercury. The differences found in both the kinetics and the distribution of PMC, MMC, and inorganic mercury in rats were discussed. (Delfiner-Vanderbilt)
W75-11525

**EFFECTS OF METHYLMERCURY CHLORIDE ON RANA PIPIENS TADPOLES,**
Wisconsin Univ., Madison. Dept. of Pathology.
I. W. Chang, K. R. Reuhl, and A. W. Dudley, Jr.
Environmental Research, Vol 8, No 1, p 82-91, August, 1974, 4 fig, 1 tab, 53 ref.

Descriptors: *Mercury, *Aquatic environment, *Frogs, *Immature growth stage, *Water pollution effects, Animal physiology, Pathology.
Identifiers: *Methylmercuric chloride, *Tadpoles, Histochemical techniques, Light microscopic examination.

Rana pipiens tadpoles were allowed to be raised in water containing various concentrations of methylmercuric chloride or were injected with 0.025 ml of 0.1% aqueous solutions of methylmercuric chloride (0.025 mg Hg), every other day for ten days. All the tadpoles which were raised in water containing more than 0.05 ppm mercury died within 48 hours. The distention of body cavities and eventual death of these tadpoles was believed to be the result of a disturbance of the osmotic regulatory system by the mercury. Total arrest of further development and differentiation was observed in tadpoles which were raised in water containing 0.001-0.01 ppm mercury. Extensive deposition of blood pigment (hemosiderosis) was observed in the livers of the mercury-injected tadpoles, which was though to be predisposed by the hemolysis of the red blood cells by mercury followed by severe peripheral edema and hemopoietic reactions in the kidneys of these tadpoles. (Delfiner-Vanderbilt)
W75-11527

**UPTAKE, DISTRIBUTION AND FATE OF 20 HG-ETHYLMERCURIC CHLORIDE IN THE GUPPY AND THE COONTAIL,**
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
S. C. Fang.
Environmental Research, Vol 8, No 1, p 112-11
August, 1974. 3 fig, 3 tab, 6 ref.

Descriptors: *Heavy metals, *Mercury, *Fis
Environmental effects, *Water pollution effect
*Radioactivity, Physiology, Spectrophotometr
Gas chromatography, Pollutant identificatio
Path of pollutants, Absorption.
Identifiers: *Mercury-ethylmercuric chlorid
*Guppy, *Coontail, Gammascintillation, Inorgan
mercury, Organic mercury, Electron capture d
tector.

The guppy (Lebistes resticulatus) and coont
(Ceratophyllum demersum) were exposed to wa
containing 203 Hg-labeled ethylmercuric chlori
(EMC). The EMC uptake was related to the ti
of exposure and the concentration of EM
Highest concentration of 203 Hg was found in
internal organs of the guppy and the body has
least concentration. The biological half-life of
Hg from EMC was approximately between 20
23 days. Both organisms are capable of convert
the absorbed EMC to inorganic mercury with
coontail having a slightly higher rate (34%) of c
version as compared to the average of 29% for
guppy during a seven-day period. Both organs
accumulated slightly more methylmercu
chloride (MMC) than EMC from a solution c
taining the same concentration of EMC or M
There was little conversion of MMC to inorga

mercury by the guppy, indicating the stability of MMC in this organism. The absorbed MMC molecule was also more stable than the EMC in the coontail. (Delfiner-Vanderbilt)
W75-11529

**ULTRASTRUCTURAL EFFECTS OF ACUTE TETRAETHYLLEAD POISONING ON NERVE CELLS OF THE RABBIT BRAIN,**
Cincinnati Univ., Ohio. Dept. of Environmental Health.
W. J. Niklowitz.
Environmental Research, Vol 8, No 1, p 17-36, Aug, 1974, 8 fig, 65 ref.

Descriptors: *Poisons, *Heavy metals, *Lead, Cytological studies, Laboratory animal, Small animals(Mammals), Animal physiology.
Identifiers: *Tetraethyllead poisoning, Rabbit brain, *Nerve cells, Cytopathogenesis.

The ultrastructural effects on nerve cell components of selected brain areas (frontal cortex, cerebellum, hippocampus) were studied after exposure of rabbits to tetraethyllead (TEL). A single dose of 100 mg/kg of TEL leads, after a latency period of 12 to 18 hours, to neurological disorders such as convulsions, and produces significant lesions of components of pyramidal cells and astroglial cells. These develop before the onset of major neurological signs of toxic manifestation. In general two types of degenerative cell changes were identified: cellular pyknosis and cellular hydrops, each specific to certain cell layers of selected brain areas. The subcellular manifestation of nerve cells undergoing hydropic degeneration exhibit a distinct pattern. The following sequence of appearance of structural alterations was determined: (1) folding of the nuclear membrane, (2) swelling and severe lesions of mitochondria, (3) hypertrophy of Golgi complexes and (4) patchy chromatolysis of the ergastoplasm. Progressive hypertrophy of Golgi saccules and vacuolization of the ergastoplasm areas lead to a vaculor hydropic degeneration of affected nerve cells. The cytopathogenesis is discussed in regard to recent findings concerning the subcellular mechanism of tetraethyllead intoxication. (Delfiner-Vanderbilt)
W75-11530

**PHYTOPLANKTON IN LAKE MASCARDI (RIO NEGRO, ARGENTINA), (IN SPANISH),**
Instituto National de Limnologie, Santo Tome (Argentina).
Maria O. Garcia De Emiliani, and Marta Schiaffino.
Bol Sci Argent Bot, Vol 15, No 4, p 411-426, 1974, illus.

Descriptors: *Chlorophyll, Lakes, Phytoplankton, Sampling, Stratification, Temperature, Seasonal, Thermal stratification, Water pollution effects.
Identifiers: Ankistrodesmus-gracilis, Argentina(Lake Mascardi), Melosira-pseudogranulata, Rhizosolenia-eriensis, Rhodomonas-minuta, Rio-negro, Transparency, Manso River, Algal growth.

A study of the phytoplankton in Mascardi Lake, carried out from March 1970-April 1971, was done on the basis of periodical samplings in 3 stations at various depths. Qualitative and quantitative changes in the composition of the phytoplankton population and some considerations to the chlorophyll a content and relations to different physical and chemical parameters were studied. Mascardi is a monomictic lake with temperature always above 4C during the circulation period (July-Sept.) and thermal stratification with a thermocline of variable depth localization (between 5-35 m deep). The thermal behavior of the lake and the water transparency reveal the influence of Manso River (the main tributary) exert especially in the west branch of the lake. The vernal circulation provides favorable conditions for algal growth due to the increase of nutrient concentration together with relatively benign temperatures. Cell number begins to increase at that period, reaching maximum concentrations in Sept. and diminishing progressively during summer and autumn. The most frequent species found were: Ankistrodesmus gracilis, Rhodomonas minuta, Rhizosolenia eriensis and Melosira pseudogranulata.--Copyright 1975, Biological Abstracts, Inc.
W75-11532

**THE OCCURRENCE OF MERCURY IN AMPHIBIA,**
Ljubljana Univ. (Yugoslavia). J. Steffan Inst.
For primary bibliographic entry see Field 5A.
W75-11534

**EFFECTS OF FISH-PONDS NEAR JAKUBOVO ON THE ORNITHOCENOSE THERE, (IN CZECH),**
Komenskeho Universita, Bratislava (Czechoslovakia). Katedra Syst. Ekol. Zool.
L. Kocian.
Biologia (Bratisl), Vol 28, No 8, p 671-678, 1973.

Descriptors: *Fish ponds, *Vegetation, Water pollution effects.
Identifiers: *Czechoslovakia(Jakubovo), *Ornithocenosis.

In 1968-1969 an ornithocenological study was carried out on some fish-ponds in Zahorie (Czechoslovakia). The building of new fish-ponds has had an effect on the ornithocenose, and it is compared with the ornithocenose of an earlier stage--wet meadows. In the 1st stage the dominant birds live among the water plants; in the 2nd stage, birds living on the water surface predominate. The number of birds living among water plants remains the same in the 2nd stage; birds living on the water surface showed some changes. In the 2nd stage there was an increase in the number of species living on the edges and banks of ponds. Birds belonging to the steppe group make use of the ponds and their vegetation as trophic or hiding areas. Comparing fish-ponds with large water expanses, the elements are relatively similar. In both cases the ecological group of birds living on the water surface predominates.--Copyright 1975, Biological Abstracts, Inc.
W75-11535

**KINETICS OF LEAD RETENTION AND DISTRIBUTION IN SUCKLING AND ADULT RATS,**
Yugoslav Academy of Sciences and Arts, Zagreb. Inst. for Medical Research and Occupational Health.
For primary bibliographic entry see Field 5B.
W75-11537

**A FOOD WEB MODEL FOR LAKE MICHIGAN PART 2-MODEL FORMULATION AND PRELIMINARY VERIFICATION,**
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
R. P. Canale, L. M. DePalma, and A. H. Vogel.
Technical Report No 43. March 1975 150 p, 78 fig, 8 tab, 79 ref. MICHU-SG-75-201. Grant No 04-5-158-16.

Descriptors: *Food chains, *Food webs, *Ecosystems, *Limnology, *Lake Michigan, Nutrients, Balance of nature, Fish food organisms, Biology, Eutrophication, Life cycles, Zooplankton, Plankton, Phytoplankton, Fish, Ecological distribution.
Identifiers: Food models, Food web model, Alewife concentrations.

Previous plankton models for the Great Lakes have considered the interactions among dissolved nutrients, chlorophyll a, and total zooplankton. These models have been developed primarily for the purpose of predicting the gross effects of nutrient input control and urban growth on the phytoplankton standing crop. However, more complex ecological problems, such as the effect of eutrophication on the forage fish and the effect of foreign marine fish species on the plankton composition, require complex food web models. The purpose of this report is to justify, develop, and verify a preliminary lower food web model for Lake Michigan. The report details the underlying hypothesis, mathematical formulation, and preliminary verification of a lower trophic-level model. It is expected that the model will provide guidance on the requirements of additional scientific research on food web transfer mechanisms and on the requirements of a comprehensive field monitoring program. (NOAA)
W75-11547

**WATER QUALITY RELATIONSHIPS IN THE GREAT LAKES: ANALYSIS OF A SURVEY QUESTIONNAIRE,**
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-11549

**MERCURY CYCLING IN A SMALL HAWAIIAN ESTUARY,**
Geological Survey, Honolulu, Hawaii. Water Resources Div.
S. N. Luoma.
Tech. Memo. Report No. 42, Sea Grant College Working Paper No. 5, December 1974. 42 p. (NSG) 14-31-0001-3811 and 4011; 04-3-158-29 (NOAA).

Descriptors: *Mercury, Biochemistry, *Heavy metals, Metals, Water pollution, Public health, Toxicity, Model studies, Mathematical studies, Estuaries, *Estuarine environment, Oceanography, Ecosystems, *Hawaii.
Identifiers: *Inorganic mercury cycling, Heavy metal contamination, Mercury analyses, Mercury poisoning, Nereis succinea, Palaemon debilis, Mercury content, Ala Wai Canal(HI).

Uptake from food and water and loss of 203 $HgCl_2$ were studied in two detritus feeders the polychaete Nereis succinea and the shrimp Palaemon debilis. During 1973 to 1974, total mercury analyses were also conducted on sediment and biota samples collected. Detritus feeders concentrated dissolved 203 Hg from 160 to 310 times over the concentration is sea water. Little 203 Hg was accumulated from labelled estuarine sediment; the steady state concentration of 203 Hg in the animals was 0.0025 to 0.015 times the concentration in the sediment the animals ingested. Net excretion of 203 Hg was slow relative to accumulation in both species. The total mercury content of shrimp and worms collected from the estuary showed a temporal pattern of variation. Samples of shrimp collected at five day intervals were used, with a mathematical description of the accumulation and loss of metal by the shrimp to simulate biotic mercury dynamics in the estuary. The simulation showed that mercury levels in shrimp in the Ala Wai Canal were never at steady state over the 1973-74 sampling period, and indicated the most important source of biologically available mercury in the estuary was some inorganic, solute form of the metal. (NOAA)
W75-11563

**INFLUENCE OF SOME BIOCIDES EMPLOYED IN THE WOOD-PROCESSING INDUSTRY ON GROWTH OF GREEN ALGAE,**
Jyvaskyla Univ. (Finland). Dept. of Biology.
V. Eloranta.
Aqua Fennica, p 21-32, 1974. 6 fig, 2 tab, 24 ref.

Descriptors: *Chlorophyta, *Pesticides, *Organic pesticides, *Chlorophyll, *Toxicity, Lethal limits, Primary productivity, Water pollution sources, Pulp and paper industry.

Identifiers: *Ankistrodesmus falcatus, Chlorophyll-a, *Biocides, *Slimicides, Bioaccumulation, NasPCP, Panacide, Fennosan, F-50, S-45, Grace 849, Fennosan B-100.

The effects of six organic biocides on green algae, Ankistrodesmus falcatus were studied. Chlorophyll-a content was used as a measure of growth. Na-PCP, commonly used in pulp and paper industries, was the most toxic of the slimicides. The LC-50 was 1.0 mg/l Na-PCP for green algae. Panacide, also a cyclic hydrocarbon and containing chlorine, was next toxic. Fennosan F-50, S-45, and Grace 849 were less toxic. Fennosan B-100 was least toxic. (Katz)
W75-11605

**SHELL DISEASE IN CRABS AND LOBSTERS FROM NEW YORK BIGHT,**
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Lab.
J. S. Young, and J. B. Pearce.
Marine Pollution Bulletin, Vol 6, No 7, p 101-105, July 1975. 4 fig, 22 ref.

Descriptors: *Crabs, *Lobsters, *Benthic fauna, *Crustaceans, *Sewage, *Sludge, *Wastes, Animal physiology, Water pollution sources, Environmental effects, Laboratory tests, Toxicity, New York.
Identifiers: Cancer irroratus, *Rock crabs, Shells, Gills, Pathology, New York Bight.

Lobsters, Homarus americanus, and rock crabs, Cancer irroratus, were collected in or near the sewage sludge and spoil disposal grounds from the New York Bight. Various pathological conditions were found in the shells and gills. The histopathology of 'shell disease', the causative agents and its effects on respiration were discussed in light of the disposal of solid wastes into the ocean. (Katz)
W75-11606

**PHYTOPLANKTON DIVERSITY AND CHLOROPHYLL-A IN A POLLUTED ESTUARY,**
Montclair State Coll., Upper Montclair, N.J. Dept. of Biology.
J. M. McCormick, and P. T. Quinn.
Marine Pollution Bulletin, Vol 6, No 7, p 105-106, July 1975. 2 fig, 1 tab, 6 ref.

Descriptors: *Phytoplankton, *Chlorophyll, *Estuaries, *Nannoplankton, *Seasons, Photosynthesis, Water pollution sources, Speciation, Biomass, Temperature, Salinity, Dissolved oxygen, Laboratory studies, Bioindicators, *New Jersey.
Identifiers: *Chlorophyll-a, Newark Bay(NJ).

The quantity of phytoplankton in Newark Bay, New Jersey as indicated by chlorophyll-a content of the water, was low in winter and early spring, and fluctuated greatly during spring and summer. Chlorophyll-a concentrations were less than 20 micro g/l until April. Between April and August, three phytoplankton blooms were indicated by concentrations up to 81.4 micro g/l. Net phytoplankton diversity values indicated generally eutrophic conditions; however, there was no significant correlation between diversity and chlorophyll-a concentrations. A role of nannoplankton in blooms was indicated. Temperature, salinity and dissolved oxygen variations were also measured. (Katz)
W75-11607

**ORGANOCHLORINE COMPOUNDS IN SEVERAL MARINE ORGANISMS FROM THE NORTH SEA AND THE DUTCH WADDEN SEA,**
Nederlands Instituut voor Onderzoek der Zee, Texel
For primary bibliographic entry see Field 5B
W75-11608

**HIGH COPPER CONCENTRATIONS IN SQUID LIVERS IN ASSOCIATION WITH ELEVATED LEVELS OF SILVER, CADMIUM AND ZINC,**
Moss Landing Marine Labs., Calif.
J. H. Martin, and A. R. Flegal.
Marine Biology, Vol 30, No 1, p 51-55, 1975. 1 fig, 4 tab, 17 ref.

Descriptors: *Aquatic animals, *Animal physiology, *Metals, *Molluscs, Silver, Cadmium, Zinc, Copper, Iron, Path of pollutants, Bioassay, Laboratory tests, Metabolism, Pollutant identification.
Identifiers: *Squids, Loligo opalescens, Ommastrephes bartrami, Symplectoteuthis oualaniensis, Livers, Tissue analysis, Bioaccumulation, Sublethal concentrations.

Livers from 43 Loligo opalescens, 14 Ommastrephes bartrami, and 7 Symplectoteuthis oualaniensis were analyzed for their silver, cadmium, copper, zinc and iron contents. Copper concentrations of up to 15,000 micro g/g dry weight were found in L. opalescens in conjunction with significant correlations between this element and Ag, Cd, and Zn. The latter elements are known to affect Cu metabolism in terrestrial organisms; however, whether the correlations occurring in marine organisms represent casual, or cause and effect, relationships is as yet unknown. (Katz)
W75-11609

**SYNERGISTIC EFFECTS OF SALINITY, TEMPERATURE AND HEAVY METALS ON MORTALITY AND OSMOREGULATION IN MARINE AND ESTUARINE ISOPODS (CRUSTACEA),**
Liverpool Univ., Port Erin (England). Dept. of Marine Biology.
M. B. Jones.
Marine Biology, Vol 30, No 1, p 13-20, 1975. 5 fig, 6 tab, 28 ref.

Descriptors: *Heavy metals, *Isopods, *Crustaceans, *Temperature, *Salinity, Mortality, Toxicity, Bioassay, Laboratory tests, Cadmium, Zinc, Lead, Mercury, Water pollution effects.
Identifiers: *Osmoregulation, *Synergistic effects, *LT-50, Idotea baltica, Idotea neglecta, Idotea emarginata, Eurydice pulchra, Jaera albifrons, Jaera nordmanni, Bioaccumulation.

Marine species (Idotea baltica, I. neglecta, I. emarginata, and Eurydice pulchra) and estuarine species (Jaera albifrons and J. nordmanni) of isopods demonstrated low mortalities in 100% SW with 10 and 20 ppm of Cd, Zn, and Pb, but a decrease in salinity caused an increase in the toxicities of these metals and reduced the LT-50 values. Mortalities at 10 degrees C were generally higher than those recorded at 5 degrees C. Effects of heavy metals upon the osmoregulatory ability of the isopods were indicated. (Katz)
W75-11610

**DECOMPOSITION OF UREA ASSOCIATED WITH PHOTOSYNTHESIS OF PHYTOPLANKTON IN COASTAL WATERS,**
Nagoya Univ. (Japan). Water Research Lab.
O. Mitamura, and Y. Saijo.
Marine Biology, Vol 30, No 1, p 67-72, 1975. 3 fig, 2 tab, 22 ref.

Descriptors: *Ureas, *Nitrogen compounds, *Photosynthesis, Light, *Phytoplankton, Aquatic life, Nitrites, Ammonia, Nitrates, Nitrogen cycle, Tracers, Decomposing, Organic matter, Coasts, Carbon dioxide.
Identifiers: *Light intensities, Decomposition, C-14, Bioaccumulation.

The urea concentation in seawater in Mikawa Bay, Japan ranged from 1.3 to 5.9 microgram-at.N/l and comprised 12-40% of the dissolved organic nitrogen. Using 14C labelled urea, the rate of CO2 liberation from urea and the incorporation rate of urea carbon into the particulate organic matter were determined. Incubation experiments with exposure to different light intensities revealed that the rate of CO2 liberation from urea and the incorporation of urea carbon into particulate organic matter change with light intensity, showing a pattern similar to that of photosynthesis. (Katz)
W75-11612

**THE ESTIMATION OF THE AMOUNT OF EMPIRE MIX CRUDE OIL IN MULLET, SHRIMP, AND OYSTERS BY LIQUID CHROMATOGRAPHY,**
Mississippi State Univ., Mississippi State Dept of Chemistry.
For primary bibliographic entry see Field 5A
W75-11613

**AGRICULTURAL USE OF SLUDGE,**
Guelph Univ. (Ontario). Dept. of Land Resource Science.
L. R. Webber, and B. C. Hilliard
In: Sludge Handling and Disposal Seminar Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 120-142, (1974). 6 fig, 5 tab, 12 ref.

Descriptors: *Sludge, *Land use, *Environmental effects, *Soil properties, Phosphorus, Nitrogen, Cadmium, Crops, Fertilizers, Algae, Lakes, Eutrophication, Water quality, Water table, Toxicity, Water pollution effects, Path of pollutants.
Identifiers: Zinc-cadmium ratio.

The environmental impact of land disposal of wastes is discussed. For sludge disposal to agricultural lands, soil properties should be evaluated. Soils with a high water table are not suitable for waste disposal. Studies are being done on concentrations and movement of nitrogenous compounds in the soil, the distribution of phosphorus, and the assessment of cadmium in crops and soil. Nitrogen in sludge applied to agricultural land is useful as fertilizer and can increase crop yield. Phosphorus can also be useful for agriculture. Both of these elements are suspect in lake eutrophication growth of algae, and poor water quality. Cadmium in certain quantities is toxic to man and animals the absorption of cadmium by plants may relate to the zinc-cadmium ratio of the soil. (See also W75-11715) (Dean-FIRL)
W75-11720

**DISPOSAL OF CHEMICAL SEWAGE SLUDGE ON LAND AND THEIR EFFECTS ON PLANTS LEACHATE AND SOIL SYSTEMS,**
Environmental Protection Service, Burlington (Ontario). Waste Water Technology Center.
For primary bibliographic entry see Field 5E.
W75-11721

**COPPER AND ZINC IN CANCER IRRORATU COMPARATIVE METABOLISM OF TH MOLT CYCLE, LE CUIVRE ET LE ZINC CH CANCER IRRORATI (CRUSTACE:DECAPODE): METABOLISM COMPARE AU COURS DU CYC D'INTERMUE,**
CEA Centre de la Hague, Cherbourg (Franc Laboratoire de Radioecologie Marine.
J-L. M. Martin.
Comparative Biochemistry and Physiology, V 51, No 4A, p 777-784, August 1975. 3 fig, 1 tab, ref.

Descriptors: *Heavy metals, *Copper, *Zi *Crab, *Crustaceans, Animal physiology, Life cles.
Identifiers: *Cancer irroratus, *Tissue analy *Bioaccumulation, Intermoult cycle, Muse Hemolymph, Sublethal concentrations.

Variations of copper and zinc content w analyzed during the intermoult cycle for Cance rroratus in the following organs and tissues:

oskeleton, hepatopancreas, hypoderm, gills, iemolymph and muscles. The hemolymph showed he largest copper concentration while the muscles presented the largest zinc content. Except for the nuscles, all organs and tissues showed significant $P < 0.01$) variations of zinc during the intermoult ycle. Variations of copper content were statistically different ($P < 0.01$) in any tissue. A significant increase ($P < 0.01$) of the copper and zinc ontent took place in the hemolymph during the C4 stage. A correlation-regression analysis etween copper, zinc and water content was carried out for each tissue and organ. A positive correlation ($P < 0.01$) between both metals occurred or the hemolymph, the gills and the hepatopancreas. Hypotheses were proposed to explain such orrelations. (Katz)
W75-11752

METHOD FOR INTERMITTENT CHLORINE OSING IN CONTINUOUS-FLOW TOXICITY ESTS,
irginia Polytechnic Inst. and State Univ., lacksburg. Dept. of Biology; and Virginia olytechnic Inst. and State Univ., Blacksburg. enter for Environmental Studies.
or primary bibliographic entry see Field 5A.
75-11754

OPPER UPTAKE AND EXCRETION BY USYCON CANALICULATUM L.,
hode Island Univ., Kingston. Graduate School of ceanography.
B. Betzer, and M. E. Q. Pilson.
ie Biological Bulletin, Vol 148, No 1, p 1-15, ebruary 1975. 4 fig, 1 tab, 16 ref.

escriptors: *Copper, *Snails, Invertebrates, nimal physiology, *Metals, *Path of pollutants, Tracers, *Gastropods, Spawning, Life cycles, oassay, Laboratory tests, Absorption.
entifiers: *Excretion, *Busycon canaliculatum, Cu, Tissue analysis, Bioaccumulation.

thways of copper into channeled whelk, isycon canaliculatum, and sites of accumulation re investigated in uptake experiments using Cu. Routes of possible copper loss were instigated in excretion experiments (rate: 7 micro 4 hr per 100 g fresh tissue weight and by determination of copper content of egg capsules (23 cro g/capsule). 64 Cu appeared in the gills, od, kidney, gut and digestive gland. Spawning s suggested as a significant route for copper s. (Katz)
5-11755

ERCURY LEVELS IN FISH IN THE LA ANDE RIVER AREA, NORTHERN QUEBEC,
Gill Univ., Montreal (Quebec).
r primary bibliographic entry see Field 5A.
5-11756

E BROWN PELICAN AND CERTAIN ENRONMENTAL POLLUTANTS IN LOUINA,
reau of Sport Fisheries and Wildlife, Laurel, . Patuxent Wildlife Research Center.
primary bibliographic entry see Field 5A.
5-11757

ECOLOGICAL SURVEY OF THE ROCKY AST ADJACENT TO A BROMINE EXTRACN WORKS,
ural Environment Research Council, Anglesey les). Unit of Marine Invertebrate Biology; and versity Coll. of North Wales, Menai Bridge. rine Science Labs.
Hoare, and K. Hiscock.
uarine and Coastal Marine Science, Vol 2, No 329-348, October 1974. 3 fig, 2 plate, 4 tab, 43

Descriptors: Effluents, *Halogens, *Bromine, Water quality, *Chlorine, *Chemical wastes, Surveys, *Rhodophyta, *Crustaceans, *Algae, *Amphipoda, Saline water, *Hydrogen ion concentration, Growth rates, Water pollution sources, Environmental effects, Silts, Toxicity, Plant physiology, Animal physiology.
Identifiers: Echinoderms, Polyzoa, Laminaria hyperborea.

Investigations of the fauna and flora of a rocky coast were carried out in the vicinity of an acidified, halogenated effluent discharge. Many species, both littoral and sublittoral, were excluded from the area of the outfall while a few were present in increased numbers. Echinoderms, Polyzoa and Amphipod Crustacea together with the red algae appear to be particularly sensitive to the reduction in water quality. An analysis of the fauna associated with Laminaria hyperborea suggested the presence of a pollution gradient with numbers of species increasing with distance from the outfall. Several algal species showed retarded or abnormal growth especially in the littoral region. Data are presented for the pH and free chlorine content of the sea water and possible reasons for the distribution of prominent species are discussed. (Katz)
W75-11758

BIOLOGICAL CONSIDERATIONS ON THE USE OF THERMAL EFFLUENTS FOR FINFISH AQUACULTURE,
Oceanic Inst., Waimanalo, Hawaii.
J. R. Sylvester.
Aquaculture, Vol 6, No 1, p 1-10, July 1975. 1 tab, 50 ref.

Descriptors: *Effluents, *Fish, *Aquaculture, *Fish farming, *Thermal pollution, *Temperature, *Warm-water fish, Water quality, Metabolism, On-site laboratories, Sampling.

The use of thermal effluents was suggested as a source of warm water to control and maintain a fish farm system within optimum thermal limits. High temperatures of thermal effluents would exert their primary effect on cultured organisms through increased activity and metabolism. Site studies in thermal effluents indicated that the principal fishes attracted to thermal effluent areas were warmwater species and that these fish could provide suitable culture animals. (Katz)
W75-11759

ELIMINATION OF HYDROCARBONS BY MUSSELS,
Instituto di Biologia del Mare, Venice (Italy).
V. U. Fossato.
Marine Pollution Bulletin, Vol 6, No 1, p 7-11, January 1975. 2 fig, 1 tab, 17 ref.

Descriptors: *Organic compounds, *Mussels, *Water pollution sources, *Water temperature, *Animal physiology, Laboratory tests, *Oil.
Identifiers: *Mytilus galloprovincialis, Elimination, *Tissue analysis, Bivalves, Bioaccumulation.

Mussels, Mytilus galloprovincialis, collected from hydrocarbon polluted areas of the Lagoon of Venice were transferred to the relatively unpolluted port entrance of Malamocco. Hydrocarbon elimination was rapid in the first 10-15 days but later was slow and incomplete: 12% of the initial content persisted in the tissue for 8 weeks. Elimination of hydrocarbons was independent of water temperature between 7.5-26 degrees C. but virtually ceased in one lot when the temperature abruptly dropped from about 11 degrees C to 4.5-6.0 degrees C. The biological half-life of hydrocarbons in the mussels was calculated to be 3 1/2+ days, but this related only to the initial rapid phase of elimination. (Katz)
W75-11760

THE GROWTH OF POSIDONIA AND THE URBAN POLLUTION IN THE GULF OF GIENS, (IN FRENCH),
Institut Scientifique et Technique des Peches Maritimes, Nantes (France). Service de Pollution.
P. Maggi.
Ann Inst Michel Pacha, Vol 5, No 1, p 1-11, 1972, Illus.

Descriptors: Europe, *Urbanization, *Water pollution sources, Erosion, *Accelerated erosion, *Sediment control, Sands, Plant breeding, *Water pollution treatment.
Identifiers: *France(Giens Gulf), Posidonia-Oceanica, Pollution, *Posidonia, Light sediment, *Urban pollution.

Studies were carried out in the Gulf of Giens (France), which receives a large amount of urban pollution. This pollution may be the reason for the disappearance over a large area of Posidonia oceanica, which played a large part in fixing the light sediments. This resulted in hollowing of the sea floor and severe erosion of the sand beaches. A solution aimed at stopping the sources of pollution is considered. The problem of reconquest of the light sediments is approached by an original method of P. oceanica reimplantation. An 18 mo. trial showed that slips of the plants take root firmly in a sand bottom.--Copyright 1975, Biological Abstracts, Inc.
W75-11761

FURTHER OBSERVATIONS ON THE EFFECT OF SODIUM SALT OF 2,4-D ON EARLY DEVELOPMENTAL STAGES OF CARP (CYPRINUS CARPIO L.),
Polish Academy of Sciences, Warsaw. Inst. of Experimental Biology.
E. Kamler, O. Matlak, and K. Srokosz.
Polskii Archiwum Hydrobiologii, Vol 21, No 3-4, p 481-502, 1974. 10 fig, 7 tab, 51 ref.

Descriptors: *Sodium compounds, *Salts, *Carp, *Herbicides, *2-4-D, *Fish physiology, *Growth stages, Larvae, Toxicity, Mortality, Growth rates, Feeding rates, Environmental effects, Behavior, Metabolism, Water pollution effects.
Identifiers: Pielik, Sublethal concentrations.

Acute tests (48 hrs) demonstrated that the herbicidal formulated product 'Pielik' is about twice more toxic than the pure sodium salt of 2,4-5. The mortality test was the least sensitive of all acute tests applied for Cyprinus carpio. Long-term tests were much more sensitive than the acute ones. 'Pielik' continuously applied in a concentration of 50 mg active ingredient/l caused delayed hatching, behavioral changes, feeding impairment, severe morphological disturbances, slower growth rate and finally mass mortality of larvae. The observed drop in oxygen consumption, with a simultaneous increase in respiratory quotient and lactic acid content, indicated that 'Pielik' impairs the metabolic aerobic processes in favor of the anaerobic ones. (Katz)
W75-11762

## 5D. Waste Treatment Processes

REMOVAL OF SOLUBLE MERCURY FROM WASTE WATER BY COMPLEXING TECHNIQUES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemistry.
D. L. Michelsen, J. A. Gideon, G. P. Griffith, J. E. Pace, and H. L. Kutat.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 890, $6.25 in paper copy, $2.25 in microfiche. Bulletin 74, Virginia Water Resources Research Center, Blacksburg, May 1975. 161 p, 37 fig, 29 tab, 111 ref. OWRT A-044-VA(3).

Descriptors: Mercury, *Waste water treatment, Milk, Rubber, *Ion exchange, Economics, Heavy metals, Anion exchange, Cation exchange, Absorption, Ions.
Identifiers: *Mercury removal, Complexing techniques, Xanthates, Keratin, *Tannery hair.

Milk proteins, xanthates, modified rubber products, and keratin in various forms can be used for the removal of ionic mercury from water systems. In particular, anionic and cationic ion-exchange products made from ground tire cord rubber compete very favorably with classical ion-exchange resins with regard to capacity and rate of pickup. Cow and pig hair selectively remove ionic mercury, and the performance with tannery hair based on equilibrium capacity, rate of removal, and pressure drop was as good as classical ion-exchange resins. Regenerative studies of ionic mercury from tannery hair with HCl and NaCl were successful, and a number of scale-up studies including economics were completed to illustrate how tannery hair might be used for the treatment of waste streams containing ionic mercury. Compared to the existing state of the art, the results were very encouraging.
W75-11357

**FISH TOXICANTS IN KRAFT EFFLUENTS,**
British Columbia Univ., Vancouver. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W75-11358

**METHODS AND EQUIPMENT FOR THE TREATMENT OF SPENT OIL EMULSIONS (VERFAHREN UND ANLAGEN ZUR BEHANDLUNG VERBRAUCHTER OEL-EMULSIONEN),**
F. Rueb.
Wasser, Luft und Betrieb, Vol 19, No 7, p 415-419, 1975. 8 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Oil wastes, Oily water, Separation techniques, Filters, Centrifugation, Electrolytes, Emulsions, Flocculation, Membrane processes.
Identifiers: Ultrafiltration.

Methods and equipment for the treatment of used oil emulsions are described. Emulsion breakage is accomplished by using separating agents and temperatures up to 80C; the resulting oil and water phases are separated by centrifugation. Water containing traces of oil is passed through a filter system containing wood chips and a separating agent to obtain water with a residual oil content of 20-25 mg/liter. The separating agent expenditure can be reduced by preliminary emulsion breakage by means of less expensive electrolytes or salts. A residual oil content of 20 mg/liter can be achieved by chemical separation, using salts, acids, or flocculants for emulsion breakage. A fully automatic and continuous process uses sulfuric acid for the hot emulsion, and neutralizes the separated water. Aluminum and iron sulfates, iron chloride, sodium hydroxide, and flocculation aids are used in a batch type flocculation process. Thermal processes, yielding water vapor and used oil, are usually combined with catalytic afterburners to reduce air pollution. Ultrafiltration through cellulose acetate or polyamide membranes, combined with preliminary filtration, is suitable for continuous or batch operation at low energy expenditure. (Takacs-FIRL)
W75-11359

**SEPARATION OF EMULSIFIED OIL FROM WATER,**
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
L. K. Wang, J. Y. Yang, and D. B. Dahm.
Chemistry and Industry, No 13, p 562-564, July 5, 1975. 40 ref.

Descriptors: *Industrial wastes, *Waste water treatment, *Emulsions, *Reviews, Oil wastes, Oily water, *Separation techniques, Equipment, Flotation, Adsorption, Chromatography, Filtration, Membrane processes, Absorption, Centrifugation, Evaporation, Freezing, Oxidation.
Identifiers: Bilge water, Refinery wastes, Steel manufacturing wastes.

Oil-water emulsions are found in waste effluent streams from many sources, including the discharge of bilge and balast water from ships, washrack and hanger waste water, petroleum refineries, rolling mills, and chemical processing and manufacturing plants. A review of the state-of-the-art development of alternative commercial techniques for separating emulsified oil is presented. Techniques include conventional flotation, precipitate flotation, adsorption flotation, magnetization, coalescence, chromatography, layer filtration, membrane filtration, absorption and adsorption, centrifuge and hydrocyclone treatment, sedimentation, chemical coagulation, heating, evaporation and distillation, crystallization or freezing, biological oxidation, clarification-flotation, and filtration-extraction-filtration. A brief description of each of these processes is given. Although there are many commercial devices available for the removal of emulsified oil from water, there is no one economical and efficient method. (Orr-FIRL)
W75-11360

**OPTIMUM DESIGN OF SOUR WATER STRIPPERS,**
Exxon Research and Engineering Co., Florham Park, N.J. Fractionation/Thermodynamics Section.
G. A. Melin, J. L. Niedzwiecki, and A. M. Goldstein.
Chemical Engineering Progress, Vol 71, No 5, p 78-82, June, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, Computer models, Economics, Capital costs, Operating costs, Ammonia, Hydrogen sulfide.
Identifiers: *Refinery wastes, *Sour water strippers.

Sour water stripping is an important process in the pollution abatement practices of petroleum refineries. Although the optimum design of sour water strippers had been of little concern until recently due to the relative ease of removing H2S, the more strict requirements for the removal of NH3 have necessitated research into optimizing the design. Computer simulations were used to examine the effect of various operating parameters on sour water stripper performance. The parameters included: steam-to-feed ratio; number of theoretical trays; feed tray location; feed temperature; distillate drum temperature and pressure; feed H2S and NH3 concentration levels. The steam-to-feed ratio and the number of theoretical trays are the two most important design parameters. The economic optimization of sour water strippers required information on the efficiency of tower internals (trays or packing), the operating costs (primarily the cost of steam), the effect of operating conditions on steam consumption, the operating limitation set by other process equipment, and materials selection. The most important factor in the optimum economic design of a stripper is to balance investment costs with operating costs. Because other contaminants present in waste water change the pH of the water and thus affect the stripping of H2S and NH3, it is necessary to determine what particular species are present and at what concentration levels. The optimum design for a sour water stripper will include more trays than are currently used a rectifying section, and the addition of a strong base near the bottom of a single stripper to aid in the removal of tied up NH3. (Orr-FIRL)
W75-11361

**SEQUENTIAL TREATMENT OF KRAFT PULP WASHING WASTEWATER BY PILOT PLANT-ACTIVATED SLUDGE TREATMENT, LIME TREATMENT AND ACTIVATED CARBON TREATMENT, (IN JAPANESE),**
T. Fujii, H. Kabeya, H. Kamishima, T. Kubo, and J. Hosokawa.
Shikoku Kogyo Gijutsu Snikenjo Hokoku. (Rep of the Gov Ind Res Inst, Skikoku), Vol 7, No 1, p 1-13, March, 1975. 10 fig, 8 tab, 15 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Activated sludge, Lime, Activated carbon, Pulp wastes, Pilot plants, Color, Water reuse, Chemical oxygen demand, Lignins.

A sequential treatment consisting of activated sludge treatment, lime treatment, and activated carbon adsorption treatment was tested on unbleached kraft pulp mill washing waste water in a pilot plant system. Activated carbon adsorption was performed on water pretreated by activated sludge and lime. The fixed-bed activated carbon adsorption column system consisted of six columns filled with graular activated carbon of 8-30 mesh. Each column was 2 m long with a diameter of 15 cm. The flow rate was 60 liters/hour. The quality of the raw waste water was about 400 ppm COD, about 280 ppm lignin, and about 2400 platinum units of color. Treatment by a combination of activated sludge and lime resulted in about 90 percent removal of the COD, about 85 percent removal of lignin, and about 90 percent removal of color. The activated carbon treatment of this pretreated effluent produced a colorless, extremely low COD water suitable for reuse. The adosprtion efficiency of each activated carbon adsorption column was also estimated. (Orr-FIRL)
W75-11362

**FLOAT-WASH FRACTIONATOR SAVES FIBRE AND WATER AT GRAND'MERE,**
Consolidated-Bathurst Ltd., Grand'Mere (Quebec).
K. Godin.
Pulp and Paper Canada, Vol 76, No 6, p 81-83, June, 1975. 5 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Water reuse, Suspended solids, Separation techniques, Equipment, Water consumption, Water conservation.
Identifiers: White water, Float-Wash Fractionator.

A pollution abatement program was initiated in 1973 at Consolidated-Bathurst's paper mill at Grand-Mere, Quebec. The Boxboard Department was found to be contributing more than its share to mill solids losses. Although the largest amount of solids losses within the Boxboard Department could be blamed on accidental spills, caused by equipment carelessness, and frequent grade changes, an appreciable amount of the ss loss was due to the white water overflows from the Board Machine itself. It was felt that the surplus white water could be used to replace the cold fresh water used on the flood showers, oxcillating high pressure showers, and trim squirts of the Board Machine. A Type A06 Float-Wash Fractionator was tested for its treatment of the white water. The fractionator consists of two steel vessels stacked one above the other and separated by a spray nozzles, six fractionating devices and an overflow pipe, an inlet header, an outlet for the coarse fraction, an outlet for the fine fraction, an automatic bleeding valve with associated vacuum control equipment, and a vacuum pump. Problems during the trial included: loss of vacuum control when replacing screens; water flowing into the vacuum signal line; erratic control of vacuum level; and splitting of screens. Almost all of the problems were solved by installing new screens of a polyamine material, instead of polyester screens like the old screens. The recycling of white water on the Board Machine has not created any ma

perating problems. Suspended solids losses, as a ercentage of production, have decreased dra- iatically. Fresh water consumption has been educed by about 300 gal within the Board Depart- ent. (Orr-FIRL)
/75-11363

**EW EFFLUENT TREATMENT PLANT PENED AT BRISTOL FOR BOARD MILLS.**
/ater Services, Vol 79, No 952, p 232-234, June, 75. 4 fig.

escriptors: *Industrial wastes, *Waste water eatment, *Pulp and paper industry, Mixing, occulation, Sludge treatment, Filtration, Aera- on, Water reuse.
entifiers: Clariflocculators, Rotary vacuum fil- rs, Screw presses.

comprehensive effluent treatment plant has en built to treat the waste from St. Anne's Board ill Company, Bristol, G.B. The Board Mill oduces about 140,000 tons annually of board hich is used in the manufacture of cigarette car- ns, detergent cartons, rocord sleeves, and as cking for pharmaceuticals, toiletries, toys, mes, and electrical items. Equipment at the ility consists of a flash mixer, two clariflocculа- rs, a storage thickner, four filters, two screw esses, and two floating surface aerators. All ef- ent streams are combined and pass through a ating cup screen, where coarse tramp material emoved. Raw effluent is dosed with alum and e before entering the flash mixer. Polyelec- lyte is added immediately after the mixer to in- ce flocculation of suspended particles in the ef- ent stream. The dosed effluent then enters two ntical Dorr Clariflocculators arranged in paral- Clarified effluent overflows the peripheral irs of the clariflocculators and flows to a lagoon ere the dissolved oxygen level in the effluent is reased by the use of two floating aerators. Up 200,000 gph of the clarified effluent can be rned to the water treatment plant to be orinated and then returned to the mill water tem. Suspended solids are removed from the uent stream after chemical and mechanical culation and passed into the sludge thickener ere consolidation to about 5 percent solids oc- s. Further dewatering of the sludge to 20-25 cent solids is performed by four Oliver rotary uum filters. Final dewatering to 45 percent ds is carried out by two Krima screw presses. rate water is returned to the flash mixers for itional treatment because the ss level is too to permit direct discharge. (Orr-FIRL)
5-11364

**ND SPREADING EFFLUENT FROM A CONDARY FACILITY,**
eral Electric Co., St. Petersburg, Fla. Environ- tal Health Div.
. Applegate, and D. Y. Gray.
er and Sewage Works, Vol 122, No 7, p 85-87, , 1975. 4 fig, 1 tab.

criptors: *Waste water treatment, *Industrial es, *Municipal wastes, *Waste water osal, Activated sludge, Irrigation, Water e, Neutralization.
tifiers: Land application, Spray irrigation, bined municipal and industrial wastes.

Pinellas Plant in west central Florida employs t 1150 people for the design, development and ufacture of specialty electronic and mechani- uclear weapons components. Industrial and cipal wastes from the plant are being treated system which utilizes two retention lakes cou- through a spray irrigation field with subsur drainage. The system, implemented in 1973, is ble of treating a maximum projected volume 5,000 gpd. The effluent meets the criteria of State of Florida Waste Treatment Standards produces water of sufficient quality for reuse n the treatment plant for the cooling towers and deionized water facility. Sanitary wastes are treated in an extended aeration activated sludge plant. After chlorination, the sanitary effluent is passed through underground piping where it joins the plant's industrial wastes which have been treated in a neutralization facility where the normally acidic pH is automatically adjusted by the addition of sodium hydroxide. The combined wastes enter the lake for an average retention time of 52 days. The first lake also contains floating aerators. Water from the first lake is withdrawn through a strainer sump by one of two alternately operating pumps. A timed programmer directs the water flow to any single row of sprinklers or to any combination of six rows, each containing eight sprinkler heads. Polyethylene pipes are installed between each row of sprinklers and are connected to another polyethylene pipe which discharges the field drainage into a sump. Water from the field sump is pumped into the second lake and retained an average of 65 days. The effluent released from this lake is controlled by a dam with a valved outlet and eventually enters a salt water bayou after flowing through a series of county drainage ditches. (Orr-FIRL)
W75-11365

**CITY, INDUSTRY FACE POLLUTION ABATEMENT TOGETHER,**
Camp, Dresser and McKee, Inc., Boston, Mass.
W. H. Ringer, and W. C. Freeman.
The American City, Vol 90, No 6, p 101-103, June, 1975. 4 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Municipal wastes, Activated sludge, Interceptor sewers, Screens, Landfills, Settling basins, Centrifugation, Sludge treatment, Filtration, Plastics, Pulp and paper industry, Cities.
Identifiers: Pressurized heat treatment, Vacuum filtration, Combined municipal and industrial wastes.

The new municipal treatment facility at Haverhill, Mass. will also treat wastes from plastics and paper board production. The sewage and industrial wastes will be collected by interceptor sewers and pumped to the treatment plant via a force main. Raw sewage will be passed through catenary-type mechanically cleaned bar screens. Grit and primary solids will be separated in primary sedimentation basins, concentrated by travelling bridge scrapers in the primary basins, and pumped to vortex-type separators and classifiers. Centrifugal separators will be used to separate grit from sludge. The primary sludge will be discharged to gravity thickeners. Secondary treatment will be an activated sludge system. Three aeration tanks will be built that can be used for conventional, completely mixed, or step activated sludbe treatment. Tank aeration and mixing will be effected by mechanical aerators; foaming will be controlled by an antifoam spray. The activated sludge will be passed to three clarifiers for separation of sludge from plant effluent. The effluent will be chlorinated prior to discharge into the river. The waste activated sludge will be thickened by flotation. Both the thickened primary sludge and waste activated sludge will be subjected to pressurized heat treatment in a low pressure, wet air system. The processes sludge will be dewatered on vacuum filters. Screening, grit, and processed sludge will be disposed of at the city landfill. Projected completion date of the plant is mid-1976; total project cost will be $30.5 million. (Orr-FIRL)
W75-11366

**METHOD FOR RECLAIMING INDUSTRIAL WASTES AND ELIMINATING POLLUTION,**
J. M. Haviland.
Canadian Patent 968,891. Issued June 3, 1975. The Patent Office Record, Vol 103, No 22, p 85, June 3, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, *Metals, Recycling, Chemical precipitation, Sludge treatment, Centrifugation.
Identifiers: Metal recycling.

A process for removing one or more metal compound contaminants from contaminated industrial waste water is described. The metal compound contaminants are precipitated from the waste water to form aqueous metal compound sludge. The sludge is allowed to settle, and is concentrated by centrifugation. The metal compound contaminants are reclaimed from the sludge for reuse as either the metal compounds or the free metals. (Orr-FIRL)
W75-11367

**WATCH THAT WATER,**
G. Cook.
British Steel, No 28, p 23-26, June, 1975. 2 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Water reuse, Steel, Cooling water, Biological treatment, Activated sludge, Recirculated water, Water consumption, Water conservation, *Recycling.
Identifiers: *Steel manufacturing industry, Air/water heat exchangers, Open evaporative cooling towers.

The Appleby-Frodingham Works of the British Steel Corporation uses recycling systems for all major water demands. Although by 1976 the output of steel from the plant will have increased by about 220 percent from 1972, the intake of freshwater will have increased by only 100 percent. Changes in the steelmaking process and careful consideration of all aspects of water conservation and pollution prevention account for the savings in water usage. A total cooling water flow of 900 cu m/min is handled by 41 separate systems which may be divided into two groups: systems in which the water is used only to remove heat, indirect cooling systems; and, combined cooling and cleaning systems, direct cooling systems. Air/water heat exchangers are being used in addition to open evaporative cooling towers. Treatment of the direct cooling waters which have absorbed solids from the processes as well as heat is performed in a biological treatment plant commissioned in June 1974. The effluents are collected in a large holding reservoir used to equalize fluctuations in effluent flow and quality in addition to providing storage for the temporary failure of collecting pipes or the treatment plant. The mixed liquor is treated by activated sludge and then clarified. The effluent from the clarifier is stored in a 'tidal storage' reservoir and discharged into the River Trent during a 4 hr period around each high tide. Sludge is thickened to about 3 percent w/w and then lagooned. The plant has made good progress toward achieving the required degree of treatment. (Orr-FIRL)
W75-11368

**DEHYDRATING INDUSTRIAL SLUDGES BY FILTRATION.**
Belgian Patent BE 821-579. Issued April 29, 1975. Derwent Belgian Patents Report, Vol W, No 20, p 2, June 24, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Sludge treatment, *Filtration, *Patents, Flocculation, *Dehydration, Filters.

A method for dehydration of flocculated industrial sludges by filtration is described. The filter device consists of a supporting filter-bag structure of polyester or polyamide filaments lined with a nonwoven textile, preferably a needled felt or random web, made of synthetic fibers. The filters have a high efficiency and effectiveness for retaining small particles. They can be used for sludges from the ceramic, metallurgical, paper, and sugar industries, chipboard and vegetable preserve manufacturing, wire presses, slaughterhouses, latex waste waters, mirror polishing, stainless steel etching neutralization, electroplating, and dissociated emulsions. (Orr-FIRL)

W75-11369

**PLATING AND CYANIDE WASTES, (LITERATURE REVIEW),**
Weston (Roy F.), Inc., West Chester, Pa.
J. E. Germain, and S. R. Kellogg.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1479-1483, June, 1975. 113 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Heavy metals, *Reviews, Water reuse, Recirculated water, Membrane processes, Ion exchange, Neutralization, Chemical precipitation, Adsorption, Analytical techniques, Sampling, Patents, Standards, Evaporation, Reverse osmosis, Activated carbon, Electrolysis, Ozone, Polymers, *Bibliographies.
Identifiers: *Metal plating wastes, *Cyanide wastes, Closed-loop plating, Freeze-crystallization, Effluent guidelines.

The 1973-74 literature concerned with the treatment of plating and cyanide wastes was reviewed. Topics covered include recycling and recovery, membrane processes and ion exchange, neutralization and precipitation, adsorption, cyanides, sampling and analytical methods, patents, and effluent guidelines. Countercurrent rinsing was used to effect water use reductions. Atmospheric evaporative towers, freeze-crystallization, mixing of alkaline and acid wastes, and neutralization/ precipitation/ion exchange are some of the methods used to form closed-loop plating processes. Plating wastes may also be treated by reverse osmosis, ion exchange, activated carbon adsorption, or FeS sludge adsorption. Cyanide wastes may be treated with H2O2., a cobalt-based catalyst and chloride-producting electrolytic cells, various electrolysis methods, electrodialysis, oxonation and ion exchange. Methods for the removal of heavy metals from waste water include a wool or silk filter treated with dilute alkali or dilute acid, treatment with a sulfur containing agent and diffusion through peat, or polymer addition. (Orr-FIRL)
W75-11370

**ACCELERATION OF BIOCHEMICAL TREATMENT OF WASTEWATER IN PETROLEUM REFINERIES,**
Ya. A. Karelin, D. D. Zhukov, I. A. Saidaminov, O. N. Klochkov, and M. A. Denisov.
International Chemical Engineering, Vol 15, No 3, p 560-562, July, 1975. 2 fig, 2 tab. Trans from Nefte Pererabotka i Neftekhimiya, No 9, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, Oil wastes, Municipal wastes, Sludge, Activated sludge, Aeration, Flotation.
Identifiers: Refinery wastes, Biochemical treatment, Pressurized flotation, Sludge thickening, Combined municipal and industrial wastes.

Pressurized flotation has been widely used in the treatment of petroleum products containing water, and for concentrating sediment and excess sludge. A two-stage biochemical treatment unit has been developed in which the first-stage sludge separator is a pressurized flotation unit. The unit consists of a Stage I aerotank-mixer, a flotation sludge separator, a Stage II aerotank-mixer, and a vertical settler. It treats refinery wastes and municipal sanitary sewage. A sludge dose of 15-16 g/liter is maintained in the Stage I aerotank-mixer. The sludge mixture is pumped from the aerotank to a pressure tank, saturated with air at a pressure of 3.0-3.4 kgf/sq cm, and passed through a reducing valve into the flotation chamber. The concentration of sludge in the surface water in the flotation tank is 30-33 g/liter; this is passed to the Stage II aerotank. Sludge is precipitated in the Stage II separator and transferred to a distributor tank. Part of the sludge from the distributor tank is combined with the sludge-air mixture from the pressure tank and then subjected to flotation and consolidation. The other part of the sludge is returned to the State II aerotank. Pressurized flotation produces a rapid separation of high-concentration sludge mixtures and return of a highly concentrated activated sludge to the aeration zone, thereby maintaining large doses of sludge in the aerotank. The oxidation capacity is increased, the time for sludge deparation is reduced, and the degree of sludge thickening is increased over conventional values by using this process. (Orr-FIRL)
W75-11371

**ADVANCED TREATMENT OF WASTE WATER FROM MACHINERY WORKS BY ACTIVATED CARBON (KASSEITAN NI YORU KIKAI KOJO HAISUI NO KODO SHORI),**
M. Kishi.
Yosui to Haisui, (Jour. of Water and Waste), Vol 17, No 8, p 1011-1015, August, 1975. 4 fig, 7 tab, 5 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Activated carbon, *Tertiary treatment, Biochemical oxygen demand, Chemical oxygen demand, Surfactants, Oily water, Oil wastes, Water reuse.
Identifiers: *Machinery factories.

The use of activated carbon as the advanced treatment method for waste water discharged from machinery factories was discussed. Biological treatment of this waste water was difficult since the BOD varied greatly. Typical machinery factories discharged waste water containing low BOD and COD in the range from 30 to 50 ppm as well as suspended oil residues and surfactants. The efficiency of activated carbon for the removal of GOD and COD was high if the waste water contained low levels of BOD and COD; about 80 percent COD removal could be expected. The activated carbon treatment would be most effective as the advanced treatment for waste water from machinery factories; the treated water is suitable for reuse. When the activated carbon method was applied to effluent from a machinery factory which treated its effluent by flotation followed by sand filtration, the quality of the treated water obtained was COD, 3.1 ppm, BOD, 5 ppm, ss, 5.3 ppm, and n-hexane extractable components, 0.9 ppm. The concentrations in the original waste water were COD, 16.8 ppm, BOD, 27.6 ppm, ss, 36.1 ppm, and n-hexane extractable components, 3.4 ppm. (Katayama-FIRL)
W75-11372

**STUDIES ON RECOVERY OF CHEMICALS AND MANUFACTURE OF ACTIVATED SUBSTANCES FROM PULPING WASTE LIQUOR, PART 2, USE OF SOFTWOOD KP-WASTE LIQUOR, (IN JAPANESE),**
Hokkaido Univ., Sapporo (Japan). Dept. of Applied Chemistry.
K. Tosaka, and J. Hayaski.
21Japan Tappi, Vol 29, No 6, p 40-47, June, 1975. 6 tab, 2 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Pulp wastes, Activated carbon, Color.
Identifiers: *Activated adsorptive substances, Kraft pulping waste liquor, Decolorization.

Studies were performed on the manufacture of activated adsorptive substances from softwood kraft pulping waste liquor. NaOH contained in the liquor was carbonated with CO2 gas and the concentrated matter was directly activated with Na2SO4 under several sets of conditions without carbonization. The activated substances prepared with 10 perdent Na2SO4 at 750 or 800C for one or two hours had a decolorization effect on the kraft pulp washing liquor comparable with or superior to the commercially available activated carbon 'Shirasagi'. The activated substances prepared with Glauber's salt or solution showed excellent relative efficiency but lower yield than the anhydride and were therefore considered unsatisfactory. The activated substances prepared at 750 or 900C also showed methylene blue adsorption and specific surface area comparable to those of 'Shirasagi'. (Orr-FIRL)
W75-11373

**TREATMENT OF WASTE WATER FROM TEXTILE DYEING PROCESS (SENSHOKU HAISUI SHORI),**
K. Tsukabayashi.
Yuki Gosei Kagaku Kyokai-shi, (Jour of Synthetic Organic Chemistry Japan), Vol 33, No 5, p 377-383, May, 1975. 5 fig, 8 tab, 12 ref

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Dyes, Color, Chemical precipitation, Flotation, Filtration, Adsorption, Biological treatment, Biochemical oxygen demand, Ozone, Activated carbon.
Identifiers: Decolorization, Textile dyeing wastes, Zero discharge.

Treatment methods for waste water discharged from textile dyeing processes are reviewed. These are coagulation precipitation, flotation, filtration, adsorption, and biological methods. The coagulation precipitation method removes about 60 percent of the BOD and COD from the waste water, and 90 percent of the color. However, the large quantity of sludge generated is one of the problems with this method. The flotation method has a larger surface load capacity for waste water treatment than the coagulation precipitation method permitting the use of a smaller facility with the flotation method to achieve the same results as a larger coagulation precipitation facility. Both these methods are very effective in the decolorization of waste water. Selection of the appropriate coagulation agent will permit removal of most dyes. The adsorption method by activated carbon or bauxite is suitable as a secondary treatment method for waste water rather than as a primary method. The presence of chromium, copper, chloride, and aldehydes in waste water can be toxic to biological activity. Ozone treatment is excellent but very expensive; it can be used as a secondary treatment method. Any combination of these methods will produce water which will meet water quality standards. A completely-closed system of water/waste water is difficult to maintain in textile industries because of the high quality of water that is needed in some of the individual processes. (Katayama-FIRL)
W75-11374

**REDUCED COST FLOCCULATION OF A TEXTILE DYEING WASTEWATER,**
Saint Regis Paper Co., West Nyack, N.Y.
J. S. Kace, and H. B. Linford.
Journal Water Pollution Control Federation, V 47, No 7, p 1971-1976, July, 1975. 5 fig, 1 tab, ref.

Descriptors: *Waste water treatment, *Industr wastes, *Textiles, Dyes, Costs, Flocculatio Coagulation, Polyelectrolytes, Color, Aluminum
Identifiers: Disperse dyes, PEI 400.

The polyelectrolyte flocculation of a simulat textile waste water with and without the additi of coagulants was investigated. The two dispe dyes tested were Artisil Blue-Green and Art Red. Five polyelectrolytes were screened for th effectiveness in flocculating the dyes at a pH 7.0. The three cationic polyelectolytes examin were capable of achieving better than 90 perc color removal. The two anionic polyacrylami studied were not capable of achieving flocculat over a wide range of dosages. PEI 400 polyethyleneimine polyelectrolyte, was found require the lowest dosage to achieve effec flocculation. Studies of the flocculation of dyes with PEI 400 at pH 5.0 and 4.5 in an atte to reduce the polymer dosage required sho that the amount of polymer could be reduced

that a sharp optimum occurs at the lower pH values indicating that control of this flocculation system would be critical. A relatively low aluminum ion dosage was capable of reducing the residual color by coagulation to an acceptable level. A combined polymer and aluminum system was capable of achieving a color removal better (95 percent) than either chemical used alone with a low level of redispersion. A plot of the optimum flocculation points as Al(+++) dosage required versus PEI dosage required shows nearly a hyperbolic relationship between these ordinates, indicating that they are interacting synergistically. Filtration studies were performed to provide a measure of the filterability of the generated sludges. The results of the two dyes studied were similar. The filtration rate decreased as the amount of the aluminum hydroxide floc present increased. High percentage polymer flocs showed a relatively fast filtration rate. Costs are discussed for the tested combinations of treatment. (Orr-FIRL)
W75-11375

**STUDIES ON THE TREATMENT OF WASTE-WATERS FROM THE TOWEL DYEING INDUSTRY,**
H. Takechi, S. Kagawa, K. Senba, and S. Kurosaka.
Kogai, (Pollution Control), Vol 10, No 4, p 38-48, July, 1975. 14 fig, 9 tab, 13 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Dyes, Color, Aeration, Coagulation, Sedimentation, Chemical oxygen demand, Trickling filters, Activated sludge, Ozone, Activated carbon.
Identifiers: *Japan.

Studied were conducted on the treatment of waste water from the towel dyeing industry in Japan. In order to comply with the 1971 pollution regulations of Japan, it was necessary to install an overall storage tank for waste water from various sources. During a detention time of about one half day, the pH is maintained in the range from 6.5 to 8.0 by an automatic pH regulator. It was also necessary to install an aeration basin capable of aerating the waste water for about four hours in order to mix the waste water with air and increase the dissolved oxygen concentration. Coagulative sedimentation was investigated as a method for the reduction of chemical oxygen demand (COD). The addition of 500-600 ppm of aluminum sulfate, 3 ppm of a high polymer coagulant, and 2 ml/liter of an emulsion of calcium hydroxide achieved a COD removal of nearly 50 percent. However, the method is not recommended because of the large amount of sludge produced. Trickling filter processes and activated sludge were effective methods for COD reduction to below 100 ppm. Treatment with ozone to reduce the color content of waste water was tested. Ozonation was effective for waste water from factories using reactive dye, but was ineffective for those from factories using threne dye, naphthol dye, and/or sulfur dye. However, since about 90 percent of the dye used in the towel dyeing industry in the Ehime Prefecture is reactive dye, treatment with ozone is a viable method for this area. Treatment with activated carbon was also effective in the removal of color; the decoloration effect was greatly enhanced by the combined use of activated carbon with ozone. (Orr-FIRL)
W75-11376

**TREATMENT AND DISPOSAL OF ANODIZING EFFLUENTS, PART I,**
Grand Sheet Metal Products Co., Melrose Park, Ill. Croname Div.
R. Satee.
Products Finishing, Vol 39, No 10, p 75-79, July, 1975. 1 tab, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Waste water disposal, Neutralization, Water reuse, Phosphates.
Identifiers: *Anodizing effluents.

Part one of an article dealing with the treatment and disposal of anodizing effluents discusses general treatment goals, processes found in such plants, consitituents of the waste water, and neutralization as an in-plant treatment operation. The type of equipment and testing facilities used are determined by the objective of the plant. Any modern anodizing plant will include the following baths: cleaners; bright dips; etchants; anoidizing; desmutting; sealing; and, conversion coating. The final waste water may contain phosphates, sulfates, chlorides, fluorides, chromium, nitrates, nickel, and aluminum. Design of an effective treatment system should begin with collection of waste water samples over a week of normal activity. Analysis of the samples will provide an average concentration range. The flow rate should also be determined. An estimate of the degree of pollution of the waste water can be obtained by comparison with raw water sources; notable increases are usually found in chloride, sulfate, phosphate, and nitrate along with substantial increases in chromium, nickel, and aluminum. After the metal hydroxides are precipitated and removed from the waste water, the main problem left is the removal of phosphates. Many anoidizing plants have a separate area or station where the additions for pollution control can be made continuously. Most anodizing plant waste after pH treatment will have an acceptable pH ranging from 7.0 to 7.5, due to the reaction of acidic constituents with alkaline solution from etching rinses. Since the rate of flow is known, the rate at which a solution of sodium hydroxide must be added to maintain a proper pH can be easily calculated. An example is given. (Orr-FIRL)
W75-11377

**TREATMENT AND DISPOSAL OF ANODIZING EFFLUENTS, PART II,**
Grand Sheet Metal Products Co., Melrose Park, Ill. Cronome Div.
R. Satee.
Products Finishing, Vol 39, No 11, p 68-73, August, 1975. 1 tab, 6 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, *Waste water disposal, Flocculation, Phosphates, Coagulation. Lime, Chromium, Settling basins, Surface waters, Discharge(Water), Water reuse.
Identifiers: *Anodizing effluents.

Part two of an article dealing with the treatment and disposal of anodizing effluents discusses the addition and effectiveness of flocculating agents, phosphate removal by coagulation followed by lime treatment or treatment with trivalent metal ions, removal of hexavalent chromium, extra-plant facilities such as settling tanks, ponds, or lagoons, and discharge into surface waters which must include sampling and testing. Removal of metal hydroxides and other suspended solids from the final effluent can be achieved effectively and rapidly by the addition of certain organic polymers. The only advantages of lime treatment for phosphorus removal is that it is relatively inexpensive, and effective when stringent standards are not enforced. Disadvantages of the process are that the precipitation of phosphorus by lime is very slow; particles of the precipitate may behave like colloids; and, certain polymeric phosphates form soluble phsophate complexes with calcium. A highly effective treatment for phosphates removal involves the use of metal salts such as ferric or aluminum chloride or aluminum sulfate. Waste pickling liquors can be used for phosphorus removal. Batch treatment of hexavalent chromium employs sulfur dioxide, in the form of sodium metabisulfite, for the reduction of the hexavalent chromium to trivalent. Sulfur dioxide gas may be used for the continuous reduction of chromium in conversion coating wastes. Ferrous sulfate can also effectively reduce chromium. A series of ponds or lagoons can be used for the final treatment of the effluent before discharge into receiving water. The ideal method of treating water in an anodizing plant is for reuse within the plant. Sludge should be dewatered and disposed of at a landfill. Disposal of the effluent into surface waters requires an equalization tank and filtration systems. (Orr-FIRL)
W75-11378

**METHOD OF PURIFYING WATER,**
S. R. Kennedy.
Canadian Patent 968,893. Issued June 3, 1975. Patent Office Record, Vol 103, No 22, p 85, June, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Potable water, *Neutralization, Iron, Aluminum.
Identifiers: Acidification, *Chemical treatment.

The patented method described may be used for purifying sewage or other polluted water to render it suitable for use as drinking water. The polluted water is acidified with a mineral acid such as sulfuric, nitric, hydrochloric, or mixtures thereof. This mixture is then treated with iron to produce an iron salt in situ, then neutralized. An iron or aluminum nitrate or sulfate may be added to the mixture when it is treated with the iron. (Orr-FIRL)
W75-11379

**LARGE DIAMETER SUBMARINE STEEL PIPELINE CROSSINGS,**
Greater Vancouver Sewage and Drainage District. (British Columbia)
For primary bibliographic entry see Field 8A.
W75-11380

**CONTINUOUS TREATMENT OF POLLUTED LIQUIDS.**
Australian Patent 460, 875. Issued May 8, 1975. Official Journal of Patents, Trade Marks and Designs, Vol 45, No 15, p 1690, May, 1975.

Descriptors: *Patents, *Waste water treatment, *Flocculation, Sedimentation, Sludge.
Identifiers: *Bioflocculation, Continuous treatment.

A method for the continuous treatment of polluted liquids has been patented. The liquid is first subjected to a bioflocculation process in a closed space. Part of the liquid along with the formed suspension is continuously removed and allowed to sediment by gravitation in an inclined sedimentation channel. A first stream of liquid with a diluted suspension is taken from the external part of the sedimentation channel for filtering through a perfectly fluidized sludge blanket. A second stream of the suspension concentrated by gravity is passed from the internal part of the sedimentation channel back into the bioflocculation chamber. The liquid which as passed through the sludge blanket is removed for further treatment. (Orr-FIRL)
W75-11381

**VACUUM SYSTEM FOR SEWAGE DISCHARGE IN KREMPEL (DISTRICT OF DITHMARSCHEN)-EXPERIENCE WITH A NEW KIND OF SEWERAGE (VAKUUMENTWAESSERUNG KREMPEL/DITHMARSCHEN- ERFAHRUNG-SBERICHT UEBER EINE NEUARTIGE KANALISATION),**
H. Drebes, and H. Ivers.
Wasser und Boden, Vol 27, No 5, p 115-118, May, 1975. 4 fig, 2 tab, 2 ref.

Descriptors: *Sewers, Waste disposal, Pumps, Storm runoff, Overflow, Personnel, Construction materials.
Identifiers: *Vacuum sewers, Waste discharge, Germany.

The new vacuum sewer system in Krempel, a village of 500 inhabitants in the district of Dithmarschen, West Germany, is described. Due to the lack of sufficient slopes, a vacuum system including waste water pumps, two vacuum pumps, collection tanks, and PVC pipes cost about 50% of a conventional gravitational system. Storm runoff is not provided for, and the storage capacity of the vacuum sewer system is limited. Emergency overflow is not possible. The valve-controlled connection shafts are 80 cm in diameter and 150 cm in height. All repair and maintenance work must be done by trained personnel to avoid damages and breadkown. (Takacs-FIRL)
W75-11383

**THE SPACE/TIME COEEFFICIENT METHOD FOR CALCULATION OF RAINWATER RUNOFF (DAS RAUMZEITBEIWERTVERFAHREN FUER DIE BERECHNUNG VON REGENWASSERABFLUESSEN),**
H. Schulz.
Wasserwirtschaft-Wassertechnik, Vol 25, No 3, p 99-101, March, 1975. 2 fig, 1 tab, 4 ref.

Descriptors: *Sewers, Runoff, Model studies, Mathematic studies, Hydraulics, Rainfall intensity.
Identifiers: Space/time coefficient.

The space-time coefficient method is a simple model for the approximate calculation of runoff retardations in sewer systems. The space-time coefficient method is based upon Fantoli's mathematical-hydraulical formulas, and represents a generalized simplification of the partial and total retention and translation relations of individual runoff curves. The highest obstruction-free runoff in the sewer system is generated by rainfalls whose duration equals the filling time of the sewer system. More prolonged rainfalls cause either obstruction or runoff under pressure after the filling time. The space-time coefficient curves are based on a computed rainfall for a frequency of n = 1 at a rainfall duration of 45 minutes. (Takacs-FIRL)
W75-11384

**PROCESS FOR TREATING WASTE WATER,**
Etudes et Procedes d'Assainissement Purator, Rennes (France). (assignee).
S. O. R. L. Lewandowski, and R. Lewandowski.
United States Patent 3,883,426. Issued May 13, 1975. Official Gazette of the United States Patent Office, Vol 934, No 2, p 737, May 1975.

Descriptors: *Patents, *Waste water treatment, Aluminum, Mercury, *Flotation, Water purification.
Identifiers: Alumina, Hydrogen gas.

A process for the purification of waste water has been issued a patent. The process involves mixing waste water and aluminum in a flotation zone. The flotation zone should have an amalgam of aluminum and mercury on at least one surface. The waste water is allowed to react with the amalgam to form hydrogen gas and alumina. Impurities are carried to the surface of the waste water by the evolved hydrogen gas and alumina and removed. The purified waste water is then recovered. (Orr-FIRL)
W75-11387

**AN EVALUATION OF THE EFFECTIVENESS AND APPLICABILITY OF PHYSICAL-CHEMICAL TREATMENT OF URBAN LAND RUNOFF,**
North Carolina State Univ., Raleigh.
P. Samar.
Available from University Microfilms, Inc., Ann Arbor, Mich. 48106. Order No 75-7712. PhD Thesis, 1974. 169 p.

Descriptors: *Waste water treatment, *Storm runoff, *Sludge, *Coagulation, *Alum, Design criteria, Urban runoff, Suspended solids, Chemical oxygen demand, Turbidity.
Identifiers: *Physico-chemical treatment.

Urban runoff was treated by a physico-chemical method of coagulation, flocculation, and sedimentation. Sludge handling was also developed, and sludge characteristics were evaluated by density, resistivity, and solid content of the sludge. The selection of an effective coagulant for physico-chemical treatment was investigated by assessing the parameters involved and by evaluating the criteria for effecient treatment. The parameters effective in the design were shown to be directly related to the type of coagulant used. Several organic and inorganic coagulants were evaluated in jar test analyses. The most efficient coagulants in terms of suspended solids removal, COD, and turbidity were found to be alum and the cationic polyelectrolyte Calgon 2660. Based on the parameters of initial suspended solids, alkalinity, and mixing conditions, alum was selected as the best coagulant for treatment of urban runoff. (Prague-FIRL)
W75-11389

**ENVIRONMENTAL CONSTRAINTS CHALLENGE DESIGNERS OF SHORELINE COMMUNITY NEAR KANSAS CITY, MISSOURI,**
Larkin and Associates, Kansas City, Mo.
G. C. Gray.
Professional Engineer, Vol 45, No 6, p 42-44, June, 1975.

Descriptors: *Waste disposal, *Sewage disposal, *Pumps, Planning, Recreation facilities, *Waste water treatment, Missouri.
Identifiers: *Pressure sewers, *Gravity sewers, Kansas City(Mo).

Waste disposal in a planned community near Kansas City, Missouri had been accomplished by septic tanks, with absorption field effluents being pipelined to a recreational lake. In 1917, planners decided to develop an alternate disposal method which would protect the Lake Weatherby quality, involving a sanitary sewer system. When a gravity sewer system with ultimate treatment at the Kansas City treatment facility was considered, project costs were found to be too high. A vacuum type sewer system would not be effective in waste treatment for this particular topographic condition. A pressure sewer system was then chosen, featuring small size pressure main lines constructed along the street rights-of-way, following the street profile at a shallow uniform trench depth, with a pump unit at each home, pumping into the main pressure line. The pump units consist of an integral grinder and are installed in an opening about four feet in diameter and five feet deep. The final design was a cost effective pressure sewer system constructed of SRD-26 (160 psi rated) PVC pressure pipe. The project included 309 grinder pump units, 35,000 linear feet of main pressure sewers, 37,100 linear feet of pressure service lines from pumps to street mains, 42 air relief valves, 24 flushing and cleanout connections, and 5300 linear feet of eight-inch gravity sewer for connection to existing Kansas City interceptor sewers. (Prague-FIRL)
W75-11392

**SUFFICIENT WATER SUPPLY AND SEWER SYSTEM, AND EQUITABLE DISTRIBUTION OF THE COSTS (TILLSTREKKELIGE VANN- OG KOLAKKANLEGG-SAMT RETTFERDIG FORDELING AV KOSTNADENE),**
C. Smits.
Teknisk Ukeblad-Teknikk, Vol 122, No 15, p 41-42, April, 1975. 6 refs.

Descriptors: *Sewers, *Waste disposal, *Costs, Water pollution control, Water supply, *Pollution taxes(Charges).
Identifiers: *Sewer use charges, *Norway, Waste water discharge.

The new Water and Wastewater Fee Act, promulgated on January 1, 1975 in Norway, is described. A uniform fee system was designed to provide for a sufficient and dependable water supply, and to set the water and sewage fees to cover their respective costs, as well as to promote economization. Payment shall be for the actual, metered consumption. The sewage fee to be paid will be determined on the basis of water consumption assuming that the volume of the water consumed is equivalent to that of the waste water discharged into the sewer system. Special discounts will be available for users with installations providing water economy, as compared to conventional systems, and for those users who discharge waste water with very low pollution levels. (Takacs-FIRL)
W75-11393

**SEWAGE OXIDATION TREATMENT APPARATUS,**
R. N. E. Edwards
Netherlands Patent 75740V/43. Issued March 4, 1975. Derwent Netherlands Patents Report, Vol W, No 12, p 3, April 29, 1975.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Oxidation, Oxygen, Liquid wastes, Absorption.
Identifiers: Waste oxidation, Chemical oxidation.

A patent was granted to a liquid sewage and waste oxidation system. The apparatus is used for chemical oxidation of contaminants having a high degree of oxygen absorption and utilization. It is composed of an enclosed vessel divided into lower and upper portions. Inlet means for receiving liquid sewage wastes define a liquid level, and outlet means for discharging the treated liquid are found in the lower portion. Means are connected to the vessel to supply oxygen to the upper portion of the vessel. An oxygen rich atmosphere results, above the liquid level. A comminutor in the upper portion directs a stream of liquid sewage from the lower portion upward, to exit into the oxygen atmosphere. At the comminutor, the liquid waste is broken into a myriad of particles, thus increasing the interfacial area between the oxygen and sewage, where oxygen may then be readily absorbed. (Prague-FIRL)
W75-11395

**ACTIVATED SLUDGE SEWAGE TREATMENT FOR SEASONALLY VARIABLE THROUGHPUT,**
F. Ostreicher.
Belgian Patent 16070W/10. Issued February 1975. Derwent Belgian Patents Report, Vol W, No 10, p 2, April 15, 1975.

Descriptors: *Patents, *Waste water treatment, *Activated sludge, *Biological treatment, Facilities, Sewage treatment.
Identifiers: Sludge quantity(Seasonal), Stock ta

An activated sludge sewage treatment method is patented which is applicable to treatment of seasonally variable throughout, and may be sustained in low seasons with supplemental waste matter. In this biological treatment plant sewage is delivered into an activated sludge tank which will discharge a treated effluent. When the rate of sewage delivery is too low to sustain an adequate activated sludge level, supplemental sludge is infed from a stock tank. The tank is also filled when there are periods of excess sludge in the activated sludge tank. The activated sludge tank may be preceded by a decantation chamber and any deficiency in sewage supply is then made up by agitation of sediment in the decantation chamber, which causes suspended sediment to be carried over to feed the sludge tank. (Prague-FIRL)
W75-11396

**SEPARATING IONISED MATERIALS FROM AQUEOUS SOLUTIONS.**
German Patent 85847V/50. Issued March 27, 1975. Derwent German Patents Report, Vol W, No 14, p 2, March, 1975.

Descriptors: *Patents, *Waste water treatment, *Heavy metals, *Separation techniques, Ionization, Aqueous solutions.
Identifiers: Osmolarity.

A patented method suitable for treating freshwater, seawater, or waste water containing heavy metals is described. Ionized materials of differing chemical or physical properties are separated from aqueous solutions containing at least 0.5 mM mg and/or Ca and K by contact with small bubbles formed by complex-former containing living cells. Complex formers are admitted through the cell walls from a complex former absorbing solution, having an osmolarity below that of the contained cells. The osmolarity of the complex former containing solution is then increased by addition of osmolytically active materials such as Ca, K, and Na ions. Bubbles containing complex former are separated and added to an aqueous solution, until the ionizing materials migrate through the bubble membrane into the bubble. The ionizing materials are thus converted into complexes which dissolve or dissociate with difficulty. The cell bubbles are then separated from the aqueous solution. (Prague-FIRL)
W75-11397

**SEWAGE TREATMENT.**
French Patent 53421U/37. Issued February 7, 1975. Derwent French Patents Report, Vol W, No 12, p 10, January, 1975.

Descriptors: *Patents, *Sewage treatment, *Aeration, *Waste water treatment, Sedimentation, Separation techniques, Sludge treatment, Facilities, Activated sludge.
Identifiers: *Package treatment plants, Waste purification.

A package plant for treatment of sewage was patented. The plant is divided into separate aeration, stabilization, and sedimentation chambers. A digestion cavity is positioned beneath the stabilization chamber. Raw sewage and settled sludge from the stabilization chamber are introduced into the aeration chamber. Sewage solids are converted into a liquid suspension of activated sludge flocs. These are directed to the sedimentation chamber for separation. The separated solids then pass to the stabilization chamber and purified liquid is removed from the sedimentation chamber. (Prague-FIRL)
W75-11398

**SINGLE TANK SEWAGE TREATMENT PLANT,**
H. R. Kaelin.
German Patent 15826U/12. Issued February 27, 1975. Derwent German Patents Report, Vol W, No 10, February 27, 1975.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Tanks, Control structures, Treatment facilities.
Identifiers: *Liquid turn-over device(LTD), Waste clarification.

A patent was issued for a single basin sewage clarification plant. This single tank installation has a liquid turn-over device (LTD) with two openings, an upwardly directed suction opening and a downwardly directed outflow opening. One or more supply lines for the feed of an oxygen-containing gas mixture terminates in the immediate suction region of the LTD. Control devices prevent a lowering of the liquid level below the level of the suction opening. Conveyor paddles are fitted at their leading edges with cutting edges and produce shear action. The paddles have a plane running vertically to the axis of rotation of the LTD. A simple LTD of non-adjustable height is reliable, almost noiseless, and provides sufficient turn-over and oxygen supply to even the lowest liquid layer. (Prague-FIRL)
W75-11399

**PROPOSED STANDARDS: LAND DISPOSAL OF EFFLUENTS,**
University of South Florida, Tampa. Dept. of Biology.
J. V. Betz.
Civil Engineering, ASCE, Vol 45, No 5, p 77-79, May, 1975.

Descriptors: *Waste water treatment, *Waste disposal, Effluents, Pre-treatment, Land management, Sewage treatment, Economics, Groundwater, *Water quality standards, Percolation.
Identifiers: Land disposal, Land application.

Advantages and areas of concern for and disposal of effluents are discussed. When proper pre-treatment is given to sewage effluent, thus eliminating nitrates, toxic metals, detergents, and pathogenic bacteria, the resulting effluent may be used to irrigate the soil and crops. Purification then takes place, encompassing: nutrient uptake capacity of vegetative cover; biochemical reactions caused by microorganisms in the soil; inorganic chemical absorption to some extent by non-living soil constituents; and, mechanical filtering effects of passing through the soil. Advantages of this type of land disposal include: pollutants being kept from surface waters; sewage water providing crop and vegetation fertilizer; nutrients being recycled back into the soil and water being recharged back into the ground. In addition, the process is more economical than advanced waste treatment. However, the quality of groundwater is threatened when land disposal is not properly regulated or enforced. Examples occur if: septic tanks are not properly installed and permit aquifer contamination; sewage sludge disposed of in landfills is not monitored; drainage wells dispose of unwanted stormwater from farmlands, streets, and polluted lakes, as well as some sewage plants; open dump leachate seep into groundwater; canals and flood control channels cut into underlying aquifers and permit salty or polluted water to contaminate groundwater; or if sewage treatment plant effluents are disposed of in lagoons, percolation, or evaporation ponds, and then seep underground. (Prague-FIRL)
W75-11400

**GREEN SYSTEMS FOR WASTEWATER TREATMENT.**
Environmental Science and Technology, Vol 9, No 5, p 408-409, May, 1975. 1 fig, 1 tab.

Descriptors: *Waste water treatment, *Water treatment, Aquiculture, Treatment facilities, Precipitation(Chemical), Spraying, Irrigation, Water reuse, Nutrient removal, Water quality control.
Identifiers: *Living filter concept, Biological systems, Secondary treatment, Rhine River, Blue Nile River, Spray irrigation.

Biological techniques may be successfully applied to the treatment of water and waste water. Such methods were described at the International Conference on Biological Water Quality Improvement Alternatives, held this spring at the University of Pennsylvania in Philadelphia. Traditional water treatment is achieved on a household scale in the Sudan where water from the Blue Nile is flocculated and clarified in a 20 liter jar with pounded seeds of the tree Moringa olifera. At the Krefeld water treatment facility in West Germany, polluted Rhine river water is given secondary treatment (following primary treatment) by pumping the water through the reeds to precipitate solids; sludge is then aerated and sprayed into a lagoon containing bulrushes. These bulrushes neutralize extreme pH values, reduce COD, and increase DO. Tertiary treatment may then follow by filtration through natural sand and gravel. In Holland, a similar reed-bulrush-polypropylene fiber system was developed. At Penn State University, waste water reuse with spray irrigation of treated municipal sewage effluent to a mixed hardwood forest has been practiced for twelve years. Called 'the living filter concept', this system is recommended as efficient and economical for small cities and suburbs with available land. At Woods Hole, Massachusetts, marine aquiculture systems are being considered for removal of nutrient-rich wastes, and perhaps to provide a new commercial crop. Other biological techniques suggested include the use of biological 'filters', such as fresh water plants, invertebrates, and fish to control influent pH, and to improve organic, mineral, and bacteriological water quality. (Prague-FIRL)
W75-11401

**STUDIES OF THE BIOCHEMICAL FACTORS CONTROLLING THE FLOCCULATION OF ACTIVATED SLUDGE, (IN JAPANESE),**
Y. Magara, and Y. Nanbu.
Gesuido Kyokaishi, (Jour. of the Japanese Society of Sewerage), Vol 11, No 126, p 5-11, 1974. 20 ref.

Descriptors: *Activated sludge, *Flocculation, *Sewage treatment, *Waste water treatment, Sedimentation, Organic matter, Efficiencies.
Identifiers: External cellular parts(ECP), Poly-beta-hydroxybutyric acid.

Flocculation and sedimentation of activated sludge in sewage water treatment were studied in relation to poly-beta-hydroxybutyric acid (PHB) produced within cellular parts of microorganisms in the activated sludge particles, organic matter produced at external cellular parts (ECP), and the electrophoresis value of solution. Three different types of the Pasveer's artificial sewage water were used. These were 0.135, 0.350, and 0.750 kg BOD/kg MLSS day. Both PHB and ECP levels decreased with increased average TOC staying time, and the absolute electrophoresis value of solution increased with the decreased PHB and ECP levels. Since the ECP are considered to have a carbonyl group, the sludge particles have negative charges and the electrical repulsive force between particles increases with higher ECP level, causing lowered flocculation and sedimentation. Thus the ECP was thought to be the main factor responsible for the efficiency of flocculation. Flocculation and sedimentation become poorer with higher concentrations of organic matter in the sewage water. This is explained from the fact that the average TOC staying time decreases since the average sludge staying time shortens with more organic matter per unit weight of activated sludge. (Katayana-FIRL)
W75-11402

**FINAL DISPOSAL OF MUNICIPAL SLUDGE IN SWEDEN,**
National Swedish Environment Protection Board, Stockholm. Research Lab.
For primary bibliographic entry see Field 5E.
W75-11403

**THE PHYSICO-CHEMICAL TREATMENT OF CRUDE SEWAGE,**
J. McKendrick, and E. R. Swart.
Water Pollution Control, Vol 74, No 2, p 155-159, 1975. 4 tab, 6 ref.

Descriptors: *Pilot plants, *Waste water treatment, *Sewage treatment, Activated carbon, Alum, Clarification, Filtration, Ammonium.
Identifiers: *Physico-chemical treatment, Crude sewage, Nitrogen removal, Zeolites, Clinoptilolite, *Rhodesia.

A pilot plant for physico-chemical treatment of crude sewage is being planned in Rhodesia. This

process is designed to overcome some of the problems of the land irrigation of final effluents, especially for this type of area which has seasonal rainfall, and relies on storage dams for adequate water supply. In addition, physico-chemical processes can be more immediately corrected for changes in sewage quality than can biological ones. The proposed method consists of flocculation of raw sewage with alum, clarification, sand filtration, and activated carbon treatment. Ammonia and total nitrogen removal from the activated carbon effluent presents the greatest problem. Laboratory trials resulted in 99.7% ammonia removal with the use of the naturally occurring zeolite clinoptilolite. This level is well below Rhodesian Water Pollution Regulations, but use of this treatment depends upon whether natural clinoptilolite can be found in Rhodesia or whether a resin with similar characteristics can be economically synthesized. (Prague-FIRL)
W75-11404

**AMMONIA REMOVAL FROM MUNICIPAL WASTEWATERS BY ION EXCHANGE,**
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
J. H. Koon, and W. J. Kaufman.
Journal Water Pollution Control Federation, Vol 47, No 3, p 448-465, March, 1975. 14 fig, 9 tab, 23 ref.

Descriptors: *Ion exchange, Economics, *Ammonium, *Waste water treatment, Municipal wastes, Costs.
Identifiers: *Zeolites, *Clinoptilolite.

The conditions under which the zeolite ion exchanger clinoptilolite is most effective and economical for ammonia removal from waste waters were investigated. Experimental results were cited for defining optimum operating parameters for clinoptilolite exchangers and for estimating the cost of ammonia removal with clinoptilolite. It was found that the ammonium exchange capacity of clinoptilolite in domestic waste water treatment may be estimated from the cationic strength of the column influent. While total ammonium exchange capacity for Na- and Ca-clinoptilolite were identical, breakthrough capacity was more than two times as great for Na-clinoptilolite, probably because of the greater mobility of the smaller sodium ion in the zeolite pores. The total cost for ammonium removal with clinoptilolite for a 10 mgd plant was estimated to be $0.101 per 1000 gallons when regenerant is reused and $0.163 per 1000 gallons when regenerant is used only once. (Prague-FIRL)
W75-11405

**INSTRUMENTAL INVESTIGATION OF BIOLOGICAL WASTE WATER TREATMENT (A SZENNYVISEK BIOLOGIAI TISZTITASANAK MUSZERES VIZSGALATA),**
S. Fekete.
Kemiai Kozlemenyek, Vol 42, p 277-283, 1974.

Descriptors: *Instrumentation, *Biological treatment, *Waste water treatment, Phenols, Oxidation, Measurement, Biodegradation, Analytical techniques, Pollutant identification.
Identifiers: *Electrolytic cells.

A method and an automatic instrument for the measurement of the respiration of bacteria as a parameter of biological waste water treatment are described, as well as measurement data concerning the biodegradation of phenol in waste water. The instrument is composed of a closed reactor vessel with carbon dioxide absorber for the activated sludge sample, and a communicating electrolytic cell with properly profiled electrolytes for oxygen generation as a function of the respiration intensity of the bacteria. The respiration intensity is measured as the current intensity of the electrolytic cell. Measurements in phenol-contaminated waste water revealed a prolonged adaptation period preceding the aerobic microbial oxidation of phenol. The adaptation time increases with the phenol concentration in the waste water, and with the phenol load of the activated sludge. The oxidation peak was demonstrated to be in proportion to the phenol concentration. (Takacs-FIRL)
W75-11407

**AN AUTOMATED SPECTROPHOTOMETRIC SUSPENDED SOLIDS ANALYSIS FOR ACTIVATED SLUDGE,**
Municipality of Metropolitan Seattle, Renton, Wash. Renton Treatment Plant.
R. E. Finger, and B. J. Strutynski.
Journal Water Pollution Control Federation, Vol 47, No 5, p 1043-1054, May, 1975. 11 fig, 4 tab, 15 ref.

Descriptors: *Activated sludge, *Biological treatment, *Suspended solids, *Waste water treatment, Colorimetry, Automation, Sampling, Measurement, Analytical techniques, *Pollutant identification, *Spectrophotometry.
Identifiers: *Sludge volume index.

The measurement of suspended solids (ss) concentration in biological waste treatment is used as a primary control for process adjustment. The ss measurement is necessary for calculation of cell residence time, organic loading, and sludge volume indexes. The determination of types of polysaccharides associated with activated sludge and their effects on the physical characteristics of sludge have been investigated by a simple colorimetric test. The purpose of this study was to consider the possibility of adapting this test to an automated procedure. A manual colorimetric procedures which takes two or three hours was first tested and it proved to effectively measure mixed liquor suspended solids and vss. The automated spectrophotometric ss test takes only fifteen minutes and was demonstrated to be practical for use on a continuous basis. The major problem with the technique is sampling, which may be improved by the installation of a homogenization system. (Prague-FIRL)
W75-11408

**THE USE OF COMPUTERS FOR FORECASTING THE SANITARY SYSTEMS OF WATER BODIES (PRIMENENIYE EVM DLYA PROGNOZIROVANIYA SANITARNOGO SOSTOYANIYA VODOYEMOV),**
Ya. I. Vaysman, N. V. Zaytseva, B. M. Krasovskiy, and A. V. Mikhaylov.
Gigiyena i Sanitariya, No 9, p 102-104, 1974.

Descriptors: *Computers, Surface waters, *Forecasting, Hydrologic aspects, Water treatment, *Waste water treatment, *Pollutant identification.
Identifiers: Waste discharge, *USSR.

A computerized method for forecasting the sanitary status of surface water bodies is presented. Factors characterizing the dynamics of waste water discharges and their quantitative and qualitative parameters during the investigation period, the technological water treatment measures to be taken for pollution abatement, as well as the dynamics of the hydrological parameters of the water body were chosen as input data. The algorithm elaborated permits the determination of the concentration of one or more pollutant components as a function of time and of the size of the water body. It also determines the probability of the occurrence of definite pollutant concentrations. The algorithm was tested for the chloride load of the Kama river in the USSR. (Takacs-FIRL)
W75-11410

**BREAKTHROUGH IN SEWAGE TREATMENT--CASH, LAND, AND ENERGY SAVED.**
Water Services, Vol 79, No 950, p 132, 140, April, 1975. 3 fig

Descriptors: *Waste disposal, *Pilot plants, Effluents, *Sewage treatment, Biological treatment, Municipal wastes, Industrial wastes, *Waste water treatment.
Identifiers: *Underground disposal, *Deep Shaft Effluent Treatment Process

A method of underground treatment of both municipal and industrial effluents has been developed which will reduce the size of sewage works in half, operate them at lower costs, and produce 50% of the present amount of sludge. Called the ICI Deep Shaft Effluent Treatment Process, the basis of the system is a shaft hundreds of feet deep, partitioned into two sections. A pilot plant has been operated successfully since mid-1974 by the Northumbrian Water Authority, in Great Britain. In the process, sewage effluent enters the shaft continuously, is circulated through the sections of the shaft several times, then overflows by gravity for separation of solids. Biological oxidation is promoted by the compressed air that is also the driving force for the circulating the liquid effluent. The depth of the shaft determines the efficiency of oxygen transfer. Conventional drilling techniques are used for construction of the system. In all but optimal geological conditions, the hole must be lined with either concrete or steel and the annulus between the lining and the rock must be pressure grouted or filled with cement grout, because the lining carries the load from the rock and the hydrostatic heads. ICI recommends their process as a land-saving method for use in densely populated areas, and for treatment in cold climates where slow treatment rates have been a persistent problem. (Prague-FIRL)
W75-11413

**STORM AND COMBINED SEWER ABATEMENT TECHNOLOGY IN THE UNITED STATES--AN OVERVIEW,**
Environmental Protection Agency, Washington D.C. Municipal Pollution Control Div.
F. J. Condon.
In: 3rd U.S.-Japan Conference on Sewage Treatment Technology, February 12-16, 1974, Tokyo Japan, p 505-546. 4 fig, 16 tab.

Descriptors: *Storm runoff, *Urban area, *Combined sewers, Sewerage, Waste discharge, Treatment, Urban hydrology, Effluents, Water pollution control, Mathematical models, *Waste water treatment, United States.
Identifiers: Non-point pollution sources, Storm Water Management Models.

An overview of principal sources of runoff induced pollution as investigated by the Office of Research and Development of the United States Environmental Protection Agency is given. These include: combined sewer (domestic sewage and runoff) overflows, sewered storm water discharge, sanitary sewers surcharged by infiltration, treatment works or pump station bypass, and urban non-point or overland runoff. Remedial solutions for these specific causes must include urban hydrology as well as sanitary engineering. Schematic diagrams of urban hydrologic systems have been developed. In evaluating water pollutant loading, strength and mass emission of pollutants from an event must be considered. Projects for control include quantity reduction (infiltration control), quality improvement (deicing methods, runoff rate attenuation (porous pavements), improved materials (electro-magnetic subsurface profiling) for urban areas. Possible alternatives for effluent management facilities are also detailed. Treatment may be physical, physico-chemical, biological, or biophysical. The well-developed mathematical Storm Water Management Model and associated work are outlined as the principal tools for use in application of a total system

cept for selecting water pollution control alternatives. (PraguenFIRL)
W75-11414

**ELIMINATION OF WATER SURFACE POLLUTION.**
Australian Patent 458,317. Issued February 27, 1975. Official Journal of Patents, Trade Marks, and Designs, Vol 45, No 6, p 542, February 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution control, *Organic wastes, Pollutants, Organic wastes.
Identifiers: *Chemical treatment.

A patent has been issued for a composition that can be used for the elimination of water surface pollution. The composition is in a granular or powdered form and is suitable for concentrating organic pollutants on the surface of a body of water. The components of the composition include a carrier having an apparent density of less than one g/cc, a wetting agent consisting of a mono or polyhydric alcohol, and a surface active agent having a hydrophilic group other than a hydroxyl group. In each 100 parts by weight of the three components, there are 10-90 parts carrier, 1-10 parts wetting agent, and 9-80 parts surface active agent. (Orr-FIRL)
W75-11416

**VALVE FOR CONTROLLING LIQUID DISCHARGE.**
For primary bibliographic entry see Field 8C.
W75-11417

**FILTRATION AND PURIFICATION OF CONTAMINATED WATER,**
A. Schreiber, B. Schreiber, and E. Schreiber.
Canadian Patent 959,980. Issued December 24, 1974. Patent Office Record, Vol 102, No 52, p 85, December 24, 1974.

Descriptors: *Patents, Filtration, *Waste water treatment, *Trickling filters, Sludge treatment, Waste disposal, Water purification.
Identifiers: Waste discharges.

A process for the filtration and purification of contaminated water by means of a trickling filter was patented. A wear-resisting filler material having a specific gravity of approximately one or below is employed. Sludge adhering to the filler material is removed by first filling the material with flushing or scavenging water, then agitating the filler material, sludge, and added water. During agitation, the greater part of the sludge is discharged, mixed with water. The flushing water is then discharged, along with any sludge it contains, after which the trickling filter may be utilized again. (Prague-FIRL)
W75-11418

**OPEN WATER PURIFICATION SYSTEM,**
J. Rafael.
French Patent 32834V/18. Issued August 2, 1974. Derwent French Patents Report, Vol 40, No 3, p 3, November 12, 1974.

Descriptors: *Water purification, *Patents, *Oil spills, Water treatment, Plastics, Tanks, Flocculation, Separation techniques.

An open water purification system was patented. The system is versatile and has a high treatment capability, such as for the cleaning up of oil slicks. Two positions are used with their internal tanks coupled by an elongated flexible plastics walled duct. The duct acts as a flocculation dwelling chamber for raw water, taken in at the bow of the first position, and mixed in the tank of that position with a flocculating agent injected into it from an on-board preparation tank. The second position contains a separation system for the precipitated sludge and an aft discharge port for the treated water. (Prague-FIRL)
W75-11419

**USE OF OXIDIZED CATIONIC STARCH IN FLOCCULATION AND DEWATERING OF MUNICIPAL SLUDGE,**
Anheuser-Busch, Inc., St. Louis, Mo. (assignee)
W. G. Hunt, and R. J. Belz.
United States Patent 3,875,054. Issued April 1, 1975. Official Gazette of the United States Patent Office, Vol 933, No 1, p 338, April 1975.

Descriptors: *Patents, *Sewage treatment, *Sludge treatment, *Flocculation, *Waste water treatment, Municipal wastes, Sewage sludge.
Identifiers: *Starches.

A method was patented for treating raw primary sedimented sewage sludge. Its steps include the addition of from 0.016% to 0.1875% by weight (based on the dry weight of the sludge) of gelatinized oxidized cationic starch ether of amine butene halide to the raw sludge. The starch ether should have a carboxyl content equivalent to a degree of substitution of 0.0036 to 0.0108 and a degree of substitution of amine butene halide of about 0.15 to 0.25. The sludge is flocculated and then dewatered to below about 70% moisture. (Prague-FIRL)
W75-11420

**WATER PROCESSING PLANT TO CONTROLLED ACIDITY LEVEL,**
For primary bibliographic entry see Field 5F.
W75-11421

**ELECTROLYTIC CHLORINE USED TO PURIFY DISINTEGRATED SEWAGE.**
Belgian Patent 1442W/09. Issued January 16, 1975. Derwent Belgian Patents Report, Vol W, No 9, p 2, April 8, 1975.

Descriptors: *Waste water treatment, *Patents, *Biological treatment, Suspended solids, *Sewage treatment, Bacteria, Biochemical oxygen demand, Odors, Chemical oxygen demand.
Identifiers: *Electrolytic chlorine, Sewage purification.

A patent was granted for electrolytic chlorine used to purify disintegrated sewage. Sewage containing a chloride of an alkali metal in solution is run into a first chamber. There suspended solids are broken down by a high speed disintegrator while an immersed anode and cathode subject the liquid to electrolysis evolving chlorine. The treated liquid suspension is transferred to a second chamber to be further mixed by an agitator before discharge from an outlet. Electrolysis should be continued in the second chamber. The system may be used in the purification of waste water or sewage to reduce the BOD, the COD, bacteria, and malodors to a level acceptable for discharge to rivers, canals, lakes, or the sea. (Prague-FIRL)
W75-11422

**FILTER FOR PURIFICATION OF WASTE WATER.**
an Patents Report, Vol 5, No 46, p 2, October 1974.

Descriptors: *Waste water treatment, *Patents, *Filters, Sludge, Microorganisms, Aeration, Filtration.

A filter was patented for the physical and/or biological purification of waste water. The sewage or waste water is allowed to trickle for a limited period over the filter bed, thus building up a layer of sludge and microorganisms. Grains covering the filter bed are circulated periodically and the sludge removed. To increase the efficiency of this sludge removal process, the waste water is distributed uniformly over the whole of the filter bed by rotating distribution arms. The grains, with diameters of about 6 mm are kept in a reservoir, resting on a concrete base. Arms for washing and sludge recovery rotate around two pipes; one admits compressed air and the other evacuates sludge. The biological layer of the grains is thus aerated and the circulation of the filter grains prevents clogging. (Prague-FIRL)
W75-11423

**SLUDGE DEWATERING INSTALLATION.**
Netherlands Patent 74332V/43. Issued October 23, 1974. Derwent Netherlands Patents Report, Vol 5, No 45, p 3, December 1974.

Descriptors: *Patents, *Sewage treatment, *Dewatering, *Sludge treatment, Drainage, *Waste water treatment.

A patent was granted to a sludge dewatering installation. Straining tanks are used for dewatering industrial wastes, municipal wastes, or sewage and consist of skips with sloping sides, lined throughout with wire mesh grilling. These are supported so as to leave space for drainage to bottom outlets, from the surface of settling sludge. The skips are easily transportable by skip-lorries, to dumping or disposal sites. This eliminates manual transfer from tank to transport. The installation is economical in terms of site space required, and may be located at the sludge source. (Prague-FIRL)
W75-11424

**WASTE WATER TREATMENT SYSTEM WITH AN OZONE GENERATOR,**
S. Koigawa, and M. Furuse.
Japanese Patent 49-27714. Applied March 4, 1970. Issued July 27, 1974. Japan Model Utilities. 1 fig.

Descriptors: *Waste water treatment, *Ozone, *Patents, Equipment, Mixing.
Identifiers: *Ozone generator, Mixing efficiency.

A waste water treatment apparatus equipped with an ozone generator was patented. The ozone generator is enclosed within the reaction bath of the apparatus and is thus cooled effectively by the surrounding waste water. The generated ozone is collected at the top of the generator and bubbled through from the bottom of the reaction bath. Spiral fines are attached outside of the ozone generator, which increases the mixing efficiency between ozone and the waste water. (Katayama-FIRL)
W75-11426

**DOMESTIC WATER PURIFICATION METHOD AND SYSTEM,**
Inca-One Corp., Los Angeles, Calif. (assignee)
J. D. Zeff.
United States Patent 3,843,521. Issued October 22, 1974. Official Gazette of the United States Patent Office, Vol 927, No 4, p 1637, October 1974. 1 fig.

Descriptors: *Patents, *Ozone, *Water purification, Domestic water, Equipment, *Waste water treatment.
Identifiers: *Ozone generator.

A patent was given for a household ozone generator and purification system, used for the purification of small quantities of impure water. It consists of a housing; an ozone generator mounted in the housing; means secured to the housing for energizing the ozone generator for preselected time intervals; and an open topped container with an impeller adjacent to its base. A cap for this open top defines an opening and means for mounting the housing on the cap permit ozone to flow through the cap and into a container. Thus, when the impeller is rotated, ozone is generated and flows into the container, purifying the domestic water. (Prague-FIRL)
W75-11427

**REMOVING SOLIDS FROM SEWAGE.**
U.S.S.R. Patent SU 407842. Issued December 10, 1973. Soviet Inventions Illustrated, Vol 5, No 41, p 2, September 19, 1974. 1 fig.

Descriptors: *Patents, *Sewage treatment, *Ammonia, Temperature, *Waste water treatment.
Identifiers: Solids removal, Cooling agents.

A patent for a method of removing solids from sewage was issued which involves freezing with a cooling agent such as ammonia and subsequently thawing and reliquifying the ammonia. Energy consumption is reduced by liquifying the cooling agent in two stages using high and low pressure compressors in series. Ammonia is fed along a pipeline to a crystallizer/evaporator where it evaporates, drawing its heat from the sewage residues which have been poured into the vessel and frozen. Ammonia vapor passes along by the low-pressure compressor and condenses from the pressure of boiling ammonia to the pressure of intermediate condensation in the condenser/meter. Heat transfer takes place, and the previously-frozen residues melt. The high pressure compressor removes the vaporous ammonia from the condenser-melter, raising the pressure to that of the high-temperature condenser. Excess heat is transferred from the condensation temperature of the cooling agent to that in the condenser. The result is that the cooling agent liquifies and is once more conveyed by a pipeline into the crystallizer/evaporator and the cycle is repeated. (Prague-FIRL)
W75-11428

**BIOLOGICAL PURIFICATION OF TOWN AND INDUSTRIAL EFFLUENTS.**
French Patent 11432W/07. Issued December 20, 1974. Derwent French Patents Report, Vol W, No 7, p 3, March 1975.

Descriptors: *Biological treatment, *Municipal wastes, *Industrial wastes, *Waste water treatment, Bacteria, Anaerobic treatment, Secondary treatment, Sludge treatment, Effluents.

A biological purification treatment method was patented which has been applied to rural, municipal, and industrial effluents. The effluent is seeded with bacterial strains, selected according to the nature of the effluent. The wastes are subjected to conditions which allow anaerobic and/or aerobic degradation of the organic matter. The effluent is coarse-screened and transferred to the primary settling tank where it is seeded with freeze-dried bacteria; corresponding natural enzymes and certain wetting agents are added. Anaerobic degradation occurs and after one to three days the effluent is collected from the upper part of the tank by passage along a pipe to an oxidation tank equipped with a projection turbine. After a period of twelve hours to twenty days, according to the degree of pollution, the effluent goes to a secondary settling tank where mineralized sludge is deposited. The treated effluent thus passes out by the overflow. (Prague-FIRL)
W75-11429

**IRRADIATION PLANT FOR FLUID MATERIAL, PARTICULARLY SEWAGE SLUDGE.**
German Patent 12845W/08. Issued February 13, 1975. Derwent German Patents Report, Vol W, No 8, p 2, February 1975.

Descriptors: *Patents, *Sewage treatment, *Irradiation, *Treatment facilities, *Sludge treatment, *Waste water treatment, Sewage sludge.

A plant for irradiating fluid material, particularly sewage sludge, was patented. Radioactive sources comprise an irradiation chamber through which the material flows. The equipment is provided with a container for a series of radiation sources, having channels for the introduction and withdrawal of these sources, which can be closed off and sealed against the fluid material. A common closure piece is provided for closing the channels and can be pressed down onto the radiation source container by a clamping retaining element. The closure piece is more reliable than individual closure elements and the radiation sources can be exchanged in a much shorter time; the danger that more than one channel is not completely sealed is considerably reduced. (Prague-FIRL)
W75-11430

**CONTINUOUS DETERMINATION OF TOXICITY OF EFFLUENTS.**
For primary bibliographic entry see Field 5A.
W75-11431

**APPARATUS FOR CLEANING LOOSE FILTERING MATERIAL IN SLOW WATER FILLED WATER SUPPLY FILTERS,**
For primary bibliographic entry see Field 5F.
W75-11436

**FLOTATION AERATOR FOR AERATING AND MOVING WATER,**
R. A. Cramer, Jr.
United States Patent 3,865,909. Issued February 11, 1975. Official Gazette of the United States Patent Office, Vol 931, No 2, p 859, February, 1975. 1 fig.

Descriptors: *Patents, *Aeration, *Flotation, Equipment, *Water treatment, *Waste water treatment.
Identifiers: *Flotation aerator.

An apparatus for aerating a body of water was patented. The process consists of propelling a stream of water from the body upward and outward above its surface. A float member of substantial area serves as a support, having through it a central opening with a vertical axis. A ring member is positioned in and encases a central opening and defines a vertical water flow passage. Motor supports are spaced on the ring member. A submersible motor is carried by its supports, spaced below the float member; the motor has a power shaft axially aligned with the flow passage. A propeller and diffuser are used to impinge upon a stream of water and to disperse the water upward and outward over a wide area. (Prague-FIRL)
W75-11439

**INCINERATOR DEVICE AND A METHOD OF PROCESSING RESIDUALS IN WASTE WATER, LIQUEFIED SEWAGE AND SLUDGE,**
Klein (Albert) KG, Niederfischbach (West Germany). (assignee).
W. Bastgen.
United States Patent 3,871,285. Issued March 18, 1975. Official Gazette of the United States Patent Office, Vol 932, No 3, p 851, March, 1975. 1 fig.

Descriptors: *Patents, *Incineration, *Waste water treatment, Sewage treatment, Equipment, Sludge treatment.
Identifiers: Granulation.

A device was patented for incinerating granulated combustible material. At least one sieve-type grate feeds combustible material; the grate is in the form of a rigid plate-shaped member with spaced perforations. The peripheral outline in each perforation is small in relation to the total area of the plate-shaped area. Supply means continuously feed air to the grate from below, thereby cooling the grate. Residuals are dried preliminarily by applying pressure; the predried residuals are granulated, maintaining a bed of hot air above the grate. The granulate in the form of a layer is guided along the hot air bed, and swinging movements to the layer cause the granulate to dip intermittently into the hot air bed. (Prague-FIRL)
W75-11440

**LIQUID TREATMENT PLANT AND PROCESS PARTICULARLY FOR WASTE WATER,**
J. E. Chatfield
Canadian Patent 962,386. Issued February 4, 1975. Patent Office Record, Vol 5, p 82, February, 1975.

Descriptors: *Patents, *Phosphorus, *Waste water treatment, Treatment facilities, Pollutants, Lime, *Coagulation, *Flocculation.

A patent was issued for a treatment process and plant which are adaptable and can be placed within a compact package unit. The process is designed to efficiently remove phosphorus and other pollutants from waste water. In the treatment process lime or another chemical coagulant is mixed with an influent solution to coagulate the solute and to flocculate the suspended particles in a flocculation chamber. There the mixture is raised through a field of suspended particles and reseeded with deposited particles to encourage the flocculation. The mixture is thus caused to pass through curtains of falling floc and between sedimentation trays to deposit the particles. The unit produces gravity flow serially and at predetermined individual velocities through the successive stages of the process, optimizing its flocculation and deposition conditions. (Prague-FIRL)
W75-11441

**SEWAGE TREATMENT WITH HYDROGEN PEROXIDE.**
Australian Patent 458, 666. Issued March 6, 1975. Official Journal of Patents, Trade Marks, and Designs, Vol 45, No 7, p 680-681, March, 1975.

Descriptors: *Waste water treatment, *Sewage treatment, *Odors, *Patents, Hydrogen sulfide, *Corrosion control, Sulfides.
Identifiers: *Hydrogen peroxide.

A process for treating sewage and sewage system to remove odors caused by hydrogen sulfide and to reduce corrosion caused by oxides of sulfur has been patented. It involves using hydrogen peroxide to oxidize sulfide and hydrogen sulfide and control their regeneration or recurrence. The preconditioning treatment is to introduce hydrogen peroxide into the sewage in an amount 10 times the stoichiometric equivalent of sulfide and hydrogen sulfide in the influent sewage for a period of time sufficient to reduce the sulfide and hydrogen sulfide levels to essentially zero. The sulfide and hydrogen sulfide are then continuously maintained at essentially zero levels either by introducing hydrogen peroxide into the sewage in the absence of aeration in an amount 1-2 times the stoichiometric equivalent of sulfide and hydrogen sulfide into the sewage while aerating the system with air or oxygen enriched air or oxygen in an amount one-fourth to one times the stoichiometric equivalent of sulfide and hydrogen sulfide in the influent sewage. (Orr-FIRL)
W75-11443

**TREATING EFFLUENT.**
Australian Patent 459,333. Issued March 29, 1975. Official Journal of Patents, Trade Marks and Designs, Vol 45, No 9, p 951, March, 1975.

Descriptors: *Patents, *Sewage treatment, *Plastics, Filtration, *Waste water treatment, Effluents, Aeration.

A method was patented to treat whole raw sewage effluent. The effluent is mascerated, then passed into a vessel of submerged contact media. The media consists of a bed of randomly arranged pieces of plastic material. After the effluent is passed through the media, it is aerated. Treated effluent is then withdrawn from the vessel at a point above the bed. (Prague-FIRL)
W75-11444

**REGIONAL SEWERING AND GROUNDWATER QUALITY IN THE SOUTHERN SAN JOAQUIN VALLEY,**
K. D. Schmidt.
Water Resources Bulletin, Vol 11, No 3, p 515-525, June 1975. 4 fig, 9 ref.

Descriptors: *Groundwater movement, *Water pollution, *Water quality, *Seepage, *Sewage disposal, *California, Water reuse, Groundwater recharge, Sewage treatment, Chlorides, Chemical analysis.
Identifiers: *San Joaquin Valley(Calif), *Regional sewering, Fresno(Calif).

Sewage effluent is commonly disposed of on land in arid regions, and the majority usually recharges the groundwater. Few evaluations have been made on the effect of effluent disposal on groundwater quality in the west. Groundwater hydrologists are rarely involved with treatment plant design and operation or effluent disposal in the San Joaquin Valley, California. The effect of regional sewering programs on groundwater quality in this valley was evaluated. Research was conducted on past studies of sewage effluent disposal. An extensive water sampling program was undertaken near the Fresno Sewage Treatment Plant. Chloride contents were used to trace recharged effluent. The extent of recharged effluent was delineated and traced for about ten miles. Sampling between the plant and the urban Fresno area indicated a high probability of large-scale leakage of raw sewage to the groundwater. There was demonstrated a need for development of better, smaller sewage treatment plants and individual waste disposal systems. (Lardner-ISWS)
W75-11446

**SCALE EFFECTS ON COOLING TOWER MODEL STUDIES,**
Iowa Inst. of Hydraulic Research, Iowa City.
For primary bibliographic entry see Field 8B.
W75-11470

**GYPSUM SOLUBILITY AND SCALING LIMITS IN SALINE WATERS,**
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 3A.
W75-11473

**RESPONSE OF COMPLETELY MIXED ACTIVATED SLUDGE SYSTEMS TO CHANGES IN THE ENVIRONMENT,**
Oklahoma State Univ., Stillwater. Center for Water Research in Engineering.
J. F. Gaudy, Jr.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-245 , $7.50 in paper copy, $2.25 in microfiche. Completion Report, June 1975. 236 p, 28 fig, 6 append. OWRT A-043-OKLA(1).

Descriptors: *Activated sludge, Temperature, Effluents, Flow rate, Hydrogen ion concentration, Water pollution effects, *Waste water treatment, Microbial degradation, Growth rate.
Identifiers: *Shock loading.

This project was undertaken to analyze experimental results dealing with the response of continuously cultured heterogeneous microbial populations, elg., activated sludge, to step changes in feed flow rate, feed concentration, pH and temperature. The response was characterized by determining preshock, transient stage and final 'steady state' conditions of effluent substrate and biomass concentration and biochemical composition of biomass. Both once-through and cell recycle systems were studied and effect of specific growth rate and mean hydraulic retention time on response were assessed. In general, an increased retention time, cell recycle and biomass concentration lessened the amount of substrate leakage during the transient stage, whereas, a decreased specific growth rate alleviated disruption of plant efficiency. An appendix consists of six papers on these types of shock loading.
W75-11478

**WATER QUALITY CHANGES RELATED TO THE DEVELOPMENT OF ANAEROBIC CONDITIONS DURING ARTIFICIAL RECHARGE,**
Geological Survey, Lubbock, Tex.
For primary bibliographic entry see Field 5B.
W75-11497

**CALICUM SULFATE SCALING IN REVERSE OSMOSIS (HYPER-FILTRATION) OF BRACKISH WATERS BY HOLLOW-FIBER AND SPIRAL-WOUND MODULES,**
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 3A.
W75-11505

**METHOD FOR COMBATTING POLLUTION USING A CHROMIUM COMPLEX,**
Seppic, Paris(France). (assignee).
For primary bibliographic entry see Field 5G.
W75-11506

**AEROBIC SEWAGE TREATMENT SYSTEM,**
Coate Burial Vault, Inc., West Milton, Ohio. (assignee).
K. J. Yost.
United States Patent 3,879,285. Issued April 22, 1975. Official Gazette of the United States Patent Office, Vol 933, No 4, p 1741, April, 1975. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Aerobic conditions, Equipment, Aeration, *Aerobic treatment, Domestic wastes.
Identifiers: *Aerobic digestion.

An apparatus and method for the aerobic digestion of sewage have been patented. The apparatus consists of the following parts: an essentially cylindrical treatment tank; a sewage water inlet line; a water discharge line defining an outlet within the center portion of the treatment tank; an air space above the surface of the water; an air conduit; means for directing a flow of air against the surface of the water to be treated in a manner such that circulation of the sewage in a horizontal circular path is effected; an air discharge passage from the air space for removing the circulated air. The sewage is treated by introducing it into the tank, supplying the air to effect the circulation of the water thereby centrifugally moving the heavier more polluted water radially outward in the tank while diffusing air into the water, and then exhausting the air. (Orr-FIRL)
W75-11507

**SEWAGE TREATMENT DEVICE,**
International Telephone and Telegraph Corp., New York. (assignee).
A. J. Peirish, Jr., and T. M. Uyeda.
United States Patent 3,878,569. Issued April 22, 1975. Official Gazette of the United States Patent Office, Vol 933, No 4, p 1513, April, 1975. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Equipment, Municipal wastes, Domestic wastes.
Identifiers: Maceration.

A device for the treatment of sewage has been patented. It contains the following parts: a housing including a generally cylindrical section and a forward sewage inlet end; a rotable shaft coaxially mounted within the cylindrical section; a sewage macerating and conveying means mounted on the rotable shaft; an impeller mounted on the shaft; a discharge outlet on the housing; a means for rotating the shaft to cause maceration of the sewage entering through the inlet end and also to convey sewage to the impeller and out through the discharge outlet. The macerating means is comprised of a tapered auger-like element with a point facing forward, and a pair of blades with spiral-shaped leading edges converging toward the point. (Orr-FIRL)
W75-11508

**DOMESTIC SEWAGE SYSTEM,**
N. D. Arnot, Jr.
United States Patent 3,879,290. Issued April 22, 1975. Official Gazette of the United States Patent Office, Vol 933, No 4, p 1743, April, 1975. 1 fig.

Descriptors: *Patents, *Waste water treatment, Equipment, *Sewage treatment, Domestic wastes, Sterilization, *Oxidation, Aeration.

A patented sewage system which is designed primarily for domestic use consists of the following parts: two tanks of a similar size; a third tank smaller than the first two; connections between the three tanks in flow series; inlet means for sewage to enter the first rank and then flow into the second and third tanks; means for continuously aerating the sewage in the first and second tanks; means for causing essentially complete oxidation of the contents of the third tank; and timer means for actuating the oxidizing means and discharge means according to a predetermined sequence. The time sequence is in response to the filling of the third tank, allowing sufficient time for the sterilization of the contents of the third tank. (Orr-FIRL)
W75-11509

**SEWAGE TREATMENT SYSTEM,**
V. J. Kovarik.
United States Patent 3,875,051. Issued April 1, 1975. Official Gazette of the United States Patent Office, Vol 933, No 1, p 337-338, April, 1975. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Equipment, *Biodegradation, Treatment, Suspended solids, Domestic wastes, Sewage, Flow control, *Separation techniques.

This patented method for collecting and treating sewage consists of the following steps: collection of the sewage of several containers; storage and non-biodegradable sewage solids in each container; partial decomposition of biodegradable solids through diagenetic decomposition in each container to reduce them in size and alter their specific gravity; separation (in each container) of the liquid sewage containing suspended solids smaller than a predetermined size from floating settled, and other solids; accumulation and temporary storage of these liquids and suspended solids between predetermined levels in each container; and, pumping the stored liquids and solids from each container as the liquid reaches the predetermined upper level. The storage of each container is used to promote a more even flow rate from a plurality of containers through collection lines interconnecting each container and the central final treatment means. (Orr-FIRL)
W75-11510

**SEWAGE DISPOSAL SYSTEM,**
Babcock and Wilcox Co., New York. (assignee).
E. P. Foster, R. J. Kelly, and W. L. Sage.
United States Patent 3,875, 357. Issued April 1, 1975. Official Gazette of the United States Patent Office, Vol 933, No 1, p 416, April, 1975. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Sewage disposal, Incineration, Fuel, Waste disposal, Ultimate disposal, *Sewage treatment, Municipal wastes.
Identifiers: A sewage disposal system has been patented which includes a liquid fuel fired steam generator, steam generating tubes, a furnace, and a passageway with a gas flow in communication

with the furnace. The first step is to fire the liquid fuel within the furnace to maintain a high temperature combustion zone for the generation of steam through indirect heat exchange. The fuel input to the furnace is continuously monitored. When the fuel input exceeds a predetermined level, a pressurized liquid-solids sewage mixture is injected into the combustion zone. The sewage input mixture is steam atomized prior to being injected, continuously metered into the combustion zone, and regulated so as to maintain a sewage to fuel input ratio resulting in essentially complete vaporization and incineration of the sewage mixture. (Orr-FIRL)
W75-11511

**SEWAGE AND GARBAGE DISPOSAL.**
Australian Patent 458,672. Issued March 6, 1975. Official Journal of Patents, Trade Marks and Designs, Vol 45, No 7, p 682, March 1975.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Waste disposal, Ultimate disposal, Incineration, Fuels, Oil, Oxidation, Domestic wastes, Oil wastes, *Sewage disposal.
Identifiers: Hydrocarbon fuels.

A process for the disposal of garbage, solid waste matter, sewage, or mixtures thereof has been patented. The ground garbage, ground solids waste matter and/or thickened and dewatered sewage is combined in a mixing zone with a fluidizing medium. The fluidizing medium can be a liquid hydrocarbon fuel, a liquid hydrocarbon fuel-particulate carbon slurry, a particulate carbon-water slurry, or a mixture of these. The resultant mixture is called the feed mixture and is introduced into the reaction zone of a free flow unpacked noncatalytic gas generator. The feed mixture is reacted by partial oxidation with a free-oxygen containing gas and stream under synthesis-gas producing conditions. The conditions comprise an autogenous temperature in the range of 1500 to 3000 F and a pressure in the range of one to 250 atmospheres. The result of the reaction is a hot gaseous effluent stream composed of hydrogen, carbon monoxide, carbon dioxide, water, and particulate carbon.
W75-11514

**DESALINATION OF WATER.**
For primary bibliographic entry see Field 3A.
W75-11515

**TREATING SEWAGE.**
Australian Patent 459,688. Issued April 10, 1975. Official Journal of Patents, Trade Marks and Designs, Vol 45, No 11, p 1161, April, 1975.

Descriptors: *Patents, *Sewage treatment, *Filtration, *Waste water treatment, Suspended solids, Equipment.

Water containing suspended solids from a sanitary system may be treated by a patented method. The steps comprise: aerating the water; delivering the water to a screen with a directional component across the screen surface and a directional component through the screen. This screen has openings which are large enough to pass the majority of suspended solids, and the screen can hold a coating of the solids on its upstream side, controlling the flow of water containing suspended solids. As a coating of suspended solids forms of the screen surface, water is continuously delivered, and solids are filtered from the water passing through the coating and the screen. The relationship between the directional components is thus controlled, maintaining the coating on the screen, while still delivering water through the screen. Water which has passed through the screen is then stored and recycled to the sanitary system. (Prague-FIRL)
W75-11516

**IRRADIATION PLANT FOR FLUID MATL PARTIC SEWAGE SLUDGE.**
Netherlands Patent 12845W/08. Issued March 7, 1975. Derwent Netherlands Patents Report, Vol W, No 12, p 3-4, April 29, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Sludge treatment, *Irradiation, *Treatment facilities

Irradation of fluid material, particularly sewage sludge, is described. Radioactive sources are contained in an irradiation chamber, through which the material flows. The container for a series of radiation sources has channels for the introduction and withdrawal of these sources which can be closed off and sealed against the fluid material. A common closure piece is provided for closing these channels and can be pressed down onto the radiation source container by a clamping retaining element. The closure piece insures that radiation sources can be exchanged in a much shorter time. Thus the danger that one or more channels is not completely sealed is considerably reduced. (Prague-FIRL)
W75-11517

**HORIZONTAL REACTOR FOR POLYMSN. SEWAGE OXIDATION ETC.,**
F. Moser.
French Patent 87495V/51. Issued January 31, 1975. Derwent French Patents Report, Vol W, No 12, p 2, April 29, 1975.

Descriptors: *Patents, *Sewage treatment, *Water purification, Oxidation, Equipment, *Waste water treatment.
Identifiers: Hydrocarbons, Horizontal reactor.

A horizontal reactor is used for several chemical reactions including sewage water purification, sulfur dioxide absorption, and hydrocarbon halogenation. Reactions are carried out efficiently in a long horizontal vessel through which the main reaction medium, introduced at the inlet, flows. Over the whole length of the installation, separate devices are provided, positioned centrally at the bottom of the reactor. Holes are spaced closer at the start and widen in pitch progressively towards the opposite end. A second fluid medium is introduced at the point in order to set up additional currents rotating on axes parallel to the flow of the first medium. (Prague-FIRL)
W75-11518

**DEVICE AND METHOD FOR CONDUCTING WASTE LIQUID FROM A RECEPTACLE TO A PNEUMATIC LIQUID DISPOSAL SYSTEM,**
S. E. A. Svanteson.
Canadian Patent 967,843. Issued May 20, 1975. Patent Office Record, Vol 103, No 20, p 30, May, 1975.

Descriptors: *Patents, *Equipment, *Waste water treatment, Conduits, Liquids, Waste disposal, *Sewage disposal.
Identifiers: Vacuum disposal.

Equipment is described which conveys liquid from a holding receptacle to a vacuum sewage disposal system. There the waste liquid is conducted through a transport conduit. The conduit provides a suitable admixture of atmospheric air to the waste liquid being conveyed at the inlet end of the transport conduit. This gives greater efficiency in the conveyance of the liquid. (Prague-FIRL)
W75-11519

**LIQUID TREATMENT APPARATUS HAVING COMBINED REACTION BASIN AND CLARIFIER,**
L. S. Love.
Canadian Patent 968,081. Issued May 20, 1975. Patent Office Record, Vol 103, No 20, p 20-81, May, 1975.

Descriptors: *Patents, *Waste water treatment, Equipment, Aeration, Sludge, Industrial wastes, Municipal wastes.
Identifiers: *Clarification.

A treatment apparatus is designed for aerating or mixing and clarifying liquids such as industrial and sanitary waste waters and for conducting chemical reactions. The aeration or mixing basin and the clarifier are formed as one integral unit separated by a baffle. The flow from the aeration basin into the clarifier is controlled by flow control plates. The bottom of the clarifier slopes toward the aeration basin bottom such that solids settling in the clarifier flow down the clarifier bottom towards the aeration basin. This flow causes solids to be picked up by circulation in the aeration basin and re-suspended. A sludge scraper is periodically drawn across the clarifier bottom to dislodge sludge adhering to the bottom. The clarifier surface is periodically skimmed by a skimmer to remove scum. (Orr-FIRL)
W75-11521

**SEWAGE DISPOSAL PROCESS,**
A. Brent, and C. F. Teichmann.
Canadian Patent 967,751. Issued May 20, 1975. Patent Office Record, Vol 103, No 20, p 10-11, May 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage disposal, *Dewatering, Fuel, Oxidation, Sludge treatment, Water reuse.

A disposal method for sewage involves the conversion of the sewage into synthesis gas or fuel gas by dewatering municipal sanitary sewage and producing a thickened sludge. The thickened sludge is mixed with a fluid selected from a group composed of water, liquid hydrocarbon fuel, particulate carbon slurries in water or in a liquid hydrocarbon fuel which is produced subsequently in the process, and mixtures of these, to produce a feed mixture stream. The feed mixture is heated to a temperature between 212 and 600 F to vaporize volatile constituents in the feed mixture and to produce a feed dispersion stream. The feed dispersion stream is partially oxidized with an oxygen rich gas in an unpacked free-flow non-catalytic synthesis gas generator, at a temperature between 1500 and 3000 F and at a pressure between one and 250 atmospheres, to produce synthesis gas. The water separated from the sewage is purified and used for industrial purposes or converted into product steam by indirect heat exchange with the product gas. This method can also be used to dispose of garbage by mixing bits of garbage with the thickened sewage sludge and the fluid, forming a feed mixture which is converted into synthesis gas by partial oxidation reaction with an oxygen rich gas in the same type of gas generator. (Orr-FIRL)
W75-11522

**METAL REMOVAL BY PHYSICAL AND CHEMICAL TREATMENT PROCESSES,**
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
T. Maruyama, S. A. Hannah, and J. M. Cohen.
Journal Water Pollution Control Federation, Vol 47, No 5, p 962-975, May, 1975. 13 fig, 11 tab, 31 ref.

Descriptors: *Heavy metals, *Coagulation, *Sedimentation, *Filtration, *Adsorption, *Separation techniques, Mercury, Zinc, Nickel, Copper, Manganese, Lead, Chromium, Barium, Arsenic, *Waste water treatment, *Trace elements.
Identifiers: Waste water pollution, *Physical-chemical processes, Carbon adsorption.

Physical-chemical processes consisting of coagulation, sedimentation, filtration, and carbon adsorption have been shown to be capable of re-

ng substantial quantities of toxic or otherwise un-
esirable metals from raw wastewater. No one
oagulation system gave the best removal for all
etal forms. Metals tested were: Mn, Ni, Zn, Cu,
d, Ba, Pb, Cr, As, Hg. The chemistry of the
etals and the coagulant systems is presented.
lthough they are not evaluated in this study,
uitable process modifications, such as a change
f pH or the addition of oxidizing agents, reducing
gents, and specific precipitants, should further
nhance removal of the metals. The use of supple-
entary coagulants as filtration aids would also be
xpected to increase removal of precipitated
etals. (Delfiner-Vanderbilt)
75-11542

LATING AND CYANIDE WASTES
ITERATURE REVIEW),
eston (Roy F.), Inc., West Chester, Pa.
E. Germain, and K. E. Patterson.
ater Pollution Control Federation Journal, Vol
, No 6, p 1301-1315, June, 1974, 101 ref.

escriptors: *Heavy metals, Analytic techniques,
ollutant identification, *Reviews, Pollutants,
on exchange, Electrodialysis, Adsorption,
otation, Carbon, Ozone, Iron, Reduction, Indus-
al wastes, *Waste water treatment, Bibliogra-
ies.
entifiers: *Literature reviews, *Cyanide,
lating wastes, Carbon adsorption, Kastone
ocess, Scrap iron.

review is presented of papers published in 1972-
dealing with the technology developed to treat
anide and plating wastes. Processes reported
re conventional chemical treatment, ion
change, evaporation, integrated chemical
sing, precipitation of Cr (6+), electrolysis (after
uction to Cr (3+)), reverse osmosis, electro-di-
sis, Kastone process, ozone destruction of cya-
e, carbon adsorption, carbon bed catalytic
truction of cyanide, ion flotation, 'waste plus
ste,' freezing processes, sulfide precipitation of
tals, and reduction of chromium by scrap iron.
lfiner-Vanderbilt)
5-11545

EN CUT METHOD USED FOR MAJOR
WER.
gineering and Contract Record, Vol 88, No 6, p
15, June, 1975. 2 fig.

criptors: *Sewers, *Waste water treatment,
neling, Construction equipment, Earth han-
g equipment, Pipelines.
ntifiers: Sanitary collector sewer, Open cut
struction method.

n cut methods are being used by the Beaver
derground Structures of Ottawa, Canada, to in-
2500 feet of a 5742 foot sanitary collector
er. As compared to conventional tunneling,
s of the open cut method will be considerably
er. This method is possible with the use of
e trenching equipment and sophisticated de-
ering techniques. One of the first Koehring
D hydraulic excavators, with a maximum
h at grade level of over 60 feet and a maximum
depth of 40 feet, was used for excavation; its
sized buckets have a capacity range from 5 1/2
2 5/8 cubic yards. Additionally, the project util-
the Fiat-Allis HD41, the largest existing bull-
r, which can push up to 28 cubic yards of
rial at one pass. Pipelaying, pipe alignment by
, and backfill are described. A deep well de-
ring system was chosen, comprising 13 per-
ent wells. A pump system pumped 7 mgd at its
. A 10-ft diameter tunnel has been excavated
g two sunken shafts, one supported with steel
t piping and ring beam whalers, the other with
auge liner plate. Whe completed in late 1975,
unnel will be concrete lined to a 7 foot 6 inche
ter using full circle steel forms. (Kramer-
L)
-11618

**MILE OF SEWER LINE RENEWED WITH PLASTIC PIPING.**
Roads and Streets, Vol 118, No 6, p 94, 96, June, 1975. 3 fig.

Descriptors: *Waste water treatment, *Sewerage, *Plastic pipes, Construction materials, Pipes, Piping systems, Costs, Sewage treatment, Texas.
Identifiers: Remote tapping, Sewer repair.

Problems of backups, seepage, and an overloaded system due to breakdowns of existing pipes from unstable soil conditions in Houston, Texas have been solved. Rather than a conventional system of pipe removal and replacement, a one-mile sewer line was lined with ultra high molecular weight high density polyethylene pipe. This type of plastic piping is strong, very flexible, completely watertight, and chemically inert. Seven excavations were made over an 80 work day period and no more than one block of streets was closed to residents at any time. Segments of 8-inch diameter pipe 120, 350, and 453 feet long were inserted into the deteriorating line. A 16-inch diameter line was pulled 1016 feet, and a 20-inch diameter line was pulled 2350 feet. A remote tapping technique was used to connect house laterals to the sewer mains. This was the first municipal application of the tapping system. It involved: swaging down the flared plastic pipe (used for the connection) at the work site by forcing it into a die, making its diameter smaller; inserting the swaged pipe into a hole in the sewer main to the depth of the shoulder of the swage; and allowing the swaged part of the polyethylene pipe to return to its original size for a pressure tight seal. (Kramer-FIRL)
W75-11619

**PIPE INSERTION RENEWS SEWERS WITH LITTLE EXCAVATION.**
Water and Sewage Works, Vol 122, No 6, p 56-57, June, 1975. 2 fig.

Descriptors: *Waste water treatment, *Sewerage, *Sewage treatment, *Piping systems, Pipes, Plastic pipes, Costs, Construction materials, Pipelines, Sewers, Texas, Outfall sewers.
Identifiers: Sewer repair.

The collapse of a major clay outfall line which led directly to the Wylie, Texas sewage treatment plant occurred in 1972. The black-clay soil in that area is extremely corrosive; also, soil expansion during wet seasons exerts crushing pressures on the system's clay sewer pipes. The cost of direct burial of ductile iron pipe as replacement was the prohibitive amount of $175,000, and the city of Wylie chose instead to insert a flexible, corrosion resistant polyethylene pipe into 3730 feet of their deteriorated sewer lines. This new method saved the city close to 80 percent of the cost of the burial method. 'Aldyl' D polyethylene pipe, 13 3/8-inch diameter was heat-fused so that continuous lengths of up to 600 feet were formed. Ten lengths of plastic piping were each pulled by a 5/8 inch steel cable, threaded through the sewer from a winch located at a pulling excavation to an access trench at the opposite end of the line. Sewer insertion renewal was completed without disruption of service to the community, and excavation time was greatly reduced as compared to conventional pipe replacement. (Kramer-FIRL)
W75-11620

**IMPROVEMENT OF COMBINED SEWER SYSTEM STORM WATER STORAGE POOL (GORYU-SHIKI GESUIDO NO KAIRYO, TAISUI IKE HOSHIKI),**
S. Matsubara.
Gesuido Kyokaishi, Vol 12, No 131, p 39-46, April, 1975. 9 fig, 5 tab, 6 ref.

Descriptors: *Combined sewers, *Rainfall, *Storm water, *Waste water treatment, Sewerage, Model studies, Rivers, Overflow.
Identifiers: Storage pools, Japan.

Combined sewer systems, in which excess water from rainfall is forced to flow to a municipal river may be improved. This simulation considers a hypothetical storage pool to reduce the discharge of sewer water into a river under rainfall conditions. Two cases were discussed, each considering the amount of rainfall, capacity of the sewer systems, input rate ofthe sewage water by an urban population, BOD value in the sewer system, storage pool capacity, and capacity of the pump which is used to flush back the water in the storage pool to the sewer system when rainfall has stopped. A calculation was made for the Atsugi drainage system in which excess sewer water is flowed to a nearby river when the input rate of sewer water exceeds 3.0 cu m/sec. When a 30,000 cu m storage pool was employed with a pump of 2.3 cu m/sec capacity, the calculated number of overflows of the sewer sytem was 4.2/year which is 15% of the present number; overflow water into the river was 5.9 ton/year or 33% of the present level, and the overflow time was 102 hr/year or 16% of its present level. If the capacity of the storage pool was 10,000 cu m with the 2.3 cu m/sec pump, the overflow is calculated to occur 10.3 times/year with an overflow amount of 11.3 ton/year and overflow time of 29.8 hr/year. As long as the pump capacity is kept at over 0.5 cu m/sec, the determining factor of sewer water overflow to the river is the capacity of the storage pool. (Katayama-FIRL)
W75-11621

**SUBSURFACE WASTE INJECTION IN THE UNITED STATES: FIFTEEN CASE HISTORIES,**
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
E. C. Donaldson, R. D. Thomas, and K. N. Johnston.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $1.15. Information Circular 8636, 1974. 72 p, 27 fig, 19 tab, 54 ref.

Descriptors: *Industrial wastes, *Waste disposal wells, *Injection wells, *United States, Injection, Waste disposal, Geologic formations, Geology, Subsurface waters, Waste storage, Underground waste disposal, Waste water treatment, Liquid wastes, Slurries, Fluid mechanics, Design criteria, Costs, Water pollution.

Subsurface injection of liquid and slurry-type industrial waste is being used as a means of waste disposal. This U.S. Bureau of Mines survey showed that the method can be economically and environmentally attrative if the proper precautions are taken, especially when the alternative is cursory treatment and discharge at the surface. Attention was called to petroleum technology and experience that can be applied to subsurface waste injection. The report included discussions of: (1) the general aspects of subsurface waste-injection systems; (2) the literature concerning the geologic formations available for injection in the United States; and (3) 15 case histories describing the source and nature of the waste and the geology, surface equipment, well completion, and operation of the systems. (Robinson-ISWS)
W75-11627

**PROVIDING SUBURBAN SEWERAGE DESPITE ENVIRONMENTAL AND CONSTRUCTION PROBLEMS,**
Minnetonka Public Works, Minn.
D. Asmus, and J. Orr.
Public Works, Vol 106, No 7, p 76-77, July 1975. 3 fig.

Descriptors: *Sewerage, *Construction costs, *Construction equipment, Environmental effects, Dewatering, *Waste water treatment, Sewage treatment.
Identifiers: Sanitary sewers, Gravity sewers.

An internal trunk sanitary sewerage collection system was planned and constructed by the suburban community of Minnetonka, Minnesota. The system has been designed for a population equivalent of 160,000; projected costs were 15 million dollars with financing largely through the sale of general obligation improvement bonds. Construction was carried out by a series of thirty-one separate trunk sewer contracts. One environmental problem in construction was the building of an 18-inch gravity sewer out across Wing Lake in order to avoid damaging trees in the adjacent wooded land. To facilitate construction, over 17,000,000 gallons of water were pumped from the lake and it was afterward refilled from the municipal water system. Other problems included placing of sewers on treated wood piling in unstable soils such as the glacial moraine marsh areas, and the frequent drying up of private wells due to construction dewatering. The first problem was solved by longitudinal pile spacing of eight to twelve feet; the second was solved when residents with dried-up wells were supplied with a temporary water source and wells were found in most cases to be usable after dewatering operations were stopped. (Kramer-FIRL)
W75-11657

**SEWAGE BIOLOGICAL PROCESSING,**
S. Matskrle, and V. Matskrle.
Soviet Patent 415862. Issued May 20, 1975. Derwent Soviet Patents Report, Vol W, No 15, p 7, May 1975.

Descriptors: *Patents, *Biological treatment, *Sewage treatment, Flocculation, Separation techniques, Filtration, Activated sludge, *Waste water treatment, Coagulation, Flotation, Recycling, Water reuse.

A biological sewage treatment process was patented which operates by the formation of bioflocs, followed by filtration separation, flotation, and recirculation. The suspension is subjected to sedimentation, and the dilute suspension flows back, returning to the process. In this example, 5 to 7 kg/cu m of activated sludge was used with sewage in the activation chambers, with a residence time of two to three hours being sufficient for purification. The separation rate was up to one mm/sec; oxidation activity was 18.5 g 02 from one cu m of air. The chamber used was divided into two similar chambers to allow the flocs to float freely and to grow. Dilute suspension flowed directly to the filters for separation and the flocs floated to a homogenizer where coagulant could be added to the suspension. (Kramer-FIRL)
W75-11658

**WASTE WATER AND SEWAGE PURIFICATION.**
French Patent 22898W/14. Issued February 21, 1975. Derwent French Patents Report, Vol W, No 14, p 3, May 1975.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, Sludge treatment, Oxygen, Activated sludge, Tanks, Treatment facilities.

A plant patented for waste water and sewage purification is described. The facility uses pure oxygen or air enriched with oxygen in the presence of activated sludge. A biological tank contains bacterial beds which are in the form of discs one cm thick, spaced 2.5 cm apart. A quantity of 1.5 to 2.0 kg of sludge per cu m of the tank may be maintained on the discs; of this, one kg or more is living matter. The tank is connected by an overflow to a clarifier from which the purified water overflows while sludge collects at the bottom. Water to be treated as well as some of the sludge from the base of the clarifier arrive at the inlet together. Oxygen is introduced and the oxygenated water passes into the biological tank, meeting activated sludge. Aeration takes place outside the biological tank, with a low circulation rate and a reduction in the energy requirements. (Kramer-FIRL)
W75-11659

**BIOLOGICAL AND CHEMICAL PURIFICATION PLANT.**
Belgian Patent 22554W/14. Issued March 3, 1975. Derwent Belgian Patents Report, Vol W, No 14, p 3, May 1975.

Descriptors: *Patents, *Biological treatment, *Waste water treatment, *Water treatment, Costs, Equipment, *Treatment facilities.
Identifiers: Chemical treatment, Modular units.

A biological and chemical water purification plant for use in populated areas was issued a patent. The plant is constructed from uniform modular units which reduce manufacturing costs and allow for the assembly of different types of purification plants. Biological purification equipment consists of three recipients with cylindrical envelopes which are open at the top and have conical shoulders arranged tangentially. The space between two recipients, formed by an inclined wall, forms a separation space to separate the suspended flocculates from the purified water. A partition forms a gas separation space in which the gas is removed from the purified water before its entry into the separation space. Aerators in the activation space are provided and are immersed to a shallow depth. Raw water enters at the center of this space and clarified water leaves via collecting pipes in the upper portion of the plant. Sludge is withdrawn through aeration grids which make the operation economical and lower the energy consumption. (Kramer-FIRL)
W75-11660

**DOMESTIC WASTE WATER AND SEWAGE EVACUATION DEVICE.**
French Patent 29528W/18. Issued March 21, 1975. Derwent French Patents Report, Vol W, No 18, p 5, June 1975.

Descriptors: *Waste water treatment, *Patents, Domestic wastes, Sewage treatment, Sewers, Pumps, Tanks, Domestic water, Costs, Equipment.
Identifiers: Evacuation.

An evacuation device for domestic waste water and sewage was patented, for use when the lowest point of an installation is below the level of the sewer or the septic tank. The equipment consists of a welded metal tank, which acts as a reservoir and a turbine pump driven by an electric motor with a vertical shaft. Waste water entering at the top of the tank is pumped out through a pipe; this water reaches the pump by an opening. Volute, surrounding the pump turbine, is kept filled so that the pump is continually primed and there are no starting problems. The tank and its connections all are welded and simply constructed; costs are therefore low and space requirements minimal. (Kramer-FIRL)
W75-11661

**SOLIDIFICATION OF SEWAGE SLUDGE TO A HARD MATERIAL.**
Belgian Patent 29090W/18. Issued April 1, 1975. Derwent Belgian Patents Report, Vol W, No 18, p 2, June 1975.

Descriptors: *Patents, *Sewage treatment, Drying, *Sewage sludge, Coagulation, *Waste water treatment.
Identifiers: Aluminosilicates, Sludge solidifying, Waste reuse.

A patent was granted for a method of solidifying sewage sludge into a hardened solid material. This may be accomplished with or without prior coagulation and decantation by incorporation of aluminosilicates on a dry weight basis. For example, fly ash (preferably 30 to 80%), lime (preferably 1 to 6%), earth (preferably 20-45%), and CaSO4, usually as anhydrite (preferably 1.5 to 3.0%) are utilized. The final water content is optimally 15 to 30% and the final dry weight of solid sludge varies from one to 50%, preferably 4 to 20%. The fly ash may be replaced by crushed furnace slag. CaSO4 may be replaced by an equimolar amount of alkaline earth metal sulphate and cement dust, quicklime or dust from a basic oxygen furnace may substitute for the lime. Hardening in the atmosphere gives a granular or monolithic solid, which can be used as a building material. The product offers good resistance to compression, humidity, and leaching. (Kramer-FIRL)
W75-11662

**WASTE WATER PURIFICATION.**
South African Patent 30562W/18. Issued February 5, 1975. Derwent South African Patents Report, Vol W, No 18, p 3, June 1975.

Descriptors: *Patents, *Waste water treatment, *Sludge treatment, Oxidation, Potable water, Separation techniques, Water reuse, Coagulation, Acidity, *Water reuse.
Identifiers: *Wet air oxidation, Aluminum compounds, Waste reuse.

A patent was granted whereby waste water is purified and the oxidized sludge may be reused for further waste treatment. This potable water clarification or waste water purification process consists of coagulation-separation, using coagulants of aluminum compounds. Wet air oxidation treatment of the sludge results from the coagulation-separation process. The pH of the sludge should be adjusted in advance so that an oxidized sludge of pH below 1.5 or above 9.0 can be obtained. The oxidized sludge may be reused for water treatment either directly or after the dissolving of the aluminum compounds by the addition of acid or alkali. (Kramer-FIRL)
W75-11663

**ADVANCED TREATMENT OF WASTE WATE AFTER SECOND STAGE TREATMENT. E PERIMENTAL RESULTS AT THE WATE TREATMENT PLANT OF KAWASAKI CIT (GESUI NIJI SHORISUI NO KODO SHOR KAWASAKI-SHI GESUI SHORIJO NI OKER JIKKEN HOKOKU).**
Mizushori Gijutsu (Water Purification and Liqu Waste Treatment), Vol 16, No 4, p 365, 1975. fig, 17 tab.

Descriptors: *Waste water treatment, *Water p rification, *Tertiary treatment, *Water reu Coagulation, Filtration, Activated carbon, A sorption, Electrodialysis, Reverse osmosis, Wa treatment, Treatment facilities.

The advanced purification of secondary trea waste water for reuse as industrial water was s died. Waste water treated by a conventio sewage plant is used as the raw water, and i treated by coagulation with inorganic and orga reagents, followed by filtration, activated car adsorption, and electrodialysis or reverse osmo The raw water with 10 ppm turbidity may be proved to 2 ppm turbidity with the addition o ppm inorganic and one ppm organic coagula agents. The 75% to 95% of COD, TOC, and A were removed by an activated carbon, but ads tion of ammonia, heavy metals, and phosph were difficult by the activated carbon. More 90% removal of sodium, potassium, chlo sulfate ions was achieved with 150 mi deionization by an electrodialysis technique, water with the dielectric constant less than microohm/cm could be obtained. However soluble salts and organic compounds were removed by this method. The osmosis techn was also applicable to the purification of water, and purified water of industrial quality be continuously produced for several hur hours. (Katayama-FIRL)
W75-11664

**COAGULANT RECOVERY TAKES PLANNING,**
C. G. Dunkle.
Water and Wastes Engineering, Vol 12, No 5, p 47-48, 104, May 1975.

Descriptors: *Waste water treatment, *Sludge treatment, Lime, Recycling, *Coagulation, Economics, Costs, Dewatering, Waste disposal, Polymers, Polyelectrolytes.
Identifiers: *Coagulants, *Alum, Recovery, Magnesium carbonate.

The recovery of coagulants from the waste sludge of water treatment plants demands the prior study of each specific coagulant and related methods of clarification. Several treatment facilities are discussed. For example, the recovery of alum at Tampa, Florida for reuse in the filtration plant gave odorless waste solids which could be stored before final disposal. Similarly, reclamation of lime and CO2 from chemical treatment plants at Dayton, Ohio, and St. Paul, Minnesota, lessened the final disposal problem and reduced the facilities' operational costs. In Montgomery, Alabama, lime and MgCO3 were recovered; the magnesium carbonate is recycled to remove color and turbidity from raw water. Applicability of polymers as primary coagulants, coagulant aids, and sludge conditioning agents are being investigated. Polymers are expensive but more efficient than alum. However, there is no universal polymer, and careful choice of specific polyelectrolyte is necessary for individual applications. The efficiency and economy of sludge production and handling indicated that a combination of alum recovery and horizontal vacuum filtration would require a large capital and operating costs but would produce a useful end product, decrease the size of dewatering equipment needed, and reduce landfill requirements. (Kramer-FIRL)
W75-11665

**THE APPLICATION OF MEMBRANE PROCESSES IN THE TREATMENT OF SEWAGE,**
Atomic Energy Research Establishment, Harwell (England).
D. C. Sammon, and B. Stringer.
Process Biochemistry, Vol 10, No 2, p 4-12, March 1975. 2 fig, 11 tab, 56 ref.

Descriptors: *Membrane processes, *Reverse osmosis, *Waste water treatment, Water quality, Activated sludge, Costs, *Sewage treatment.
Identifiers: Ultrafiltration, Electrodialysis, Effluent reuse, Salt removal.

The membrane processes of reverse osmosis, ultrafiltration, and electrodialysis, now established for water treatment, are under evaluation for use in sewage effluent treatment. With an increasing reuse of sewage effluents, possible applications of membrane processes are in the reduction of salt content and of several organic species. Findings of published experimental work were reviewed. The major areas of investigation were: stability of flux and the mechanism of flux loss due to fouling; product quality with respect to a range of species; treatment of sludges; and economics and possible applications. It was concluded that direct reuse of sewage effluent for potable water has not yet received public acceptance. Costs of reverse osmosis rather than conventional treatment for water reuse at a less than potable quality level indicate that osmosis is not economically feasible. The state of the art currently is that pilot scale work has identified problem areas and indicated operational techniques. Except for the use of activated sludge treatment, coupled with ultrafiltration, membrane process applications for waste water treatment remain theoretical. (Kramer-FIRL)
W75-11666

**SEWAGE TREATMENT PLANT EQUIPPED WITH AN AERATION IMPELLER,**
R. Kaelin.
Canadian Patent 968,475. Issued May 27, 1975. Patent Office Record, Vol 103, No 21, p 81, May 1975.

Descriptors: *Patents, *Waste water treatment, Treatment facilities, *Sewage treatment, Equipment, *Aeration, Design.
Identifiers: *Aerators.

A patent has been issued for a sewage treatment plant which is equipped with a motor driven aerator. The aerator is supported in a basin at a minimum of three points. The support mechanism for the aerator embodies at least two supports which at their ends nearest to the aerator enclose an acute angle with a horizontal plane less than 45 degrees. (Orr-FIRL)
W75-11670

**REPORT OF ANALYSES FOR INDUSTRIAL WASTE WATER IN TWENTY-EIGHT FACTORIES, (IN JAPANESE),**
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5A.
W75-11671

**MEANS FOR AND METHOD OF PURIFYING CONTAMINATED WATER,**
R. J. Campbell.
United States Patent 3,885,399. Issued May 27, 1975. Official Gazette of the United States Patent Office, Vol 934, No 4, p 1379, May, 1975. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Water treatment, Equipment, Freezing, *Crystallization.
Identifiers: *Freeze-crystallization.

A method for purifying contaminated water by freeze-crystallization has been patented. The apparatus consists of: a first stage including a first freezer-crystallizer and wash collumn subassembly for treating contaminated water and producing a first concentrate; a second freezer-crystallizer and wash column subassembly for treating the first concentrate and producing pure ice crystals and a second concentrate; and, means for returning part of a mixture of ice crystals and first concentrate from the second wash column to the first stage. The second freezer-crystallizer is coupled to the first wash column to receive the first concentrate and also to the second wash column to receive the second concentrate. The second wash column is coupled to the first wash column for receiving and using the first concentrate to wash the ice crystals in the second wash column and to form a mixture of the first concentrate and the ice crystals. (Orr-FIRL)
W75-11672

**PURIFYING PLANT FOR SEWAGE,**
J. Bosje.
Canadian Patent 967,295. Issued May 6, 1975. Patent Office Record, Vol 103, No 18, p 75, May, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Activated sludge, Biological treatment, Aeration, Sludge treatment, Treatment facilities.

An activated sludge process sewage treatment plant has been patented. The plant includes an open curved tank with an elongated aerating space shaped so that its end walls are located adjacent to each other. The aerating space is divided by a partition wall which forms an inner channel portion enclosed within an outer channel portion. The channels are in series with each other, forming an endless aerating channel. Means are provided to discharge sewage into the aerating channel and to withdraw aerated sewage from the channel. A minimum of one surface aerator is provided for aerating the contents of the aerating channel. At least one sludge thickening chamber is concentrically arranged in the sludge settling chamber which is located in the inner channel portion of the aerating channel. Means are provided for returning settled sludge from the settling chamber to the aerating space, and for discharging the purified water out of the sludge settling chamber. The end walls of the aerating channel are separated to provide space for the apparatus for operating the plant and for a control chamber. (Orr-FIRL)
W75-11673

**SANITARY-VIROLOGICAL STUDY OF THE EFFECTIVENESS OF DECONTAMINATION OF WASTE WATERS ON IRRIGATED FARM YIELDS, (IN RUSSIAN),**
Uzbekskii Nauchno-Issledovatelskii Institut Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
For primary bibliographic entry see Field 5B.
W75-11674

**SEWER BRANCH SADDLE CONNECTOR,**
For primary bibliographic entry see Field 8C.
W75-11677

**DISTRIBUTION OF LIGNIN IN THE WATERS OF LOURIZAN INLET, AS A MEASUREMENT OF CONTAMINATION DUE TO DUMPING OF LIGNINSULFONIC LYES, RESULTING FROM PRODUCTION OF CELLULOSE PULP, (IN SPANISH),**
Instituto Espanol de Oceanografia, Madrid (Spain).
For primary bibliographic entry see Field 5B.
W75-11678

**CENTRIFUGAL PUMP FOR PROCESSING LIQUIDS CONTAINING ABRASIVE CONSTITUTENTS, MORE PARTICULARLY, A SAND PUMP OF A WASTEWATER PUMPER,**
Neratoom N.V., The Hague (Netherlands). (assignee).
J. H. Bunjes.
United States Patent 3,881,840. Issued May 6, 1975. Official Gazette of the United States Patent Office, Vol 934, No 1, p 227-228, May, 1975. 1 fig.

Descriptors: *Patents, *Pumps, *Centrifugation, *Waste water treatment, Equipment.

A centrifugal pump for waste water treatment was patented, consisting of: a housing with an inlet opening and an annular delivery chamber; an impeller whose inlet eye is aligned to the inlet opening and whose peripheral portion discharges to the delivery chamber. The impeller and the housing thus define an intermediate chamber leading to the delivery chamber. Also, sealing means are formed between the openings, including opposed surface portions of the impeller. These define a sealing slot which has an outer end communicating with the intermediate chamber and an inner end connected to the inlet opening. Duct means in the impeller lead from an annular chamber to the intermediate chamber in order to redirect sediment back into the intermediate chamber. (Kramer-FIRL)
W75-11679

**AIR DRIVEN ROTATING BIOLOGICAL CONTACTOR APPARATUS,**
Autotrol Corp., Milwaukee, Wis. (assignee).
D. G. Prosser.
United States Patent 3,886,074. Issued May 27, 1975. Official Gazette of the United States Patent Office, Vol 934, No 4, p 1594-1595, May, 1975. 1 fig.

Descriptors: *Waste water treatment, *Patents, *Biological treatment, *Aeration, Equipment, Oxygen.
Identifiers: Biological contactor apparatus.

The equipment for biological treatment of waste water by an air driven rotating biological contactor was patented. The apparatus consists of a treatment tank with both a fluid inlet and a fluid outlet, a circular rotating biological contactor assembly which is mounted for rotation around a horizontal axis and which can be partially submerged in the waste water in its tank. Several pockets are built along the length of the contactor and have a depth of the minor portion of the radius of the contactor assembly. A source of oxygen which contains gas under pressure and a gas conduit leading from this source into the tank are described. The conduit has submerged openings beneath the length of the contactor. Each pocket opens outwardly in a direction opposite to the direction of rotation of the assembly in order to trap gas released from the conduit. (Kramer-FIRL)
W75-11680

**OXYGENATION OF WASTE WATER,**
P. W. Garbo.
Canadian Patent 970,483. Issued July 1, 1975. Patent Office Record, Vol 103, No 26, p 82-83, July, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Oxygenation, Suspended solids.

Sewage or other waste water may be oxygenated using a patented process. The waste water is passed through a turbulent mass of solid contact particles, together with oxygen-containing gas. Pollutant solids collide with these contract particles which may be made of coarse sand, and a fine dispersion of the oxygenating gas results throughout the liquid suspension. The contact of the dispersion of gas with the suspended and dissolved solids of the sewage or waste water causes an acceleration in the oxygenation process. (Kramer-FIRL)
W75-11681

**BIOLOGICAL PURIFICATION OF WASTE WATER.**
Australian Patent 461,079. Issued May 15, 1975. Official Journal of Patents, Trade Marks and Designs, Vol 45, No 16, p 1791, May, 1975.

Descriptors: *Patents, *Biological treatment, *Waste water treatment, *Activated sludge, Aeration, Settling basins.
Identifiers: Clarification.

A patent was issued for a method of biological waste water treatment. Activated sludge treatment is used in equipment consisting of common enclosure aeration and settling-clarification sections. The system is designed so that the two sections communicate with each other and aerated liquid may flow from the aeration section to the aeration section. Aerated liquid is directed to the bottom of a set of parallel inclined plates which cover almost the entire settling surface area of the settling-clarification section. (Kramer-FIRL)
W75-11683

**SEWER LINE BLOW-OUT PLUG,**
M.M.S., Inc., Memphis, Tenn. (assignee).
For primary bibliographic entry see Field 8C.
W75-11684

**SEWAGE TREATMENT PROCESS,**
G. V. Levin, and G. J. Topol.
Canadian Patent 970,887. Issued July 8, 1975. Patent Office Record, Vol 103, No 27, p 84, July, 1975.

Descriptors: *Patents, *Activated sludge, *Waste water treatment, *Sewage treatment, Nutrient removal, Biological treatment, Phosphates, Sludge treatment, Anaerobic conditions.

An activated sludge treatment process was patented, consisting of mixing influent sewage material with activated sludge to provide a mixed liquor. This mixed liquor is passed first to an aeration zone, where BOD is reduced and microorganisms present take up phosphate, and then to a settling zone, containing an anaerobic sludge layer. In the settling zone, the phosphate-enriched sludge settles into the anaerobic sludge layer, so that a substantially phosphate-free effluent is removed from above the sludge layer. Sludge must be maintained under the anaerobic conditions long enough for the organisms in the sludge to release phosphate to the liquid phase of the sludge. Sludge is then treated to remove the soluble phosphate from its liquid phase and is then recycled for mixing with influent sewage material. (Kramer-FIRL)
W75-11685

**OUTLINE OF TAGAWA SEWAGE PLANT IN UTSUNOMIYA CITY, (IN JAPANESE),**
I. Koike, and N. Saito.
Gesuido Kyokaishi, (Jour of Japan Sewage Works Assoc), Vol 12, No 129, p 72-76, February, 1975. 1 fig, 3 tab.

Descriptors: *Waste water treatment, *Sewage treatment, Facilities, Municipal wastes, Sludge treatment, Precipitation(Chemical), Aeration, Chlorine, Dehydration, Incineration, *Treatment facilities.
Identifiers: *Japan.

Since 1965, the Tagawa plant in Utsunomiya city Japan, has been treating its municipal sewage water. With an added capacity of its facility in 1970, the plant now treats waste water for a population of 125,000. The sewage water is passed through several screens to remove large objects before entering a sand-precipitation pool. It is then pumped into a first-precipitation pool and stays for 1 3/4 hours in the pool. The supernatant water then enters into an aeration tank, a final-precipitation pool, and a chloride mixing pool, before being discharged into the Tagawa River. During wet weather, the aeration and final-precipitation steps are skipped, and the supernatant water is sent directly to the chloride mixing pool. Sludges produced during precipitation and aeration treatment are sent to a sludge concentration tank. After dehydration of the treated sludges, they are sent to an incinceration furnace and combusted at 800 to 1000C. (Katayama-FIRL)
W75-11686

**PACKAGE PLANT OWNER RESPONSIBILITY AND OPERATION OF SMALL SEWAGE UNITS,**
N. P. Nicolle.
Water Pollution Control, Vol 74, No 2, p 199-200, 1975.

Descriptors: *Waste water treatment, *Sewage treatment, *Maintenance, Aeration, Biological treatment, Filters, Sewage effluents, *Operations, *Treatment facilities.
Identifiers: *Package plant sewage units, Effluent control.

The necessary care and maintenance of package plant small sewage units is described. The major required daily duty is removal of gross solids to prevent sewage from backing up or overflowing, particularly in the openings of valves and pumps. Package plants of the conventional biological filtration type and extended-aeration units with aerobic digestion are the two basic types of package plants available for small communities. Quality control for the conventional unit requires the daily determination of settleable solids in primary sedimentation tank effluent as well as from humus tanks or sand filters and determination of residual chlorine which may be present in effluent entering the contact tank. On a monthly or three-monthly basis, values should be measured of: 4-hour permanganate value; COD, ammonia nitrogen, suspended solids, fecal E. coli, and methylene blue stability. For the extended aeration units, daily determination must be made of settleable solids in effluent, MLSS concentration by centrifuge, and residual chlorine in the final effluent. The final effluent should be checked monthly for SS, 4-hour permanganate value, COD, ammonia nitrogen, fecal E. coli, and methylene blue stability. For both types of packages, cleaning is necessary of filters, screens, pipes, drying beds tanks and other surfaces. Other specific maintenance recommendations are given, in order to keep the unit at peak performance. (Prague-FIRL)
W75-11688

**PACKAGE PLANTS: THE CONTRACTOR'S POINT OF VIEW,**
E. L. Chontz.
Water Pollution Control, Vol 74, No 2, p 201-20
1975.

Descriptors: *Sewage treatment, *Administratio
Waste water treatment, Equipment, Design, E
fluents, Population, *Waste treatment.
Identifiers: *Sewage treatment package plants.

Package type sewage plants are discussed from t
point of view of the contractor. Advantages to t
contractor of such plants are that a discrete ran
of standard products can be offered, eliminati
design, administrative, and after sales cost
overall plant responsibility minimizes possib
controversy over process malfunction or failur
and plant complexity is reduced, plant compa
ness increased, and costs decreased without
fecting plant performance. The disadvantages
package plants for the contractor include: a lack
flexibility in choice of size range; absence
adaptability; and difficulty for a prospective clie
to assess and judge the variety of types
packages offered by different contractors. Whe
client approaches a contractor directly, he spe
fies a contributing population or a total daily flo
he also may specify the particular type of tre
ment to be employed. However, the plant desi
size of equipment, and guarantee of performan
and quality is up to the contractor. Package pla
should not be specified where extreme variatio
in population (such as a temporary camping s
occur. It is expected that package sewage tre
ment plants will increase in use. Control and re
lation of effluent discharges necessitates enlarg
their field of application. Non-biological treatm
processes in package plants are needed as
plants which will operate at peak efficiency
gardless of the volume and load of the influ
(Prague-FIRL)
W75-11689

**THERMOPHILIC DIGESTION AT T HYPERION TREATMENT PLANT,**
Los Angeles Sanitation Bureau, Playa del
Calif. Hyperion Treatment Plant.
W. F. Garber, G. T. Ohara, J. E. Colbaugh, and
K. Raksit.
Journal Water Pollution Control Federation,
47, No 5, p 951-961, May, 1975. 6 fig, 5 tab, 10

Descriptors: *Waste water treatment, *Sl
treatment, *Anaerobic digestion, *Temperat
Heat, Energy, Costs, Organic loading, Dew
ing, California.
Identifiers: *Thermophilic digestion.

The Hyperion Treatment Plant, Playa del
California, used full-scale thermophilic dige
(thermophilic temperatures, 46-54.5C) from
to 1957. Thermophilic digestion is again bein
stituted at the plant in an attempt to achieve
removal of digested-screened solids prior to
disposal of the treated waste water. In additi
confirming earlier conclusions about thermo
anaerobic digestion, the dewaterability of the
philic sludge through the use of various typ
chemical conditioning and dewatering appara
being examined. Thermophilic anaerobic dige

f waste water solids has been shown to be a suc-
essful process. Temperature change has been
ound to be more critical than with mesophilic
gestion. The solids dewatering step is signifi-
antly improved by the thermophilic digestion.
he solids particle sizes are larger, lower amounts
chemicals are needed, drier cakes are obtained,
d centrate-filtrates carry substantially fewer
lids. The work at the Hyperion plant is still in-
mplete; the upper limits of loading are not yet
tablished. At the currently possible temperature
d loadings, the changes in gas production and
lids breakdown do not overcome the added en-
ronmental and monetary costs of the extra heat
ergy needed if the change in sludge dewatering
ignored. The net benefit of thermophilic
gestion seems to be greater than the costs result-
g from the increased heat requirement. (Orr-
RL)
75-11690

**HASE II GIVES HAMILTON SECONDARY REATMENT.**
ater and Pollution Control, Vol 113, No 6, p 14-
, June, 1975. 5 fig.

escriptors: *Waste water treatment, *Treatment
cilities, *Municipal wastes, *Biological treat-
nt, Activated sludge, Incineration, Methane,
els, Industrial wastes, Nutrient removal,
nada, *Sewage treatment.
ntifiers: Hamilton(Ontario Canada).

econdary treatment phase was recently added
the municipal sewage treatment plant at the City
Hamilton, Ontario, Canada. The secondary
atment phase includes activated sludge treat-
nt, pressure flotation for excess activated
dge thickening, additional digester, filter and
ler capacity, sludge incineration, stand-by
wer facilities, and landscaping. It also includes a
0 IGPD pilot treatment plant which is being
d to study the effects of biological treatment of
ious industrial wastes discharged to the sewer
tem, and for assessing the effectiveness of dif-
ent nutrient removal processes. The methane
generated in the digestion process is used as al-
native fuel for the diesel generators during peak
iods. The gas is also used as fuel for the sludge
nerators, to fire the steam boilers for heating
buildings, and for the digestion process. The
t has been essentially trouble free in operation
produces a high quality effluent. A quantita-
description of some of the equipment is given
well as an outline of the treatment process.
r-FIRL)
5-11692

**EDISH EXPERIENCES IN CHEMICAL EATMENT OF WASTEWATER,**
ndiaconsult International A.B., Stockholm
eden).
Ilmgren.
rnal Water pollution Control Federation, Vol
No 4, p 696-703, April, 1975. 4 fig, 5 tab, 9 ref.

criptors: *Chemical precipitation, *Waste
er treatment, *Phosphorous, *Nutrient
oval, Biochemical oxygen demand, Chemical
gen demand, Suspended solids, Hydraulic
gn.
tifiers: Sweden, Lamella sedimentation.

den has more than 500 plants that are designed
the chemical treatment of sewage with or
out biological treatment and more than 600
ts that use biological treatment alone. Chemi-
treatment is gaining in favor because of the
rictions of phosphorus content and BOD of the
harged effluent and also because the long win-
in the northern part of Sweden make biologi-
treatment unsatisfactory. The methods used
chemical treatment are direct (primary and
ndary), simultaneous, and pre- and post-
ipitation. Post-precipitation is used in 80-85%
e chemical treatment plants. Alum is used in 85-90% of the plants. Lime and bivalent or trivalent iron salts are also used. 'Guidelines for Design of Sewage Treatment Plants' has been prepared by the Swedish National Environment Protection Board. Sections for coarse treatment and primary sedimentation should be designed to handle more than four times the hydraulic flow. Biological and chemical treatment processes should be able to handle up to two times the hydraulic flow. Lamella sedimentation has been successfully used for the separation of chemical flocs, but does not work well for separating biological flocs. The results of a survey of more than 50 municipal treatment plants for chemical precipitation conducted from 1971 to July 1973, indicate that the majority of the plants operate relatively well. The use of chemical precipitation for treating many different types of waste water in Sweden is expanding because of the fact that chemical precipitation will reduce the BOD, COD, and suspended solids of the discharged water in addition to removing phosphorus. (Orr-FIRL)
W75-11694

**UP-RATING HYDRAULICALLY OVER-LOADED SEDIMENTATION TANKS BY INCLINED PLATES,**
T. W. Gray, and P. S. Churchill.
Effluent and Water Treatment Journal, Vol 15, No 2, p 77-81, February, 1975. 2 fig, 4 tab, 9 ref.

Descriptors: *Sedimentation, *Waste water treatment, Treatment facilities, *Settling basins, Sedimentation rates, Suspended solids.
Identifiers: *Sedimentation tanks.

High-rate sedimentation, by means of submerged inclined compartments, is becoming an established way to improve an existing overloaded municipal sewage treatment plant without expanding the facilities. CJB Developments is ofering two high-rate sedimentation processes using inclined corrugated plates to assist in this upgrading. The first process is the uprating of existing sedimentation tanks using low-cost high-rate sedimentation modules of plastic construction. The second process is a purpose-built, fabricated, high-rate sedimentation tank. The second process requires less land than a conventional tank and lowers the risk of developing anaerobic conditions. Conventional sedimentation tanks can be either horizontal-flow or upward-flow type. Both types can be successfully uprated for solids settlement using high-rate sedimentation modules. There is very little surface attraction to the plates in the CJBD module of the type of solids found in primary or humus tanks. The supernatant liquid flows in a clear stream up the arch-forming corrugation on the corrugated plate while the solids form a counter-current flow down the troughs. Washing down has not been necessary on a pilot unit which has been in operation for two years in a humus tank. (Orr-FIRL)
W75-11695

**INNOVATIVE WATER PLANT SLATED FOR NEW JERSEY,**
Havens and Emerson Ltd., East Paterson, N.J.
For primary bibliographic entry see Field 5F.
W75-11696

**ENERGY-WASTEWATER TREATMENT AND SOLIDS DISPOSAL,**
Playa Del Rey, Calif. Hyperion Treatment Plant.
W. F. Garber, G. T. Ohara, and S. K. Raksit.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 101, No EE3, p 319-332, June, 1975. 5 fig, 4 tab, 21 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Environmental effects, *Energy, Biological treatment, Sludge disposal, Landfills, Bodies of water, Dewatering, Nitrification, Oceans, California, *Waste disposal.
Identifiers: Los Angeles(Calif), Santa Monica Basin(Calif), Chemico-physical treatment, Anoxic-anaerobic deep water.

Effluent discharge standards and funding criteria established by control agencies as a result of the concern about environmental quality have affected the design and construction of waste water treatment facilities and waste water solids disposal systems. The increased energy needed for advanced treatment methods may actually increase the overall pollution. Work at the Environmental Protection Agency's Cincinnati Laboratories has shown that an activated sludge process for complete nitrification uses almost twice as much energy as treatment for carbonaceous oxygen demand removal alone. The amount of fossil fuel combustion to produce this energy would undoubtedly cause an increase in negative environmental impact. The State of California Water Resources Control Board has notified the City of Los Angeles that it must cease discharging digested-screened waste water solids into the anoxic-anaerobic deep waters and sediments of the Santa Monica Basin by the end of 1976. The City of Los Angeles has operated both chemico-physical and biological waste water treatment facilities. They have found that the chemico-physical treatment requires almost five the amount of energy as biological treatment. Alternatives to disposal in the ocean are: pumping to evaporation ponds with disposal on sanitary landfills requiring 16 times the energy than ocean disposal; and, mechanical dewatering prior to sanitary landfill disposal requiring 35 times more energy than the prior to sanitary landfill disposal requiring 35 times more energy than the present method. (Dean-FIRL)
W75-11697

**IN-LINE FILTRATION MAY BE JUST FOR YOU,**
Nalco Chemical Co., Chicago, Ill.
G. J. Venema.
Water and Wastes Engineering, Vol 12, No 5, p 50-52, 57, May, 1975. 1 fig.

Descriptors: *Filtration, *Waste water treatment, Water quality, Filters, Coagulation, Polymers, Mass transfer, Solid wastes.
Identifiers: Filter media, Solids, Polycationics, Physico-chemical treatment.

In the past, filtration technology was concerned with rapid sand and high rate filters. Current research in filtration technology is directed at the definition of the parameters for deep-bed filtration, upflow filtration, direct filtration, and in-line filtration. In-line filtration is an alternative to coagulation/settling for treating low turbidity water. Treatment requirements for water quality goals are the primary concern of direct and in-line filtration. Increasing the allowable flow rate through a media is the concern of rapid sand, deep-bed, and upflow filtration. Therefore, direct and in-line filtration treatment methods can be applied to rapid sand, high rate, deep-bed, and upflow filters. In direct filtration, coagulation of solids occurs prior to filtration. Coagulation occurs during filtration in the in-line filtration method. In-line and direct filtration depend on the theories of mass-transfer of solids from the liquid to the media surfaces and physico-chemical attachment of solids to the media. The advantages of these methods are a reduction of chemical consumption, a lower sludge production, longer filter runs, and improved water quality. The performance of in-line and direct filtration depend on the type and amount of solids, filter media characteristics such as effective grain size, depth and type, filter operating parameters including degree of flow surges and filtration rate, and achievement of optimum coagulation. Both direct and in-line filtration make use of polymers for coagulation, particularly polycationics, which are polyamines having low to moderate molecular weight and high cationic change density. (Dean-FIRL)
W75-11698

**ADVANCED WASTEWATER TREATMENT PLANT WITH DESIGNED-IN RELIABILITY,**
Stevens, Thompson and Runyan, Inc., Portland, Oreg.
L. K. Anderson.
Public Works, Vol 106, No 6, p 81-84, June, 1975. 2 fig.

Descriptors: *Planning, *Treatment facilities, *Waste water treatment, *Tertiary treatment, Construction, Financing, Rivers, Water pollution, Reservoir storage, Activated sludge, Filtration, Chlorination, Effluents, *Oregon.
Identifiers: Washington County(Oreg), Tualatin River, Chemical treatment.

In the mid-1950's the rapidly growing suburban area of Washington County, Oregon, faced sewage collection and treatment problems due to lack of a master plan; by the mid-1960's the urban creeks had become open sewers. A waste water management plan was drawn, which called for the formulation of an area-wide agency responsible for financing, constructing, and operating the proposed regional facilities. The United Sewerage Agency of Washington County was established. The master plan called for the elimination of all treatment plants in the tributaries of the Tualatin, the major river, and the construction or expansion of six major plants on the river itself. The first and largest of the new facilites is the Durham Advanced Wastewater Treatment Plant, which will have a 20 mgd capacity upon completion. It can be expanded to 60 mgd. Reliability is a critical factor in this plant, as it is located in a residential area, and because of the need to minimize pollutant discharges to the Tualatin River, especially in the low river flow season (May to November). Flow augmentation is part of the total design, for which purpose multipurpose storage reservoirs were constructed upstream. During the rest of the year less stringent discharge standards are in effect; a conventional activated sludge plant, which has automatic surge and bypass control, meets these requirements. Advanced treatment features of the plant include chemical treatment and filtration prior to chlorination and discharge of the effluent from the activated sludge process, and preparation of organic sludge for incineration. (Murphy-FIRL)
W75-11700

**A PLANT GROWS IN BROOKLYN,**
Hazen and Sawyer, New York.
C. R. Walter, and J. Lastihenos.
Water and Wastes Engineering, Vol 12, No 6, p 36-42, June, 1975. 7 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, Interceptor sewers, Screens, Pumps, Settling basins, Aeration, Sludge treatment, Sludge disposal, Chlorination, New York.
Identifiers: Skimmers, High-rate digesters, *New York(NY).

The expansion and modernization of New York City's 26th Ward Water Pollution Control Plant was completed in May 1975 at a cost of $43 million. The existing regulators on the interceptor sewers were modernized to handle storm overflow automatically. The original screens were replaced by new units about 40 feet long, with a conveying mechanism carrying the screenings to dry, above-grade screen chambers. Grit removal is performed in cyclone degritters on a sludge/grit mixture taken from the preliminary settling tanks. Main sewage pumps were replaced with units incorporating variable speed controls. Automatic skimmers and new safety and sludge handling units were added to the preliminary settling tanks. The aeration process was upgraded by the installation of modern air diffusers and high-efficiency electrostatic air filters, the establishment of new step-aeration feed points, and the repair of joints in the aeration tanks. The eight original folded-flow final settling tanks were combined into four straight-flow tanks and equipped with modern sludge collection and scum removal equipment. Three new final tanks were also constructed. Two new chlorine contact tanks were installed with a total capacity of one million gallons. The hypochlorite storage and feed equipment was modernized and automated. Four new gravity thickeners were installed. Two of the original floating-cover digesters were modernized to fully mixed, high-rate digesters. The two other units were converted to sludge storage tanks. (Orr-FIRL)
W75-11701

**NOVEL WASTE TREATMENT VARIATION SHOWS GREAT PROMISE,**
C. Brucker.
Water and Pollution Control, Vol 113, No 6, p 17, 19, 37-39, June, 1975. 3 fig.

Descriptors: *Waste water treatment, *Sewage, *Activated sludge, Domestic wastes, Industrial wastes, Biochemical oxygen demand, *Settling basins, Sludge, Treatment facilities, Aeration, *Aeration, *Recycling.
Identifiers: Activation tank, *France, Cheese production wastes, *Brucker system.

A novel variation of the activated sludge technique for treating domestic sewage has been developed and patented. The Brucker system has been in operation in a plant in France for more than a year, and has been described as a single combined activation and settling tank that incorporates an aerating and recycling device. The unit treats waste water from a cheese plant at 170 kg of BOD per day. The waste receives no pre-treatment before entering the 180 cu m tank, and has a mean BOD of 2,000 mg/liter with peaks up to 5,000 mg/liter and pH from 4 to 11.5. The sewage is purified during its passage in horizontal flow through the single, combined, activation and settling tank of an elongated rectagular shape. Incoming sludge is received at the upstream end of the tank in a grit compartment bounded by a siphon partition. The tank has two zones, activation and settling, the volumes of which are variable. Sedimented sludge is sucked up by a screw pump, delivered upstream, and sprayed into the air. The oxygenated biological mass falls to the surface of the liquid in the tank, flocculates in the activation zone, and falls towards the bottom of the tank before being carried away by the screw pump to be recirculated. Energy consumption of the treatment plant is 130 kWh/day. (Murphy-FIRL)
W75-11702

**THEY'RE PACKING UP WASTE PONDS.**
Chemical Week, Vol 116, No 24, p 37, June 11, 1975.

Descriptors: *Packed beds, *Biological treatment, *Anaerobic digestion, *Liquid wastes, Microorganisms, Sewage Treatment, *Waste water treatment, Industrial waste, Methane.
Identifiers: Anflow unit, Biological reactors, Chemicals recovery.

An upflow packed-bed biological reactor, called an Anflow unit, has been developed by Union Carbide. This system is applicable for anaerobically treating liquid wastes from sewage and from various industries and in converting these wastes into chemicals or fuels. Liquid wastes are pumped into the bottom of this system and travel upward through the packing. Microorganisms have been implanted on the packing material and once they have been implanted they appear to regenerate without wearing out. One such column has operated for three years without adding to the microorganisms. The Anflow process can recover methane as off-gas during treatment of liquid wastes from starch, food processing, and from domestic sewage. The retention times for the system are as low as four hours. (Kramer-FIRL)
W75-11703

**ALUMINUM SULPHATE FOR WATER TREAT MENT.**
Water Services, Vol 79, No 950, p 150-153, Apr 1975.

Descriptors: *Coagulation, *Waste water trea ment, Municipal wastes, Industrial wastes
Identifiers: *Alum, Coagulants.

Aluminum sulfate, or alum, is used as a coagula for both industrial and municipal water treatme The alum provides gelatinous precipitate hydroxide which by physical and electrochemi means entrains the suspended and colloidal mat present in water after filtration. Because most c loidal impurities in water have a negative char and alum is charged positively, collodial mat and particles of aluminum hydroxide floc are m tually attracted and form a precipitate which m be removed by filtration. The most economi form of alum for effluent treatment is Aluminof ric, available in slab block form; this substanc readily soluble in water and solutions of it can metered into an effluent flow. (Kramer-FIRL)
W75-11704

**TERTIARY STAGE ADDED TO STRATFO SEWAGE PLANT.**
Water and Pollution Control, Vol 113, No 5, p 16, May, 1975.

Descriptors: *Waste water treatment, *Tert treatment, *Treatment facilities, *Water qua standards, Filters, Flow, Rivers, Waste discha Biochemical oxygen demand, Canada.
Identifiers: *Effluent quality standards.

In order to meet stringent Canadian effluent q ty standards, the city of Stratford, Ontario, forced to improve its sewage treatment p Discharge is to a river of variable and somet very low flows, and the biochemical oxyger mand was to be limited to 300 pounds per day. alternative chosen was tertiary treatment, within the existing biological treatment fac This supplemental effluent treatment consis polishing by filtration, combined with nut removal. Better effluents were produced wit use of variable rate filters. A dual media filter used with a larger size anthracite top layer ab finer sand layer. Backwash control was ach by a differential pressure indicator for the fl reverse direction to filtration. Performance on the new system indicated an average E value of 3.5 mg/liter. The tertiary treatment c capacity is 8 mgd. Thus, the maximum amou BOD discharged on the river would be 28 BOD per day, which is within the required dards. (Kramer-FIRL)
W75-11705

**THE ICI DEEP-SHAFT EFFLUENT-TR MENT PROCESS.**
Engineers' Digest, Vol 36, No 5, p 37, 39, 1975. 2 fig.

Descriptors: *Waste water treatment, *Bio treatment, Sewage, Effluents, Microorga Sludge, Costs.
Identifiers: Northumbrian Water Authorit lingham Sewage Works, *Deep-sharft ef treatment process.

A process has been developed for high-in biological treatment of sewage or biodegr industrial effluent. Based on circulating the effluent by an air-lift principle in a deep sh process also entails maintaining a cult microorganisms in the effluent which are supplied with air, so that high treatment achieved. The shaft is divided into two sec downcomer and a riser. At the shaft head disengagement basin. Compressed air is i into the riser at shallow depth. As circul established, the air is transferred downcomer where it is deawn down by liqu

Shaft depth can be from 100 to 300 meters chieved by conventional drilling and mining echniques. The air which provides the microor-anisms with oxygen also initiates circulation, hich makes the process simple and economical. Other advantages of this process are that the ajor part of the treatment stages are un-erground, thereby eliminating odor, and there is a inimal land requirement. The quantity of sludge roduced is half that of the conventional activated ludge process, resulting in a substantial cost eduction. A pilot plant has been operating suc-essfully since mid-1974 at the Billingham sewage orks of the Northumbrian Water Authority. Murphy-FIRL)
775-11706

IDROTHERM DESALINATION,
ommonwealth Scientific and Industrial Research rganization, Melbourne (Australia). Div. of hemical Technology.
. A. Bolto.
hemtech, p 303-307, May, 1975. 10 fig, 14 ref.

escriptors: *Desalination, Effluents, Ion xchange, *Australia, Water treatment, *Waste ater treatment, Resins.
entifiers: *Sirotherm process.

n Australian desalination process has been eveloped which uses ion exchange resins but hich achieves regeneration of the salt-loaded sins whith hot water, rather than with chemicals. he process is effective on waters having up to 00 mg/liter is dissolved salts, but is not suitable r the treatment of seawater. This Sirotherm ocess is economically and environmentally asible for desalting low-salinity waters of natural industrial origin because there are no costs for emicals and the amount of waste salt discharged the effluent is reduced significantly. A mixture weakly basic and weakly acid resins is utilized hereby exchange sites are formed by proton nsfer from the acidic to the basic groups, as in e overall equilibrium which is heat-sensitive. In der to best use the thermal regeneration enomenon, it was necessary to develop special sins with capacities for salt adsorption plus rapid action rates. ICI Australia has plans for building commercial Sirotherm unit of 165,000 gpd pacity in an industrial factory in South Australia demonstrate the application of the process in salting low-salinity industrial facility waters. Fu-e studies, such as the desalination of sewage ef-ent, which will require pre-treatment, are being nsidered. (Kramer-FIRL)
75-11707

IE EFFECT OF TEMPERATURE ON THE ROBIC DIGESTION OF WASTEWATER UDGE,
w Hampshire Univ., Durham. Dept. of Civil gineering.
R. LePage.
ailable from the National Technical Informa-n Service, Springfield, Va. 22161, as PB-245 , $4.75 in paper copy, $2.25 in microfiche. MS esis, June 1974. 81 p, 18 fig, 41 ref. OWRT A-NH(1).

scriptors: *Sludge treatment, *Waste water atment, *Temperature, Digestion, Aerobic con-ons, Stabilization, Laboratory tests, Anaerobic estion.
ntifiers: Temperature effects, *Aerobic estion.

all-scale laboratory experiments were per-med on an undiluted primary waste water ge to determine the effects of temperature on aerobic digestion process. Conclusions in-le: greater reduction in BOD, COD, total ds, and total volatile solids occur at higher tem-atures; digestion for periods longer than 15 s produced only a small improvement in the ree of stabilization; the effect of temperature on the degree of stabilization was more significant at shorter detention times; no correlation was found between temperature and settleability of the sludge; the settleability of treated sludge was less than that of the raw feed sludge; higher temperatures of digestion resulted in improved filterability of the treated sludge; after 15 days digestion at higher temperatures, the filterability of the treated sludge sharply dropped; filterability of digested sludge was not as good as the filterability of the raw sludge; aerobically digested sludge had no disagreeable odor either during aeration or filtration; at 5C, a longer detention time is required to reach stabilization and to improve the characteristics of the digested sludge than at higher temperatures; and, the time and effort required to achieve the same degree of stabilization is much less with aerobically digested primary sludge than with anaerobically treated sludge. (Orr-FIRL)
W75-11708

AEROBIC DIGESTION OF WASTEWATER SLUDGE UNDER LOW TEMPERATURE CONDITIONS,
New Hampshire Univ., Durham. Dept. of Civil Engineering.
P. L. Bishop, and L. R. LePage.
Available from the National Technical Technical Information Service, Springfield, Va. 22161, as PB-245 341, $3.25 in paper copy, $2.25 in microfiche. March, 1974. 17 p, 6 fig, 1 tab, 12 ref. OWRT A-037-NH(1).

Descriptors: *Waste water treatment, *Aerobic treatment, Digestion, *Sludge treatment, *Temperature, Laboratory tests, Odor, Stabilization.
Identifiers: *Aerobic digestion, Settleability.

The feasibility of winter operation of anerobic digesters in Hew Hampshire and other northern areas was examined. Small-scale laboratory experiments were conducted using continuous aeration, intermittent mechanical mixing, and a batch draw and fill operation, at six different temperatures ranging from 5 to 30C. Conclusions include: greater reductions in BOD, COD, Total solids and Total volatile solids occur at higher temperatures; digestion for periods longer than 15 days achieved only minimal improvement in stabilization except at temperatures below 5C; the effect of temperature on the degree of stabilization was more significant at shorter detention times; no correlation was found between temperature and settleability of sludge; the settleability of treated sludge was less than that of raw sludge; higher temperatures of digestion improved the filterability of the treated sludge; filterability was decreased after 15 days digestion at higher temperatures; the filterability of digested sludge was not as good as that of the raw sludge; and, no disagreeable odor of the aerobically digested sludge was found during aeration or filtration. (Orr-FIRL)
W75-11709

URBAN RUNOFF AND COMBINED SEWER OVERFLOW, (LITERATURE REVIEW),
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
R. Field, and D. Knowles.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1352-1369, June, 1975. 155 ref.

Descriptors: *Storm runoff, *Reviews, *Combined sewers, *Urban runoff, *Waste water treatment, Pollutant identification, Water management, Monitoring, Computers, Overflow, Bibliographies.
Identifiers: Nonpoint pollution sources.

A literature review of current research on storm water runoff and combined sewer overflow problems is presented. Nonpoint pollution sources are becoming increasingly important. Such urban land runoff pollutants include organic materials with significant amounts of oxygen demand and suspended solids, sediment from urban construction or erosion, unprotected croplands, air pollution fallout, heavy metals such as oil containing lead used for road dust control, highway deicing salts, and chemical fertilizers containing nitrogen and phosphorus. Alternatives for management of storm water pollution were categorized as: source control; collection system control; storage and treatment; and integrated (complex) systems. Runoff predictions using several mathematical methods were discussed. Effective combined waste water pollution abatement alternatives should combine control and treatment facilities. Pollution control may be achieved by computer monitoring and remote activation, by proper maintenance of drainage and sewer systems, by provisions for storage facilities, and, in some cases, by separation of sanitary and storm sewers. The applicability of biological, physico-chemical, and disinfection methods of treatment were compared, as related to overflow. The most promising approaches to urban storm flow management involve multidisciplinary systems, such as wet-period discharges, dry-period discharges, land use, and water use. Various sampling programs and flow meters are also being developed for analysis of sewer flow and waste water quality conditions. (Kramer-FIRL)
W75-11710

METEOROLOGICAL, TOPOGRAPHICAL, AND CONSTRUCTION INFLUENCE ON THE RAIN RUNOFF IN SEWER SYSTEMS (METEOROLOGISCHE, TOPOGRAPHISCHE UND BAUTECHNISCHE EINFLUESSE AUF DEN REGENABFLUSS IN KANAL-ISATION-SNETZEN),
S. Pfeiff.
Gesundheits-Ingenieur, Vol 96, No 5, p 140-142, May 1975.

Descriptors: *Sewers, *Rainfall, *Rainfall-runoff relationships, *Storm runoff, Design, Meteorology, Reviews, *Waste water treatment.
Identifiers: Sewer construction.

Meteorological, topographical, and construction influences on the storm runoff in sewer systems are presented. A critical review was made of existing calculation and design methods. Storm runoff analysis as applied presently in unsuitable for a proposed new coefficient-less method for network filling and runoff calculations. The runoff coefficient is unsuitable, and should be used only for approximate calculations as a ratio of the surface area with full runoff to the total runoff surface. Flow velocity as a parameter should be replaced by throughput in liters/sec and filling should be expressed in liters/min; the term runoff retardation should be abandoned completely. The course of rain over time is of great influence on the storm runoff in the sewer system. A late peak in rain intensity is less favorable for the filling of the sewer system than is an early peak. Analyses of the frequency of network filling in a well-defined water capture area should be used to dimension sewer systems rather than rainfalls yielding a runoff with a definite frequency. (Takacs-FIRL)
W75-11712

RECYCLING OF INCINERATOR ASH,
L. L. Diosady.
Environment Canada Research Report No 19, (1974). 82 p, 13 fig, 14 tab, 37 ref, append.

Descriptors: *Sludge treatment, *Incineration, *Phosphorus, *Heavy metals, Separation techniques, Iron, Aluminum, Pilot plants, Ultimate disposal, Recycling.

A preliminary study was performed on the feasibility of recovery of iron, aluminum, heavy metals, and phosphorus from incinerated sewage sludge ash. The project included a literature review; examination of ash composition, solubility

of ash components, and separation techniques; and an economic evaluation of separation methods and an estimation of the equipment needed for a pilot plant. Aluminum and iron recovery was found to be uneconomical. Aluminum was present in the ash in the form of a refractory oxide that is not amenable to any inexpensive chemical treatment. The ash was highly varied in composition. Approximately 50% of the ash was in the chemically inert form of silicates and alumina. A large proportion of all heavy metals, especially zinc and chromium, was physically or chemically bound by these refractories, which are not available through acid digestion. The simplest approach to safe ash disposal may be to form refractories from all ash components. By adding fluxing agents, or by altering the incinerator conditions, it may be possible to produce a glasslike ash that will contain much lower quantities of leachable heavy metals than the present ash. Phosphorus, present to the extent of 14-18% expressed as phosphoric acid, has the highest economic value in the ash. It may be recovered by the use of phosphoric or 60% sulfuric acids. (Orr-FIRL)
W75-11714

**SLUDGE HANDLING AND DISPOSAL SEMINAR, CONFERENCE PROCEEDINGS NO. 2.**
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
Held at Toronto, Ontario, September 18-19, 1974, 465 p. Published jointly with Environment Canada, Ottawa.

Descriptors: *Conferences, *Sludge disposal, Land, Crops, Nutrients, Legal aspects, Microbiology, Environmental effects, Centrifugation, Dewatering, Filtration, Incineration, Pumping, Cities, Treatment facilities, *Waste water treatment, *Canada.
Identifiers: *Sludge handling, Metal recovery, Metal removal, Phosphate removal, Hauling.

Twenty-eight papers, mostly by Canadian authors are presented. The subjects include disposal of sludge on agricultural land with relation to crop utilization of nutrients in the sludge, land reclamation, regulatory aspects, microbiological aspects, and the potential environmental hazards of this practice. Also covered is sludge handling with regard to centrifugation, dewatering, filtration, incineration, metal recovery or removal, phosphate removal, pumping and hauling. Sludge handling and disposal practices in a regional municipality and a metropolitan area are also discussed. (See W75-11716 thru W75-11731) (Dean-FIRL)
W75-11715

**OVERVIEW OF CANADIAN SLUDGE HANDLING AND LAND DISPOSAL PRACTICES AND RESEARCH,**
Ontario Ministry of the Environment, Toronto.
S. A. Black, and N. W. Schmidtke.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No. 2, September 18-19, 1974, Toronto, Ontario, Canada, p 1-9, (1974). 2 tab, 4 ref.

Descriptors: *Sludge disposal, *Anaerobic digestion, *Landfills, *Lagoons, *Canada, *Waste water treatment, Environmental effects, Phosphorus, Chemical precipitation, Great Lakes region, Treatment facilities.
Identifiers: Agricultural land, Canada-Ontario Agreement.

Sludge handling and disposal practices in some major Canadian cities and sludge handling practices in Ontario are discussed. The most widely used methods of disposal in Canada are anaerobic digestion, followed by placing the sludge in storage lagoons, sanitary landfills, or on agricultural lands without consideration of the environmental effect. Ontario is now involved in a phosphorus removal program. In the most critical areas of the Province the facilities were to have been in operation by December 1973, in less critical areas by December 1975, and all other areas three years after notification. Chemical precipitation will be used in the phosphorus removal facilities. Research studies included land application of sewage sludges and handling and treatment of sewage sludges under the Canada-Ontario Agreement. These studies should result in the upgrading of the treatment facilities in the Lower Great Lakes Basin. (See also W75-11715) (Dean-FIRL)
W75-11716

**SLUDGE HANDLING AND DISPOSAL PRACTICES IN ENGLAND,**
Agricultural Development Advisory Service, Leeds (England).
J. Webber.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 10-26, (1974). 11 tab, 12 ref.

Descriptors: *Sludge, *Sludge disposal, Land reclamation, Incineration, Bodies of water, Nitrogen, Phosphorus, Copper, Zinc, Lead, Cadmium, Mercury, *Waste treatment.
Identifiers: England, Wales, Composting, Farmland.

In England and Wales approximately 94% of the population has sewers. Four-fifths of the sewage is treated at sewage plants and used for agricultural purposes or otherwise disposed of on land. The remaining one-fifth is disposed of at sea or in estuaries after some pre-treatment. For disposal at sea, liquid sludge is taken out to deep water in specially designed barges where it is dumped. Studies of Liverpool Bay have shown no serious pollution but suggest that some accumulation of chemicals, pesticides, and metals might be harmful to marine life in the future. Sewage sludge has been used to reclaim the land at gravel pits and collieries with some success. Sewage farms near large centers of population are being used less frequently due to the value of the land for housing. Incineration and composting are other methods for sludge disposal that have been occasionally in use in England. Sewage sludge is also disposed of on agricultural lands where it is used as a source of nitrogen and phosphorus. Studies have shown that where sludges from industrial areas have been used there may be damage to crops from zinc and copper. When sludges include lead, cadmium, or mercury, there may also be a hazard to man and livestock consuming the crops. (See also W75-11715) (Dean-FIRL)
W75-11717

**USE OF SEWAGE SLUDGE IN AGRICULTURE WITH ADEQUATE ENVIRONMENTAL SAFEGUARDS,**
Agricultural Research Service, St. Paul, Minn.
W. E. Larson, R. H. Susag, R. H. Dowdy, C. E. Clapp, and R. E. Larson.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 27-45, (1974). 3 fig, 4 tab, 14 ref.

Descriptors: *United States, *Sludge disposal, *Sewage treatment, *Waste water treatment, Dewatering, Incineration, Land reclamation, Industrial wastes, Costs, Crop production, Food chains, Surface runoff, Farm management, Landfills.
Identifiers: Pollution regulations, Agricultural land, Soil productivity.

In the United States methods of handling and disposal of sewage sludge are being re-evaluated. The processing and disposal of sludge accounts for half of the cost of sewage treatment. In small communities disposal of sewage sludge by land spreading has been used for years. In larger communities dewatering followed by incineration has been used to dispose of sludge. Stricter air pollution restrictions and increased costs are making incineration less desirable. New pollution regulations applied to landfills require improved dewatering techniques. The most desirable alternatives is agricultural use of the sludge. The advantages of this method are increased crop yield and reclamation of land. An area of concerns is that heavy metals from industrial wastes may seep into the soil, causing reduced soil productivity and increases of heavy metals in the human food chain. A problem that could arise is pollution of surface water from runoff. This could be controlled by proper management. (See also W75-11715) (Dean-FIRL)
W75-11718

**AEROBIC AND ANAEROBIC SLUDGE DIGESTION,**
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
B. I. Boyko.
In: Sludge Handling and Disposal Seminar Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 46-62, (1974). 3 fig.

Descriptors: *Anaerobic digestion, *Aerobic treatment, *Sludge treatment, *Waste water treatment, Enzymes, Microorganisms, Oxidation, Treatment facilities.
Identifiers: Acid fermentation, Alkaline fermentation, Organic pollutants.

The goal of water pollution control plants is to produce high quality effluents. This is achieved through the removal of organic pollutants. A process which produces quantities of sludge requiring pre-treatment before disposal. Digestion is the method by which these sludge solids are treated. Anaerobic digestion is a biochemical process taking place in the absence of oxygen through the action of enzymes and microorganisms. It is a two phase process consisting of an acid fermentation phase and a methane phase. Aerobic digestion is a biological process involving oxidation of bio-degradable matter by microorganisms and microbial cellular material by endogenous respiration. Both methods can be inhibited by toxic materials. When the two methods are compared for performance they should not be considered as equal alternatives for sludge treatment. The size and usage of the facility are among factors determining the choice of the method to be applied. (See also W75-11715) (Dean-FIRL)
W75-11719

**DESIGN INFORMATION ON DEWATERING PROPERTIES OF WASTEWATER SLUDGES,**
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. B. Farrell.
In: Sludge Handling and Disposal Seminar Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 269-279 (1974). 2 tab, 11 ref.

Descriptors: *Sludge treatment, *Dewatering, *Nutrient removal, Phosphorus, Lime, Aluminum, Iron, Equipment, Costs, Treatment facilities, *Waste water treatment.
Identifiers: Sludge yield.

Information on the handling of sludges produced by phosphate removal processes is presented. To design a minimum cost facility, it is necessary to 'cost out' a number of potential process options in order to identify the more economical approach. A large part of the plant cost is dewatering. Tests are presented whereby sludge yields can be estimated. The mass of chemical sludge produced when iron or aluminum salts are used has usually been estimated from simplified stoichiometric relationships; however, experimental data suggest that these estimates are low and should be increased by up to 35%. The mass of sludge produced by lime addition depends on the dose

ne required, the alkalinity of the waste water, id to a small degree on the phosphate content of e waste water. Calculated lime sludge doses ould be increased by 20%. Field visits have also en made to plant sites with a sludge dewatering ailer. The site visits make it possible to compare fectiveness of various dewatering devices, com- re the performance of the dewatering equipment the plant with the equipment in the trailer, and serve at a number of sites how the performance each device is affected by differences in sludge pe and waste water source. (See also W75-11715) rr-FIRL)
75-11722

**FFECTS OF CONTROL VARIABLES AND LUDGE CHARACTERISTICS ON THE PER- ORMANCE OF DEWATERING AND HICKENING DEVICES,**
nvironmental Protection Service, Burlington ntario). Waste Water Technology Center.
Campbell, and B. P. LeClair.
: Sludge Handling and Disposal Seminar, Con- rence Proceedings No 2, September 18-19, 1974, ronto, Ontario, Canada, p 280-314, (1974). 13 , 2 tab, 10 ref.

escriptors: *Treatment facilities, *Waste water atment, *Water quality, Sludge treatment, ewatering, Great lakes, Pilot plants, Effluents, ntrifugation, Polymers, Nitrogen, Carbon, osphorus, Waste treatment.
entifiers: Air flotation unit, Gravity thickner.

e Canada-Ontario Agreement on Great Lakes ater Quality of August 1971 insures the restora- n and protection of the Great Lakes water quali- A drastic reduction of nitrogen, carbon, and osphorus in waste treatment plant effluents is ecified in the agreement. A program is described measure sludge production, characterize the ysical and chemical properties of sludges, and rrelate these properties with various sludge de- tering processes. Equipment included mobile ot-scale dewatering units and a mobile bench- ot scale sludge dewatering facility. Various cen- fuges and filters as well as the air flotation unit l gravity thickener were used. Sludges were en from an extended aeration pilot plant and ac- ated sludge plants at two locations in Ontario. A ymer was used in the separation process in the trifuges. In the solid bowl centrifuge the ymer dosage was an important adjustable con- l variable. For all sludges, 99% solids recoveries re possible. The cake solids were not as ceptible to control variables as solids recovery. the basket centrifuge, polymer addition was cessary to produce a high recovery when ested alum sludge was used, while for waste ac- ated sludge recovery in excess of 90% was ssible without the addition of a polymer. Cen- ugation gave the greatest degree of thickening for clarification of waste activated sludge, air tation was superior. (See also W75-11715) ean-FIRL)
5-11723

**E USE OF PHYSICOCHEMICAL SLUDGE ARACTERISTICS AND BENCH DEWATER- G TESTS IN PREDICTING THE EFFICIENCY THICKENING AND DEWATERING OCESSES,**
vironmental Protection Service, Burlington ntario). Waste Water Technology Center.
Stickney, and B. P. LeClair.
Sludge Handling and Disposal Seminar, Con- ence Proceedings No 2, September 18019, 1974, ronto, Ontario, Canada, p 315-350, (1974). 9 fig, ab, 12 ref.

scriptors: *Treatment facilities, *Sludge treat- nt, Effluents, Nitrogen, Carbon, Phosphorus, ae, Dewatering, *Waste treatment.
ntifiers: Phosphorus removal, Lime treatment.

The Canada-Ontario Agreement on Great Lakes Water Quality of 1971 specifies that the levels of nitrogen, carbon, and phosphorus considered essential for the growth of algae be drastically reduced in waste treatment plant effluents. Pilot plant studies provided data on sludge production and properties. Sludge production and characteristics were altered by adding phosphorus removing chemicals. These chemical additions resulted in an increase in total solids production and sludge volume and had a harmful effect on dewatering characteristics. In most cases the introduction of chemical treatment will result in the need to increase sludge handling facilities. Lime treatment is the notable exception. The improvment in dewatering was such that the handling facilities could be reduced even though the sludge solids increased. (See also W75-11715) (Dean-FIRL)
W75-11724

**CENTRIFUGES - TYPES AND APPLICATIONS,**
Penwalt Corp., Warminster, Pa. Sharples-Stokes Div.
F. W. Keith, Jr.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 351-368, (1974). 10 fig.

Descriptors: *Treatment facilities, *Sludge, Polymers, Centrifugation, *Waste water treatment, Equipment, Industrial wastes, Municipal wastes, Sludge treatment, Thickening, Dewatering.
Identifiers: *Centrifuges, Disc centrifuge, Scroll centrifuge, Imperforate bowl knifing centrifuge.

Three types of centrifuges are currently being used in municipal and industrial waste treatment plants for thickening or dewatering. The scroll type centrifuge is most commonly used. Because of its design it can be used for almost all sludges containing primary solids as well as for those with lime added for phosphorus removal. In order to handle soft secondary sludges a polymer must be added. The imperforate bowl knifing centrifuge has been successful with biological sludges and handles alum sludges readily. The main advantage is a recovery of 90-95% without a polymer. The disc centrifuge is used for the thickening of clean secondary activated sludge. It has had recovery rates of 85-90% without a polymer. The three types of centrifuges may be used separately or in combination. (See also W75-11715) (Dean-FIRL)
W75-11725

**SLUDGE DEWATERING USING THE KRUGER CENTRIFUGE,**
L. P. Roe.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 369-384. (1974) 1 fig.

Descriptors: *Dewatering, *Sewage sludge, Canada, Polymers, Equipment, Centrifugation, *Waste water treatment, Operation.
Identifiers: *Centrifuges(Kruger).

The use of solid bowl decanter centrifuges for dewatering sewage sludges is now becoming common in Canada. The decanter centrifuge advantages are that it requires little operator attention and operates continuously. Its disadvantages are wear on the solids conveying scroll by the abrasive action of grit in the sludge and poor solids capture. Work has been done to overcome these disadvantages. Design improvements were made and the use in recent years of synthetic polymer flocculant aids has improved the solids capture. By lowering the g-force and scroll differential speed and by using an efficient degritting system abrasive wear can be lowered. Sludge dewatering investigations have been carried out at various treatment plants in Canada using the improved centrifuge. Performance varied according to the type of sludge. The decanter centrifuge is relatively easy to maintain, having only two major moving parts; the scroll and the bowl. The solid conveying scroll requires the most maintenance. To shorten the downtime, it would be advantageous to have a spare scroll available. (See also W75-11715) (Dean-FIRL)
W75-11726

**VACUUM DEWATERING OF SEWAGE SLUDGE,**
G. D. Kemp.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 385-390, (1974). 2 fig, 1 tab.

Descriptors: *Filters, *Dewatering, *Sludge, Lime, Polyelectrolytes, *Waste water treatment, Sludge treatment, Activated sludge, Canada.
Identifiers: *Vacuum filters, Ontario, Ferric chloride, Alum.

Vacuum filters are being used at plants in Ontario to dewater raw sludge conditioned with polyelectrolytes or ferric chloride and lime, and in one case thickened waste activated sludge conditioned with a polyelectrolyte. The filter mediam used in many of the filters in Ontario are stainless steel springs. Fabric is the other filter medium used. The purpose of a vacuum filter is to achieve the dryest filter cake using the least amount of coagulant at the highest drum speed. Tests can be made to determine the proper amount of coagulant needed. Alum, lime, or ferric chloride are being used for reduction of nutrients at most of the plants using vacuum filters. Alum has had some effect on the amount of filter yield while lime and ferric chloride have not. (See also W75-11715) (Dean-FIRL)
W75-11727

**ASPECTS OF INCINERATING CHEMICAL SLUDGES,**
Environmental Protection Service, Burlington (Ontario). Waste Water Technology Center.
E. E. Shannon, D. Plummer, and P. J. A. Fowlie.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 391-412, (1974). 8 fig, 7 tab, 15 ref.

Descriptors: *Incineration, *Sludge disposal, Waste disposal, Municipal wastes, North America, Europe, Dewatering, Sludges, Canada, United States, *Waste treatment.
Identifiers: Furnaces.

Incineration has been used as one of the cheapest methods of sludge disposal by large municipalities. The three types of incinerators are the multiple hearth furnace which is the most common method of incinerating sewage sludges in North America and Europe, the fluidized bed furnace, and the rotary kiln furnace which has not been extensively used although it has the potential for handling thickened sludge directly. In incineration systems the most critical pretreatment step is sludge dewatering. In view of the potential problems involved in the incineration of phosphorus removal sludges, a sludge incineration and precipitant recovery program was initiated. The preliminary results showed that the calorific value of the chemical sludges varies with the type of sludge. The lime sludge did not present any problems but with the alum and iron sludges there is the possibility of clinker build-up. It is possible to recover iron and other heavy metals from incinerator ash. S(See also W75-11715) (Dean-FIRL)
W75-11728

**REMOVAL OF PHOSPHATES AND METALS FROM SEWAGE SLUDGES,**
Waterloo Univ., (Ontario). Dept. of Chemical Engineering.
D. S. Scott, and H. Horlings.

In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 413-443, (1974). 5 fig, 7 tab, 6 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Nutrient removal, Sludge, Iron, Aluminum, Zinc, Phosphates, Phosphorus, Heavy metals, Filters, Extraction, *Chemical precipitation.
Identifiers: Agricultural land, *Phosphate removal, Experimental work, Chemical treatment.

Now that waste water treatment plants are using chemical treatment for the removal of phosphates the sludges produced will not only contain phosphate but metals such as iron and aluminum used as coagulants or in the removal process. The sludges will also contain the phosphorus and metals that entered the plant. The removal of phosphates and metals from sewage sludges has become important particularly when the sludges are used on agricultural lands. Experimental work has been done on the extraction and precipitation of metals from filter cake. The metals and phosphorus could be extracted by acid from either unconditioned or conditioned final anaerobic digested sludges. The control of the pH was important in the production of solid products containing iron and aluminum in one case and heavy metals in the other. Iron, aluminum, zinc, and phosphate can be recovered by further treating the solid products by conventional means. (See also W75-11715) (Dean-FIRL)
W75-11729

**SLUDGE HANDLING AND DISPOSAL PRACTICES IN THE REGIONAL MUNICIPALITY OF NIAGARA,**
Regional Municipality of Niagara, Niagara Falls (Ontario). Public Works Dept.
E. R. Simonen.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, Toronto, Ontario, p 444-451, (1974). 2 tab.

Descriptors: *Treatment facilities, Anaerobic digestion, Aerobic treatment, *Sludge disposal, Research and development, Landfills, Sludge treatment, Canada, Sludge treatment, Waste water treatment.

An act of the provincial government established the Regional Municipality of Niagara on January 1, 1970. The area is 719 square miles with a population of approximately 350,000. The region is comprised primarily of rural and agricultural land with about 70% of the population concentrated at St. Catharines, Niagara Falls, and Welland. At present the region has twelve sludge producing plants. This will be reduced to eight as new plants are completed. Anaerobic digestion is used except at the Crystal Bay, Chippawa, and Grimsby plants. Aerobic digestion is used at the Crystal Bay plant. The Chippawa plant will be phased out upon completion of the south side sewer scheme at which time its sludge will be treated at the Niagara Falls plant. Ainoperative digester is being used as a holding tank for raw sludge at the Grimsby plant and the sludge is treated at one of the larger plants. The digested sludge in the region is disposed of on land, offered to the public for use, or disposed of at landfills. The region has also been involved in research projects. Various types of vehicles for spreading sludge on fields were tested amd a spraying system was investigated. Computer selection of various sludge disposal alternatives was evaluated. (See also W75-11715) (Dean-FIRL)
W75-11730

**SLUDGE HANDLING AND DISPOSAL PRACTICES IN METROPOLITAN TORONTO,**
W. A. Salih.
In: Sludge Handling and Disposal Seminar Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 452-465, (1974) 1 fig, 2 tab.

Descriptors: *Treatment facilities, *Sewerage, *Sludge disposal, Anaerobic digestion, Polymers, Lime, Centrifugation, Filtration, Incineration, Landfills, Dewatering, Canada, *Waste disposal, *Waste water treatment.
Identifiers: *Toronto(Canada), Thermal processing, Ferric chloride.

In 1954 when Metropolitan Toronto was created there were 17 treatment plants operating in Toronto and its suburban municipalities with two plants under construction. A sewerage system plan put into effect in 1954 provided for trunk sewers to convey waste water to four major plants. By the 1960's the smaller plants had been taken out of service and the sludge disposal consolidated at the four treatment plants. All four plants process the sludge by anaerobic digestion followed by conditioning with polymers or ferric chloride and lime then centrifugation or vacuum filtration. The sludge is disposed of by hauling to landfill areas, incineration, or air drying storage and removal by the public for use as soil conditioners. Future plans for expansion of the main treatment plants are as follows: Highland Creek Treatment Plant will increase its capacity from its present 16 mgd to 64 mgd and the sludge will be processed by thermal processing, dewatering and incineration; Humber Treatment Plant will increase from 62 mgd to 120 mgd and the sludge dewatered and hauled to the Main Treatment Plant for incineration; and modernization of the present facilities is under consideration for the North Toronto Treatment Plant. (See also W75-11715) (Dean-FIRL)
W75-11731

**HEAT TREATMENT OF SEWAGE SLUDGE,**
Public Works Research Inst., Tokyo (Japan).
K. Saito.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 20-64, May 1975 6 fig, 12 tab.

Descriptors: *Sewage treatment, *Sludge treatment, *Heat treatment, Dewatering, *Waste water treatment, Maintenance, Recycling, Equipment, Costs, Sludge, Odor, Treatment facilities.
Identifiers: Japan, Odor removal.

Results of a three-year investigation of facilities for heat treatment of sewage sludge are presented. Care must be taken for prevention of corrosion and organic deposition. Heat treated sludge dewaters easily and can be burned without the use of additional fuel. However, three major problems of this method persist. These are: removal of odors from the treatment process; treatment of supernatants having high BOD, including removal of nitrogen compounds and heavy metals; and the need to establish operation and maintenance systems for periodic inspection. In order to implement a heat treatment system, optimum operating conditions must be determined by quality of supernatant for each particular sewage treatment facility. It is desirable to establish a closed system for heat treatment, where heat from incineration of the cake is recycled and odorous gases are reused as combustion air. In addition, it is recommended that equipment be standardized in order to simplify quality control and for cost reduction. (Prague-FIRL)
W75-11732

**COMBINED TREATMENT OF MUNICIPAL AND INDUSTRIAL WASTEWATER,**
Yokohama Sewerage Bureau, Kanagawa (Japan).
M. Sato, H. Fujii, and S. Yasuda.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 65-127, May 1975 12 fig, 24 tab.

Descriptors: *Waste water treatment, *Pre-treatment, Industrial wastes, Municipal wastes, Facilities, Aeration, Oxygen.
Identifiers: *Combined municipal-industrial waste treatment, *Kyoto(Japan).

Systems for combined treatment of municipal and industrial waste water require consideration of technical knowledge, expense allotment, and administrative measures. Factors concerning combined treatment are discussed for systems with and without pre-treatment of industrial waste waters. Described are the Torihama industrial waste water pre-treatment plant, the combined treatment of industrial and domestic waste water at Shingashi Valley, and the combined treatment of industrial and municipal waste water in kyoto. In the Kyoto treatment plant, comparisons between pure oxygen aeration and the conventional air system demonstrated that pure oxygen aeration is useful for treatment of highly polluted sewage with a variable load. (Prague-FIRL)
W75-11733

**STUDIES ON ADVANCED WASTE TREATMENT,**
Public Works Research Inst., Tokyo (Japan).
M. Kashiwaya, and S. Nanbu.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 128-188, May 1975 24 fig, 1 tab, 4 ref.

Descriptors: *Tertiary treatment, *Lime, Pilot plants, Municipal water, Activated sludge, Filtration, Adsorption, Suspended solids, Biological treatment, *Waste water treatment, *Chemical precipitation.
Identifiers: *Japan, Water quality matrices, *Chemical treatment.

Results of laboratory and pilot scale tests concerning lime precipitation in municipal waste water are given from two areas in Japan. Pilot plant installations at the Shita-machi Sewage Treatment Plant in Yokosuka and at the partially completed Tobi Sewage Treatment Plant in Kyoto are described. In Japan, 71% of the municipal sewage treatment plants use the activated sludge method. However, organic suspended solids are not always removed from the final settling tanks of this process. The down-flow filtration process is being investigated as well as an up-flow type granular activated carbon adsorption system. Treatability of waste water may be evaluated, based on water quality matrices; variables used were impurity size, chemical property, and concentrattion. For removal of organics, three water quality indices such as TOC, and ultraviolet absorbance of 260 (E260) and 220 (E220) millimicron meters connected with impurity size distribution could describe the usefulness of biological treatment, chemical coagulation, carbon adsorption, or other treatment processes. (Prague-FIRL)
W75-11734

**TREATMENT AND DISPOSAL OF SLUDGE FROM MUNICIPAL WASTEWATER PLANTS IN THE UNITED STATES,**
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. B. Farrell.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 223-233, May 1975 3 tab, 1 ref.

Descriptors: *Waste water treatment, *Municipal wastes, *Wastes disposal, *Sewage treatment, Incineration, Anaerobic digestion, Heat treatment, Equipment, Filters, Centrifuges, Economics, *Sludge treatment.
Identifiers: *Sludge conditioning.

ous methods used for treatment and disposal ludge from municipal waste water treatment ts in the United States are described. Because ndary treatment is a national goal, an increase e amount of secondary and chemical sludges pected. The largest percent of sewage sludge sposed to land while a substantial proportion is erated with the ash disposed to land. Ocean osal is not viewed as a favorable method for uture. Types of stabilization are compared, in- ing anaerobic digestion, aerobic digestion, rine stabilization, and lime stabilization. ge conditioning may be approached by treat- with inorganic chemicals, polymers, or heat. atering methods are dependent on solids con- types of filters and centrifuges are described. elines for disposal by means of incineration, ill, or by landspreading are evaluated as is the omic viability of each alternative. (Prague-
.)
-11735

ERIENCES WITH SLUDGE HANDLING IN AS,
s Water Quality Board, Austin.
hittington.
rd US-Japan Conference on Sewage Treat- Technology Proceedings, February 12-16, Tokyo, Japan, p 239-244, May 1975 4 ref.

riptors: *Sludge treatment, *Sludge disposal, as, *Waste water treatment, Rural areas, n areas, Dewatering, Anaerobic digestion, ated sludge, Municipal wastes.
ifiers: *Sludge handling, *Land application.

e handling in small plants in rural areas of s is successfully accomplished by anaerobic tion with dewatering on open beds and sub- nt land application. For small plants located ban areas, a trend is toward aerobic rather anaerobic digestion. This is due to extensive f contact stabilization treatment plants which best utilizing aerobic digestion, and various nce problems which are associated with obic sludge handling. One technique used in ton, for transporting excess activated sludge plants with no dewatering facilities to a e processing plant is the pumping of sludge ressure conduits to a sanitary sewer which flows to major plants. At larger municipal s, a variety of sludge disposal techniques been applied. Descriptions are given of the ge treatment facilities of the City of Houston, ulf Coast Waste Disposal Authority, the City stin, and the City of San Antonio. Larger s in arid areas will continue utilizing sludge ning where feasible. Where final disposal is y landfill, vacuum filters will be used for de- ing; where ultimate disposal is fertilizer ction or long-distance landfill, pressure fil- re likely to be used. (Prague-FIRL)
11736

GES GENERATED IN PHOSPHATE OVAL PROCESSES,
nal Environmental Research Center, Cincin- Ohio. Advanced Waste Treatment Research
Farrell.
d US-Japan Conference on Sewage Treat- Technology Proceedings, February 12-16, Tokyo, Japan, p 271-282, May 1975 2 fig, 10 ref.

iptors: *Nutrient removal, *Phosphates, inum, *Iron, *Lime, *Waste water treat- Dewatering, Pilot plants, Facilities.
fiers: Physico-chemical treatment, Sludge e, Thickening, Clarifiers.

aluminum salts, iron salts, and/or lime are n the physical-chemical treatment of waste to remove phosphate, the sludge mass in- es and dewatering properties are affected. asses of sludge formed from each treatment can be calculated from chemical equations. Aluminum and iron salts generally reduce the solids content of primary clarified sewage so that sludges cannot be thickened to as high a solids content. With lime, the opposite result occurs. Thickening and dewatering properties are substantially improved and sludge conditioning agents can often be eliminated. While the mass of sludge is generally higher with lime treatment, the volume is often lower than when Al or Fe salts are used. Tests of treatment with these chemicals were conducted under plant conditions at Little River, Ontario, and at Blue Plains in Washington, D.C., at Contra Costa, California, and at Salt Lake City, Utah. Results indicated excellent sludge characteristics, such as filter yielded and sludge concentration, with lime treatment. Modifications in clarifier design are being investigated to improve Al and Fe sludge treatment. (Prague-FIRL)
W75-11737

**EPA EXPERIENCES IN OXYGEN-ACTIVATED SLUDGE,**
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
E. F. Barth.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings February 12-16, 1974, Tokyo, Japan, p 283-357, May 1975, 26 fig, 26 tab, 7 ref.

Descriptors: *Aeration, *Oxygen, *Waste water treatment, Biological treatment, Treatment facilities, Sludge treatment, Sludge disposal, Administration, *Sewage treatment.

The role of the EPA between 1968 and 1974 in the development of the oxygen aeration process is summarized. Facilities from seven projects are detailed. These are: Batavia I and II (Union Carbide Corporation), the purpose of which was to establish the feasibility of a multi-stage, covered-tank oxygenation concept; Newtown Creek (New York City), where scaled-up demonstration of the multi-stage, covered-tank oxygenation system was investigated; Las Virgenes (California) Municipal Water District, which demonstrated the single-stage, covered-tank oxygenation system; FMC Corporation, which hoped to establish the feasibility of the open-tank oxygenation concept; the EPA/District of Columbia (Blue Plains) Pilot Plant, to determine the process kinetics over a wide range of operating conditions; the Bureau of Reclamation, which tested materials of construction for corrosion potential; and the Rocketdyne Division of Rockwell International, which planned to define safety requirements and to develop a safety manual and checklist. As a result of these studies, it was concluded that oxygenation systems are equally applicable to the construction of new facilities and the upgrading of existing secondary treatment plants. Such systems should be designed as integrated packages, with a biological reactor, a secondary clarifier, and sludge handling equipment. Further work should verify or contradict data which indicate that reduced excess biological sludge production is possible with oxygenation. (Prague-FIRL)
W75-11738

**AERATION SYSTEMS FOR METRO CHICAGO,**
Metropolitan Sanitary District of Greater Chicago, Ill.
B. T. Lynam, S. Graef, and D. Wunderlich.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 358-392, May 1975 5 fig, 5 ref.

Descriptors: *Aeration, Design criteria, Treatment facilities, Mathematical studies, Activated sludge, Economics, *Waste water treatment, Illinois.
Identifiers: *Chicago(Ill), *Bubble aeration.

Aeration systems for the greater Chicago area are described. Development of aeration technology involved diffuser plate studies for permeability, uniformity, and diffuser plate rating. More recent work concerned instream aeration, basin aeration, and small plant design and modification. Fine bubble aeration practices, involving intakes, filters, blowers, air mains, and aeration tanks, are detailed. From investigations since 1920, the Metropolitan Sanitary District of Greater Chicago has made contributions in diffuser permeability criteria, design and operation of primary and secondary air filters, and aeration tank configuration and diffuser placement. Mathematical relationships for oxygen transfer have been formulated. An overall effective economic technology for activated sludge treatment has been developed. (Prague-FIRL)
W75-11739

**OXYGEN ACTIVATED SLUDGE SYSTEMS IN TEXAS,**
Texas Water Quality Board, Austin.
D. Whittington, and T. B. Tischler.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 393-399, May 1975 3 ref.

Descriptors: *Waste water treatment, *Texas, *Sludge treatment, Odors, Oxygen, Personnel, Operation, Maintenance, Monitoring, Economics, Municipal wastes, *Activated sludge.
Identifiers: *Unox Process, Hydrocarbons, Pure oxygen treatment.

Pure oxygen systms for waste treatment, particularly the Unox Process, are discussed in terms of the applicability of this system to facilities in Texas. Four small to medium size Unox systems are under construction or in planning stages for Texas municipalities. The advantages of this process include reductions in biological reactor volumes, higher oxygen-transfer efficiencies, improved sludge handling characteristics, simplified process control, and odor control. Some possible disadvantages are that the more sophisticated mechanical and electrical control systems may not be operated by all treatment plant personnel. Also, there is a possibility of volatile hydrocarbons entering the enclosed system, which could lead to a serious explosoion. For this reason, a monitoring device for hydrocarbons is installed in each Unox unit, and should be properly maintained. Because of reduction of tank volumes and land area needed, the Unox process may be a viable future alternative to conventional activated sludge treatment for Texas. This is especially trud in large municipal plants, where an economic advantage results. (Prague-FIRL)
W75-11740

**SUSPENDED SOLIDS REMOVAL PROCESSES STUDIED AT METRO CHICAGO,**
Metropolitan Sanitary District of Greater Chicago, Ill.
B. T. Lynam, D. R. Zenz, C. Lue-Hing, and G. R. Richardson.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 400-488, May 1975 15 fig, 4 tab.

Descriptors: *Suspended solids, *Waste water treatment, *Pilot plants, Hydraulic properties, Filters, Filtration, Effluents, Equipment, Solid wastes, Illinois, Treatment facilities.
Identifiers: *Hydraulic loading, *Microstrainers, *Chicago(Ill).

Metro Chicago has investigated its suspended solids removal processes by full-scale and pilot studies. At Hanover Park, a full-scale evaluation of sand filtration and microstraining was carried out in order to determine maximum suspended solids loading and maximum hydraulic loading to both the sand filter and the microstrainer. Pilot

plant studies evaluated three devices, the DeLaval filter, the Neptune Microfloc Unit, and the Graver Filter. All filtration units were capable of producing effluent suspended solids and BOD of under 10 mg/liter. The Graver pressure filter can be successfully operated at higher hydraulic loadings (9.0 gpm/sq ft) and suspended solids loadings (1.9 lbs/sq ft) than the other two units. The Neptune Microfloc Unit achieved the best effluent quality, with less than 6.0 mg/liter of suspended solids and BOD. A 15 mgd rated capacity microstrainer at the north side treatment works of the District was also evaluated. The various test results were compared, indicating that microstrainer flow capacity is very much dependent upon the type of effluent solids. Additionally, sand filters are capable of achieving better suspended solids removal than microstraining devices, and batch type filters appear to be capable of loadings over 1.2 lbs/sq ft/filter run. (Prague-FIRL)
W75-11741

**METRO CHICAGO STUDIES ON NITRIFICATION,**
Metropolitan Sanitary District of Greater Chicago, Ill.
B. T. Lynam, D. R. Zenx, C. Lue-Hing, G. R. Richardson, and B. T. Washington.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 449-503, May 1975 17 fig, 5 tab, 6 ref.

Descriptors: *Nitrification, Ammonia, Nitrogen, *Waste water treatment, *Illinois, *Treatment facilities.
Identifiers: *Chicago(Ill).

Nitrification was tested in the Chicago area at three facilities. A two-stage nitrification process at Hazlecrest, Illinois, produced an effluent high in nitrate-nitrite and low in ammonia concentrations at a 3.0 to 5.0 hour detention time in the second stage. Temperature effects were a major factor for both initiating and maintaining nitrification. At the Calumet Sewage Treatment Plant, a pilot plant process steps included preliminary and secondary treatment, anaerobic sludge digestion, and contact chlorination. Under such a second-stage nitrification system, a nitrified effluent with an ammonia nitrogen residual of under 2.5 mg/liter could be produced with: influent NH3-N, 10 to 25 mg/liter, SRT of at least ten days, and a minimum operating temperature, 12 to 15C. A Water Reclamation Plant at Lemont, used nitrification and employed extended aeration. When operated at long detention times, with sewage temperatures as low as 45 F, a well-nitrified effluent was produced. The concept of single-stage nitrification at all major plants in the Chicago area is being tested a pilot scale levels. A new plant under construction at West-Southwest will have a maximum flow capacity of 26 mgd, detention time, 5.5 hours, with return sludge flow capability of 26 mgd. The Metropolitan Sanitary District of Greater Chicago policy toward nitrification at future full-scale plants has not yet been decided. (Prague-FIRL)
W75-11742

**A SURVEY OF THE TOKYO METROPOLITAN SHIN-KASHI TREATMENT PLANT, (TOKYO-TO SHINKASHI SHORIJO NO GAIYO),**
T. Nagahama.
Gesuido Kyokai-shi, (Jour Japan Assn of Sewage Works), Vol 11, No 125, p 67-75, 1974.

Descriptors: *Waste water treatment, *Sewage treatment, *Industrial wastes, Municipal wastes, Precipitation(Chemical), Facilities.
Identifiers: *Tokyo(Japan).

The Tokyo Shin-Kashi sewage treatment plant, an advanced and final stage treatment plant which is needed to keep the water quality to a pH between 5.8 to 8.6, to below 20 mg/liter for BOD, and to below 70 mg/liter for SS, is described. The plant treats both municipal waste water and treated industrial waste water which have flowed into the plant through separate drainages. The total input of water to the plant is 380,000 cu m/day and is expected to increase to 940,000 cu m/day with the completion of other drainages now under construction. The industrial waste water is pre-treated separately from the municipal waste water. A pH adjustment, additional aeration treatment, and chemical precipitation treatment are given to the industrial water before mixing it with municipal waste water at a pre-aeration tank. The mixed waste water is fed into a primary precipitation pond, then an aeration tank, a final-precipitation pond, and a chloride mixing tank. The purification efficiency of waste water in this plant is much higher than those plants treating the mixture of both municipal and industrial water without industrial water pre-treatment. Both operational and dimensional details of individual treatment facilities are presented. (Katayama-FIRL)
W75-11743

**DIMENSIONING AND DESIGN OF SMALL WASTE WATER PUMPING STATIONS (BEMESSUNG UND GESTALTUNG VON KLEIN-ABWASSERPUMPWERKEN),**
For primary bibliographic entry see Field 8C.
W75-11744

**THE INFLUENCE OF TEMPERATURE ON THE BIOLOGICAL OXIDATION OF URBAN WASTE WATERS BY MEANS OF AN ACTIVATED SLUDGE (INFLUENZA DELLA TEMPERATURE NELLA OSSIDAZION BIOLOGICA DEI LIQUAMI URBANI MEDIANTE FANGHI ATTIVI),**
M. Bolla, and G. Dini.
Rassegna Chimica, Vol 26, No 3, p 155-158, May/June, 1974. 2 fig.

Descriptors: *Waste water treatment, *Activated sludge, *Water temperature, *Biological treatment, Organic matter, Municipal water, Biochemical oxygen demand, Nitrification, Municipal waste, *Oxidation.

The influence of temperature, activated sludge concentration, and retention time on the biological oxidation of organic matter in urban waste water was studied. The BOD5 values decreased with increasing temperature in the temperature range of 10 to 20 C. The rate of nitrification was a function of the temperature, the hold time, and the activated sludge concentration. At an activated sludge concentration of 4700 to 6000 ppm, a retention time of 3 to 4 hours was required at 18 C. At an activated sludge concentration greater than 6000 ppm, the reaction time must be 4 hours and the temperature 15 C. With the activated sludge concentration under 6000 ppm, the reaction time must be increased accordingly. Diagrams for the determination and coordination of the activated sludge concentration, temperature, and retention time for a given residual BOD value or ammonium nitrogen content are presented. (Takacs-FIRL)
W75-11745

**PHOSPHATE PRECIPITATION IN ACTIVATED SLUDGE PLANTS WITH SLUDGE STABILIZATION AND DENTRIFICATION (PHOSPATFAELLUNG IN BELEBUNGSANLAGEN MIT SCHLAMMSTABILISATION UND DENITRIFIKATIONSSTUFE),**
K. H. Kienzle.
Vom Wasser, Vol 42, p 329-369, 1974. 16 fig, 9 tab, 14 ref.

Descriptors: *Activated sludge, *Waste water treatment, Phosphates, Nitrogen, Alum, Efficiency, Precipitation(Chemical), Biochemical oxygen demand, Facilities, *Denitrification, Oxidation.

Activated sludge plants with sludge stabilization were studied both in laboratory scale plants and in a full scale oxidation ditch. The study investigated the influence of precipitation of phosphate on both the purification effect and the nitrogen elimination efficiency. Phosphate elimination due to adding ferrous (III) chloride was not sufficient. The precipitant caused a lowered pH value in the plants and negatively influenced the activated sludge. Thus, the purification efficiency of the plants decreased, particularly regarding BOD5 degradation and nitrogen elimination. With alum precipitation, the efficiency was over 90% with effluent concentrations of less than one mg total phosphorus per liter. In this case BOD5 and nitrogen elimination were not negatively influenced. A low nutrient content in the effluent of activated sludge plants with sludge stabilization and a pre-step denitrification may be obtained by the simultaneous addition of aluminum for phosphate precipitation. (Prague-FIRL)
W75-11746

**EXPERIENCE OF THE RUHRVERBAND WITH THE TREATMENT OF SEWAGE SLUDGE (ERFAHRUNGEN DES RUHRVERBANDES BEI DER KLAERSCHLAMMBEHANDLUNG),**
R. Imhoff.
Gas-und Wasserfach-Wasser/Abwasser, Vol 116, No 5, p 216-221, May, 1975. 6 fig, 3 tab, 6 ref.

Descriptors: *Sewage treatment, *Sludge disposal, Waste treatment, *Waste water treatment, Waste disposal, Dewatering, Aerobic treatment, Sludge treatment, Activated sludge, Stabilization, *Treatment facilities.
Identifiers: Composting, Ashing, Germany.

Sewage sludges must be stabilized prior to disposal. This can be achieved by rotting, aerobic stabilization, composting, or ashing. The Ruhrverband in the Federal Republic of Germany operates 115 small water purification plants; on the average only 33,000 residents are served per plant. For these systems, primarily digestion tanks are used. Nine plants with population equivalents of less than 10,00 are operated according to the activated sludge method with aerobic sludge stabilization. The first plant in that area using sludge ashing preceding dewatering was recently put into operation. It serves a population of 300,000. Since natural sludge disposal will increasingly become more difficult for larger plants serving a population of 300,000 to 500,000 four more sludge ashing plants will go into operation shortly. Since sludge incineration is two or three times as expensive as digestion tanks, incinerators for this purpose will be built only if no other method can be applied. (Nave-FIRL)
W75-11747

**PLANNING AND CONSTRUCTION OF SLUDGE TREATMENT PLANTS (PLANUNG UND BAU VON SCHLAMMBEHANDLUNGSANLAGEN),**
W. Vater.
Technische Mitteilungen, Vol 68, No 5, p 181-18
May, 1975. 6 fig, 36 ref.

Descriptors: *Sludge treatment, *Waste disposal, *Sludge disposal, Legislation, *Waste water treatment, Water reuse, Incineration, Stabilization, Construction, Planning, *Treatment facilities.
Identifiers: Germany, Composting.

Treatment of sludge from communal waste water is planned to either convert the sludge into a useful form such as fertilizer or to complete hazard-free disposal. At the planning stage of such facilities the Federal Waste Disposal Act (Germany), the Water Act and the Technical Directives for the Conservation of Clean Air (TA-Luft) must be taken into consideration. The advice of specialists is recommended. Any recycling or disposal of sewage sludges must be preceded by a stabilization process such as aerobic, anaerobic, aerobic-thermophilic stabilization, or by pasteurization, irradiation, or composting. Existing sludge disposal methods including composting, thermal drying and incineration are reviewed. (Nave-FIRL)

75-11748

**)MPOSTING PLANT FOR REFUSE-SEWAGE UDGE IN THE DISTRICT OF GROSS-GERAU**

**MUELL-KLAERSCHLAMM-KOMPOSTI'M NLAGE FUER DEN KREIS GROSS-GERAU),**
Kurney.
fbereitungs-Technik, Vol 16, No 5, p 219-225, ıy, 1975. 7 fig, 2 ref.

scriptors: *Sewage treatment, *Waste water atment, Biological treatment, Solid wastes, croorganisms, Odors, Aeration, Organic com-unds, Automation, *Treatment facilities.
ntifiers: Composting, Vacuum-pressure, tting process, Germany.

composting plant for a mixture of refuse and vage was designed. The facility is automated l incorporates transport systems which meet vironmental protection requirements. Biological atment is accomplished with the vacuum-pres-e impulse method. Material is heaped onto a ating plate and a vacuum is produced in the ove so that air is drawn through the sh/sewage sludge mixture, yielding a high per-ıtage of oxygen to the microorganisms. Odors carried to a compost filter where odorous sub-nces adhere to the filter material and are omposed by microorganisms. Waste gases ving the compost filter are free of unwanted rs. Through the supply of oxygen, mesophile later thermophile bacteria develop, raising the perature within three days to about 60 or 70 C. s temperature can be maintained through aera-ı until all organically decomposable substances used up; end products are sifted and either d in agriculture or dumped. (Nave-FIRL)
5-11749

**STEURIZATION OF SAPROPEL STEURISIERUNG VON FAULSCHLAMM),**
. Soerensen.
-und Wasserfach-Wasser/Abwasser, Vol 116, 5, p 222-224, May, 1975. 1 fig, 2 tab, 2 ref.

criptors: *Sludge treatment, *Waste water tment, *Aerobic treatment, *Anaerobic treat-t, Chemical oxygen demand, Bacteria, E. coli. ntifiers: *Pasteurization, *Sapropel.

eurization experiments with sludge remaining n waste water purification were carried out in al heat exchangers. Pasteurization for five utes at 80 C eliminated all salmonellae and the cator bacterium Escherichia coli. A determina-of the total germ number at 37C under aerobic anaerobic conditions revealed no relationship veen the intensity of the pasteurization effect the pasteurization temperature. This may be ained by the varying content of bacterial es in the digested sludge . In the experiments, duction in the germ number from 65 to 85 per-has been achieved. The increase of the COD he sludge water doubled at pasteurization veen 75 and 85 C and rose to nine-fold at eurization temperatures between 90 and 95 C. steam consumption of the experiments was 47 team/cu m sludge at a throughput of 15 cu m ge/hr. (Nave-FIRL)
-11750

**MESTIC SEWAGE TREATMENT BY UN-DRAINED FILTER SYSTEMS,**
rio Ministry of the Environment, Toronto. ution Control Branch.
. Chowdhry.
ication No 53, December, 1974. 93 p, 37 tab, f, 3 append.

criptors: *Waste water treatment, *Filtration, tic tanks, Tile drains, Phosphorus, Ammonia, hemical oxygen demand, Suspended solids, rms, *Sewage treatment, *Filters.

Identifiers: Underdrained sand filters, Red mud.

Tests conducted for 3 1/2 years demonstrated the effectiveness of underdrained sand filters as alternatives to conventional tile fields for treating septic tank effluent. The commonly available sands from gravel pits used as the filter media ranged from 0.15 mm to 2.50 mm effective size and 1.0 to 4.5 uniformity coefficient. The filter beds produced effluents with BOD5 equal to or less than 7.8 mg/liter and suspended solids equal to or less than 4.6 mg/liter. The efficiency of treatment was 96.5%. Phosphorus removal by the filter media without chemical additives was 26.3-36.2%. The filter bed containing red mud, a by-product of Bauxite purification containing oxides of calcium, aluminum, and iron, removed 72.5-88.9% of the phosphorus. A period of six months was required for the stabilization of nitrogeneous compounds and the satisfactory reduction in free ammonia. Fecal coliforms were not totally removed but were considerably reduced when compared to septic tank effluent. (Orr-FIRL)
W75-11751

**AN INTEGRATED POWER PROCESS MODEL OF WATER USE AND WASTE WATER TREATMENT IN CHLOR-ALKALI PRODUCTION,**
Houston Univ., Tex. Dept. of Quantitative Management Science.
F. D. Singleton, Jr., J. A. Calloway, and R. G. Thompson.
Water Resources Research, Vol 11, No 4, p 515-525, August 1975. 11 fig, 4 tab, 22 ref.

Descriptors: *Water pollution control, *Standards, *Effluents, *Waste water treatment, *Linear programming, Economics, *Evaluation, Chemical industry, Chlorine, Alkalis(Bases), Effects, Costs, Treatment facilities, Optimization, Design, Solid wastes, Waste disposal, Technology, Water policy, Marginal costs, *Water utilization, Operations research, Mathematical models, Equations, *Waste water treatment.
Identifiers: Water withdrawal, Cost minimization, Power process model.

Described is an economic evaluation of the effects of increasingly restrictive waste water effluent standards and higher costs of water withdrawals on resource use, solid waste discharges, production costs, effluent taxes, and water use in chlorine and caustic production. A large-capacity diaphragm cell process, a small mercury process, and a combination of these production methods (for plant expansion) are studied for large modern plants at the design stage. A linear programming model provides an analytical description of a chlor-alkali plant at the design stage and determines the least -cost combination of processes. Model solution (1) identifies an optimal process configuration consisting of the production facility, waste treatment plant, and process energy system which satisfies all constraints and resource limitations pertinent to the problem, (2) gives minimum-cost levels of operation for each production and treatment process, (3) indicates the marginal costs of any resource or effluent restrictions, and (4) gives the total optimal cost of chlor-alkali production, water use, and waste water treatment. The model describes the three alternative methods for producing chlor-alkali products. According to results, zero discharges of total solids in diaphragm cell plants increased production costs 5.6%; zero discharges of total solids in mercury cell plants increased production cost 12.1%. Zero-discharge restrictions of mercury may only be accomplished by use of diaphragm cells. Similar results were obtained for assumed Houston and Saginaw locations. (Bell-Cornell)
W75-11765

**ON TAXATION AND FIRMS CHOICE OF WASTE WATER TREATMENT TECHNOLOGY,**
Technical Univ. of Denmark, Lyngby.
For primary bibliographic entry see Field 5G.
W75-11767

**WATER RESOURCES PLANNING IN URBAN AREAS,**
Office of the Chief of Engineers (Army), Washington, D.C. Urban Studies Branch.
R. L. Fulton.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 101, No HY9, Proceedings paper No. 11571, p 1249-1255, September 1975. 1 ref.

Descriptors: *Water resources, *Planning, *Water pollution, *Sewage treatment, Legislation, State jurisdiction, Federal jurisdiction, Alternative planning, Projects, *Waste water treatment.
Identifiers: *Urban areas.

Congress authorized the U.S. Army Corps of Engineers to initiate an Urban Studies Program late in fiscal year 1972. This program provides a planning service conducted in coordination with local and state officials to address water resources problems in urban areas. The objective is to formulate alternative plans for solving the water resource problems which will aid in the solving of other urban problems. These studies, which take three to four years to complete, provide a General planning service with strong public involvement and participation by state and local interests and other Federal agencies. Traditional Corps projects resulting from the plans will be recommended to Congress for construction; wastewater treatment components will meet appropriate requirements of the Federal Water Pollution Control Act of 1972 and be utilized by local interests in applying for construction grants administered by the EPA. (Bell-Cornell)
W75-11769

**A DESIGN AND ECONOMIC EVALUATION OF WET-AIR AND CATALYTIC OXIDATION OF SEWAGE SLUDGE,**
Delaware Univ., Newark. Dept. of Chemical Engineering.
A. G. Fishbeck.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-235 266, $4.25 in paper copy, $2.25 in microfiche. May 1974. 54 p, 16 fig, 6 tab, 19 ref, append. OWRT A-014-DEL(9).

Descriptors: *Sludge treatment, *Sludge disposal, Activated sludge, Organic wastes, Yeast, Kinetics, Costs, *Oxidation.
Identifiers: *Wet air catalytic oxidation, Solubilization kinetics.

A modification of the wet air oxidation process developed by Zimpro Incorporated is proposed. The wet air oxidation reactor is redesigned to solubilize 99% of the organic solids at a lower pressure and temperature. The resulting organic rich solution will then be passed through a heterogeneous catalytic reactor in which the organic compounds will be completely oxidized. The experimental determination of solubilization kinetics for sludge solids was performed using yeast as the sludge model because of its similarity to sludge and ease of handling. The solubilization of yeast was found to involve both rapid oxidation and slower hydrolysis reactions which followed first order kinetics in solids concentration. The rate became oxygen mass-transfer limited after the oxygen initially dissolved in the solution was consumed. The wet air catalytic oxidation process was economically similar to a typical wet air oxidation process, $4.10/ton solids processed and $3.87/ton, respectively. The wet air catalytic process achieves 99% removal of total organic carbon while the wet air oxidation process achieves only 60-70% removal and requires more severe conditions. The final products of a wet air catalytic oxidation of sludge are sanitary, easily disposed of, do not require recycle, and are essentially pollution free. Future experiments in solubilization kinetics should be performed using activated sludge instead of yeast as the solid. (Orr-FIRL)
W75-11784

**THICKENING OF UNWANTED SPENT LIME REJECTS,**
D. R. Christensen, and R. W. Prettyman.
Water and Sewage Works, Vol 122, No 5, p 102-104, May, 1975. 6 fig, 2 tab, 3 ref.

Descriptors: *Waste water treatment, *Centrifugation, *Lime, *Sludge treatment, Dewatering, Design criteria, Treatment facilities, Maryland.
Identifiers: *Sludge thickening, Montgomery County(Md).

The Montgomery County Regional advanced waste treatment plant in Maryland is planning to treat its lime sludge by separating the unwanted materials (rejects) from the spent lime by centrifugation. The spent lime can be reused following recalcination. The rejects will be further settled in gravity thickeners before being pumped to dewatering equipment prior to final disposal. An investigation was conducted to obtain design data for the gravity thickening units. The tests were conducted with rejects from a centrifuge at the South Lake Tahoe advanced waste treatment plant in California. Rejects from the centrifuge are expected to enter the thickeners at 3% solids. A 24 hr detention time in a 6 ft depth at 4% solids should result in a solids loading rate of 15 lb/sf/day. Two 90 ft diameter rejects thickeners with a 10 ft side water depth are the preliminary design recommendations. This design will produce solids loading at a maximum flow of 16 lb/sf/day. (Orr-FIRL)
W75-11848

**THE INFLUENCE OF PARTICLE SIZE ON OXIDATION OF TOTAL, SOLUBLE, AND PARTICULATE MUNICIPAL WASTEWATER COMPONENTS BY OZONE,**
Southern Methodist Univ., Dallas, Tex.
J. J. McCarthy.
Available from University Microfilms Inc., Ann Arbor, Mich., 48106, Order No 75-11,452. PhD Thesis, 1974. 153 p.

Descriptors: *Waste water treatment, *Ozone, *Oxidation, *Municipal wastes, Solids, Oxygen demand.
Identifiers: Waste water fraction, Particulate matter.

Experimental data using ozone as a waste water treatment oxidizing agent are presented. Municipal waste water containing varying sizes of solids was ozonated in a quiescent settling column and an ozone contact chamber. The effect of ozone oxidation on particular waste water parameters was measured. Samples were separated into soluble and particulate fractions and the effects of ozone on each fraction were analyzed. Ozone tended to oxidize the particulate more than the soluble waste water fraction. The oxidation of the soluble waste water fraction is dependent upon the solids content of the waste water. With respect to waste water solids content and ozone consumption, the limitations of ozone in removing organic carbon, in acting as a disinfectant, and in satisfying oxygen demand were demonstrated. Solid particle size and distribution with increased settling time and ozone consumption were also discussed. (Prague-FIRL)
W75-11850

## 5E. Ultimate Disposal Of Wastes

**LAND SPREADING EFFLUENT FROM A SECONDARY FACILITY,**
General Electric Co., St. Petersburg, Fla. Environmental Health Div.
For primary bibliographic entry see Field 5D.
W75-11365

**TREATMENT AND DISPOSAL OF ANODIZING EFFLUENTS, PART I,**
Grand Sheet Metal Products Co., Melrose Park, Ill. Croname Div.
For primary bibliographic entry see Field 5D.
W75-11377

**TREATMENT AND DISPOSAL OF ANODIZING EFFLUENTS, PART II,**
Grand Sheet Metal Products Co., Melrose Park, Ill. Cronome Div.
For primary bibliographic entry see Field 5D.
W75-11378

**VACUUM SYSTEM FOR SEWAGE DISCHARGE IN KREMPEL (DISTRICT OF DITHMARSCHEN)-EXPERIENCE WITH A NEW KIND OF SEWERAGE (VAKUUMENTWAESSERUNG KREMPEL/DITHMARSCHEN- ERFAHRUNGSBERICHT UEBER EINE NEUARTIGE KANALISATION),**
For primary bibliographic entry see Field 5D.
W75-11383

**ENVIRONMENTAL CONSTRAINTS CHALLENGE DESIGNERS OF SHORELINE COMMUNITY NEAR KANSAS CITY, MISSOURI,**
Larkin and Associates, Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W75-11392

**PROPOSED STANDARDS: LAND DISPOSAL OF EFFLUENTS,**
University of South Florida, Tampa. Dept. of Biology.
For primary bibliographic entry see Field 5D.
W75-11400

**FINAL DISPOSAL OF MUNICIPAL SLUDGE IN SWEDEN,**
National Swedish Environment Protection Board, Stockholm. Research Lab.
V. Tullander.
Journal Water Pollution Control Federation, Vol 47, No 4, p 688-695, April, 1975. 2 fig, 1 tab, 1 ref.

Descriptors: *Legislation, *Ultimate disposal, Municipal wastes, Waste disposal, Treatment facilities, Waste water treatment, Sludge disposal, Landfills, Storage, Fertilizers.
Identifiers: *Sweden, *Sludge handling, Agricultural disposal.

A summary is presented of the most recent legislation from the National Swedish Environmental Protection Board on final disposal of municipal sludge in that country. The responsibility for municipal sludge disposal is seen as resting with the individual waste water treatment plant manager. Sludge handling for final disposal is dependent upon the sludge quality, preliminary treatment, and available local disposal methods. The types of disposal recommended are deposition either at sludge disposal sites or at landfill, or deposition for soil enrichment and agricultural use. Methods such as drying, incineration, or composting, are considered to intermediate rather than ultimate disposal steps. Choice of storage site should be based on the assessment of ground conditions. Factors to be considered in developing a disposal system include the diversion of rain and surface water, the building of dike walls around the disposal site, the collection and disposal of sludge runoff, and the continued inspection of sites, with appropriate safety measures to be taken. Sludge for agricultural use may require a short term, intermediate storage site, which should be located where no leaching and subsequent pollution of local water supplies might occur. Digested sludge as a fertilizer must meet Swedish standards such as metal content and must be continuously controlled as to effluent quality and frequency of application. (Prague-FIRL)
W75-11403

**BREAKTHROUGH IN SEWAGE TREATMENT--CASH, LAND, AND ENERGY SAVED.**
For primary bibliographic entry see Field 5D.
W75-11413

**A CASE OF SUBTERRANEAN WATER POLLUTION CAUSED BY THE PUBLIC REFUSE DISPOSAL GROUND, (IN JAPANESE),**
Obihiro Zootechnical Univ. (Japan). Dept. of Veterinary and Public Health.
For primary bibliographic entry see Field 5B.
W75-11432

**INCINERATOR DEVICE AND A METHOD OF PROCESSING RESIDUALS IN WASTE WATER, LIQUEFIED SEWAGE AND SLUDGE,**
Klein (Albert) KG, Niederfischbach (West Germany). (assignee).
For primary bibliographic entry see Field 5D.
W75-11440

**SEWAGE DISPOSAL SYSTEM,**
Babcock and Wilcox Co., New York. (assignee).
For primary bibliographic entry see Field 5D.
W75-11511

**SEWAGE AND GARBAGE DISPOSAL.**
For primary bibliographic entry see Field 5D.
W75-11514

**DEVICE AND METHOD FOR CONDUCTING WASTE LIQUID FROM A RECEPTACLE TO A PNEUMATIC LIQUID DISPOSAL SYSTEM,**
For primary bibliographic entry see Field 5D.
W75-11519

**SEWAGE DISPOSAL PROCESS,**
For primary bibliographic entry see Field 5D.
W75-11522

**DISPOSAL OF SANDY PIPELINE DREDGE SPOILS BY END DUMPING,**
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W75-11566

**SUBSURFACE WASTE INJECTION IN THE UNITED STATES: FIFTEEN CASE HISTORIES,**
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 5D.
W75-11627

**A TOPOGRAPHIC-HYDROGEOLOGIC MODEL FOR SOLID WASTE LANDFILL SITING,**
Iowa State Univ., Ames. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W75-11644

**OUTLINE OF TAGAWA SEWAGE PLANT I UTSUNOMIYA CITY, (IN JAPANESE),**
For primary bibliographic entry see Field 5D.
W75-11686

**ENERGY-WASTEWATER TREATMENT AN SOLIDS DISPOSAL,**
Playa Del Rey, Calif. Hyperion Treatment Plant.
For primary bibliographic entry see Field 5D.
W75-11697

**RECYCLING OF INCINERATOR ASH,**
For primary bibliographic entry see Field 5D.
W75-11714

SLUDGE HANDLING AND DISPOSAL SEMINAR, CONFERENCE PROCEEDINGS NO. 2.
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
For primary bibliographic entry see Field 5D.
W75-11715

OVERVIEW OF CANADIAN SLUDGE HANDLING AND LAND DISPOSAL PRACTICES AND RESEARCH,
Ontario Ministry of the Environment, Toronto.
For primary bibliographic entry see Field 5D.
W75-11716

SLUDGE HANDLING AND DISPOSAL PRACTICES IN ENGLAND,
Agricultural Development Advisory Service, Leeds (England).
For primary bibliographic entry see Field 5D.
W75-11717

DISPOSAL OF CHEMICAL SEWAGE SLUDGES ON LAND AND THEIR EFFECTS ON PLANTS, LEACHATE AND SOIL SYSTEMS,
Environmental Protection Service, Burlington (Ontario). Waste Water Technology Center.
P. K. Chawla, D. N. Bryant, and D. Liu.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 207-233, (1974). 8 fig, 1 tab, 14 ref.

Descriptors: *Sewage sludge, *Environmental effects, Land, Soils, Fertilizers, Plant growth, Leachate, Nitrogen, Phosphorus, Potassium, Nickel, Copper, Zinc, Aluminum, Groundwater, Canada, *Sludge disposal, *Waste disposal.
Identifiers: Sludge-soil-plant system, Petroleum hydrocarbons.

In 1972 an extensive lysimeter study was undertaken at the Wastewater Technology Centre, Burlington, Ontario, to determine the long-term environmental effects of chemical sewage sludges on land. The soils were silt loam and loamy sand. The sludges were anaerobic digested lime treated sludge, and ferric chloride treated sludge. A commercial fertilizer was also used. Plants and leachates were collected and analyzed. The rate of sludge application determined the yield of the dry matter. With a high rate of iron and lime sludges on loamy sand, the yields were comparable to fertilizer. On silt loam the yields were higher than with the fertilizer addition. On both soils, alum sludge gave lower yields than iron sludge, lime sludge, or fertilizer. Plant growth retardation could occur from the low potassium, high zinc and aluminum content of the alum sludge. High concentrations of petroluem hydrocarbons in the alum sludge also caused some plant toxicity. The nitrogen, phosphorus, potassium, nickel, copper, and zinc concentrations in the plants related to the amount of sludge applied. The nitrogen level in the leachate did not pose a potential hazard to groundwater. During the one-year study period no apparent chemical changes in the soil were observed. (See also W75-11715) (Dean-FIRL)
W75-11721

DESIGN INFORMATION ON DEWATERING PROPERTIES OF WASTEWATER SLUDGES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-11722

ASPECTS OF INCINERATING CHEMICAL SLUDGES,
Environmental Protection Service, Burlington (Ontario). Waste Water Technology Center.
For primary bibliographic entry see Field 5D.
W75-11728

SLUDGE HANDLING AND DISPOSAL PRACTICES IN THE REGIONAL MUNICIPALITY OF NIAGARA,
Regional Municipality of Niagara, Niagara Falls (Ontario). Public Works Dept.
For primary bibliographic entry see Field 5D.
W75-11730

SLUDGE HANDLING AND DISPOSAL PRACTICES IN METROPOLITAN TORONTO,
For primary bibliographic entry see Field 5D.
W75-11731

TREATMENT AND DISPOSAL OF SLUDGE FROM MUNICIPAL WASTEWATER PLANTS IN THE UNITED STATES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-11735

EXPERIENCES WITH SLUDGE HANDLING IN TEXAS,
Texas Water Quality Board, Austin.
For primary bibliographic entry see Field 5D.
W75-11736

SLUDGES GENERATED IN PHOSPHATE REMOVAL PROCESSES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-11737

EPA EXPERIENCES IN OXYGEN-ACTIVATED SLUDGE,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-11738

EXPERIENCE OF THE RUHRVERBAND WITH THE TREATMENT OF SEWAGE SLUDGE (ERFAHRUNGEN DES RUHRVERBANDES BEI DER KLAERSCHLAMMBEHANDLUNG),
For primary bibliographic entry see Field 5D.
W75-11747

PLANNING AND CONSTRUCTION OF SLUDGE TREATMENT PLANTS (PLANUNG UND BAU VON SCHLAMMBEHANDLUNGSANLAGEN),
For primary bibliographic entry see Field 5D.
W75-11748

A DESIGN AND ECONOMIC EVALUATION OF WET-AIR AND CATALYTIC OXIDATION OF SEWAGE SLUDGE,
Delaware Univ., Newark. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W75-11784

## 5F. Water Treatment and Quality Alteration

GREEN SYSTEMS FOR WASTEWATER TREATMENT.
For primary bibliographic entry see Field 5D.
W75-11401

FIELD EXPERIENCE IN DISINFECTING WATER MAINS (IN RUSSIAN),
N. A. Zaznobova, and V. D. Nemchinov.
Gig Sanit. 5. p 97-98, 1974.

Descriptors: Water supply, Water quality, Water quality standards, *Water quality control, Chlorination, Water resources development, Water treatment.
Identifiers: Perm District, *USSR(RSFSR).

Measures taken in the city of Usol'e in the Perm district of the Russian SFSR (USSR) to improve the water quality in the old part of the city are described. The water did not meet the sanitary standards with respect to bacteriological indices. Intensified monitoring of the quality of water in the water mains, flushing the mains and subsequent chlorination had a favorable effect. The sanitary service of the city has made recommendations to improve the maintenance and operation of the city's water mains.--Copyright 1975, Biological Abstracts, Inc.
W75-11411

SANITARY AND HYGIENIC EVALUATION OF SEEPAGE WATERS OF STRUCTURES PROTECTING RESERVOIRS (IN RUSSIAN),
Gorkovskii Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 5B.
W75-11412

WATER PROCESSING PLANT TO CONTROLLED ACIDITY LEVEL,
K. G. Zeidel.
U.S.S.R. Patent SU 420569. Issued March 25, 1975. Derwent Soviet Patents Report, Vol W, No 7, p 1, March 1975. 1 fig.

Descriptors: *Acidity, *Patents, *Water treatment, *Treatment facilities, *Control, Equipment, Measurement, Pipelines, Design, Waste water treatment.
Identifiers: *Water processing plant.

A water processing plant to control acidity level which utilizes the addition of a reagent maintaining the pH difference between treated and untreated water was patented. This water treatment plant consists of a bifurcated pipeline, in which a branch is adapted for injection of acid from a tank through its corresponding needle valve. Alkalinity and acidity of water in two branches are measured by detectors, connected to an electronic regulator and programmer. Signals are applied to a reversible regulator, acting through a servomotor on a valve. The design provides a stable value of the residual alkalinity of water in the outlet pipe. (Prague-FIRL)
W75-11421

APPARATUS FOR CLEANING LOOSE FILTERING MATERIAL IN SLOW WATER FILLED WATER SUPPLY FILTERS,
B. F. Volokh.
Canadian Patent 957, 288. Issued November 5, 1974. Patent Office Record, Vol 102, No 45, p 38, November, 1974.

Descriptors: *Patents, *Filters, *Water supply, Cleaning, Equipment, Filtration, Water treatment, Waste water treatment.
Identifiers: Washing, Filtering material, Water supply filters.

Equipment was patented for cleaning loose filtering material in slow water-filled water supply filters. The apparatus consists of: a washing chamber with an open bottom, placed upon the surface of a layer of filtering material to be cleaned in a water-filled filter; means for moving this washing chamber relative to the filtering material to be cleaned. A suction pipe evacuates dirty water from the washing chamber. The washing tubes and suction pipe are installed within the washing chamber. Means regulate the degree of buoyancy of the washing chamber which is afloat in the filter, by regulating the pressure of the washing chamber upon the surface of the filtering material layer. (Prague-FIRL)
W75-11436

**FLOTATION AERATOR FOR AERATING AND MOVING WATER,**
For primary bibliographic entry see Field 5D.
W75-11439

**BIOLOGICAL AND CHEMICAL PURIFICATION PLANT.**
For primary bibliographic entry see Field 5D.
W75-11660

**THE CONTINUOUS MONITORING OF WATER QUALITY,**
Clyde River Purification Board, Glasgow (Scotland).
For primary bibliographic entry see Field 5A.
W75-11667

**BALANCING RESERVOIR--A KEY ELEMENT IN WATER SUPPLY PLAN,**
Freese and Nichols, Fort Worth, Tex.
For primary bibliographic entry see Field 4A.
W75-11687

**IRON AND MANGANESE REMOVAL WITH OZONE, PART I,**
R. R. Furgason, and R. O. Day.
Water and Sewage Works, Vol 122, No 6, p 42, 45-47, June, 1975. 2 fig.

Descriptors: *Water treatment, *Ozone, Potable water, *Iron, *Manganese, Ion exchange, Filtration, Idaho, *Oxidation.
Identifiers: Sequestering, Chemical oxidation, Gravity filtration, Pressure filtration, Contact filtration, Manganese greensand, Moscow(Ida).

A water treatment demonstration program performed in the Moscow, Idaho, municipal water system showed that ozone can be used to effectively and economically oxidize iron and manganese to an insoluble form that can be removed by filtration. The water supply of Moscow is supplemented at times of peak demand by several wells containing water with a high iron and manganese content. The high costs of developing new wells which would provide a higher quality water have prompted research into methods of iron and manganese removal. In addition to the tests on ozone treatment, ion exchange, sequestering, chemical oxidation and gravity filtration, chemical oxidation and pressure filtration, and contact filtration/manganese greensand processes were examined. Ion exchange was found to be unsatisfactory because of the high operating and maintenance costs and the high sodium residual introduced into the water. Sequestering would be an economical process but has problems connected with its operation such as a chance of exceeding the maximum phosphate level, the heating effect could render the sequestering agent unusable, the need for pH adjustment, and the doubt as to the ability of this method to remove manganese. Gravity filtration is unacceptable because of the high operational and maintenance costs and also the danger of high sodium residual levels. Pressure filtration is an economical and effective way to remove iron but to also remove manganese significantly increases the cost of this method. The costs of contact filtration substantially exceed those of pressure filtration, but this process will remove the manganese along with the iron. (Orr-FIRL)
W75-11693

**INNOVATIVE WATER PLANT SLATED FOR NEW JERSEY,**
Havens and Emerson Ltd., East Paterson, N.J.
P. W. Doe, and W. R. Inhoffer.
Water and Wastes Engineering, Vol 12, No 4, p 30-32, 66, April, 1975. 1 fig.

Descriptors: *Treatment facilities, *Water treatment, *Waste water treatment, Sludge disposal, Planning, Investigations, Automation, Dewatering, *New Jersey
Identifiers: Passaic Valley(NJ), Filter backwash water, Alum sludge.

The Passaic Valley Water Commission's major treatment plant is located at Little Falls, New Jersey on the Passaic River and serves Paterson, Passaic, Clifton and eleven other north New Jersey communities. Improvements taking place at this plant will provide an innovative water treatment project which is one of the first in the country to include a comprehensive filter backwash water and alum sludge disposal scheme. These improvements are expected to be completed in the near future. Extensive investigation both on-site and in the laboratory into dewatering, off-site disposal, and on-site disposal went into the plans for this project. Four pumping stations, a chemical dosing system, a backwash water settling tank, a sludge thickening complex, and a sludge press house will make up the backwash water and sludge disposal facilities. Overflows have been provide in case of emergency. Some phases of the process will be completely automated. (DEAN-FIRL)
W75-11696

**SEA WATER SOFTENING WITH THE LIME-MAGNESIUM CARBONATE (LMC) PROCESS,**
Burns and Roe Construction Corp., Fountain Valley, Calif.
J. D. Mavis, and A. Checkovich.
Industrial and Engineering Chemistry, Process Design and Development, Vol 14, No 3, p 204-209, 1975. 4 fig, 3 tab, 10 ref.

Descriptors: *Sea water, *Water softening, Pilot plants, Distillation, Desalination, Evaporators, Lime, Water treatment, Magnesium carbonate.
Identifiers: *Lime-magnesium carbonate process, Calcining, Magnesium hydroxide production, Magnesium hydroxide carbination.

A pilot plant to remove 70% of the calcium from sea water using the lime-magnesium carbonate (LMC) process was tested and improved. The advantages of the LMC process are that it does not depend on the sale of byproducts for its economic use, and all materials produced in the process are recycled for use in some other part of the process. Nominal chemical makeup is required. The two feedstocks required are limestone and fuel oil - all other materials in the process are derived from these. The four basic operations involved are softening, calcining, magnesium hydroxide production, and magnesium hydroxide carbonation. A prototype LMC plant was operated at the San Diego Test Facility by the Office of Saline Water, Department of the Interior. The utility of the LMC process as a pre-treatment for high temperature distillation desalting plants was demonstrated. The Test Facility experiments confirmed that an evaporator can be operated at a maximum brine temperature of at least 335 F, and that an LMC plant could be designed to have a high on-stream factor. The LMC pre-treatment is estimated to cost 5.1 cents per 1000 gallons of treated water for a plant sized to supply a 50 mgd desalting plant. The process may be useful with desalting processes using feed water more saline than the oceans. (Murphy-FIRL)
W75-11699

**UPRATING AND REDESIGN OF WATER TREATMENT PLANTS, PART II,**
E. O. LaFontaine.
Water and Sewage Works, Vol 122, No 5, p 96-97, May, 1975. 1 fig.

Descriptors: *Water treatment, *Treatment facilities, *Water supply, Filters, Pumps, Automatic control, Water demand, Pipes, Valves.

Advanced engineering technology can be used to uprate many water plants to provide greatly increased output. Increased output can often be effected through the use of new and better chemicals together with improved operating techniques without the need for physical disruption of the plant or new construction. Pressure filters and gravity filters may be uprated with properly designed pre-treatment facilities and chemical application. Filters may be rebuilt and uprated at a relatively modest cost. When rebuilding filters it may be desirable to replace the filter bottoms or under drain systems. The backwash system generally does not have to be rebuilt to perform satisfactorily with a rebuilt filter if it has performed well in the past. The installation of improved jet wash or air scouring equipment should be considered in an uprating program. Proper automatic control over the application of chemicals, rate of flow, filter operation, pump operation and emergency facilities will improve plant efficiency and insure a higher plant capacity. Uprating a plant will mean an increase in water which in turn may necessitate installation of new pipes, valves, and high lift pumps. A diesel generator set for standby power provides a significant improvement in operational efficiency under emergency conditions. A large clear water storage facility will also increase the capacity by providing the capability for operation under various load conditions. (Orr-FIRL)
W75-11849

## 5G. Water Quality Control

**SEPARATION OF EMULSIFIED OIL FROM WATER,**
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W75-11360

**COUNTY COMBATS URBAN STORM WATER RUNOFF PROBLEMS,**
Mecklenburg County, Engineer's Office, Charlotte, N.C.
E. K. Hoffman.
Public Works, Vol 106, No 5, p 92-93, May, 1975.

Descriptors: *Water management(Applied), *Storm runoff, *Urbanization, Flood control, Flood plains, Streams, Drainage, Storm water, *North Carolina.
Identifiers: Sediment control.

Storm water management is being planned in Mecklenburg County, North Carolina, after a study of the effects of urbanization on storm runoff. It was found that an increase in the amount of runoff caused by urbanized impervious areas, coupled with a reduction in lag time, increases peak discharges up to 2 1/2 times, and causes an increased frequency and extent of downstream flooding. To prevent further encroachment on the existing floodplain, a floodway ordinance was passed, restricting development along any stream with a drainage area of at least one square mile. A five-year drainage capital improvement program has also been developed for stream bank sloping and stabilization and for the control of channel widening. In addition, the planning includes erosion and sediment control to minimize stream degradation. (Prague-FIRL)
W75-11390

**AN EQUITABLE SEWER USE CHARGE SYSTEM,**
Gilbert Associates, Inc., Reading, Pa.
P. A. Podolick.
Public Works, Vol 106, No 5, p 91, 95, 136A, May, 1975. 1 tab.

Descriptors: *Federal Water Pollution Control Act, Costs, Sewers, Treatment facilities, Waste disposal, Biochemical oxygen demand, Suspended solids, *Pollution taxes(Charges).
Identifiers: *Sewer use charges, Sewer rent, Effluent quality, Unit treatment costs.

a result of the Federal Water Pollution Control
t Amendments of 1972, equitable sewer use
arge systems are being developed and imple-
nted. Traditional sewer rentals or charges were
sed on an 'economy of scale', whereby the more
ic feet of waste water a particular user
charged, the less per cubic foot he would pay.
e PL 92-500 guidelines stipulate that all
ipients of Federal funds must pay a base charge
proportion to their contribution to the total
ste water loading of their treatment works. In
ition to the base charge, an industrial waste
charge will be applied to all users who
charge waste water with concentrations of
D, suspended solids, and/or dissolved solids in
ess of those of normal domestic sewage. The
e user charge assumes that domestic users
charge waste water with similar characteristics,
is determined by computing the total opera-
al and maintenance costs for the previous year
dividing this figure by the total volume of
ste water treated that year, to yield a charge in
lars per cubic foot of waste water discharged.
non-domestic wastes, an industrial surcharge
ased on the preliminary determination of actual
t of treatment on a unit cost basis for BOD,
pended solids, and dissolved solids. A formula
quarterly surcharge is then implemented, in-
ving unit treatment costs and waste loadings for
h parameter as applied to an individual system.
formula must be updated each year by deter-
ation of current unit treatment costs. (Prague-
L)
5-11391

**EN WATER PURIFICATION SYSTEM,**
primary bibliographic entry see Field 5D.
5-11419

**GIONAL SEWERING AND GROUNDWATER ALITY IN THE SOUTHERN SAN JOAQUIN LLEY,**
primary bibliographic entry see Field 5D.
5-11446

**THOD FOR COMBATTING POLLUTION NG A CHROMIUM COMPLEX,**
pic, Paris(France). (assignee).
artineau, and F-J. Biechler.
ted States Patent 3,886, 070. Issued May 27,
5. Official Gazette of the United States Patent
ce, Vol 934, No 4, p 1593, May, 1975. 1 fig.

criptors: *Waste water treatment, *Water pol-
n control, *Oil wastes, *Oil-water interfaces,
ents, *Separation techniques, Water pollution
ces, Oil spills, Oil pollution, *Skimming.
tifiers: *Oil-water separation.

ethod for the control of water pollution by oily
lucts has been patented. The method involves
ing a paste of the oily products, which then
s on the surface of the water and is removed
kimming. The first step of the method is the
aration of a product comprising a chromium
plex anchored to solid particles of a metallic
inosilicate. The chromium comples is coor-
ted to an acyclic carboxylic acid having at
seven carbon atoms, by contacting about 5-20
s by weight of solid particles of an aluminosil-
e of less than 100 micron average particle size
one part by weight of an aqueous alcoholic
tion containing from about 20-30% by weight
ne coordinated chromium complex. The mix-
is then heated to dryness at a temperature of
200 C. One to four parts by weight of the dried
luct are distributed over one part by weight of
oily product floating on the surface of the
r. The oily product then forms a paste floating
he surface of the water. The last step is to
ve the paste from the surface of the water by
ming. (Orr-FIRL)
-11506

**EVALUATION OF THE QUALITY OF SURFACE WATER FOR DEVELOPING RECOMMENDATIONS OF NONSPECIFIC PROPHYLAXIS OF INTESTINAL INFECTIONS, (IN RUSSIAN),**
Kuybyshevskii Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny (USSR).
For primary bibliographic entry see Field 5C.
W75-11512

**APPARATUS FOR SEWER TREATMENT TO KILL THREE ROOTS AND OTHER ORGANIC GROWTH THEREWITHIN,**
Airrigation Engineering Co., Inc. Carmel Valley, Calif. (assignee).
F. F. Horne.
United States Patent 3,880,176. Issued April 29, 1975. Official Gazette of the United States Patent Office, Vol 933, No 5, p 2038, April, 1975. 1 fig.

Descriptors: *Patents, *Sewerage, *Pipes, Organic compounds, Phytotoxicity, Liquid wastes, Pressure.

Root-infested sewer pipes may be treated with a newly patented apparatus. Its parts consist of: a sled with a low center of gravity having a bottom skid for engaging only the lower portion of a pipe; means for pulling the sled through a pipe; and, upwardly facing spray means for producing a diffuse and foam-inducing spray. The sled is open at its upper end and the spray means are mounted on the sled so that they can direct spray against the upper walls of the pipe. An aqueous mixture of liquid phytocidal fumigant and surfactant is thus sprayed under pressure to the upper portions of the sewer pipe so that undesired organic growths are eliminated. (Prague-FIRL)
W75-11513

**THE ECOLOGY OF THE CUMBERLAND ISLAND NATIONAL SEASHORE CAMDEN COUNTY, GEORGIA,**
Georgia Univ., Savannah. Marine Extension Center.
For primary bibliographic entry see Field 2L.
W75-11546

**COASTAL ZONE LEGAL REFERENCES (SELECTED) 1975.**
State Univ. of New York, Buffalo. Faculty of Law and Jurisprudence.
For primary bibliographic entry see Field 2L.
W75-11548

**WETLANDS - RELATED LEGISLATION IN THE UNITED STATES,**
Miami Univ., Fla. School of Law.
For primary bibliographic entry see Field 6E.
W75-11550

**LEGAL MEASURES CONCERNING MARINE POLLUTION.**
North Carolina Univ., Chapel Hill. School of Law.
UNC SG 75-04, February 1975. Seymour W. Wurfel (Ed.). 80 p.

Descriptors: *Law of the Sea, *International law, *Water pollution control, Oceans, Chemical wastes, Water pollution, Technology, Water rights, Jurisdiction.
Identifiers: *Marine resources law, Marine environment, Enforcement.

The purpose of this UNC Sea Grant paper is to chronicle new concepts and developments in marine pollution control and progress in marine resources law. The articles herein were researched and written by students of International Law at the University of North Carolina during the 1974 fall semester. (NOAA)
W75-11551

**DISPOSAL OF SANDY PIPELINE DREDGE SPOILS BY END DUMPING,**
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
W. L. Schroeder, and M. R. Pyles.
In: Proceedings, ASCE National Structural Engineering Convention, April 14-18, 1975, New Orleans. Reprint no. ORESU-R-75-004. 18 p, 13 fig, 1 tab, 6 ref.

Descriptors: *Dredging, Excavation, Mathematical models, Channel improvement, Disposal, *Waste disposal.
Identifiers: *Dredge spoiling, *End dumping, Ambient velocity patterns, Induced velocities, Settling velocity, *Pipeline dredge spoils, Channel maintenance, Open water disposal.

It has been shown that it is possible to predict, within limits, the fate of sandy spoils discharged from a pipeline dredge in water. The means of making these predictions is based on a simple representation of the actual physical conditions at the end of the pipeline. More refined predictions are possible if physical conditions can be more completely characterized. In light of the nature of a real spoiling operation, and the possibility of more closely controlling spoil dispersion therefrom, it is unlikely that further refinements are warranted. A model based on settling velocities and average currents in the receiving body, coupled with an empirical representation of the effects of the pipeline jet, appears to be satisfactory. (NOAA)
W75-11566

**AN INVENTORY AND STUDY OF THE VERMILION BAY-ATCHAFALAYA BAY COMPLEX; AREA DESCRIPTION, BIOLOGY, HYDROLOGY AND CHEMISTRY, AND SEDIMENTOLOGY,**
Louisiana Wildlife and Fisheries Commission, New Orleans. Div. of Oysters, Water Bottoms and Seafoods.
For primary bibliographic entry see Field 2L.
W75-11571

**DEVELOPMENT OF SALINITY CONTROL TECHNOLOGY IN GRAND VALLEY,**
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
G. V. Skogerboe, W. R. Walker, R. S. Bennet, and J. H. Taylor.
Presented at the 1974 Annual Meeting of the American Society of Agricultural Engineers, June 23-26, 1974. Stillwater, Oklahoma, Paper No 74-2031. 23 p, 8 fig, 5 ref.

Descriptors: *Saline soils, *Saline water, Salinity, Technology, Irrigation, Agriculture, *Colorado, Irrigation operation and management, Crop production.
Identifiers: *Grand Valley(Colo), *Salinity control.

Research recently undertaken will evaluate the effects of various irrigation water management practices on the chemical quality of subsurface return flows as well as crop yields. The results of this effort will allow predictions of chemical quality in the Colorado River when various salinity control measures are implemented. (Skogerboe-Colorado State)
W75-11585

**THE CASCO BAY OIL SPILL: PROBLEMS OF CLEANUP AND DISPOSAL,**
Environmental Protection Agency, Boston, Mass. Div. of Surveillance and Analysis.
C. L. Eidam, E. V. Fitzpatrick, and J. F. Conlon.
In: 1975 Conference on Prevention and Control of Oil Pollution Proceedings; American Petroleum Institute, EPA, and U.S. Coast Guard; p 217-221, March 1975. 8 fig, 4 ref.

Descriptors: *Oil pollution, Sources, *Oil spills, Treatment, *Methodology, *Sands, *Commercial shellfish, Water quality, Survival, Lobsters, Intertidal areas, Burning, Disposal, Environmental effects, *Maine.
Identifiers: *Seaweeds, *Cleanup techniques, Follow-up studies, Recolonization, Casco Bay(Maine).

The control and cleanup of a 422,000 liter no. 6 fuel oil spill which occurred in Casco Bay, Maine, on July 22, 1972, were discussed. A lack of locally available equipment, transportation, and the disposal of large amounts of oil-soaked debris presented unique problems. The development of priorities for cleanup proved critical because of commercial harvests of shellfish, lobsters, and intertidal seaweed, and recreational interests. The disposal of 7,646m to the 3rd power of oil-soaked seaweed and 3,440 m to the 3rd power of contaminated beach sand was a major obstacle. The damage resulting from the spill and the effectiveness of the cleanup were studied up to one year after the spill. The studies indicated that the cleanup techniques used resulted in more successful survival and/or recolonization of intertidal populations than in areas not cleaned. (Katz)
W75-11615

**REHABILITATING OILED AQUATIC BIRDS,**
International Bird Rescue Research Center, Berkeley, Calif.
D. C. Smith.
In: 1975 Conference on Prevention and Control of Oil Pollution Proceedings; American Petroleum Institute and U.S. Coast Guard; p 241-247, March 1975. 1 tab, 3 append, 84 ref.

Descriptors: *Aquatic animals, *Oil pollution, *Oil spills, *Birds, *Animal physiology, Treatment, Economics, Cleaning, History, Population, Environmental effects, Mortality, Research and development, Detergents.
Identifiers: *Rehabilitation, *Aquatic birds.

In the 1971 San Francisco oil spill, $900.00 was spent per successfully released bird, with 95% of the 4,686 treated birds dying in captivity. Through continuing research and development, those figures are improving. In 1973, the International Bird Rescue Research Center treated 523 oiled birds with a 41% survival rate at a cost of approximately $15 per successfully released bird. The history, population effects, and physiological effects of oil pollution on birds were described, and recommendations were given for treatment. The problems of maintaining aquatic birds in captivity were also discussed. Advance preparations of instructional materials, equipment, and supplies have been made in anticipation of future oiled-bird incidents. Additional research was indicated. (Katz)
W75-11616

**THE STATUS OF OILED WILDLIFE: RESEARCH AND PLANNING,**
American Petroleum Inst., Washington, D.C.
K. G. Hay.
In: 1975 Conference on Prevention and Control of Oil Pollution Proceedings; American Petroleum Institute, EPA and U.S. Coast Guard; p 249-253, March 1975. 23 ref.

Descriptors: *Oil pollution, Aquatic animals, *Oil spills, *Birds, Treatment, *Research and development, *Comprehensive planning, Mortality, Population, Assessments, Cleaning, Environmental effects.
Identifiers: Rehabilitation.

The efforts taken by organizations and individuals in recent years in the United States, Canada and Great Britain to improve the cleaning and rehabilitation of oiled wildlife, especially water fowl, were discussed. Biological problems were assessed. Research results were outlined. (Katz)
W75-11617

**REVISION OF THE REGULATIONS 'PLANNING OF SANITARY PROTECTION ZONES OF A CENTRAL WATER SUPPLY SYSTEM AND WATER SOURCES' (IN RUSSIAN),**
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR)
S. N. Cherkinskii, and N. N. Trakhtman.
Gig Sanit, Vol 38, No 11, p 89-92. 1973.

Descriptors: Potable water, *Water quality control, *Regulation surface waters, Water pollution sources, *Water quality standards, *Water zoning, Water treatment, Bacteria.
Identifiers: Contamination, *USSR

When revising the regulations on the planning of sanitary protection zones, the existing bacterial contamination of surface water sources, the known limitations of water treatment at water works, and the dependence of the end result of water treatment and decontamination on its initial quality must be considered. These factors necessitate the creation of sanitary protection zones of central drinking water systems to limit contamination of the water by bacteria, viruses and organic matter from domestic and industrial sewage. The boundaries of the protection zones of surface water sources should be based on the rate of bacterial self-purification and the climatic zone.--Copyright 1975, Biological Abstracts, Inc
W75-11682

**POLLUTION DETECTION AND RIVER QUALITY MANAGEMENT,**
For primary bibliographic entry see Field 5A.
W75-11753

**ON TAXATION AND FIRMS CHOICE OF WASTE WATER TREATMENT TECHNOLOGY,**
Technical Univ. of Denmark, Lyngby.
M. Bundgaard-Nielsen, and C. L. Hwang.
Water Resources Bulletin, Vol 11, No 4, p 805-810, August 1975. 3 fig, 22 ref.

Descriptors: *Water quality control, *Waste water treatment, Technology, *Taxes, Effluents, *Pollution abatement, Management, Linear programming, Optimization, Economic efficiency, Equations, Systems analysis, *Pollution taxes(Charges).
Identifiers: Environmental quality, Consumer prices, Production costs, Waste discharge, Cost minimization.

In recent years, the use of effluent charges or taxation to abate pollution has been advocated extensively. A major argument in support of the taxation approaches is that they can achieve economic efficiency with minimum information requirements. Byrne and Spiro (1973) have demonstrated that taxation is a necessary condition but not a sufficient one for attainment of an efficient solution under certain circumstances when the firm has at its disposal a number of production processes where low levels of pollution require high capital input and vice versa. This paper extends the work of Byrne and SIRO AND PRESENTS A DISCUSSION of the interaction between the level of taxation and the firms accruing choice of treatment technology. Presented is a linear programming solution for the choice of least-cost waste treatment process. In conclusion, the interaction between available technology and enforcement strategy must be accounted for in order to prevent the use of taxation levels which fail to improve environmental quality yet tend to increase production costs and thus consumer prices. The possible inefficiency of a surcharge to abate pollution is similar to that of the taxation. (Bell-Cornell)
W75-11767

**HYGIENIC EVALUATION OF SPRING CAPPINGS USED ON THE SOUTHERN SHORE OF CRIMEA, (IN RUSSIAN),**
Yalta Sanitary-Epidemiology Station (USSR).
Y. E. Shapiro.
Gig Sanit, Vol 38, No 11, p 99-101. 1973.

Descriptors: *Water quality control, *Spring waters, Water sources, Potable water, Public health.
Identifiers: *Cappings, *USSR(Crimea).

A study of the structures for collecting spring water used on the water mains of Crimea (USSR) showed that hygienic requirements are met only by spring cappings of the Smolskii type which ha upland drainage ditches, puddle trenches of well crumbled and tamped fat clay, a side entrance door and a settling basin serving as the water-collecting chamber. The construction of these cappings helps to preserve the quality of spring water and their proper operation reduces the possibility of water pollution at the site of intake. Copyright 1975, Biological Abstracts, Inc
W75-11793

**ENVIRONMENTAL ASPECTS OF AQUATI PLANT CONTROL,**
Bureau of Reclamation, Denver, Colo. Div. Research.
T. R. Bartley, and E. O. Gangstad
Journal of the Irrigation and Drainage Divisio Proceedings of American Society of Civil E gineers, Vol 100, No IR3, p 231-244, Septembe 1974. 4 fig, 2 tab, 17 ref.

Descriptors: *Aquatic environment, Aquatic lif Aquatic plants, *Aquatic weed control, Aquat weeds, *Herbicides, Environmental effects.

Detailed studies on the environmental aspects aquatic control with aquatic herbicides do n preclude their use when properly selected a properly applied. Residues in the water under t conditions stated, do not preclude the use of th water for irrigation of crop plants or potable use the water. (Skogerboe-Colorado State)
W75-11843

# 6. WATER RESOURCES PLANNING

## 6A. Techniques Of Planning

**PROCEDURE FOR SELECTING A MINIM ENVIRONMENTAL IMPACT ROUTING FO WATER CONVEYANCE CANAL,**
Texas Tech Univ., Lubbock. Dept. of Civil gineering.
For primary bibliographic entry see Field 6G.
W75-11764

**AN INTEGRATED POWER PROCESS MO OF WATER USE AND WASTE WATER TRE MENT IN CHLOR-ALKALI PRODUCTION,**
Houston Univ., Tex. Dept. of Quantita Management Science.
For primary bibliographic entry see Field 5D.
W75-11765

**LAND USE AND ENVIRONMEN PLANNING: AN APPLICATION IN THE SO CAROLINA COASTAL ZONE,**
Battelle-Columbus Labs., Ohio.
For primary bibliographic entry see Field 6G.
W75-11766

**DETERMINING OPTIMAL W DISCHARGE,**
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4B
W75-11768

/ELOPMENT PLANNING OF LAGUNA DE
/--PHILIPPINES,
una Lake Development Authority, Manila
lippines).
primary bibliographic entry see Field 4A.
-11770

)PERATION IN WATER RESOURCES PRO-
AMS: ALASKA'S EXAMPLE,
Regions Research and Engineering Lab.,
banks, Alaska.
primary bibliographic entry see Field 6B.
-11775

NTIFICATION OF PARAMETERS IN A
EAR EQUATION OF GROUNDWATER
W,
rtment of the Environment, Reading
land). Central Water Planning Unit.
primary bibliographic entry see Field 2F.
-11799

ROLOGIC ASPECTS OF WATER HAR-
TING IN THE NORTHERN GREAT
NS,
cultural Research Service, Boise, Idaho.
hwest Watershed Research Center.
primary bibliographic entry see Field 2A.
-11811

## Evaluation Process

AN DRAINAGE AND FLOOD CONTROL
JECTS. ECONOMIC, LEGAL AND FINAN-
ASPECTS,
ado State Univ., Fort Collins. Dept. of Civil
neering.
Grigg, L. H. Botham, L. Rice, W. J.
maker, and L. S. Tucker.
able from the National Technical Informa-
Service, Springfield, Va. 22161, as PB-244
$7.50 in paper copy, $2.25 in microfiche.
ado Environmental Resources Center, Fort
s, Completion Report Series No 65, July
220 p, 19 fig, 31 tab, 5 append. OWRT B-113-
O(8), 14-31-0001-5059.

iptors: Benefits, Budgeting, Cities,
age, Drainage practices, *Drainage pro-
, *Economic justification, Feasibility,
cial feasibility, Flood plains, *Project
its, Runoff, *Storm drains, *Cost-benefit
sis, Colorado, *Urban drainage, Financing,
ation, Flood control, Coordination, Legisla-
Regulation, Land use.
fiers: Drainage law.

iques for evaluating minor and major Urban
age and Flood Control (UDFC) Projects are
bed. Economic, political, engineering, finan-
nd legal problems must be faced prior to im-
ntation of proper levels of these projects.
easurement of tangible benefits is described
a literature review revealed no direct objec-
chniques for quantifying intangibles. Some
ds for establishing the relative rankings of
ible contributions show promise for im-
ment of evaluation techniques, however.
egal problem of establishing benefits is
bed and a copy of recently enacted Colorado
tion is included. Information on the estima-
flood damages and the selection of discount
s presented for use by the analyst. Careful
nation of land use and drainage control mea-
is stressed. Related recent legislation and
tions are included.
1352

BENEFIT ANALYSIS AS DIMENSION-
ASIS OF FLOOD CONTROL MEASURES:
MPIRICAL REPORT (NUTZEN-KOSTEN-
YSE ALS GRUNDLAGE DER DIMEN-
SIONIERUNG VON HW-SCHUTZMASSNAH-
MEN- EIN ERFAHRUNGSBERICHT),
P. Schreiber.
Wasser und Boden, Vol 27, No 2, p 27-29, February 1975. 2 fig, 3 ref.

Descriptors: *Computers, *Flood control, Hydrologic aspects, Reservoirs, Economics, *Cost-benefit analysis, Simulation, Flood protection.
Identifiers: West Germany.

Computerized cost-benefit analysis as a basis for the dimensioning of flood protection measures involving 40 retention reservoirs in the Aller-Leine-Oker-Planes area, covering 16,000 sq km in West Germany, is discussed. The hydrological data are determined on the basis of simulation with respect to a limited number of flood events. The flood retention facilities will be designed for a probability of exceeding 0.02. The economic benefits of the flood control measures are calculated with respect to the potential damage areas classed as residential, industrial, commercial, farmlands, and forests. Averaged unit damages are assigned to each type of land use, taking into consideration the increase in landed property values as a result of flood protection. It is possible to determine the optimal sequence of the flood protection measures by the computer program. Flood retention reservoirs along the upper reaches of the recipients are most efficient even when they are more expensive than similar facilities along the lower reaches of the recipients. (Takacs-FIRL)
W75-11415

DATA REQUIREMENTS FOR THE OPTIMIZATION OF RESERVOIR DESIGN AND OPERATING RULE DETERMINATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W75-11500

WETLANDS - RELATED LEGISLATION IN THE UNITED STATES,
Miami Univ., Fla. School of Law.
For primary bibliographic entry see Field 6E.
W75-11550

NATURAL AND ARTIFICIAL REEFS IN MISSISSIPPI COASTAL WATERS: SPORT FISHING PRESSURE AND ECONOMIC CONSIDERATIONS,
University of Southern Mississippi, Hattiesburg. Bureau of Business Research.
Donnie L. Daniel, and Joe E. Seward, Jr.
Report MASGP-75-007, Spring 1975. 27 p, 1 fig, 3 tab. OSG MASGP-75-007.

Descriptors: *Reefs, *Sport fishing, *Economic feasibility, Resources, Econometrics, Cost-benefit analysis, Fisheries, Economics, Data collections, Surveys, *Mississippi.
Identifiers: *Mississippi Sound, Economic analysis, Natural reefs, Artificial reefs.

This study represents the initial research effort in an attempt to assess the sport fishing pressure at existing artificial and natural reefs in the Mississippi Sound. Activities are already underway to develop new artificial fishing reefs in that area. Hopefully, this study will provide some useful input toward an efficient utilization of scarce resources for that purpose. The purpose of this project is twofold: (1) it provides estimates of the fishing pressure on various types of artificial and natural fishing reefs in the Mississippi Sound; and (2) it provides some economic guidelines which should prove useful in determining the feasibility of artificial reefs. The study also makes recommendations that are designed to help achieve the conditions necessary for the reef to be economically justified. (NOAA)
W75-11558

THE COASTS OF WISCONSIN,
Wisconsin Univ., Madison. Sea Grant Program.
For primary bibliographic entry see Field 2H.
W75-11569

HURRICANE EXPERIENCE LEVELS OF COASTAL COUNTY POPULATIONS - TEXAS TO MAINE,
National Weather Service, Fort Worth, Tex.
For primary bibliographic entry see Field 2B.
W75-11570

COASTAL RESOURCE USE: DECISIONS ON PUGET SOUND,
Washington Univ., Seattle.
R. L. Bish.
University of Washington Press Seattle, 1975, 217 p. OSG 1-35320, NG-1-72, and 04-3 158-42; NSF GH-40 and GH-66.

Descriptors: *Resources development, *Coasts, *Natural resources, Water utilization, Fisheries, Forestry, Boating, Economics, Political aspects, Geological formations, Urban sociology, Regional analysis, *Washington.
Identifiers: *Puget Sound(WA), *Coastal resources, Legal-political system, Shoreline Management Act of 1972.

Five scholars in economics, political science, geography, and urban affairs study Puget Sound for coastal resource use patterns, trends and conflicts, and the legal and political structures through which resource use decisions are made. The volume begins with a historical description of the Puget Sound region, including its geological formations, its resources, and their role in the region's development. These patterns are related to specific uses of Puget Sound's resources, from fisheries and forestry to pleasure boating and shoreline parks. Conflicts among different resource uses are analyzed, with four in-depth case studies illustrating the nature of the conflicts and how the legal-political system functions to revolve them. The origins, controversies, and predicted consequences of Washington's landmark Shoreline Management Act of 1972 are also analyzed. Of particular interest are the original aspects of this study: the systematic analysis of conflict resolution has been integrated with the nature of the resources involved, and the forecasts of uses and conflicts have been integrated with a political analysis. (NOAA)
W75-11573

AGRICULTURAL DRAINAGE RESEARCH NEEDS AND PRIORITIES, 1974,
Agricultural Research Service, Baton Rouge, La.
For primary bibliographic entry see Field 4A.
W75-11632

COOPERATION IN WATER RESOURCES PROGRAMS: ALASKA'S EXAMPLE,
Cold Regions Research and Engineering Lab., Fairbanks, Alaska.
C. W. Slaughter, T. G. Freeman, and G. L. Audsley.
Water Resources Bulletin, Vol 10, No 4, p 802-812, August 1974. 5 fig, 2 tab, 9 ref.

Descriptors: *Water resources development, *Alaska, *Programs, Coordination, Hydrology, Planning, River basins, Snow surveys, Networks, Assessment, Watersheds(Basins).
Identifiers: Flood warning.

Alaska possesses a diversity and magnitude of water resources unmatched in any other state. With over 15% of the total area of the United States and 40% of the nation's total fresh water supply, but with an extreme lack of basic hydrologic and climatologic data, cooperation among agencies and individuals concerned with evaluating, planning, and implementing water

resources programs is essential. Toward this end, the IntereAgency Technical Committee for Alaska (IATCA) was established under charter from the Water Resources Council. Representation in IATCA includes virtually all Federal, State, and Academic entities in Alaska having an interest in the water resources of the State. Existence of IATCA has permitted or facilitated numerous Alaskan water resources programs. Several are described briefly: a flood warning network in the Chena River basin; establishment of the Caribou-Poker Creeks Research Watershed in Central Alaska; preparation and periodic updating of the 'Ten-Year Plan for Water Resources Data Acquisition;' current planning for an integrated 'real-time reporting network' for hydrometeorological data within the State; and a framework for implementation of the Alaska phase of the National Water Resources Assessment, currently in the initial phases. Accomplishments to date testify that it is indeed possible to cooperate and amalgamate in the broad field of 'Water Resources' in the largest of our 50 states. (Bell-Cornell)
W75-11775

**PLANNING FOR RESOURCES-ENVIRONMENTAL CONSERVATION,**
R. F. Bessey.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 99, No HY11, Proceedings paper No 10173, p 2061-2078, November 1973. 40 ref.

Descriptors: *Water resources, Civil engineering, *Environmental engineering, *Conservation, *Management, *Natural resources, *Regional planning, *Comprehensive planning, River basins, Multiple-purpose, Cost-benefit ratio, Evaluation.
Identifiers: *Systems engineering, Drainage basins, Environmental quality.

The need is stressed for comprehensive, integrated, resources-environmental planning in our present era of mounting endangerment of the human environment. The focus is on background and trend in water, land, and related resources, and regional planning. The human purposes and consequences of goals, policies, plans, design, and programs in resources-environment fields are implicit. The present place and potential of civil engineering (inherently concerned with the problems of citizen and civilization) in this scene of environmental threat are substantial. The burgeoning requirement for environmental impact reviews substantially expands the need and opportunity for civil engineering participation. However, the overall philosophy and organization of comprehensive planning must be interdisciplinary, with application of the gamut of concerned physical, social, and administrative sciences and arts. Analysis includes general views of: (1) the evolutionary setting, with emphasis on conservation, river basins, and regions; (2) situation and directions of planning in the present era; (3) comprehensive planning requirements, purposes, and principles; (4) organizational arrangements; (5) global aspects; and (6) salient conclusions as to civil engineering directions and practices.
W75-11781

**AN ECONOMIC AND ENVIRONMENTAL RECONNAISSANCE OF THE POSSIBILITIES FOR SMALL WATERSHED DEVELOPMENT IN CHENANGO COUNTY,**
Jones (Barclay) and Associates, Ithaca, N.Y.
For primary bibliographic entry see Field 4D.
W75-11796

## 6C. Cost Allocation, Cost Sharing, Pricing/Repayment

**AN EQUITABLE SEWER USE CHARGE SYSTEM,**
Gilbert Associates, Inc., Reading, Pa.
For primary bibliographic entry see Field 5G.
W75-11391

**SUFFICIENT WATER SUPPLY AND SEWER SYSTEM, AND EQUITABLE DISTRIBUTION OF THE COSTS (TILSTREKKELIGE VANN- OG KOLAKKANLEGG-SAMT RETTFERDIG FORDELING AV KOSTNADENE),**
For primary bibliographic entry see Field 5D.
W75-11393

**DATA REQUIREMENTS FOR THE OPTIMIZATION OF RESERVOIR DESIGN AND OPERATING RULE DETERMINATION,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W75-11500

**NATURAL AND ARTIFICIAL REEFS IN MISSISSIPPI COASTAL WATERS: SPORT FISHING PRESSURE AND ECONOMIC CONSIDERATIONS,**
University of Southern Mississippi, Hattiesburg. Bureau of Business Research
For primary bibliographic entry see Field 6B.
W75-11558

**ANALYSIS OF INTERNATIONAL GREAT LAKES SHIPPING AND HINTERLAND,**
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
M. Balfe, R. Heilmann, J. Johnson, and W. Wendling.
Special Report No 23, April 1975, 395 p.

Descriptors: *Great Lakes, *Great Lakes region, *Economics, Export, Import, Transportation, Foreign trade.
Identifiers: *Shipping, *Trade, *Commodity analysis, Port analysis, Trade routes, Chicago, Cleveland, Detroit, Duluth, Milwaukee, Toledo, Export movements, Import movements, Shipments.

This study is concerned with both a geographic and commodity-specific description of the hinterland of the Great Lakes. Using as a source report a sampling survey of export and import traffic entitled Domestic and International Transportation of U.S. Foreign Trade: 1970, issued by the Bureau of Census, the authors sought to obtain new data on the domestic leg of U.S. foreign trade and to link those with previously collected information on the international leg of 'linear-type' commodity flow. Detailed analyses constitute the bulk of the report, including specific analyses of 28 commodities and major Great Lakes ports. It is stressed that the source material was biased toward shipment weight for vessel movements and therefore the inadequacy of the sampling procedure should be taken into consideration before specific conclusions are to be drawn. (NOAA)
W75-11576

**ON TAXATION AND FIRMS CHOICE OF WASTE WATER TREATMENT TECHNOLOGY,**
Technical Univ. of Denmark, Lyngby.
For primary bibliographic entry see Field 5G.
W75-11767

**AN ECONOMIC AND ENVIRONMENTAL RECONNAISSANCE OF THE POSSIBILITIES FOR SMALL WATERSHED DEVELOPMENT IN CHENANGO COUNTY,**
Jones (Barclay) and Associates, Ithaca, N.Y.
For primary bibliographic entry see Field 4D.
W75-11796

## 6D. Water Demand

**HYDROLOGY FOR LAND-USE PLANNING: THE HILLSIDE AREA, ANCHORAGE, ALASKA,**
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W75-11504

**FORECASTING URBAN WATER USE: COMMERCIAL ESTABLISHMENTS.**
Maryland Univ., College Park. Dept. of Civil Engineering.
R. H. McCuen, R. C. Sutherland, and J. R. Kim.
Journal of the American Water Works Association, Vol 65, No 5, p 239-244, May, 1975. 4 tab, 7 ref.

Descriptors: *Water demand, *Water distribution(Applied), *Water users, *Planning, *Forecasting, Elasticity of demand, Water requirements, Water supply, Consumptive use, Human population.
Identifiers: *Commercial establishments, Mall shops.

Water demand prediction equations are derive from a study of water use in four shopping center Commercial establishment water use has not bee extensively studied because it accounts for only 1 to 20% of total water demand and lacks the larg daily and seasonal peaks of industrial and re sidential use. But accurate demand predictions ar necessary where limits are placed on water an sewer hookups. Department stores with an without restaurants and 24 types of mall shop were analyzed. Geographic differences ar minimal because water is used primarily fo domestic-type uses: water for air conditioning wa not included in the study. Use depends on sta size and also the number of public facilities foun in large stores. A close linear relationship wa found using gross floor area as a proxy variab which is much easier to determine and more rea ly available. There is also significant variati between types of mall shops since some use wat in their business activities. Classification of sho by 4-digit S.I.C. (Standard Industrial Classific tion) code allows more accurate demand predi tions by shop type. Forecasting must also consid layout and design, transportation balance, lab productivity, and the common variables of regu tions and technological change. The inelastic d mand with respect to price in domestic-type wa use suggests that commercial use, which includ considerable lavatory use, will not respond signi cantly to changes in water price. (Herr-No Carolina)
W75-11795

## 6E. Water Law and Institutions

**URBAN DRAINAGE AND FLOOD CONTR PROJECTS. ECONOMIC, LEGAL AND FIN CIAL ASPECTS,**
Colorado State Univ., Fort Collins. Dept. of C Engineering.
For primary bibliographic entry see Field 6B.
W75-11352

**FINAL DISPOSAL OF MUNICIPAL SLUDGE SWEDEN,**
National Swedish Environment Protection Bo Stockholm. Research Lab.
For primary bibliographic entry see Field 5E.
W75-11403

**COASTAL ZONE LEGAL REFEREN (SELECTED) 1975.**
State Univ. of New York, Buffalo. Faculty of and Jurisprudence.
For primary bibliographic entry see Field 2L.
W75-11548

ETLANDS - RELATED LEGISLATION IN IE UNITED STATES,
ami Univ., Fla. School of Law.
A. Crowley, J. G. MacDonald, and G. P.
tles.
port FY75-4, December 1974, 56 p. UMSG R/L-

scriptors: *Water law, *Wetlands, *Legislation, uatic environment, Common law, Administra-n, Governments, Legal aspects, Permits, nning, Regulation, Zoning, Water permits, ter rights, Administrative decisions, Judicial isions, Law enforcement, Water, Water pol-, Administrative agencies, Estuaries.

s article deals with the protection of wetlands law. It focuses on the benefits and purposes of lands and the effects of alterations on the wet-d's natural state. Specifically, it deals with the tern of state regulation of wetlands and the dif-ences in regulations from state to state. The ar-e also contains an appendix where state laws, initions, prohibited acts and/or authorizations, inistrative schemes, and standards for use and elopment of wetlands are given. (NOAA)
5-11550

GAL MEASURES CONCERNING MARINE LLUTION.
th Carolina Univ., Chapel Hill. School of Law.
primary bibliographic entry see Field 5G.
5-11551

EDERAL PLAN FOR NATURAL DISASTER RNING AND PREPAREDNESS, FIRST SUP-EMENT FY 1976 - 1980.
ional Oceanic and Atmospheric Administra-, Washington, D.C.
primary bibliographic entry see Field 2B.
5-11553

OCEEDINGS OF ALABAMA COASTAL ADERS CONFERENCE ON COASTAL ZONE NAGEMENT.
ama Development Office, Montgomery. State ning Div.
ort MASGP-75-012, April 30, 1975. 71 p.

criptors: *Conferences, *Water law, *Zoning, umentation, Public rights, Coasts, Legal cts, *Alabama.
tifiers: *Coastal zone management, Alabama t, Mobile(AL).

Alabama Coastal Leaders Conference on tal Zone Management was held in Mobile, ama, on April 30, 1975. This conference was nded by more than 250 concerned citizens and esentatives. It was the second in a series of ings on coastal zone management scheduled he current fiscal year. This conference was gned to help inform the public on the subject oastal zone management and to obtain sug-ons and support for maintaining public in-ement. It introduces a future workshop series, e coastal leaders will be encouraged to make mmendations for specific provisional policy and policy development. (NOAA)
-11555

TE REGULATION OF COASTAL WATER A PRESERVES,
ni Univ., Fla. School of Law.
atfield.
ct No. R/L-5, December 1974. 60 p. Project R/L-5.

riptors: *Water management(Applied), er conservation, *Water control, Coasts, water, Estuaries, Water rights, Marine fishe-Conservation, Water policy, River regula-*Regulation, *Preservation, Protection, State liction.

Identifiers: Coastal waters, Marine sanctuaries, *Estuarine sanctuaries, *Sanctuaries, State regulations, Coastal zones, Coastal regulations, Coastal management, State policies.

Each sanctuary should have a stated management program which would be consistent with both the goals of the particular sanctuary and with federal procedures. The program should clearly specify the controlling functions of the sanctuary, the means of accomplishing the stated purposes and the mechanisms for managing the sanctuary. Provisions should be made for the approval of projects and programs as well as for termination of them and for resolution of conflicts and for modifications of the uses of the sanctuary. Any proposed environmental modification in the vicinity of the sanctuary should be critically reviewed by responsible local, state and federal agencies and should be prohibited if it has an adverse effect on the sanctuaries. The boundaries of each sanctuary should be clearly marked and the region should be properly policed to insure that the guidelines governing sanctuary operations are not violated. (NOAA)
W75-11568

**THE MANAGEMENT OF LAND AND WATER USE IN THE COASTAL ZONE: A NEW LAW IS ENACTED IN NORTH CAROLINA,**
North Carolina Univ., Chapel Hill. School of Law.
T. J. Schoenbaum.
Reprint from The North Carolina Law Review, Vol 53, December 1974, No 2. University of North Carolina Sea Grant Reprint No 77, 30 p. OSG GH 103.

Descriptors: *North Carolina, *Water law, *Water policy, *Regulation, *Coasts, *Comprehensive planning, *Management, Legislation, Law enforcement, Legal aspects, Penalties(Legal), Water rights, Water, Zoning, Land use, Land development, Land management, Governments, Judicial decisions, Watershed management, Project planning.
Identifiers: *Coastal Area Management Act(CAMA) of 1974(NC), Federal Coastal Zone Management Act of 1972, Coastal zone management.

This article analyses and evaluates the Coastal Area Management Act of 1974, North Carolina in light of the Federal Coastal Zone Management Act of 1972 and other comprehensive state coastal zone management laws. It also describes the significant new legal processes instituted and discusses some of the new legal questions raised. The act itself was a first step toward the establishment of a comprehensive coastal land and water management program. No definitive judgment of its effectiveness can be made until after it is fully implemented. The author feels that even through the Act meets the minimum federal guidelines for a state coastal zone management program it contains serious flaws that may subvert its effective operation. These include the exclusively local character of the Coastal Resources Council, the lack of legal requirements to assure the implementation of the planning process, and the exemptions given to certain interest groups, especially agriculture and forestry. The author feels continuing empirical research on the law's operation and effectiveness are needed. (NOAA)
W75-11575

**ROLE OF COMPUTER SIMULATION IN ADMINISTERING AN URBAN DRAINAGE ORDINANCE,**
Hydrocomp, Inc., Palo Alto, Calif.
T. N. Debo, and A. M. Lumb.
Simulation Network Newsletter, Vol 7, No 2, p 1-8, February 15, 1975. 6 ref.

Descriptors: *Computer models, *Legislation, *Drainage, *Cities, Floods, Storm runoff, Hydrologic aspects, Administration, *Simulation analysis.
Identifiers: Hydrologic simulation.

A computer-simulated model urban drainage ordinance based on problems, ordinances, and experiences of urban areas was drafted. Emphasis was placed on the interaction between the technical and non-technical aspects of practical drainage problems. Contacts were made with over thirty cities and counties throughout the United States to determine which areas had relevant experience, whether they would participate in the study, and whether they felt they could benefit from results of such a study. Five areas were chosen. The drainage program of each area was intensively investigated and data were compiled into case studies. Some provisions of the model ordinance which was then drafted could pose administrative and engineering problems during implementation, which could be better handled with the help of modelling. Hydrologic computer simulation is a technical tool that may be used with minimal training by engineers of local governments and consulting firms to evaluate the effects of developments, drainage problems, and potential solutions. Once calibrated for a region, a model can be used throughout that area to get a consistent and more accurate approach for evaluating flood and drainage problems. For example, on-site storage facilities are often used in urban areas for controlling storm runoff. However, analysis of their synergistic effects is necessary to prevent potential flood peaks--a problem rapidly solved by computer simulation. Hydrologic simulation results in lower error, greater forecasting capability, enhanced ability to analyze interactive drainage characteristics, and requirements of different areas.
W75-11669

**REVISION OF THE REGULATIONS 'PLANNING OF SANITARY PROTECTION ZONES OF A CENTRAL WATER SUPPLY SYSTEM AND WATER SOURCES' (IN RUSSIAN),**
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
For primary bibliographic entry see Field 5G.
W75-11682

**WATER RESOURCES PLANNING IN URBAN AREAS,**
Office of the Chief of Engineers (Army), Washington, D.C. Urban Studies Branch.
For primary bibliographic entry see Field 5D.
W75-11769

## 6F. Nonstructural Alternatives

**COST BENEFIT ANALYSIS AS DIMENSIONING BASIS OF FLOOD CONTROL MEASURES: AN EMPIRICAL REPORT (NUTZEN-KOSTEN-ANALYSE ALS GRUNDLAGE DER DIMENSIONIERUNG VON HW-SCHUTZMASSNAHMEN- EIN ERFAHRUNGSBERICHT),**
For primary bibliographic entry see Field 6B.
W75-11415

**ROLE OF COMPUTER SIMULATION IN ADMINISTERING AN URBAN DRAINAGE ORDINANCE,**
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 6E.
W75-11669

**FLOOD PLAIN INFORMATION: LEY CREEK, SALINA AND DEWITT TOWNSHIPS, ONONDAGA COUNTY, NEW YORK.**
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W75-11785

**FLOOD PLAIN INFORMATION: FLOOD HAZARD REPORT OF 4-7 JULY 1969 FLOOD, HURON RIVER, NORWALK CREEK, OHIO.**
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W75-11787

**FLOOD PLAIN INFORMATION: PLUM CREEK, BRUNSWICK HILLS AND MEDINA TOWNSHIPS, MEDINA COUNTY, OHIO.**
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W75-11788

**FLOOD PLAIN INFORMATION: NORTHEAST STREAM GROUP, STOCKTON, CALIFORNIA.**
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W75-11789

**FLOOD PLAIN INFORMATION: VENTURA RIVER, VENTURA COUNTY, CALIFORNIA.**
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-11790

**FLOOD PLAIN INFORMATION: CONTRARY CREEK, ST. JOSEPH, MISSOURI.**
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4A.
W75-11791

**FLOOD PLAIN INFORMATION: CHITTENANGO CREEK, BRIDGEPORT, ONONDAGA AND MADISON COUNTIES, NEW YORK.**
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W75-11792

## 6G. Ecologic Impact Of Water Development

**THE ECOLOGY OF THE CUMBERLAND ISLAND NATIONAL SEASHORE CAMDEN COUNTY, GEORGIA,**
Georgia Univ., Savannah. Marine Extension Center.
For primary bibliographic entry see Field 2L.
W75-11546

**AN ECOLOGICAL SURVEY OF THE ROCKY COAST ADJACENT TO A BROMINE EXTRACTION WORKS,**
Natural Environment Research Council, Anglesey (Wales). Unit of Marine Invertebrate Biology; and University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5C.
W75-11758

**PROCEDURE FOR SELECTING A MINIMAL ENVIRONMENTAL IMPACT ROUTING FOR A WATER CONVEYANCE CANAL,**
Texas Tech Univ., Lubbock. Dept. of Civil Engineering.
D. M. Wells, J. D. Mertes, B. L. Allen, and A. N. Glick.
Water Resources Bulletin, American Water Resources Association, Vol 11, No 4, p 714-733, August 1975. 12 fig, 1 tab, 4 ref.

Descriptors: *Environmental effects, *Comprehensive planning, *Water resources development, Water conveyance, Canals, Routing, Assessment, Coasts, Evaluation, Water supply, Texas, Multiple-purpose projects, Computers.
Identifiers: Environmental corridor selection, Linear corridor selection, Interdisciplinary analysis, *Environmental impact analysis, *Overlay mapping, *Computer graphics, Value ratings

Several techniques for selecting a least environmental impact corridor have been proposed. Two approaches have been found workable: computer graphics and overlay mapping. This report combines features of both approaches to determine an appropriate routing for a water conveyance canal. The evaluation study was conducted by an interdisciplinary planning team. Environmental factors were mapped and weighted on overlay maps. Alternative routes were identified and carefully studied. Several critical environmental implications were noted. Aesthetic factors, outdoor recreation interpretation, visitor safety and disruption of human and animal travel routes were considered. Evaluation of an environmental analysis procedure requires close examination of the project objectives, scope, and ultimate decision making body that will ultimately utilize the findings. Size and scale of project play important roles when examining cost figures. The overlay map procedure provides an effective graphic media through which the process of selecting and evaluating alternative linear corridors can be presented. The importance of an interdisciplinary planning team cannot be stressed enough. (Bell-Cornell)
W75-11764

**LAND USE AND ENVIRONMENTAL PLANNING: AN APPLICATION IN THE SOUTH CAROLINA COASTAL ZONE,**
Battelle-Columbus Labs., Ohio.
G. Nehman, G. Boles, N. Dee, and J. Griffin.
Water Resources Bulletin, American Water Resources Association, Vol 11, No 4, p 759-769, August 1975. 4 tab, 2 ref.

Descriptors: *Land use, *Land development, *Environment, *Planning, *Coasts, *South Carolina, Regulation, Economics, Social aspects, Methodology, Compatibility, Data collections, Constraints, Model studies, Evaluation, Maps, Systems analysis.
Identifiers: *Beaufort County(SC), Map overlays, Suitability analysis.

Considered is Beaufort County, South Carolina's approach to dealing with the problem of land use controls. A rural, highly polarized coastal community, Beaufort County opted to set regulations for controlling its development in the face of conflicting interests. An analysis tool with economic, environmental, and social conditions as criteria for setting regulations was developed; described is the Land Use Trade-Off Model (LUTOM) and its application to Beaufort County. The model was used to define locations best suited for each size and type of desired land use within the region, to define policies which were constraints to development, and to analyze the compatibility between adjacent land uses. Map overlays were used for analyzing and aggregating the economic, environmental, and social data. Various land use categories were evaluated using a numerical scoring system, and the scores were then used to assist in developing the land use regulations. In conclusion, LUTOM provides a workable analysis tool with analytical and reproducible output that can be used for land use planning and control; it yields a rationale for setting regulations, the mechanism for which lies with the local county council and related groups. Despite its successful use in a rural community, however, it would probably need to be computerized to deal with complex urban systems. LUTOM is most useful in defining broad policy issues; it can also be used to rate alternative sites for a particular development proposal. (Bell-Cornell)
W75-11766

**MAN ON THE HYDROLOGIC CYCLE,**
Annamalai Univ., Annamalainagar (India).
For primary bibliographic entry see Field 2A.
W75-11776

**PLANNING FOR RESOURCES-ENVIRONMENTAL CONSERVATION,**
For primary bibliographic entry see Field 6B
W75-11781

# 7. RESOURCES DATA

## 7A. Network Design

**COMPARATIVE ANALYSIS OF ESTIMATION METHODS IN NONLINEAR FUNCTIONAL MODELS OF THE RAINFALL-RUNOFF PROCESS,**
Purdue Univ., Lafayette, Ind. Water Resources Research Center
For primary bibliographic entry see Field 2A.
W75-11354

**IMPROVED APPLICATION OF GEOPHYSICS TO GROUNDWATER RESOURCE INVENTORIES IN GLACIATED TERRAINS,**
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W75-11355

**THE RAINFALL RECORDER PROBLEM,**
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W75-11448

**DATA REQUIREMENTS FOR THE OPTIMIZATION OF RESERVOIR DESIGN AND OPERATING RULE DETERMINATION,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W75-11500

## 7B. Data Acquisition

**APPARATUS FOR PROVIDING A STATISTICAL COUNT OF PARTICULATE MATERIAL IN A FLUID,**
Protron Associates, Palo Alto, Calif. (assignee).
For primary bibliographic entry see Field 5A.
W75-11434

**A METHOD OF INVESTIGATING POPULATIONS OF DIATOMS IN FLOWING WATERS (IN GERMAN),**
For primary bibliographic entry see Field 2I.
W75-11445

**COMPARISON OF PRECIPITATION GAGE CATCHES WITH A MODIFIED ALTER AND A RIGID ALTER TYPE WINDSHIELD,**
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 2B.
W75-11457

**PHYSICOCHEMICAL PROPERTIES OF DREDGE SPOIL,**
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W75-11465

**A SATELLITE CLASSIFICATION TECHNIQUE FOR SUBTROPICAL CYCLONES,**
National Weather Service, Fort Worth, Tex. Southern Region.
For primary bibliographic entry see Field 2B.
W75-11562

**RRENT MEASUREMENTS USING A TILT-G SPAR,**
ripps Institution of Oceanography, La Jolla, lif.
L. Lowe, D. L. Inman, and C. D. Winant.
print from the Proceedings of the 14th Coastal gineering Conference, Copenhagen, Denmark, e 1974, p 225-239, Chapter II. 6 fig, 1 tab, 4 ref. blished by American Society of Civil Engineers.

scriptors: *Ocean currents, *Instrumentation, odel studies, *Current meters, Ocean waves, nputer models, Water circulation, Oceanog-hy, Frequency, Data processing.
ntifiers: *Tilting spar, Shelf and Shore System, rrent measurements, Wave direction, Oscilla-, Oscillatory flow.

dynamic response of the spar to oscillatory v has been examined by modeling as well as puter analysis of the non-linear differential ation. Field measurements using the tilting spar e been made. These measurements are com-ed with theory and with other more direct mea-ements of the wave field. The tilting spar has n used to estimate wave direction. These esti-es generally agree well with directional esti-es made using a pressure sensor array and a -component current meter. (NOAA)
5-11564

**ACING OCEAN CURRENTS,**
hington Univ., Seattle. Sea Grant Advisory ice.
primary bibliographic entry see Field 2E.
-11574

**PICAL CYCLONE INTENSITY ANALYSIS FORECASTING FROM SATELLITE GERY,**
onal Environmental Satellite Service, hington, D.C.
primary bibliographic entry see Field 2B.
-11577

**LD TEST OF SOIL WATER FLUX METERS,**
cultural Research Service, Riverside Calif. ity Lab.
primary bibliographic entry see Field 2G.
-11586

**PLING TOOL FOR TAKING ISTURBED SOIL CORES,**
da Univ., Gainesville.
primary bibliographic entry see Field 2G.
11599

**LULAR SNOW GENERATION--A DOP-R RADAR STUDY,**
ago Univ., Ill. Lab. for Atmospheric Probing.
rimary bibliographic entry see Field 2B.
11634

## Evaluation, Processing and ublication

**USE OF COMPUTERS FOR FORECAST-THE SANITARY SYSTEMS OF WATER ES (PRIMENENIYE EVM DLYA PROG-ROVANIYA SANITARNOGO OYANIYA VODOYEMOV),**
rimary bibliographic entry see Field 5D.
11410

**TION OF A FREE-SURFACE BOUNDARY E PROBLEM USING AN INVERSE FOR-ATION AND THE FINITE ELEMENT HOD,**
rnia Univ., Santa Barbara. Dept. of anical and Environmental Engineering.
rimary bibliographic entry see Field 2F.
W75-11447

**THE RAINFALL RECORDER PROBLEM,**
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W75-11448

**TRANSPORT MODEL, USER'S MANUAL,**
Battelle-Pacific Northwest Labs., Richland, Wash. Water and Land Resources Dept.
For primary bibliographic entry see Field 5B.
W75-11468

**VARIABLE THICKNESS TRANSIENT GROUNDWATER FLOW MODEL USER'S MANUAL,**
Battelle-Pacific Northwest Labs., Richland, Wash. Systems Dept.
For primary bibliographic entry see Field 2F.
W75-11469

**WATER QUALITY REPORT: THE COLUMBIA RIVER BELOW LONGVIEW, WASHINGTON, DECEMBER 1971 - NOVEMBER 1972,**
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 5B.
W75-11472

**HYDROGEOLOGY OF THE WAINWRIGHT AREA, ALBERTA,**
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 4B.
W75-11475

**GENERATION OF HYDROLOGIC SAMPLES: CASE STUDY OF THE GREAT LAKES,**
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W75-11476

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 1. NORTH ATLANTIC SLOPE BASINS.**
Geological Survey, Reston, Va.
Available from Sup of Documents, GPO, Washington, DC 20402 $5.55 (paper copy). Water-Supply Paper 2151, 1975. 674 p, 1 fig, 41 ref.

Descriptors: *Water quality, *Surface waters, *Sediment transport, *Water temperature, *Northeast US, River basins, Basic data collections, Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia, District of Columbia, Physical properties, Particle size, Chemical analysis, Inorganic compounds, Biological properties, Streamflow, Sampling, Sites, Surface waters.
Identifiers: *North Atlantic slop basins.

During the water year ending September 30, 1970, the Geological Survey maintained 238 stations on 139 streams in the North Atlantic slope basins for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 183 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 72 and daily at 28 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 36 stations during the year ending September 30, 1970. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 17 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W75-11479

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.**
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 $5.45 (paper copy). Water-Supply Paper 2152, 1974. 668 p, 1 fig, 41 ref.

Descriptors: *Water quality, *Sediment transport, *Water temperature, *Streams, *Southeast US River basins, Atlantic Ocean, *Gulf of Mexico, Basic data collections, Chemical analysis, Physical properties, Inorganic compounds, Biological properties, Streamflow, Sampling, Sites.
Identifiers: *South Atlantic Slope basins, *Eastern Gulf of Mexico basins.

During the water year ending September 30, 1970, the Geological Survey maintained 180 stations on 119 streams in the South Atlantic Slope and Eastern Gulf of Mexico basins for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 161 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 33 and daily at 53 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 6 stations. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 1 station. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W75-11480

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART 3. OHIO RIVER BASIN.**
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 $2.10 post-paid $1.75 GPO Bookstore. Water-Supply Paper 2093, 1973. 309 p, 1 fig, 39 ref.

Descriptors: *Water quality, *Sediment transport, *Water temperature, *Ohio River, Alabama, Illinois, Indiana, Kentucky, Maryland, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, Basic data collections, Streamflow, Chemical analysis, Physical properties, Inorganic compounds, Biological properties, Sampling, Sites.
Identifiers: *Ohio River basin.

During the water year ending September 30, 1968, the Geological Survey maintained 141 stations on 92 streams for the study of chemical and physical characteristics of surface water in the Ohio River Basin. Samples were collected daily and monthly at 75 of these locations for chemical-quality stu-

dies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 67 and daily at 42 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 21 stations during the year ending September 30, 1968. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were not determined. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W75-11481

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 6. MISSOURI RIVER BASIN.**
Geological Survey, Reston, Va.
Water-Supply Paper 2145, 1974. 441 p, 1 fig, 40 ref.

Descriptors: *Water quality, *Sediment transport, *Water temperature, *Missouri River, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, Wyoming, Basic data collections, Chemical analysis, Physical properties, Particle size, Inorganic compounds, Biological properties, Streamflow, Sampling, Sites.
Identifiers: *Missouri River basin.

During the water year ending September 30, 1969, the Geological Survey maintained 212 stations on 110 streams for the study of chemical and physical characteristics of surface water in the Missouri River basin. Samples were collected daily and monthly at 177 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 35 and daily at 77 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 40 stations during the year ending September 30, 1969. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 44 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W75-11482

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 7. LOWER MISSISSIPPI RIVER BASIN.**
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 Price $5.25. Water-Supply Paper 2156, 1975. 636 p, 1 fig, 41 ref.

Descriptors: *Water quality, *Surface waters, *Sediment transport, *Water temperature, *Mississippi River basin, Basic data collections, Arkansas, Colorado, Kansas, Kentucky, Louisiana, Mississippi, Missouri, New Mexico, Oklahoma, Texas, Physical properties, Particle size, Chemical analysis, Inorganic compounds, Biological properties, Streamflow, Sampling, Sites.
Identifiers: *Lower Mississippi River basin

During the water year ending September 30, 1970, the Geological Survey maintained 289 stations on 167 streams in the Lower Mississippi River basin for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 274 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 17 and daily at 82 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 15 stations during the year ending September 30, 1970. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 15 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W75-11483

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART 8. WESTERN GULF OF MEXICO BASINS.**
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 Price $3.45 - paper cover. Water-Supply Paper 2097, 1974. 473 p, 1 fig, 39 ref.

Descriptors: *Water quality, *Surface waters, *Sediment transport, *Water temperature, *Gulf of Mexico, River basins, Basic data collections, Colorado, Louisiana, New Mexico, Texas, Physical properties, Particle size, Chemical analysis, Inorganic compounds, Biological properties, Streamflow, Sampling, Sites.
Identifiers: *Gulf of Mexico basins(Western).

During the water year ending September 30, 1968, the Geological Survey maintained 157 stations on 88 streams in the Western Gulf of Mexico basins for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 153 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 1 and daily at 102 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 26 stations during the year ending September 30, 1968. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 26 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W75-11484

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA.**
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 $3.60 (paper copy) Water-Supply Paper 2159, 1974. 397 p, 1 fig, 41 ref.

Descriptors: *Water quality, *Sediment transport, *Water temperature, *Streams, *California, River basins, Basic data collections, Chemical analysis, Physical properties, Inorganic compounds, Biological properties, Streamflow, Sampling, Sites.
Identifiers: *Pacific Slope basins(Calif).

During the water year ending September 30, 1970, the U S Geological Survey maintained 184 stations on 124 streams of the study of chemical and physical chacteristics of surface water in the Pacific Slope basins in Calif. Samples were collected daily and monthly at 74 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 111 and daily at 27 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 77 stations. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 48 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W75-11485

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 6. MISSOURI RIVER BASIN--VOLUME 3, MISSOURI RIVER BASIN FROM SIOUX CITY, IOWA, TO NEBRASKA CITY, NEBRASKA.**
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 $3.45 postpaid $3.00 GPO Bookstore. Water-Supply Paper 2118, 1973. 71 p, 1 fig.

Descriptors: *Basic data collection, *Streamflow, *Flow rates, *Missouri River, Iowa, Minnesota, Wyoming, Colorado, Nebraska, Runoff, Discharge(Water), Gaging stations, Flow measurement, Average flow.
Identifiers: *Missouri River basin, Maximum discharges, Minimum discharges.

This report is one of a series of 37 reports presenting records of stage and discharge of streams, of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years. It contains the records for gaging stations and partial-record stations in the Missouri River basin from Sioux City, Iowa, to Nebraska City, Nebraska. This is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum and minimum discharges. (Woodard-USGS)
W75-11486

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 8. WESTERN GULF OF MEXICO BASINS--VOLUME 2. BASINS FROM LAVACA RIVER TO RIO GRANDE.**
Geological Survey, Reston, Va.

vailable from Supt of Documents, GPO, ashington, DC 20402 $5.70 (paper copy). Water-ıpply Paper 2123, 1974. 861 p, 1 fig.

escriptors: *Basic data collections, *Surface ıters, *Streamflow, *Flow rates, River basins, ılf of Mexico, Colorado, New Mexico, Texas, ınoff, Discharge(Water), Gaging stations, Flow easurement, Average flow.
entifiers: *Western Gulf of Mexico basins, Max-um discharges, Minimum discharges.

is report is one of a series of 37 reports present-records of stage and discharge of streams, and stage and contents of lakes and reservoirs in the ited States during the 1966-70 water years; it ntains the records for gaging stations and par-l-record stations in the Western Gulf of Mexico sins, Lavaca River to Rio Grande. This is one of second series of water-supply papers to be blished on a 5-year basis. The first series vered the 5-year period October 1, 1960, to Sep-nber 30, 1965. This series covers the period Oc-ber 1, 1965, to September 30, 1970. The daily le for stream-gaging stations gives the mean charge for each day and is followed by monthly d yearly summaries of total, average, maximum, d minimum discharges. (Woodard-USGS)
5-11487

**RFACE WATER SUPPLY OF THE UNITED ATES, 1966-70: PART 9. COLORADO RIVER SIN--VOLUME 3. LOWER COLORADO VER BASIN.**
ological Survey, Reston, Va.
ailable from Supt of Documents, GPO, shington, DC 20402 Price $5.55. Water-Supply ber 2126, 1975. 681 p, 2 fig.

scriptors: *Basic data collections, reamflow, *Flow rates, *Colorado River basin, zona, California, Nevada, New Mexico, Utah, ıoff, Discharge(Water), Gaging stations, Flow asurement, Average flow.
ntifiers: Maximum discharges, Minimum charges.

s report is one of a series of 37 reports present-records of stage and discharge of streams, and tage and contents of lakes and reservoirs in the ited States during the 1966-70 water years; it tains the records for gaging stations and par-record stations in the Lower Colorado River in. This is one of the second series of water-ply papers to be published on a 5-year basis. first series covered the 5-year period October 960, to September 30, 1965. This series covers period October 1, 1965, to September 30, 1970. daily table for stream-gaging stations gives the n discharge for each day and is followed by nthly and yearly summaries of total, average, ximum, and minimum discharges. (Woodard-GS)
5-11488

**RFACE WATER SUPPLY OF THE UNITED ATES, 1966-70: PART 10. THE GREAT SIN.**
ological Survey, Reston, Va.
ilable from Supt of Documents, GPO, shington, DC 20402 $7.35 (paper copy). Water-ply Paper 2127, 1974. 1143 p, 1 fig.

criptors: *Basic data collections, eamflow, *Flow rates, *Great Basin, Califor-Idaho, Nevada, Oregon, Utah, Wyoming, Ru-, Discharge(Water), Gaging stations, Flow surement, Average flow.
ntifiers: Maximum discharges, Minimum harges.

report is one of a series of 37 reports present-records of stage and discharge of streams, and tage and contents of lakes and reservoirs in the ed States during the 1966-70 water years; it ains the records for gaging stations and par-tial-record stations of the Great Basin in California, Idaho, Nevada, Oregon, Utah, and Wyoming. This is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W75-11489

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 12. PACIFIC SLOPE BASINS IN WASHINGTON--VOLUME 1. PACIFIC SLOPE BASINS IN WASHINGTON EXCEPT COLUMBIA RIVER BASIN.**
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 $4.40 (paper copy). Water-Supply Paper 2132, 1974. 640 p, 1 fig.

Descriptors: *Basic data collections, *Streamflow, *Flow rates, *Surface waters, *Washington, River basins, Runoff, Discharge(Water), Gaging stations, Flow measurement, Average flow.
Identifiers: *Pacific slope basins(Wash), Maximum discharges, Minimum discharges.

This report is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Pacific slope basins in Washington except Columbia River basin. This is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W75-11490

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 13. SNAKE RIVER BASIN.**
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 $5.50 (paper cover). Water-Supply Paper 2134, 1974. 821 p, 1 fig.

Descriptors: *Basic data collection, *Surface waters, *Streamflow, *Flow rates, River basins, Idaho, Nevada, Oregon, Utah, Washington, Wyoming, Runoff, Discharge(Water), Gaging stations, Flow measurement, Average flow.
Identifiers: *Snake River basin, Maximum discharges, Minimum discharges.

This report in one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Snake River Basin. This is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W75-11491

**SELENIUM IN WATERS IN AND ADJACENT TO THE KENDRICK PROJECT, NATRONA COUNTY, WYOMING,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W75-11492

**GEOHYDROLOGIC RECONNAISSANCE OF THE UPPER POTOMAC RIVER BASIN,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-11493

**GROUND-WATER DATA FOR BOLIVAR COUNTY, MISSISSIPPI,**
Geological Survey, Jackson, Miss.
G. J. Dalsin, and B. E. Wasson.
Mississippi Board of Water Commissioners, Jackson, County Report No 1, 1975. 55 p, 7 fig, 1 plate.

Descriptors: *Groundwater resources, *Basic data collections, *Hydrologic data, *Water quality, *Mississippi, Water wells, Well data, Water levels, Aquifer characteristics, Water utilization, Water yield, Chemical analysis.
Identifiers: *Bolivar County(Miss), Sand intervals.

Ground-water basic data in Bolivar County, Miss., are presented in 4 tables and 8 illustrations. Almost 2,000 wells are described and located. Chemical analyses, and intervals on electric logs, and the geologic section are tabulated. The occurrence of groundwater in Bolivar County is illustrated by geohydrologic sections and an aquifer thickness map. Examples of water-levels changes in wells are shown. (Woodard-USGS)
W75-11496

**GROUND-WATER DATA IN THE HARRISBURG - HALSEY AREA, CENTRAL WILLAMETTE VALLEY, OREGON,**
Geological Survey, Portland, Oreg.
F. J. Frank, and N. A. Johnson.
Oregon State Engineer, (Salem), Ground Water Report No 22, 1975. 48 p, 3 fig, 1 plate, 3 tab, 14 ref.

Descriptors: *Groundwater resources, *Basic data collections, *Water yield, *Water quality, *Oregon, Well data, Drillers logs, Water levels, Aquifer characteristics, Water utilization, Chemical analysis, Hydrographs.
Identifiers: *Central Willamette Valley(Oreg), *Harrisburg - Halsey area(Oreg).

The Harrisburg-Halsey area covers about 350 square miles in the central Willamette Valley, Oreg., and is part of a broad alluvial plain that lies between the Cascade and Coast Ranges in the central part of the Willamette Valley. Most of the data for the 506 wells in this report were obtained from well drillers' reports. Chemical analyses of water from 36 wells are tabulated. Most of the high-yield wells in the area produce water from alluvial (sand and gravel) aquifers that underlie the valley plain or that are coextensive with the present flood plain of the Willamette River. The water table in the alluvial aquifer is generally only a few feet below land surface. Pumping lifts are relatively small, and wells produce moderate to large quantities of groundwater of good chemical quality. (Woodard-USGS)
W75-11498

**GROUND-WATER LEVELS IN LOUISIANA--FOR WELLS MEASURED THROUGH 1974.**
Geological Survey, Baton Rouge, La.
Louisiana Department of Public Works, Baton Rouge, Water Resources Basic Records Report No 7, 1975. 548 p, 57 fig, 54 tab, 6 ref.

Descriptors: *Water wells, *Water levels, *Well data, *Louisiana, *Data collections, Aquifers, Observation wells, Hydrologic data, Groundwater.

This report includes data for the entire period of record for 599 wells in 54 parishes in Louisiana. The assemblage of water-level records has been divided into two parts--'currently measured wells' and 'formerly measured wells.' Currently measured wells are observation wells that are included in the current network and were measured during the period 1971-74. Water levels for current wells are included for the entire period of record. Formerly measured wells are observation wells in which measurements were discontinued prior to 1971. Records for these wells will be published in a subsequent report. The observation-well program in Louisiana was established in 1939. (Woodard-USGS)
W75-11499

**A BIBLIOGRAPHY OF BISCAYNE BAY, FLORIDA MONITORING AND RESEARCH PROGRAMS,**
Miami Univ., Fla. Sea Grant Institutional Program.
For primary bibliographic entry see Field 10C.
W75-11557

**STORM TIDE FREQUENCY ANALYSIS FOR THE COAST OF NORTH CAROLINA, SOUTH OF CAPE LOOKOUT,**
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 2B.
W75-11560

**STORM TIDE FREQUENCY ANALYSIS FOR THE COAST OF PUERTO RICO,**
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 2A.
W75-11561

**SOURCES OF WATER QUALITY, LAKE LEVEL, ICE, WATER TEMPERATURE AND METEOROLOGICAL DATA FOR THE ST. LAWRENCE GREAT LAKES,**
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 2H.
W75-11567

**AN INVENTORY AND STUDY OF THE VERMILION BAY-ATCHAFALAYA BAY COMPLEX; AREA DESCRIPTION, BIOLOGY, HYDROLOGY AND CHEMISTRY, AND SEDIMENTOLOGY,**
Louisiana Wildlife and Fisheries Commission, New Orleans. Div. of Oysters, Water Bottoms and Seafoods.
For primary bibliographic entry see Field 2L.
W75-11571

**CENTRAL NORTH PACIFIC TROPICAL CYCLONES, 1974,**
Fleet Weather Central FPO San Francisco, 96630.
For primary bibliographic entry see Field 2B.
W75-11579

**SIMULATION OF MISCIBLE DISPLACEMENT IN SOILS,**
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W75-11590

**MERCER COUNTY SURFACE WATER RESOURCES,**
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
For primary bibliographic entry see Field 4A
W75-11622

**VERMILION COUNTY SURFACE WATER RESOURCES,**
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
For primary bibliographic entry see Field 4A
W75-11623

**LAWRENCE COUNTY SURFACE WATER RESOURCES,**
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
For primary bibliographic entry see Field 4A.
W75-11624

**DE KALB COUNTY SURFACE WATER RESOURCES,**
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
For primary bibliographic entry see Field 4A.
W75-11625

**EVAPORATION DATA IN TEXAS,**
Texas Water Development Board, Austin.
J. P. Dougherty.
Report 192, June 1975. 237 p, 6 fig, 122 tab.

Descriptors: *Evaporation, *Texas, Stations, *Evaporation pans, Federal government, State governments, Local governments, Data collections, Administrative agencies, Cities, Atmometers, *Data collections.
Identifiers: *Evaporation data, *Evaporation stations, Local interests, Bureau of Plant Industry pan, National Weather Service pan, Young screen pan.

Available historical pan-evaporation data obtained in Texas, spanning a 64-year period from January 1907 to December 1970, were presented. Data gathered from 114 evaporation stations in operation in Texas during some part of the period were compiled. Most evaporation measurements were made with three types of pans: the Bureau of Plant Industry pan, the National Weather Service pan, and the Young screen pan. Several other pan types and the evaporometer have been utilized in Texas, but the volume of record obtained with these was small compared to that from the three main types of evaporation pans. The measuring devices were described completely, with photographs of installations and plans and specifications. The bulk of the report consisted of 122 data charts. It was mentioned that because of wind and other conditions, pan evaporation was not applicable to bodies of water unless proper numerical coefficients, typically between 0.6 and 1.2 for areas in Texas, are applied to the data. (Roberts-ISWS)
W75-11630

**HYMO FLOOD ROUTING,**
Agricultural Research Service, Temple, Tex.
For primary bibliographic entry see Field 4A.
W75-11647

**ROLE OF COMPUTER SIMULATION IN ADMINISTERING AN URBAN DRAINAGE ORDINANCE,**
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 6E.
W75-11669

**PROCEDURE FOR SELECTING A MINIMAL ENVIRONMENTAL IMPACT ROUTING FOR A WATER CONVEYANCE CANAL,**
Texas Tech Univ., Lubbock. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6G.
W75-11764

**FLOOD PLAIN INFORMATION: LEY CREEK, SALINA AND DEWITT TOWNSHIPS, ONONDAGA COUNTY, NEW YORK.**
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W75-11785

**FLOOD PLAIN INFORMATION: FLOOD HAZARD REPORT OF 4-7 JULY 1969 FLOOD, HURON RIVER, NORWALK CREEK, OHIO.**
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A
W75-11787

**FLOOD PLAIN INFORMATION: PLUM CREEK, BRUNSWICK HILLS AND MEDINA TOWNSHIPS, MEDINA COUNTY, OHIO.**
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W75-11788

**FLOOD PLAIN INFORMATION: NORTHEAST STREAM GROUP, STOCKTON, CALIFORNIA.**
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W75-11789

**FLOOD PLAIN INFORMATION: VENTURA RIVER, VENTURA COUNTY, CALIFORNIA.**
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-11790

**FLOOD PLAIN INFORMATION: CONTRARY CREEK, ST. JOSEPH, MISSOURI.**
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4A.
W75-11791

**FLOOD PLAIN INFORMATION: CHITTENANGO CREEK, BRIDGEPORT, ONONDAGA AND MADISON COUNTIES, NEW YORK.**
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W75-11792

**IDENTIFICATION OF PARAMETERS IN A LINEAR EQUATION OF GROUNDWATER FLOW,**
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 2F.
W75-11799

**DESERT STRIP FARMING--COMPUTER SIMULATION OF AN ANCIENT WATER HARVESTING TECHNIQUE,**
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3B.
W75-11812

**A COMPUTER MODEL FOR OPTIMIZING DESIGN OF IMPROVED CATCHMENT,**
Western Australia Dept. of Agriculture, Mount Soil Conservation Service.
For primary bibliographic entry see Field 3B.
W75-11813

## 8. ENGINEERING WORKS

### 8A. Structures

**LARGE DIAMETER SUBMARINE STEEL PIPELINE CROSSINGS,**
Greater Vancouver Sewage and Drainage District (British Columbia).

D. Mackay.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, Vancouver, British Columbia, p 71-92, 24 fig.

Descriptors: *Pipelines, *Pipes, *Sewerage, Water conveyance, Distribution systems, Steel pipes.
Identifiers: *Submarine pipeline crossings.

The Greater Vancouver area of British Columbia presents many engineering problems for the bulk transportation of water and sewage. To solve these problems, numerous summarine pipelins crossings have been installed at various sewage and water districts. To minimize the cost of the river crossings, new methods for assembling the units on land and pulling them into a dredged trench were devised. Innovative techniques have been developed for the installation of pipelines in large, fast moving alluvial rivers. The main features of the design and construction of six steel pipe submarine crossings are discussed. Some of the unique design features and new construction techniques for the installation of these large diameter steel submarine construction techniques for the installation of these large diameter steel submarine conduits include: a circular profile system which places no limit on the size and weight of conduit that can be installed as long as the circular profile can be achieved by open cut; the flectural bending of large diameter steel pipes to a degree of curvature greater than that previously used; and the launching of large diameter multiple steel pipes in a single package from timber skids on shore. The circular profile system is particularly useful where the launching space is restricted and the diameter of the pipe precludes the use of flectural bending. In the crossings described, the radii of curvature for 48, 54, and 66 inch pipe have been limited to 2400, 3000, and 4000 feet, respectively. (Orr-FIRL)
W75-11380

**SANITARY AND HYGIENIC EVALUATION OF SEEPAGE WATERS OF STRUCTURES PROTECTING RESERVOIRS (IN RUSSIAN),**
Gorkovskii Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 5B.
W75-11412

**HYDRAULIC MODEL STUDIES OF A SECOND POWERHOUSE AT ROCK ISLAND HYDROELECTRIC PROJECT,**
Washington State Univ., Pullman. Coll. of Engineering Research Div.
For primary bibliographic entry see Field 8B.
W75-11466

**HYDRAULIC MODEL STUDIES OF A SECOND POWERHOUSE AT ROCK ISLAND HYDROELECTRIC PROJECT, COFFERDAM TESTS,**
Washington State Univ., Pullman. Coll. of Engineering Research Div.
For primary bibliographic entry see Field 8B.
W75-11467

**PREDICTIVE MODELING OF EFFECTS OF THE PLANNED KINDRED LAKE ON GROUNDWATER LEVELS AND DISCHARGE, SOUTHEASTERN NORTH DAKOTA,**
Geological Survey, Bismarck, N.Dak.
For primary bibliographic entry see Field 4A.
W75-11503

**OPEN CUT METHOD USED FOR MAJOR SEWER.**
For primary bibliographic entry see Field 5D.
W75-11618

**PROVIDING SUBURBAN SEWERAGE DESPITE ENVIRONMENTAL AND CONSTRUCTION PROBLEMS,**
Minnetonka Public Works, Minn.
For primary bibliographic entry see Field 5D.
W75-11657

**CENTER PIVOT DESIGN CAPACITIES IN EASTERN COLORADO,**
Agricultural Research Service, Fort Collins, Colo.
D. F. Heermann, H. H. Shull, and R. H. Mickelson.
Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol 100, No IR2, p 127-141, June, 1974. 9 fig, 3 tab, 15 ref.

Descriptors: *Sprinkler irrigation, *Irrigation design, Irrigation engineering, Irrigation practices, Irrigation systems, Flow rates, Design flow, *Colorado.
Identifiers: *Center pivot irrigation.

Design system capacities were developed for center pivot sprinklers irrigating corn in the Central Great Plains by simulating irrigations for 60 years of climatic data collected at Akron, Colorado. The system design provides three probability levels of net irrigation requirements versus optimum soil water depletion as affected by soils with various water holding capacities. The design system capacities developed from the simulation model allow for the depletion of available soil water. An empirical procedure for determining the net system capacity from ET(net) as affected by allowable depletion level is presented. (Skogerboe-Colorado State)
W75-11835

**ANALYSIS OF CANAL SEEPAGE TO INTERCEPTOR DRAIN,**
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
H. D. Sharma, and A. S. Chawla.
Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol 100, No IR3, p 351-369, September, 1974. 11 fig, 5 ref, 2 append.

Descriptors: *Canal seepage, Seepage, *Seepage control, Drainage effects, *Drainage practices, *Drains.

An analytical solution is obtained with the help of conformal mapping for the problem of steady seepage from a canal into an interceptor drain and to the main drainage lain in homogeneous and isotropic medium extending to infinite depth. Equations have been given to determine the seepage discharge into the drain and the coordinates of the phreatic surface. The solutions of the equations have been presented in the form of dimensionless curves to facilitate computations. The analysis indicates that discharge to the interceptor drain increases with an increase in the bed width of the channel and diameter of interceptor drain, whereas it decreases with an increase in distance between the canal and the interceptor drain. As the drain is brought closer to the canal, the rate of increase of seepage into the drain increases. The effect of the drain diameter in intercepting seepage discharge is more pronounced at a deeper setting of the drain. (Skogerboe-Colorado State)
W75-11846

## 8B. Hydraulics

**SOLUTION OF A FREE-SURFACE BOUNDARY VALUE PROBLEM USING AN INVERSE FORMULATION AND THE FINITE ELEMENT METHOD,**
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W75-11447

**TURBULENT ENTRAINMENT ACROSS STABLE DENSITY STEP STRUCTURES,**
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W75-11451

**CLOSURE CONDITIONS MOUTH OF THE RUSSIAN RIVER,**
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 2L.
W75-11454

**A GEOMORPHIC SHORELINE INVENTORY WITH MANAGEMENT CONSIDERATIONS FOR WHATCOM COUNTY, WASHINGTON,**
Western Washington State Coll, Bellingham. Coastal Studies Group.
For primary bibliographic entry see Field 2L.
W75-11455

**RESISTANCE TO FLOW IN ALLUVIAL CHANNELS,**
East-Central State Soil and Water Resources (Nigeria).
For primary bibliographic entry see Field 2E.
W75-11459

**WATER HAMMER IN COAXIAL PIPE SYSTEMS,**
Karlsruhe Univ. (West Germany). Institut fuer Hydro-mechanik, Staunanlagen und Wasserversorgung.
W. Burmann.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY6, Proceedings Paper 11374, p 699-715, June 1975. 12 fig, 4 ref, 2 append.

Descriptors: *Water hammer, *Pipe flow, Pipelines, Pipes, Hydraulics, Tubes, Numerical analysis, Waves(Water).
Identifiers: *Coaxial pipe systems, *Wave equations, *Characteristic method, Wave dispersion, Wave propagation, Computation.

Transporting fluids involves the use of coaxial pipe systems in which water hammer may occur due to pump failure or valve operation. Investigations into the behavior of water hammer phenomena in such pipe systems of several different flow sections were reported. The solution of the differential equations covering nonstationary fluid flow in pipe systems of several different flow sections by means of the method of characteristics was sketched. The wave propagation as well as the transmission and reflection of waves at changes in diameter or density, and at pipe junctions, were expressed by the simplest possible formulas. (Lee-ISWS)
W75-11460

**SUBMERGED BUOYANT JETS IN QUIESCENT FLUIDS,**
Stone and Webster Engineering Corp., Boston. Mass. Environmental Engineering Div.
D. T. L. Chan, and J. F. Kennedy.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY6, Proceedings Paper 11383, p 733-747, June 1975. 6 fig, 25 ref. ONR Contract N00014-68-A-0196-0004.

Descriptors: *Buoyancy, *Temperature, Turbulence, Hydraulics, Diffusion, Entrainment, Diffusivity, Fluid mechanics, Jets, Flow, Thermal water, Discharge(Water), Numerical analysis.
Identifiers: *Jet flows, *Plumes, Diffusers, Quiescent fluids, Jet momentum, Buoyant jets.

An integral-type analysis was developed for submerged buoyant jets discharged horizontally into quiescent homogeneous fluids. Equations for conservation of volume flux, buoyancy flux, and kinematic conditions were combined with three self-similarity assumptions and one entrainment assumption. The entrainment velocity was assumed to consist of two components, one related to the initial jet momentum and the second to the buoyancy force, so that the entrainment coefficients obtained from studies of pure jets and pure plumes could be utilized. A closed-form solution was obtained which yielded polynomials describing the trajectories of both round and slot jets and linear and parabolic relations for the dilution for round and slot jets, respectively. These relations compared favorably with experimental and numerical results reported by other investigators. (Lee-ISWS)
W75-11461

**BOUNDARY SHEAR IN CHANNEL WITH FLOOD PLAIN,**
Halcron (William) and Patners, London (England).
R. C. Myers, and E. M. Elsawy.
Journal of the Hydraulics Division, Proceedings of American Soceity of Civil Engineers, Vol 101, No HY7, Proceedings Paper 11452, p 933-946, July 1975. 14 fig, 2 tab, 13 ref, 2 append.

Descriptors: *Earth-water interfaces, *Channel flow, *Flood plains, *Shear stress, Shear, Hydraulics, Momentum transfer, Channels, Boundaries(Surfaces), Cross-sections.
Identifiers: *Preston tube, *Boundary shear, Interaction, Complex cross sections.

Shear stress distributions were measured around the periphery of a channel of complex cross section using Preston tube. The complex section consisted of a deep channel and a flood plain. The measurements were carried out in the laboratory for flow in the full cross section and when the flow was confined to the deep section. In this way it was possible to compare shear stress distributions under both isolated and interacting conditions. It was revealed that the presence of the interactions between a channel and its flood plain significantly alters the values and distributions of boundary shear. The interaction mechanism increases average flood plain shear, falling off as depth increases, and has the effect of decreasing channel shear and altering the shear stress distribution shape. (Lardner-ISWS)
W75-11463

**RIVER REGIME WITH SPECIAL REFERENCE TO RIVER NILE,**
Assiut Univ. (Egypt). Dept. of Hydraulics.
For primary bibliographic entry see Field 2J.
W75-11464

**HYDRAULIC MODEL STUDIES OF A SECOND POWERHOUSE AT ROCK ISLAND HYDROELECTRIC PROJECT,**
Washington State Univ., Pullman. Coll. of Engineering Research Div.
A. F. Babb.
Bulletin 326, 1972. 116 p, 13 fig, 11 tab, 5 ref, 5 plates, 4 append.

Descriptors: *Hydraulic models, *Hydraulic structures, *Washington, *Columbia River, Model studies, Spillways, Fish passages, Hydroelectric plants, Channels, Navigation, Dams, Intakes structures, Outlets, Discharge(Water, Currents(Water), Laboratory tests, Hydraulic similitude, Distribution patterns, Velocity, Water levels, Calibrations.
Identifiers: *Rock Island Hydroelectric Project(Wash).

A second powerhouse facility is proposed for the Rock Island Hydroelectric Power Project, located on the Columbia River near Wenatchee, Washington. The modified river flow patterns were studied with the use of a 1:75 scale model. Included were investigations of (1) the flood-passing capability of both the existing and proposed structures, (2) the establishment of the best orientation of the new powerhouse from the standpoint of maximizing power output, and (3) the creation of flow patterns that would be compatible with the passage of anadromous fish and possible future navigation. Test results were summarized for spillway capacity, powerhouse orientation, navigation, and fish facilities. Appendixes presented data for model verification, velocities and flow patterns for existing structures, velocities and flow patterns for powerhous orientation tests, and navigation approach channel velocities. (See also W75-11467) (Humphreys-ISWS)
W75-11466

**HYDRAULIC MODEL STUDIES OF A SECOND POWERHOUSE AT ROCK ISLAND HYDROELECTRIC PROJECT, COFFERDAM TESTS,**
Washington State Univ., Pullman. Coll. of Engineering Research Div.
A. F. Babb.
Bulletin 326, Supplement No 1, February 1974. 18 p, 8 fig, 3 tab, 1 plate, append.

Descriptors: *Hydraulic models, *Hydraulic structures, *Washington, *Columbia River, *Cofferdams, Model studies, Spillways, Fish passages, Hydroelectric plants, Discharge(Water), Current(Water), Velocity, Distribution patterns, Water levels, Navigation, Dams, Laboratory tests, Gates, Flow control, Operations.
Identifiers: *Rock Island Hydroelectric Project(Wash).

Detailed descriptions of the Rock Island Project, the hydraulic model, the model testing program, and model test results relating to hydraulic conditions after completion of the second powerhouse were given in Bulletin 326 (1972), which gave results of tests conducted on spillway capacity, powerhouse orientation, navigation, and fish passage. Supplementary report presented data that describes flow conditions during construction to assist in design of cofferdam. Two cofferdam arrangements were tested in the model. A gate-operation sequence that will produce flow patterns conducive to efficient passage of fish was tabulated. (See also W75-11466) (Humphreys-ISWS)
W75-11467

**SCALE EFFECTS ON COOLING TOWER MODEL STUDIES,**
Iowa Inst. of Hydraulic Research, Iowa City.
T. W. Bugler, III, and J. C. Tatinclaux.
IIHR Report No 168, September 1974. 95 p, 58 fig, 8 tab, 8 ref.

Descriptors: *Hydraulic models, *Cooling towers, *Jets, *Temperature, *Model studies, Laboratory tests, Dimensional analysis, Density, Froude number, Reynolds number, Turbulence, Entrainment, Flumes, Mechanical control, Discharge(Water), Heated water, Thermal pollution.
Identifiers: *Mechanical cooling towers, *Scale effects(Models), Heated discharge, Blockage.

Scale effects had been observed in model studies of mechanical draft cooling towers. Four models with scale ratios of 1/150 and 1/504 were tested in a flume. Scale and blockage effects were investigated by recording temperature distributions in the plume from the cooling tower model. Lateral blockage was found to be no problem. The limited vertical depth was a problem if the jet velocity was more than twice the ambient current velocity in the flume. Limiting scale, width, and depth ratios were determined. (Adams-ISWS)
W75-11470

**PROGRESS REPORT TO THE ARKANSAS STATE HIGHWAY COMMISSION FOR YEAR ENDING JUNE 30, 1975,**
Geological Survey, Little Rock, Ark.
M. S. Hines
Open-file report, 1975. 21 p, 1 fig, 1 plate, 1 tab.

Descriptors: *Hydrologic data, *Flood frequency, *Peak discharge, *Bridge construction, *Arkansas, Open channel flow, Hydraulics, Flow characteristics, Flow around objects.
Identifiers: Progress report

The economic design of bridges and culverts requires a knowledge of the magnitude and frequency of floods for all size drainage basins. The Arkansas State Highway Commission and the U.S. Geological Survey are cooperating in a program to provide information concerning flood frequency and open-channel hydraulics. A summary of the accomplishments of the program is presented. Included are plans for future work and a brief description of related water-resources programs of the Geological Survey in Arkansas. The primary objective is to define regional flood frequency relations for Arkansas, with particular emphasis placed on drainage areas of less than 5 square miles. The secondary objective is to analyze the hydrologic and hydraulic floodflow characteristics at specific bridge sites. In addition the program includes the documentation of unusual small-area floods. The network of 10 crest-stage stations was operated to determine the annual peak stage and discharge at all sites. (Woodard-USGS)
W75-11501

**PREDICTIVE MODELING OF EFFECTS OF THE PLANNED KINDRED LAKE ON GROUND WATER LEVELS AND DISCHARGE SOUTHEASTERN NORTH DAKOTA,**
Geological Survey, Bismarck, N.Dak.
For primary bibliographic entry see Field 4A.
W75-11503

**HYDRAULIC DESIGN OF VERTICAL STILLING WELLS,**
Bureau of Reclamation, Denver, Colo. Div. of Research.
P. H. Burgi.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Paper 11451, p 801-816, July 1975. 12 fig, 1 tab, 7 ref, 2 append.

Descriptors: *Energy loss, *Design criteria, *Hydraulic models, *Cavitation, Hydraulics, Hydraulic structures, Dimensional analysis.
Identifiers: *Vertical stilling wells, *Sleeve valve, Corner fillet, Corner angle.

Vertical stillings wells are economical and ideally suited to dissipate high energy flow. Model studies established general design criteria for vertical stilling wells using a standard sleeve valve. Dimensionless parameters based on design discharge and valve diameter D were established to aid the designer in determining optimum well size for a specific need. Over 100 tests were conducted on two laboratory models to determine stilling well geometry. Corner fillet and corner angle provided the best design configurations. A graphical method of presentation was included to aid the designer in sizing the vertical stilling well, and design example demonstrating the method was presented. (Lardner-ISWS)
W75-11650

**TURBULENT FLOW OF POWER-LAW FLUIDS**
New Mexico State Univ., University Park. Dept. of Civil Engineering.
A. I. Y. Mohammed, N. N. Gunaji, and P. R. Smith.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 10

Y7, Paper 11459, p 885-900, July 1975. 8 fig, 2 b, 16 ref, 2 append.

escriptors: *Conduits, *Turbulence, *Turbulent ow, Fluid mechanics, Hydraulics, Friction, Mo- entum transfer, Non-Newtonian flow, Pipe flow. lentifiers: *Power-law fluids, *Reynolds stress, lixing length, Fanning friction factor.

elocity profiles for the steady incompressible rbulent flow of power-law fluids through circu- r conduits were calculated by numerical quadra- re considering both the viscous stresses and the eynolds stresses operative over the entire cross ction of the flow. A non-Newtonian stress coef- cient, K sub n, was introduced along with mixing ngth, 1, so that the Reynolds stresses could be t in a form similar to that of the viscous stresses. he form of the Reynolds stresses thus obtained duced to the Newtonian form when the flow havior index, n, equaled unity. Both l and K sub were assumed dependent upon the Reynolds mber. Similarly, friction factors for the turbu- nt flow of power-law fluids were calculated by merical quadrature. The calculated friction fac- rs were compared to 146 measured friction fac- rs over a range of Reynolds numbers from 2670 108,800. The mean absolute difference between lculated and measured friction factors for this mple was 3% with a standard deviation of 1.9%. ee-ISWS)
75-11651

**OLID PARTICLE SETTLEMENT IN OPEN- HANNEL FLOW,**
olorado State Univ., Fort Collins. Dept. of Civil ngineering.
r primary bibliographic entry see Field 5B.
75-11652

**ALL SHEAR MEASUREMENT IN SAND- ATER MIXTURE FLOWS,**
ddle East Technical Univ., Ankara (Turkey). pt. of Civil Engineering.
Yucel, and W. H. Graf.
urnal of the Hydraulics Division, Proceedings of nerican Society of Civil Engineers, Vol 101, No Y7, Paper 11453, p 947-963, July 1975. 9 fig, 13 , 2 append.

scriptors: *Boundary layers, *Anemometers, urbulence, Hydraulics, Measurement, Heat nsfer, Reynolds number, Dimensional analysis, drodynamics, Instrumentation, Fluid chanics.
ntifiers: *Boundary shear, Two phase flow, ll shear stress, Skin friction, Sand-water mix- e flow.

e wall shear stress was measured in clear-water l sand-water mixture flows with the use of a sh-mounting hot-film shear-sensor. Data were ained with two shear-sensors and two different ds (d50 = 0.45 mm and d50 = 0.88 mm) with ids concentrations of up to maximum C = 1.6% volume, and for flow Reynolds numbers of ,000 less than RD less 600,000. The 'measured' sor wall shear stresses were compared with the e' wall shear stresses obtained with the energy d loss measurements conducted in a pipeline tem. The results of the tests in the clear-water ws confirmed the relationship between the sen- power output, P sub S, and the cubic root of wall shear stress having linear relationship. e tests with the low-concentration sand-water tures in a vertical pipe indicated that, for the sent range of experiments, sensor power out- s with the mixtures exceeded those for clear- er by an average of 5%. It is shown that the ar-sensors are delicate but accurate instru- nts that can be used for the measurement of the l shear stress. (Lee-ISWS)
5-11653

**TURBULENT DRAG COEFFICIENTS OF SHARP-EDGED OBJECTS,**
Ecole Polytechnique Federale de Lausanne (Switzerland). Laboratoire d'Hydraulique.
W. H. Graf, and F. F. Mansour.
Journal of Hydraulic Research, Vol 13, No 2, p 127-147, 1975. 10 fig, 14 ref.

Descriptors: *Turbulence, *Drag, Dimensional analysis, Fluid mechanics, Reynolds number, Hydrodynamics, Turbulent flow.
Identifiers: *Turbulence intensity, *Drag coefficients, *Turbulence scale, Empirical relations, Bluff bodies, Cubes, Square rods, Circular cylinders.

The drag coefficient in turbulent flow has been found to be a function of the turbulence intensity, a dimensionless turbulence scale, and the Reynolds number. Ko and Graf combined these three factors into a single term called the 'turbulence characteristics' for circular cylinders. The correlation was extended here to sharp-edged objects, such as cubes and square rods. The ratio of the turbulence intensity squared to the drag coefficient was found to yield a better correlation with the turbulence characteristics parameter than the drag coefficient. The plots of published data for cubes and square rods showed trends similar to the plot for the circular cylinder. (Adams-ISWS)
W75-11654

**ANALYSIS OF PLUNGING PHENOMENA IN WATER RESERVOIRS,**
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 4A.
W75-11655

**VELOCITIES ABOVE ROUGH BED IN OSCILLATORY FLOW,**
Cambridge Univ. (England). Dept. of Engineering.
J. F. A. Sleath.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 100, No WW4, Proceedings paper No 10930, p 287-304, November 1974. 18 fig, 13 ref.

Descriptors: *Coastal engineering, *Flow, *Stability, *Turbulence, *Velocity, *Waves(Water), Hydrodynamics, Oceanography, Reynolds number, Numerical analysis, Analytical techniques, Laminar flow, Measurement, Roughness(Hydraulics), Equations.
Identifiers: *Fluid flow, Finite difference approximation, Rough beds.

Presented are the results of analytical and numerical solutions for the velocities produced by progressive water waves in the boundary layer above a two-dimensional rough bed. The fluid velocities close to the two-dimensional rough bed were calculated for laminar oscillatory flow, similar to that produced by waves near the seabed. At low Reynolds numbers a small-perturbation procedure was used and at high Reynolds numbers the equations of motion were solved numerically, using a finite-difference approximation. The numerical solution indicates that the flow remains laminar up to much higher Reynolds numbers than has previously been supposed, and this conclusion is confirmed by hot-wire anenometer measurements. Comparison of the computed velocity profile with measurements by Kalkanis suggests that the mean velocities may still be well represented by the numerical solution even when the flow does become turbulent. The solution involves no experimentally-determined constants and applies to situations of practical importance, and also to flow over flat beds of sand provided an appropriate definition of roughness length is used. (Bell-Cornell)
W75-11763

**INFLUENCE OF CURRENT ON STATISTICAL PROPERTIES OF WAVES,**
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-11772

**EXPERIMENTAL STUDY OF WAVE TRANSIMISSION,**
Sir George Williams Univ., Montreal (Quebec). Dept. of Civil Engineering.
M. S. Nasser, and J. A. McCorquodale.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 100, No WW4, Proceedings paper No 10928, p 279-286, November 1974. 5 fig, 1 tab, 7 ref.

Descriptors: *Coastal engineering, *Gabions, *Rock fill, *Waves(Water), Structures, Embankments, Porous media, Shallow water, Analytical techniques, Unsteady flow, Water levels, Hydraulics, Equations, Mathematical models, Systems analysis.
Identifiers: *Wave propagation, *Wave runup, Nonlinear systems, Reflection, Wave steepness, Transmission data, Impervious cores, Multilinear regression, Experiments, Non-Darcy flow.

Unsteady non-Darcy flow in rectangular rock-fill embankments with impervious cores was studied experimentally by subjecting the embankments to nonlinear, shallow water waves. Crushed rock and quartz were utilized, in sizes ranging from 0.7 cm to 4.4 cm, to build embankments of various widths. The waves in all experiments were nonbreaking. The embankments were tested for several wave conditions. Empirical formulas are presented for transmission, reflection, runup, and rushdown, and all give good correlations. An upward shift of the mean water level in the embankments was detected during the experiments. It was found that transmission decreased with decreasing conductivity and increasing wave steepness and embankment width, and that reflection decreased with increasing conductivity and width of embankment. (Bell-Cornell)
W75-11773

**WAVE ENERGY TRANSFER MECHANISMS IN WIND-WAVE TUNNELS,**
Amoco Production Co., Tulsa, Okla.
J. B. Bole.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 100, No WW4, Proceedings paper No 10932, p 325-344, November 1974. 8 fig, 5 tab, 22 ref.

Descriptors: *Air-water interfaces, *Waves(Water), *Dispersion, *Energy transfer, *Coastal engineering, Height, Deep water, Shear stress, Measurement, Equations, Mathematical models, Gravity waves.
Identifiers: *Wind-wave tunnels, Ocean engineering, Normal stress, Experiments, Graphs.

Theoretical and experimental results are reviewed for five exponential mechanisms that operate on small-amplitude deepwater gravity waves in wind-wave tunnels. Energy source term mechanisms are those due to: (1) tangential shear stress; (2) phase-shifted normal stress; and (3) airflow-pressure-gradient normal stress. Energy sink term mechanisms include only those due to viscous dissipation in the far field, and in the wall boundary layers. The results of experiments by Liang are shown to compare favorably with the theoretical airflow-pressure-gradient normal stress and to confirm its importance. On the basis of this result, phase-shifted normal stress is recalculated for the laboratory wave growth data of Bole and Hsu and is found to be an average of only 1.7 times the theoretical results of the Miles inviscid shear-flow model. This finding is in substantial agreement with the recent field measurements of Elliot, but it

is in disagreement with earlier field investigations. Graphs are presented to illustrate the relative importance of the five energy transfer mechanisms for laboratory experimental conditions. (Bell-Cornell)
W75-11774

**CAVITATION IN BUTTERFLY VALVES,**
Colorado State Univ., Fort Collins.
J. W. Ball, and J. P. Tullis.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 99, No HY9, Proceedings paper No 9993, p 1303-1318, September 1973. 12 fig, 2 tab, 15 ref.

Descriptors: *Butterfly valves, *Cavitation, *Flow control, *Hydraulics, *Pipe flow, Pipelines, Data collections, Water conveyance, Pressure, Size, Design criteria, Equations, Evaluation.

Tests made at Colorado State University have resulted in a generalization of cavitation data, making them useful in developing pipeline designs utilizing butterfly valves as control. Related cavitation design criteria evolved from the tests and the cavitation parameters considered in developing designs for water systems in which butterfly valves are used are presented. Methods for defining capacity and specific degrees of cavitation intensity (incipient, critical, and choking or supercavitation) and for evaluating cavitation design limits are given. The importance of scale effects related to system pressure and size of valve is stressed and procedures for adjusting for these scale effects are outlined. The cavitation characteristics of butterfly valves have been generalized and an example of the application of these data to the design of water conveyance systems is offered. The performance characteristics of valves makes the upstream end or the low point in the pipeline the optimum location when it is desired to minimize noise and damage due to cavitation (free discharge not considered). The design example given considers this performance characteristic. (Bell-Cornell)
W75-11777

**ENERGY LOSSES AT 90 DEGREES PIPE JUNCTIONS,**
Tohoku Univ., Sendai (Japan). Inst. of High Speed Mechanics.
H. Ito, and K. Imai.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 99, No HY9, Proceedings paper No 10022, p 1353-1368, September 1973. 12 fig, 3 tab, 23 ref.

Descriptors: *Pipe flow, *Hydraulics, *Head loss, *Junctions, Energy loss, Flow resistance, Water distribution(Applied), Diameter, Design, Reynolds number, Equations.
Identifiers: *Tees, Formulas.

The problem of determining the energy loss caused by the combination and division of flow at pipe junctions has been considered. The loss coefficients and the power-loss coefficients for four smooth tees with diameter ratio of unity were determined experimentally for each of all configurations of flow through tees. Through-out the test, the Reynolds number before the division or after the combination of flow was within the range of 10 to the 5th power - 2x10 to the 5th power. The radius of curvature of the wall at the joining edge ranged from zero up to half the diameter of the straight pipe. Empirical formulas for loss coefficients and those for power-loss coefficients which are in good agreement with experiments were presented for each configuration of flow. Empirical formulas for loss coefficients for dead end tees were also given. The comparison of the proposed formulas with the experimental results of previous investigators showed that the proposed formulas can be used to reliably estimate the energy losses at tees. (Bell-Cornell)
W75-11778

**OCEAN ENGINEERING--SELECTED REFERENCES,**
American Society of Civil Engineers, New York. Task Committee on Selected References of the Technical Council on Ocean Engineering.
W. J. Tudor.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 100, No WW3, Proceedings paper No 10767, p 241-248, August 1974. 96 ref.

Descriptors: *Coastal engineering, *Bibliographies, *Information retrieval, *Ocean waves, Anchors, Ocean currents, Underwater, Construction.
Identifiers: *Ocean engineering, Moorings, Ocean bottom.

This bibliography has been prepared by the committee on Selected References in Ocean Engineering of the Technical Council on Ocean Engineering. The references were chosen as being practical and useful to those involved in ocean engineering. Twelve catagories were used: site selection and environmental parameters (hydrospace or seafloor and coastline); soil properties, foundations and site preparation; construction equipment and systems; anchorage and moorings; design criteria and materials; life support and human engineering; management; legal; deep ocean simulation; recreation, energy, pollution, etc.,; indices; and trade magazines and journals. (Bell-Cornell)
W75-11779

**FRICTION--FREQUENCY DEPENDENCE FOR OSCILLATORY FLOWS IN CIRCULAR PIPE,**
Technische Hogeschool, Delft (Netherlands). Lab. of Thermal and Nuclear Engineering.
H. H. Safwat, and J. v. d. Polder.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 99, No HY11, Proceedings paper No 10158, p 1933-1945, November 1973. 12 fig, 6 ref.

Descriptors: *Hydraulics, *Flow, *Fluid friction, Hydrodynamics, Pipe flow, Shear stress, Unsteady flow, Frequency, Mathematical models, Forecasting.
Identifiers: *Friction coefficient(Hydraulic).

Measured data of velocity changes in oscillatory flow (o.16Hz-0.36Hz) are presented. The actual wall shear stresses obtained from these measurements are compared to calculated values based on steady flow relations and Zielke's model. A new model for the prediction of the wall shear stress as a function of velocity and acceleration changes is introduced. The proposed model may be a suitable basis for the prediction of friction data for one-dimensional flow analysis under nonsteady conditions. (Bell-Cornell)
W75-11780

**SIMULATION OF DISPERSION OF SUSPENDED PARTICLES,**
Technical Univ. of Istanbul (Turkey). Dept. of Civil Engineering.
B. M. Sumer.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 99, No HY10, Proceedings paper No 10056, p 1705-1726, October 1973. 8 fig, 2 tab, 17 ref, 3 append.

Descriptors: *Open channel flow, *Sediment transport, *Simulation analysis, *Numerical analysis, *Dispersion, *Hydraulics, *Uniform flow, Turbulent flow, Diffusion, Shear, Flow, Suspended load, Equations, Mathematical models, Systems analysis, Velocity, Digital computers.
Identifiers: Lagrangian functions.

Using the Lagrangian approach, the dispersion of suspended particles in turbulent open-channel flow is numerically simulated using a digital computer. Statistical properties which include the mean and variance of the distribution and probability density function of particle coordinates are computed for a certain range of the settling velocity parameter. The boundary condition at the bottom is assumed so that there is no particle entrainment in the flow from the bottom and no particle deposition on the bottom, i.e., particles remain in suspension motion all the time. The path of an initially marked particle is followed as it goes through statistical field variables. Many such paths are used to compile the probability distribution by an ensemble average. Two types of results are obtained: (1) the mean and variance of particle displacement in the flow direction, and (2) the probability density function of particle coordinate. Simulation results are compared, quantitatively with presently available information. Assuming that the rms of the particle (heavy) fluctuating velocity and the Lagrangian time scale for heavy particles are equal to those for fluid particles causes an error in the horizontal component of particle step which is greater than that in the vertical component; moreover, it appears that the mean computed by the simulation is reasonably satisfactory whereas the variance is not. The numerical simulation technique presented provides simplicity, flexibility and saving in computer time; its disadvantages include its relatively approximate nature and its requirement of correct input information. (Bell-Cornell)
W75-11782

**ENGINEERING ASPECTS OF WATER HARVESTING RESEARCH AT THE UNIVERSITY OF ARIZONA,**
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 3B.
W75-11802

## 8C. Hydraulic Machinery

**VALVE FOR CONTROLLING LIQUID DISCHARGE.**
Netherlands Patent 81931V/47. Issued November 6, 1974. Derwent Netherlands Patents Report, Vol 47, No 5, p 2, November 11, 1974.

Descriptors: *Patents, *Valves, Liquids, Waste disposal, Plastics, Construction materials, Sewage disposal.
Identifiers: Polyvinylchloride(PVC), Waste discharge, Hinges.

A patent was granted for a valve for controlling liquid discharge, with a plastic frame defining an opening, a plastic flap, and a hinge. This tide valve is to be placed on the banks of waters with a varying liquid height, and is especially useful for discharging sewage into tidal waters. It has a plastic frame, made of a substance such as polyvinylchloride, defining an opening and a plastic flap such as of asbestos-reinforced PVC, hinged for closing the opening. The flap is placed in the end of a tube piece, with the flexible plastic fastened to the frame and the flap, and is protected against damage. The hinge is thus given good protection and ensures prolonged and reliable operation. (Prague-FIRL)
W75-11417

**WATER HAMMER IN COAXIAL PIPE SYSTEMS,**
Karlsruhe Univ. (West Germany). Institut für Hydro-mechanik, Staunanlagen und Wasserversorgung.
For primary bibliographic entry see Field 8B.
W75-11460

**SUBMERGED BUOYANT JETS IN QUIESCENT FLUIDS,**
Stone and Webster Engineering Corp., Boston, Mass. Environmental Engineering Div.

primary bibliographic entry see Field 8B.
5-11461

PARATUS FOR SEWER TREATMENT TO
L THREE ROOTS AND OTHER ORGANIC
OWTH THEREWITHIN,
igation Engineering Co., Inc. Carmel Valley,
f. (assignee).
primary bibliographic entry see Field 5G.
5-11513

E OF SEWER LINE RENEWED WITH
STIC PIPING.
primary bibliographic entry see Field 5D.
5-11619

E INSERTION RENEWS SEWERS WITH
TLE EXCAVATION.
primary bibliographic entry see Field 5D.
5-11620

MESTIC WASTE WATER AND SEWAGE
CUATION DEVICE.
primary bibliographic entry see Field 5D.
5-11661

VER BRANCH SADDLE CONNECTOR,
. Clark, C. D. Burrier, and L. W. Gove, Jr.
adian Patent 970,792. Issued July 8, 1975. Pat-
Office Record, Vol 103, No 27, p 63, July,
5.

criptors: *Patents, *Sewers, *Sewerage,
elines, Equipment, Waste water treatment.
tifiers: *Sewer connections, Sewer branch
dle connector.

atent was issued for a connector used for the
nection of a lateral or branch sewer pipe line
a main sanitary sewer pipe line at a point
re there is no T or Y connector available.
ed a saddle connector, the assembly consists
cast iron saddle which will fit over a tapped
in the main sewer pipe line. The saddle has a
degree circular rubber O-shaped ring sealing
et, cemented in its retaining groove, which is
ted on the saddle underside. The saddle is
red to the main sewer pipe line with a stainless
strap and bronze T bolts, using attaching
ers and nuts. (Kramer-FIRL)
-11677

ER LINE BLOW-OUT PLUG,
I.S., Inc., Memphis, Tenn. (assignee).
. Melton.
ed States Patent 3,895,466. Issued July 22,
. Official Gazette of the United States Patent
ce, Vol 936, No 4, p 1199, July, 1975. 1 fig.

criptors: *Patents, *Pipelines, *Pipes,
verage, Equipment, Pressure, Hydraulics,
te water treatment.
tifiers: Sewer line blow-out plug.

tented plug for sewer lines is described. This
assembly is adaptable and will seal a clean-
end of a pipe or pipe system under normal
sure conditions. However, when subjected to
t over-pressure within the pipe system, the
will blow out, thus releasing this pressure.
assembly system consists of first and second
s for reception within the open end of a clean-
pipe and a jell-like material sandwiched
een the two plates which is extrudable to en-
the inferior surface of the pipe and to hold the
within the pipe under normal conditions.
mer-FIRL)
-11684

TRIFUGES - TYPES AND APPLICATIONS,
valt Corp., Warminster, Pa. Sharples-Stokes

For primary bibliographic entry see Field 5D.
W75-11725

**DIMENSIONING AND DESIGN OF SMALL WASTE WATER PUMPING STATIONS (BEMESSUNG UND GESTALTUNG VON KLEIN-ABWASSERPUMPWERKEN),**
F. Siefert.
Technische Mitteilungen, Vol 68, No 5, p 167-172, May, 1975. 6 fig.

Descriptors: *Pumping plants, *Design, *Pumps, Construction costs, Flood protection, Pipes.
Identifiers: Small-capacity pumping stations.

General problems of the dimensioning and design of small waste water pumping stations are described. Dry type pumps offer advantages over wet type pumps in that they facilitate cleaning due to a separated suction space. Wet type pumps require lower construction costs and less strict flood protection. Vertical pumps offer increased flood protection, while horizontal layout permits adjustment of the pump capacity to particular flow conditions. Suction and delivery pipes should have a minimum diameter of 100 mm. Delivery pipes should be made of corrosion-resistant steel with a minimum wall thickness of 6 mm. The suction space should be tiled or lined with fiber-glass-reinforced polyester to facilitate scavenging. (Takacs-FIRL)
W75-11744

**DESIGN CRITERIA FOR SINGLE-POINT MOORING TERMINALS,**
Shell Internationale Research Maatschappij N.V., The Hague (Netherlands).
J. M. Langeveld.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Socity of Civil Engineers, Vol 100, No WW4, Proceedings paper No. 10931, p 305-323, November 1974. 9 fig, 6 ref.

Descriptors: *Harbors, *Hydrography, Environmental engineering, Buoys, Deep water, Safety, *Design criteria, Operations and maintenance, Computer models, Computer programs, Alternative planning, Sites, Coastal engineering, Operations research.
Identifiers: *Crude oil, *Offshore structures, Terminal facilities, Marine environment, Tanker ships, Moorings, Berths.

Single-point moorings have come to be accepted as a logical choice for off-shore berths for large tankers. The type most commonly used is that in which a single-mooring buoy (SBM) is anchored to the seabed with long catenaries of chain. Site selection for single-point moorings (SPM) is governed above all by safety of operation of the tanker in maneuvering and mooring. Site conditions and marine environment play a major part in judging this safety. Detailed information is required on bottom conditions, sea levels, currents, winds, waves, and visibility. In the design of a specific single-buoy mooring system, the main parameter is the mooring load. Determination of this load requires model tests, since reliable design formulas are not yet available. The Royal Dutch/Shell Group, in their world-wide operations, are successfully using their single-buoy mooring system, which is undergoing gradual improvements. SBM can be operated without causing pollution to the surrounding coastline and without detrimental effect on the local marine environment. (Bell-Cornell)
W75-11771

**CAVITATION IN BUTTERFLY VALVES,**
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 8B.
W75-11777

## 8D. Soil Mechanics

**DETERMINING EFFECTIVE SOIL WATER DIFFUSIVITIES FROM ONE-STEP OUTFLOW EXPERIMENTS,**
Minnesota Univ., St. Paul.
For primary bibliographic entry see Field 2G.
W75-11592

**EXPERIMENTAL STUDY OF WAVE TRANSIMISSION,**
Sir George Williams Univ., Montreal (Quebec). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-11773

**EFFECT OF BACKFILL ON DRAIN FLOW IN LAYERED SOILS,**
California Univ., Davis.
R. B. Hwang, J. N. Luthin, and G. S. Taylor.
Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol 100, No IR3, p 267-276, September. 1974. 4 fig, 1 tab, 10 ref.

Descriptors: *Drainage practices, Drainage engineering, *Drains, *Soil profiles, Soil properties, Hydraulic conductivity, *Backfill, Compaction, *Compacted soils.

The purpose of the work is to shed some light on the transient flow towards drains in layered soils with the ultimate goal of improving the techniques of drainage design. The combination of layers occurring in the field soils is very great but experience shows that many soils can be treated as two-layered soils from a standpoint of drainage design. Trial-and-error methods in the field may well be the best way to treat some of the more complicated soil layering problems. However, for soils that can be approximated by a two-layer model the results presented herein will improve our understanding of the flow towards drains and the effect of the backfill material on such flow. (Skogerboe-Colorado State)
W75-11834

## 8G. Materials

**GYPSUM SOLUBILITY AND SCALING LIMITS IN SALINE WATERS,**
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 3A.
W75-11473

## 8I. Fisheries Engineering

**HYDRAULIC MODEL STUDIES OF A SECOND POWERHOUSE AT ROCK ISLAND HYDROELECTRIC PROJECT,**
Washington State Univ., Pullman. Coll. of Engineering Research Div.
For primary bibliographic entry see Field 8B.
W75-11466

**HYDRAULIC MODEL STUDIES OF A SECOND POWERHOUSE AT ROCK ISLAND HYDROELECTRIC PROJECT, COFFERDAM TESTS,**
Washington State Univ., Pullman. Coll. of Engineering Research Div.
For primary bibliographic entry see Field 8B.
W75-11467

**EFFECTS OF FISH-PONDS NEAR JAKUBOVO ON THE ORNITHOCENOSE THERE, (IN CZECH),**
Komenskeho Universita, Bratislava (Czechoslovakia). Katedra Syst. Ekol. Zool.

For primary bibliographic entry see Field 5C.
W75-11535

**BIOLOGICAL CONSIDERATIONS ON THE USE OF THERMAL EFFLUENTS FOR FINFISH AQUACULTURE,**
Oceanic Inst., Waimanalo, Hawaii.
For primary bibliographic entry see Field 5C.
W75-11759

## 9. MANPOWER, GRANTS AND FACILITIES

### 9A. Education (Extramural)

**DIRECTORY OF WATER RESOURCES EXPERTISE, WATER RESEARCH FACULTY AND STAFF SCIENTISTS.**
California Univ., Davis. Water Resources Center.
For primary bibliographic entry see Field 10C.
W75-11580

## 10. SCIENTIFIC AND TECHNICAL INFORMATION

### 10C. Secondary Publication And Distribution

**PLATING AND CYANIDE WASTES, (LITERATURE REVIEW),**
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5D.
W75-11370

**COASTAL ZONE LEGAL REFERENCES (SELECTED) 1975.**
State Univ. of New York, Buffalo. Faculty of Law and Jurisprudence.
For primary bibliographic entry see Field 2L.
W75-11548

**A BIBLIOGRAPHY OF BISCAYNE BAY, FLORIDA MONITORING AND RESEARCH PROGRAMS,**
Miami Univ., Fla. Sea Grant Institutional Program.
P. C. Rosendahl.
Special Report Number 2, May 1975. 82 p, 11 fig.
OSG 04-5-158-14.

Descriptors: *Data collections, Documentation, *Natural resources, Water resources, Ecosystems, Ecology, Investigations, Baseline studies, *Florida, *Bibliographies.
Identifiers: *Data monitoring programs, *Marine ecosystems, Data bases, Chemical data, Physical data, Biological data, *Biscayne Bay(FL).

Biscayne Bay is a natural resource of paramount importance to the citizens of Dade County and all of Florida. To determine the changes that have occurred to this marine ecosystem in recent time and to monitor future changes, a number of data collection programs have been conducted. This report attempts to identify data monitoring programs that have been conducted in the bay. To be included in this report, a program had to cover a broad geographical area or a time period of at least a year. Data bases should ideally have time spans of five years or more, but such a requirement would have reduced the list almost to zero. This report includes any study covering at least a Card Sound-size area of the bay, even the one-time studies. Part II also contains a literature survey for Biscayne Bay of about 900 citations. This survey should not be considered exhaustive, but should be revised as new references are discovered or new reports are written. (NOAA)
W75-11557

**DIRECTORY OF WATER RESOURCES EXPERTISE, WATER RESEARCH FACULTY AND STAFF SCIENTISTS.**
California Univ., Davis. Water Resources Center.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-245 278, $4.75 in paper copy, $2.25 in microfiche.
Miscellaneous Report, Revised August 1975, 85 p.
OWRT A-999-CAL(10).

Descriptors: *Scientific personnel, *Research and development, Universities, Publications, *California.
Identifiers: Directories.

The objective is to identify as nearly as possible those faculty and staff scientists in the University of California actively investigating one or more aspects of water resources problems. The Directory may be used as a means of direct contact with the investigator or as a means of identifying those who have published results of research investigations. The Water Resources Center maintains two specialized collections of published and archival research reports in which are located many of the publications and studies of scientists listed in the Directory. The primary collection is on the Berkeley Campus and the smaller, more regionally-oriented collection, is on the Los Angeles Campus. (Snyder-California, Davis)
W75-11580

**OCEAN ENGINEERING--SELECTED REFERENCES,**
American Society of Civil Engineers, New York. Task Committee on Selected References of the Technical Council on Ocean Engineering.
For primary bibliographic entry see Field 08B.
W75-11779

### 10F. Preparation Of Reviews

**PLATING AND CYANIDE WASTES, (LITERATURE REVIEW),**
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 05D.
W75-11370

**SEDIMENT TRANSPORT THEORIES: A REVIEW,**
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 02J.
W75-11453

**QUANTITATIVE INORGANIC ANALYSIS BY GAS CHROMATROGRAPHY, A REVIEW,**
Birmingham Univ. (England). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W75-11528

**PLATING AND CYANIDE WASTES (LITERATURE REVIEW),**
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 05D.
W75-11545

**URBAN RUNOFF AND COMBINED SEWER OVERFLOW, (LITERATURE REVIEW),**
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 05D.
W75-11710

**CONTINUOUS MONITORING, AUTOMATED ANALYSIS AND SAMPLING PROCEDURES, (LITERATURE REVIEW),**
Florida Univ., Gainesville.
For primary bibliographic entry see Field 05A.
W75-11711

**SLUDGE HANDLING AND DISPOSA SEMINAR, CONFERENCE PROCEEDINGS NO 2.**
Ontario Ministry of the Environment. Toronto Pollution Control Branch
For primary bibliographic entry see Field 05D
W75-11715

# SUBJECT INDEX


**4-D**
Further Observations on the Effect of Sodium Salt of 2,4-D on Early Developmental Stages of Carp (Cyprinus Carpio L.),
W75-11762 5C

**3 HG**
Loss of Trace Elements from Natural Water During Storage. I. Behavior of 203 Hg and 65 Zn Added to Pond Water,
W75-11543 5A

**ZN**
Loss of Trace Elements from Natural Water During Storage. I. Behavior of 203 Hg and 65 Zn Added to Pond Water,
W75-11543 5A

**SCISIC ACID**
A Water Potential Threshold for the Increase of Abscisic Acid in Leaves,
W75-11394 2I

**SORPTION**
Kinetics of Lead Retention and Distribution in Suckling and Adult Rats,
W75-11537 5B

Relation Between Nitrate Absorption and Water Transpiration by Corn,
W75-11602 3F

Effects of Water Management and Soil Aggregation on the Growth and Nutrient Uptake of Rice,
W75-11832 3F

**CELERATED EROSION**
The Growth of Posidonia and the Urban Pollution in the Gulf of Giens, (In French),
W75-11761 5C

**IDITY**
Water Processing Plant to Controlled Acidity Level,
W75-11421 5F

**IVATED ADSORPTIVE SUBSTANCES**
Studies on Recovery of Chemicals and Manufacture of Activated Substances from Pulping Waste Liquor, Part 2, Use of Softwood KP-Waste Liquor, (In Japanese),
W75-11373 5D

**IVATED CARBON**
Advanced Treatment of Waste Water from Machinery Works by Activated Carbon Kasseitan ni yoru kikai kojo haisui no kodo shori),
W75-11372 5D

**IVATED SLUDGE**
Activated Sludge Sewage Treatment for Seasonally Variable Throughput,
W75-11396 5D

Studies of the Biochemical Factors Controlling the Flocculation of Activated Sludge, (In Japanese),
W75-11402 5D

An Automated Spectrophotometric Suspended Solids Analysis for Activated Sludge,
W75-11408 5D

Response of Completely Mixed Activated Sludge Systems to Changes in the Environment,
W75-11478 5D

Purifying Plant for Sewage,
W75-11673 5D

Biological Purification of Waste Water.
W75-11683 5D

Sewage Treatment Process,
W75-11685 5D

Novel Waste Treatment Variation Shows Great Promise,
W75-11702 5D

Oxygen Activated Sludge Systems in Texas,
W75-11740 5D

The Influence of Temperature on the Biological Oxidation of Urban Waste Waters by Means of an Activated Sludge (Influenza Della Temperature Nella Ossidazion Biologica dei Liquami Urbani Mediante Fanghi Attivi),
W75-11745 5D

Phosphate Precipitation in Activated Sludge Plants with Sludge Stabilization and Dentrification (Phospatfaellung in Belebungsanlagen mit Schlammstabilisation und Denitrifikationsstufe-),
W75-11746 5D

**ADMINISTR..TION**
Package Plants: The Contractor's Point of View,
W75-11689 5D

**ADSORPTION**
Metal Removal by Physical and Chemical Treatment Processes,
W75-11542 5D

**AEGEAN SEA**
Chemical Composition of Aegean Sea Sediments,
W75-11533 2J

**AERATION**
Sewage Treatment.
W75-11398 5D

Flotation Aerator for Aerating and Moving Water,
W75-11439 5D

Sewage Treatment Plant Equipped With an Aeration Impeller,
W75-11670 5D

Air Driven Rotating Biological Contactor Apparatus,
W75-11680 5D

Novel Waste Treatment Variation Shows Great Promise,
W75-11702 5D

EPA Experiences in Oxygen-Activated Sludge,
W75-11738 5D

Aeration Systems for Metro Chicago,
W75-11739 5D

**AERATORS**
Sewage Treatment Plant Equipped With an Aeration Impeller,
W75-11670 5D

**AEROBIC DIGESTION**
Aerobic Sewage Treatment System,
W75-11507 5D

The Effect of Temperature on the Aerobic Digestion of Wastewater Sludge,
W75-11708 5D

Aerobic Digestion of Wastewater Sludge Under Low Temperature Conditions,
W75-11709 5D

**AEROBIC TREATMENT**
Aerobic Sewage Treatment System,
W75-11507 5D

Aerobic Digestion of Wastewater Sludge Under Low Temperature Conditions,
W75-11709 5D

Aerobic and Anacrobic Sludge Digestion,
W75-11719 5D

Pasteurization of Sapropel (Pasteurisierung von Faulschlamm),
W75-11750 5D

**AGRICULTURE**
Agricultural Drainage Research Needs and Priorities, 1974,
W75-11632 4A

**AIR POLLUTION**
Sanitary and Bacteriological Evaluation of the Raw Material, Air and Wastewaters of Some Bast Fiber Plants in the Uzbek SSR, (In Russian),
W75-11406 5B

Methods of Detecting the Fluorine Ion in Air and Water, (In Russian),
W75-11794 5A

**AIR-WATER INTERFACES**
Formation and Collapse of Surface Films,
W75-11642 2K

Wave Energy Transfer Mechanisms in Wind-Wave Tunnels,
W75-11774 8B

**ALABAMA**
Proceedings of Alabama Coastal Leaders Conference on Coastal Zone Management.
W75-11555 6E

**ALASKA**
Sediment Relations of Selected Alaskan Glacier-Fed Streams,
W75-11477 2J

Hydrology for Land-Use Planning: The Hillside Area, Anchorage, Alaska,
W75-11504 4A

Cooperation in Water Resources Programs: Alaska's Example,
W75-11775 6B

**ALBERTA**
Regional Chemistry of Groundwater in the Wainwright Area, Alberta,
W75-11471 2F

Hydrogeology of the Wainwright Area, Alberta,
W75-11475 4B

**ALDERSEEDLINGS**
Effect of Water Stress, Temperature, and Light on Photosynthesis in Alder Seedlings,
W75-11691 2I

**ALFALFA**
Evapotranspiration by Subirrigated Alfalfa and Pasture in the East Central Great Plains,
W75-11841 3F

ALGAE
An Ecological Survey of the Rocky Coast Adjacent to a Bromine Extraction Works,
W75-11758 5C

ALGAL GROWTH
Phytoplankton in Lake Mascardi (Rio Negro, Argentina), (In Spanish),
W75-11532 5C

ALGORITHMS
Solution of a Free-Surface Boundary Value Problem Using an Inverse Formulation and the Finite Element Method,
W75-11447 2F

ALLUVIAL CHANNELS
Resistance to Flow in Alluvial Channels,
W75-11459 2E

River Regime with Special Reference to River Nile,
W75-11464 2J

ALTER WINDSHIELD
Comparison of Precipitation Gage Catches with a Modified Alter and a Rigid Alter Type Windshield,
W75-11457 2B

ALUM
An Evaluation of the Effectiveness and Applicability of Physical-Chemical Treatment of Urban Land Runoff,
W75-11389 5D

Coagulant Recovery Takes Planning,
W75-11665 5D

Aluminum Sulphate for Water Treatment.
W75-11704 5D

ALUMINUM
Sludges Generated in Phosphate Removal Processes,
W75-11737 5D

AMBARI
Sanitary and Bacteriological Evaluation of the Raw Material, Air and Wastewaters of Some Bast Fiber Plants in the Uzbek SSR, (In Russian),
W75-11406 5B

AMBROSIA-ARTEMISIFOLIA
A Water Potential Threshold for the Increase of Abscisic Acid in Leaves,
W75-11394 2I

AMBROSIA-TRIFIDA
A Water Potential Threshold for the Increase of Abscisic Acid in Leaves,
W75-11394 2I

AMMONIA
Removing Solids From Sewage.
W75-11428 5D

AMMONIUM
Ammonia Removal from Municipal Wastewaters by Ion Exchange,
W75-11405 5D

AMPHIBIANS
The Occurrence of Mercury in Amphibia,
W75-11534 5A

AMPHIPODA
An Ecological Survey of the Rocky Coast Adjacent to a Bromine Extraction Works,
W75-11758 5C

ANAEROBIC BACTERIA
Water Quality Changes Related to the Development of Anaerobic Conditions During Artificial Recharge,
W75-11497 5B

ANAEROBIC DIGESTION
Thermophilic Digestion at the Hyperion Treatment Plant,
W75-11690 5D

They're Packing up Waste Ponds.
W75-11703 5D

Overview of Canadian Sludge Handling and Land Disposal Practices and Research,
W75-11716 5D

Aerobic and Anaerobic Sludge Digestion,
W75-11719 5D

ANAEROBIC TREATMENT
Pasteurization of Sapropel (Pasteurisierung von Faulschlamm),
W75-11750 5D

ANALYSIS
Report of Analyses for Industrial Waste Water in Twenty-Eight Factories, (In Japanese),
W75-11671 5A

ANALYTIC TECHNIQUES
Radioactive - Tracer Displacement Method for the Determination of Small Quantities of Nickel,
W75-11526 5A

ANALYTICAL TECHNIQUES
Is the Malachite Green Broth According to Habs and Kirchner Suitable for Serving as an Isolation Medium for Pseudomonas Aeruginosa from Water, (In German),
W75-11435 5B

Spectrophotometric Determination of Sugars in Natural Waters, (In Russian),
W75-11437 5A

Generation of Hydrologic Samples: Case Study of the Great Lakes,
W75-11476 2H

Atomic-Absorption Spectrometric Determination of Cadmium, Lead, and Zinc in Salts or Salt Solutions by Hanging Mercury Drop Electrodeposition and Atomization in a Graphite Furnace,
W75-11536 5A

A Comparative Study on Methods for Cadmium Analysis of Grain with an Application to Pollution Evaluation,
W75-11539 5A

Catalytic-Coulometric Determination of Copper at Microgram and Nanogram Levels,
W75-11540 5A

Submicrogram Per Gram Concentrations of Mercury in Orchard Leaves Determined by Isotope Dilution and Spark-Source Mass Spectrometry,
W75-11581 5A

The Estimation of the Amount of Empire Mix Crude Oil in Mullet, Shrimp, and Oysters by Liquid Chromatography,
W75-11613 5A

Studies of the Aromatic Compounds Content in Sea Water by Low-Temperature Luminescent Spectroscopy, (In Russian),
W75-11786 5A

Methods of Detecting the Fluorine Ion in and Water, (In Russian).
W75-11794

ANALYTICAL TECHNIQUES *POLLUTAN IDENTIFICATION
Detector of Trace Substance in Water.
W75-11388

ANCHORAGE (ALASKA)
Hydrology for Land-Use Planning: The Hi Area, Anchorage, Alaska,
W75-11504

ANEMOMETERS
Wall Shear Measurement in Sand-Water ture Flows,
W75-11653

ANIMAL PHYSIOLOGY
Influence of Lead on Calcium and Stro Transfer Through the Duodenal Wall in R
W75-11523

High Copper Concentrations in Squid Liv Association with Elevated Levels of Cadmium and Zinc,
W75-11609

Barnacles: Possible Indicators of Zinc tion,
W75-11611

Rehabilitating Oiled Aquatic Birds,
W75-11616

Elimination of Hydrocarbons by Mussels
W75-11760

ANKISTRODESMUS FALCATUS
Influence of Some Biocides Employed Wood-Processing Industry on Growth of Algae,
W75-11605

ANODIZING EFFLUENTS
Treatment and Disposal of Anodizi fluents, Part I,
W75-11377

Treatment and Disposal of Anodizi fluents, Part II,
W75-11378

ANTECEDENT MOISTURE CONTENT
Prediction of Flood Volume from Small Region Watersheds,
W75-11462

ANTITRANSPIRANTS
Utilization of Water in a Semi-Arid Reg
W75-11356

APATITE
Geochemistry and Gensis of Fluoride-ing Ground Waters in India,
W75-11645

APPALACHIAN MOUNTAIN REGION
Geohydrologic Reconnaissance of th Potomac River Basin,
W75-11493

APPLICATION METHODS
Basic Principles of Pulse Irrigation,
W75-11833

AQUACULTURE
Biological Considerations on the Use mal Effluents for Finfish Aquaculture,
W75-11759

QUATIC ANIMALS
High Copper Concentrations in Squid Livers in Association with Elevated Levels of Silver, Cadmium and Zinc,
W75-11609 5C

Rehabilitating Oiled Aquatic Birds,
W75-11616 5G

QUATIC BIRDS
Rehabilitating Oiled Aquatic Birds,
W75-11616 5G

QUATIC ENVIRONMENT
Effects of Methylmercury Chloride on Rana Pipiens Tadpoles,
W75-11527 5C

Environmental Aspects of Aquatic Plant Control,
W75-11843 5G

QUATIC PLANTS
Contribution to the Ecology of Indian Aquatics: IV. Rate of Dry Matter Production of the Leaves of Several Common Aquatic Plants of Gorakhpur (India),
W75-11386 2I

QUATIC WEED CONTROL
Environmental Aspects of Aquatic Plant Control,
W75-11843 5G

QUIFER CHARACTERISTICS
Digital-Simulation and Projection of Water-Level Declines in Basalt Aquifers of the Odessa-Lind Area, East-Central Washington,
W75-11494 2F

QUIFER RESPONSE
Well Pumping in Unconfined Aquifers: The Influence of the Unsaturated Zone,
W75-11631 4B

QUIFER SYSTEMS
dentification of Parameters in a Linear Equation of Groundwater Flow,
W75-11799 2F

QUIFERS
Response of Unconfined Aquifer Systems to Deep Percolation,
W75-11474 2F

RGENTINA (LAKE MASCARDI)
Phytoplankton in Lake Mascardi (Rio Negro, Argentina), (In Spanish),
W75-11532 5C

RID CLIMATES
Proceedings of the Water Harvesting Symposium, Phoenix, Arizona, March 26-28, 1974.
W75-11800 3B

Water Harvesting for Livestock in Western Australia,
W75-11801 3B

Engineering Aspects of Water Harvesting Research at the University of Arizona,
W75-11802 3B

Oil Treatment with Silicones for Water Harvesting,
W75-11806 3B

Performance and Durability of Sheet Metal, Butyl Rubber, Asphalt Roofing and Bentonite for Harvesting Precipitation,
W75-11808 3B

Water Harvesting Catchments on Indian Lands in the Southwest,
W75-11809 3B

Design and Construction of Roaded Catchments,
W75-11810 3B

A Computer Model for Optimizing Design of Improved Catchment,
W75-11813 3B

Sealing Leaking Excavated Tanks on Farms in Western Australia,
W75-11814 3B

Evaporation Suppression for Conserving Water Supplies,
W75-11816 3B

The Design of Roaded Catchments for Maximum Runoff,
W75-11817 3B

Crop Production by Water Harvesting,
W75-11823 3B

ARIZONA
Water Harvesting Catchments on Indian Lands in the Southwest,
W75-11809 3B

Desert Strip Farming--Computer Simulation of an Ancient Water Harvesting Technique,
W75-11812 3B

Crop Production by Water Harvesting,
W75-11823 3B

ARKANSAS
Progress Report to the Arkansas State Highway Commission for Year Ending June 30, 1975,
W75-11501 8B

ARMA PROCESSES
Models of the Stochastic and Chronologic Structure, Prediction and Simulation of Runoff Sequences - Application to the Lower Ohio Basin,
W75-11783 2E

AROMATIC COMPOUNDS
Studies of the Aromatic Compounds Content in Sea Water by Low-Temperature Luminescent Spectroscopy, (In Russian),
W75-11786 5A

ARSENIC COMPOUNDS
Lead and Arsenic Levels of Dairy Cattle in Proximity to a Copper Smelter,
W75-11544 5A

ARTIFICIAL RECHARGE
Water Quality Changes Related to the Development of Anaerobic Conditions During Artificial Recharge,
W75-11497 5B

ARTIFICIAL RECHARGES
Mathematical Models of Artificial Recharge Systems,
W75-11626 4B

ASPHALT
Performance and Durability of Sheet Metal, Butyl Rubber, Asphalt Roofing and Bentonite for Harvesting Precipitation,
W75-11808 3B

ATCHAFALAYA RIVER
An Inventory and Study of the Vermilion Bay-Atchafalaya Bay Complex; Area Description, Biology, Hydrology and Chemistry, and Sedimentology,
W75-11571 2L

ATLANTIC COASTAL PLAINS
The Ecology of the Cumberland Island National Seashore Camden County, Georgia,
W75-11546 2L

ATMOSPHERIC COMPOSITION
Atmospheric Physics and Chemistry Laboratory: Collected Reprints 1973.
W75-11552 2B

ATMOSPHERIC PHYSICS
Atmospheric Physics and Chemistry Laboratory: Collected Reprints 1973.
W75-11552 2B

ATOMIC ABSORPTION SPECTROPHOTOMETRY
Lead and Arsenic Levels of Dairy Cattle in Proximity to a Copper Smelter,
W75-11544 5A

ATOMIC ABSORPTION SPECTROSCOPY
Loss of Trace Elements from Natural Water During Storage. I. Behavior of 203 Hg and 65 Zn Added to Pond Water,
W75-11543 5A

The Behaviour of Metal Tetramethylenedithiocarbamates in the Graphite-Tube Furnace for Atomic Absorption Spectrometry,
W75-11797 5A

ATROZINE
Utilization of Water in a Semi-Arid Region,
W75-11356 3F

AUSTRALIA
Sidrotherm Desalination,
W75-11707 5D

Water Harvesting for Livestock in Western Australia,
W75-11801 3B

Bitumen, Oil, and Clay Surfaces on a Deep Sand to Increase Runoff from Catchments for Excavated Tanks in Western Australia,
W75-11805 3B

Design and Construction of Roaded Catchments,
W75-11810 3B

A Computer Model for Optimizing Design of Improved Catchment,
W75-11813 3B

Sealing Leaking Excavated Tanks on Farms in Western Australia,
W75-11814 3B

AUTOMATION
Continuous Monitoring, Automated Analysis and Sampling Procedures, (Literature Review),
W75-11711 5A

AXISYMMETRIC FLOW
Axisymmetric Seepage Flow Through Semi-Infinite Porous Media,
W75-11633 2F

BACKFILL
Effect of Backfill on Drain Flow in Layered Soils,
W75-11834 8D

BACTERIA
Is the Malachite Green Broth According to Habs and Kirchner Suitable for Serving as an Isolation Medium for Pseudomonas Aeruginosa from Water, (In German),
W75-11435 5B

BALANCE OF NATURE
The Ecology of the Cumberland Island National Seashore Camden County, Georgia,
W75-11546 2L

BALANCING RESERVOIRS
Balancing Reservoir--A Key Element in Water Supply Plan,
W75-11687 4A

BARLEY
Water Harvesting for Barley in a 30-CM Winter Rainfall Area,
W75-11825 3B

BARNACLES
Barnacles: Possible Indicators of Zinc Pollution,
W75-11611 5B

BASALTS
Digital-Simulation and Projection of Water-Level Declines in Basalt Aquifers of the Odessa-Lind Area, East-Central Washington,
W75-11494 2F

BASELINE STUDIES
Mercury Levels in Fish in the La Grande River Area, Northern Quebec,
W75-11756 5A

BASIC DATA COLLECTION
Surface Water Supply of the United States, 1966-70: Part 13. Snake River Basin.
W75-11491 7C

BASIC DATA COLLECTIONS
Surface Water Supply of the United States, 1966-70: Part 6. Missouri River Basin--Volume 3, Missouri River Basin from Sioux City, Iowa, to Nebraska City, Nebraska.
W75-11486 7C

Surface Water Supply of the United States, 1966-70: Part 8. Western Gulf of Mexico Basins--Volume 2. Basins from Lavaca River to Rio Grande.
W75-11487 7C

Surface Water Supply of the United States, 1966-70: Part 9. Colorado River Basin--Volume 3. Lower Colorado River Basin.
W75-11488 7C

Surface Water Supply of the United States, 1966-70: Part 10. The Great Basin.
W75-11489 7C

Surface Water Supply of the United States, 1966-70: Part 12. Pacific Slope Basins in Washington--Volume 1. Pacific slope Basins in Washington Except Columbia River Basin.
W75-11490 7C

Ground-Water Data for Bolivar County, Mississippi,
W75-11496 7C

Ground-Water Data in the Harrisburg - Halsey Area, Central Willamette Valley, Oregon,
W75-11498 7C

BAST
Sanitary and Bacteriological Evaluation of the Raw Material, Air and Wastewaters of Some Bast Fiber Plants in the Uzbek SSR, (In Russian),
W75-11406 5B

BAY MUSSELS
Hydrocarbons Associated with Suspended Particulate Matter in San Francisco Bay Waters,
W75-11614 5A

BEAR CREEK (CALIF)
Flood Plain Information: Northeast Stream Group, Stockton, California.
W75-11789 4A

BEAUFORT COUNTY (SC)
Land Use and Environmental Planning: An Application in the South Carolina Coastal Zone,
W75-11766 6G

BED FORMS
Resistance to Flow in Alluvial Channels,
W75-11459 2E

BEDROCK
Improved Application of Geophysics to Groundwater Resource Inventories in Glaciated Terrains,
W75-11355 2F

BENCH LEVELING
Runoff Utilization for Grain Production,
W75-11824 3B

BENTHIC FAUNA
Oligochaetes in the Bottom Fauna and Stomach Content of Trout, Salmo Trutta (L.),
W75-11385 2H

Shell Disease in Crabs and Lobsters from New York Bight,
W75-11606 5C

BENTHOS
Hydrochemical and Hydrobiological Peculiarities of Limans in the Danube-Dniester Interfluve, (In Ukrainian),
W75-11847 2K

BENTONITE
Performance and Durability of Sheet Metal, Butyl Rubber, Asphalt Roofing and Bentonite for Harvesting Precipitation,
W75-11808 3B

BIBLIOGRAPHIES
Plating and Cyanide Wastes, (Literature Review),
W75-11370 5D

A Bibliography of Biscayne Bay, Florida Monitoring and Research Programs,
W75-11557 10C

Ocean Engineering--Selected References,
W75-11779 8B

BILIARY EXCRETION
Biliary Excretion of Phenyl and Methyl Mercury Chlorides and Their Enterohepatic Circulation in Rats,
W75-11525 5C

BIOACCUMULATION
Organochlorine Compounds in Several Marine Organisms from the North Sea and the Dutch Wadden Sea,
W75-11608 5B

Copper and Zinc in Cancer Irroratus: Comparative Metabolism of the Molt Cycle, le Cuivre et le Zinc Chez Cancer Irroratus (Crustace:Decapode) Metabolisme Compar au Cours du Cycle D'intermue,
W75-11752 5

BIOASSAY
The Estimation of the Amount of Empire M Crude Oil in Mullet, Shrimp, and Oysters b Liquid Chromatography,
W75-11613 5

BIOCIDES
Influence of Some Biocides Employed in th Wood-Processing Industry on Growth of Gree Algae,
W75-11605 5

BIODEGRADATION
Sewage Treatment System,
W75-11510 5

BIOFLOCCULATION
Continuous Treatment of Polluted Liquids.
W75-11381 5

BIOGEOGRAPHY
The Ecology of the Cumberland Island N tional Seashore Camden County, Georgia,
W75-11546

BIOINDICATORS
Continuous Determination of Toxicity of fluents.
W75-11431

Barnacles: Possible Indicators of Zinc Po tion,
W75-11611

BIOLOGICAL TREATMENT
Activated Sludge Sewage Treatment Seasonally Variable Throughput,
W75-11396

Instrumental Investigation of Biological Wa Water Treatment (A szennyvisek biologiai t titasanak muszeres vizsgalata),
W75-11407

An Automated Spectrophotometric Suspen Solids Analysis for Activated Sludge,
W75-11408

Electrolytic Chlorine Used to Purify Di tegrated Sewage.
W75-11422

Biological Purification of Town and Indus Effluents.
W75-11429

Sewage Biological Processing,
W75-11658

Waste Water and Sewage Purification.
W75-11659

Biological and Chemical Purification Plant.
W75-11660

Air Driven Rotating Biological Contactor paratus,
W75-11680

Biological Purification of Waste Water.
W75-11683

Phase II Gives Hamilton Secondary Treatr
W75-11692

They're Packing up Waste Ponds.
W75-11703

he Ici Deep-Shaft Effluent-Treatment rocess.
75-11706 5D

he Influence of Temperature on the Biological xidation of Urban Waste Waters by Means of Activated Sludge (Influenza Della Tempera-re Nella Ossidazion Biologica dei Liquami rbani Mediante Fanghi Attivi),
75-11745 5D

D POPULATIONS
abitat Heterogeneity and Avian Community ructure in North American Grasslands,
75-11425 2I

DS
abitat Heterogeneity and Avian Community ructure in North American Grasslands,
75-11425 2I

habilitating Oiled Aquatic Birds,
75-11616 5G

e Status of Oiled Wildlife: Research and nning,
75-11617 5G

e Brown Pelican and Certain Environmental llutants in Louisiana,
75-11757 5A

AYNE BAY (FL)
Bibliography of Biscayne Bay, Florida Moni-ing and Research Programs,
75-11557 10C

CK SEA
dies of the Aromatic Compounds Content in Water by Low-Temperature Luminescent ectroscopy, (In Russian),
75-11786 5A

drochemical and Hydrobiological Peculiari-of Limans in the Danube-Dniester Inter-ve, (In Ukrainian),
5-11847 2K

VAR COUNTY (MISS)
ound-Water Data for Bolivar County, Mis-ippi,
5-11496 7C

ON DESORPTION
etic and Equilibrium Studies of Boron sorption from Soil,
5-11600 2G

OM SEDIMENTS
dies of the Aromatic Compounds Content in Water by Low-Temperature Luminescent ctroscopy, (In Russian),
5-11786 5A

DARY CONDITIONS
Reduction of Artificial Boundary Reflex-in Numerically Modelled Estuaries,
5-11452 2L

DARY LAYERS
l Shear Measurement in Sand-Water Mix-Flows,
5-11653 8B

DARY PROCESSES
tion of a Free-Surface Boundary Value blem Using an Inverse Formulation and the te Element Method,
-11447 2F

DARY SHEAR
ndary Shear in Channel with Flood Plain,
-11463 8B

Wall Shear Measurement in Sand-Water Mixture Flows,
W75-11653 8B

**BRIDGE CONSTRUCTION**
Progress Report to the Arkansas State Highway Commission for Year Ending June 30, 1975,
W75-11501 8B

**BROMINE**
An Ecological Survey of the Rocky Coast Adjacent to a Bromine Extraction Works,
W75-11758 5C

**BROOK TROUT**
Mercury Levels in Fish in the La Grande River Area, Northern Quebec,
W75-11756 5A

**BROWN TROUT**
Oligochaetes in the Bottom Fauna and Stomach Content of Trout, Salmo Trutta (L.),
W75-11385 2H

**BRUCKER SYSTEM**
Novel Waste Treatment Variation Shows Great Promise,
W75-11702 5D

**BUBBLE AERATION**
Aeration Systems for Metro Chicago,
W75-11739 5D

**BUOYANCY**
Submerged Buoyant Jets in Quiescent Fluids,
W75-11461 8B

**BUSYCON CANALICULATUM**
Copper Uptake and Excretion by Busycon Canaliculatum L.,
W75-11755 5C

**BUTTERFLY VALVES**
Cavitation in Butterfly Valves,
W75-11777 8B

**CABBAGE**
Quantity and Frequency of Trickle and Furrow Irrigation for Efficient Cabbage Production,
W75-11839 3F

**CADMIUM**
A Comparative Study on Methods for Cadmium Analysis of Grain with an Application to Pollution Evaluation,
W75-11539 5A

The Determination of Cadmium in Sea Water by Radioactivation,
W75-11798 5A

**CADMIUM RADIOISOTOPES**
The Determination of Cadmium in Sea Water by Radioactivation,
W75-11798 5A

**CALAVERAS RIVER (CALIF)**
Flood Plain Information: Northeast Stream Group, Stockton, California.
W75-11789 4A

**CALCIUM**
Influence of Lead on Calcium and Strontium Transfer Through the Duodenal Wall in Rats,
W75-11523 5C

**CALCIUM SULFATE**
Gypsum Solubility and Scaling Limits in Saline Waters,
W75-11473 3A

Calicum Sulfate Scaling in Reverse Osmosis (Hyper-filtration) of Brackish Waters by Hollow-Fiber and Spiral-Wound Modules,
W75-11505 3A

**CALCIUM SULFATE SCALE**
Gypsum Solubility and Scaling Limits in Saline Waters,
W75-11473 3A

**CALIFORNIA**
Regional Sewering and Groundwater Quality in the Southern San Joaquin Valley,
W75-11446 5D

Closure Conditions Mouth of the Russian River,
W75-11454 2L

Quality of Surface Waters of the United States, 1970: Part II. Pacific Slope Basins in California.
W75-11485 7C

Directory of Water Resources Expertise, Water Research Faculty and Staff Scientists.
W75-11580 10C

Simulation of Crop Resonse to Energy Inputs,
W75-11588 3F

Hydrocarbons Associated with Suspended Particulate Matter in San Francisco Bay Waters,
W75-11614 5A

Flood Plain Information: Northeast Stream Group, Stockton, California.
W75-11789 4A

Flood Plain Information: Ventura River, Ventura County, California.
W75-11790 4A

**CANADA**
Regional Chemistry of Groundwater in the Wainwright Area, Alberta,
W75-11471 2F

Hydrogeology of the Wainwright Area, Alberta,
W75-11475 4B

Sludge Handling and Disposal Seminar, Conference Proceedings No. 2.
W75-11715 5D

Overview of Canadian Sludge Handling and Land Disposal Practices and Research,
W75-11716 5D

Disposal of Chemical Sewage Sludges on Land and Their Effects on Plants, Leachate and Soil Systems,
W75-11721 5E

Mercury Levels in Fish in the La Grande River Area, Northern Quebec,
W75-11756 5A

**CANAL SEEPAGE**
Analysis of Canal Seepage to Interceptor Drain,
W75-11846 8A

**CANCER IRRORATUS**
Copper and Zinc in Cancer Irroratus: Comparative Metabolism of the Molt Cycle, le Cuivre et le Zinc Chez Cancer Irroratus (Crustace:Decapode): Metabolisme Compare au Cours du Cycle D'intermue,
W75-11752 5C

CAPPINGS
Hygienic Evaluation of Spring Cappings Used on the Southern Shore of Crimea, (In Russian), W75-11793 5G

CARP
Further Observations on the Effect of Sodium Salt of 2,4-D on Early Developmental Stages of Carp (Cyprinus Carpio L.), W75-11762 5C

CATALYTIC-COULMETRIC DETERMINATION
Catalytic-Coulometric Determination of Copper at Microgram and Nanogram Levels, W75-11540 5A

CATION EXCHANGE
Physicochemical Properties of Dredge Spoil, W75-11465 5B

CATTLE
Lead and Arsenic Levels of Dairy Cattle in Proximity to a Copper Smelter, W75-11544 5A

CAVITATION
Hydraulic Design of Vertical Stilling Wells, W75-11650 8B

Cavitation in Butterfly Valves, W75-11777 8B

CENTER PIVOT IRRIGATION
Center Pivot Design Capacities in Eastern Colorado, W75-11835 8A

CENTRAL US
Variation in Effectiveness of Supplemental Irrigation on Sweet Corn Yield Components, W75-11844 3F

CENTRAL WILLAMETTE VALLEY (OREG)
Ground-Water Data in the Harrisburg - Halsey Area, Central Willamette Valley, Oregon, W75-11498 7C

CENTRIFUGAL COMPRESSOR-MELTER
Centrifugal Compressor-Melter for Desalination of Water. W75-11676 3A

CENTRIFUGATION
Centrifugal Pump for Processing Liquids Containing Abrasive Constitutents, More Particularly, a Sand Pump of a Wastewater Pumper, W75-11679 5D

Thickening of Unwanted Spent Lime Rejects, W75-11848 5D

CENTRIFUGES
Centrifuges - Types and Applications, W75-11725 5D

CENTRIFUGES (KRUGER)
Sludge Dewatering Using the Kruger Centrifuge, W75-11726 5D

CHANNEL FLOW
Boundary Shear in Channel with Flood Plain, W75-11463 8B

CHANNEL IMPROVEMENT
Studies of Floodplain Vegetation and Water Level Fluctuation in the Kissimmee River Valley, W75-11628 4A

CHANNEL MORPHOLOGY
River Regime with Special Reference to River Nile, W75-11464 2J

CHANNELS
Closure Conditions Mouth of the Russian River, W75-11454 2L

CHARACTERISTIC METHOD
Water Hammer in Coaxial Pipe Systems, W75-11460 8B

CHARTS
Great Lakes Ice Cover, Winter 1973-74, W75-11572 2C

CHELATION
The Behaviour of Metal Tetramethylenedithiocarbamates in the Graphite-Tube Furnace for Atomic Absorption Spectrometry, W75-11797 5A

CHEMICAL ANALYSIS
Interlaboratory Study of Methods for Chemical Analysis of Water, W75-11409 5A

Geochemistry of Surface Sediments in an Acid Stream Estuary, W75-11531 2J

Atmospheric Physics and Chemistry Laboratory: Collected Reprints 1973. W75-11552 2B

Methods of Detecting the Fluorine Ion in Air and Water, (In Russian), W75-11794 5A

The Behaviour of Metal Tetramethylenedithiocarbamates in the Graphite-Tube Furnace for Atomic Absorption Spectrometry, W75-11797 5A

CHEMICAL PRECIPITATION
The Determination of Traces of Lead (II) by Solid-State Luminescence, W75-11541 5A

Swedish Experiences in Chemical Treatment of Wastewater, W75-11694 5D

Removal of Phosphates and Metals from Sewage Sludges, W75-11729 5D

Studies on Advanced Waste Treatment, W75-11734 5D

CHEMICAL PROPERTIES
Loss of Trace Elements from Natural Water During Storage. I. Behavior of 203 Hg and 65 Zn Added to Pond Water, W75-11543 5A

CHEMICAL REACTIONS
Transport Model, User's Manual, W75-11468 5B

Water Quality Changes Related to the Development of Anaerobic Conditions During Artificial Recharge, W75-11497 5B

CHEMICAL TREATMENT
Method of Purifying Water, W75-11379 5D

Elimination of Water Surface Pollution. W75-11416

Studies on Advanced Waste Treatment, W75-11734

CHEMICAL WASTES
An Ecological Survey of the Rocky Coast jacent to a Bromine Extraction Works, W75-11758

CHENANGO COUNTY (NY)
An Economic and Environmental Recon sance of the Possibilities for Small Wate Development in Chenango County, W75-11796

CHICAGO (ILL)
Aeration Systems for Metro Chicago, W75-11739

Suspended Solids Removal Processes St at Metro Chicago, W75-11741

Metro Chicago Studies on Nitrification, W75-11742

CHICKASHA (OKLA)
Soil Moisture Accounting Component USDAHL-74 Model of Watershed Hydrol W75-11656

CHITTENANGO CREEK (NY)
Flood Plain Information: Chittenango Bridgeport, Onondaga and Madison Co New York. W75-11792

CHLORIDES
Chloride and Tritiated Water Flow in Dis and Undisturbed Soil Cores, W75-11594

CHLORINATED HYDROCARBONS
The Brown Pelican and Certain Environ Pollutants in Louisiana, W75-11757

CHLORINE
A Method for Intermittent Chlorine De Continuous-Flow Toxicity Tests, W75-11754

An Ecological Survey of the Rocky Co jacent to a Bromine Extraction Works, W75-11758

CHLOROPHYLL
Phytoplankton in Lake Mascardi (Rio Argentina), (In Spanish), W75-11532

Influence of Some Biocides Employe Wood-Processing Industry on Growth Algae, W75-11605

Phytoplankton Diversity and Chlorophy Polluted Estuary, W75-11607

CHLOROPHYLL-A
Phytoplankton Diversity and Chlorophy Polluted Estuary, W75-11607

CHLOROPHYTA
Influence of Some Biocides Employe Wood-Processing Industry on Growth Algae, W75-11605

ROMATOGRAPHY
ne Estimation of the Amount of Empire Mix rude Oil in Mullet, Shrimp, and Oysters by quid Chromatography,
75-11613 5A

ES
ple of Computer Simulation in Administering Urban Drainage Ordinance,
75-11669 6E

RIFICATION
quid Treatment Apparatus Having Combined action Basin and Clarifier,
75-11521 5D

ANUP TECHNIQUES
e Casco Bay Oil Spill: Problems of Cleanup d Disposal,
75-11615 5G

IATIC DATA
Federal Plan for Natural Disaster Warning d Preparedness, First Supplement FY 1976 - 80.
75-11553 2B

IATOLOGICAL CHARACTERISTICS
ne Climatological Characteristics of Hurnes and Tropical Storms, Gulf and East asts of the United States,
5-11556 2B

IATOLOGICAL DATA
stern North Pacific Typhoons, 1974,
5-11578 2B

ntral North Pacific Tropical Cyclones, 1974,
5-11579 2B

ATOLOGY
ne Climatological Characteristics of Hurnes and Tropical Storms, Gulf and East asts of the United States,
5-11556 2B

OPTILOLITE
monia Removal from Municipal Wasters by Ion Exchange,
5-11405 5D

D MODELS
pical Showers in an Axisymmetric Cloud del,
5-11635 2B

D PHYSICS
ular Snow Generation--A Doppler Radar dy,
5-11634 2B

pical Showers in an Axisymmetric Cloud del,
5-11635 2B

Acceleration System for Water Drops,
-11636 2B

ision and Breakup of Water Drops at Terl Velocity,
-11637 2B

ision Efficiency of Water Drops in the Atphere,
-11638 2B

he Collection Efficiency of Water Droplets er the Influence of Electric Forces, I: Exnental, Charge-Multipole Effects,
-11639 2B

ULANTS
gulant Recovery Takes Planning,
-11665 5D

COAGULATION
An Evaluation of the Effectiveness and Applicability of Physical-Chemical Treatment of Urban Land Runoff,
W75-11389 5D

Liquid Treatment Plant and Process Particularly for Waste Water,
W75-11441 5D

Metal Removal by Physical and Chemical Treatment Processes,
W75-11542 5D

Coagulant Recovery Takes Planning,
W75-11665 5D

Aluminum Sulphate for Water Treatment.
W75-11704 5D

COALESCENCE
Collision Efficiency of Water Drops in the Atmosphere,
W75-11638 2B

COASTAL AREA MANAGEMENT ACT (CAMA) OF 1974 (NC)
The Management of Land and Water Use in the Coastal Zone: A New Law is Enacted in North Carolina,
W75-11575 6E

COASTAL ENGINEERING
A Geomorphic Shoreline Inventory with Management Considerations for Whatcom County, Washington,
W75-11455 2L

Velocities Above Rough Bed in Oscillatory Flow,
W75-11763 8B

Influence of Current on Statistical Properties of Waves,
W75-11772 2L

Experimental Study of Wave Transimission,
W75-11773 8B

Wave Energy Transfer Mechanisms in Wind-Wave Tunnels,
W75-11774 8B

Ocean Engineering--Selected References,
W75-11779 8B

COASTAL HURRICANES
Hurricane Experience Levels of Coastal County Populations - Texas to Maine,
W75-11570 2B

COASTAL RESOURCES
Coastal Resource Use: Decisions on Puget Sound,
W75-11573 6B

COASTAL STORMS
Hurricane Experience Levels of Coastal County Populations - Texas to Maine,
W75-11570 2B

COASTAL ZONE MANAGEMENT
Proceedings of Alabama Coastal Leaders Conference on Coastal Zone Management.
W75-11555 6E

COASTAL ZONES
The Coasts of Wisconsin,
W75-11569 2H

COASTLINES
The Coasts of Wisconsin,
W75-11569 2H

COASTS
Coastal Zone Legal References (Selected) 1975.
W75-11548 2L

Storm Tide Frequency Analysis for the Coast of North Carolina, South of Cape Lookout,
W75-11560 2B

Storm Tide Frequency Analysis for the Coast of Puerto Rico,
W75-11561 2A

The Coasts of Wisconsin,
W75-11569 2H

Coastal Resource Use: Decisions on Puget Sound,
W75-11573 6B

The Management of Land and Water Use in the Coastal Zone: A New Law is Enacted in North Carolina,
W75-11575 6E

Land Use and Environmental Planning: An Application in the South Carolina Coastal Zone,
W75-11766 6G

Studies of the Aromatic Compounds Content in Sea Water by Low-Temperature Luminescent Spectroscopy, (In Russian),
W75-11786 5A

COAXIAL PIPE SYSTEMS
Water Hammer in Coaxial Pipe Systems,
W75-11460 8B

COFFERDAMS
Hydraulic Model Studies of a Second Powerhouse at Rock Island Hydroelectric Project, Cofferdam Tests,
W75-11467 8B

COLLECTION EFFICIENCY
On the Collection Efficiency of Water Droplets Under the Influence of Electric Forces, I: Experimental, Charge-Multipole Effects,
W75-11639 2B

COLLISION EFFICIENCY
Collision Efficiency of Water Drops in the Atmosphere,
W75-11638 2B

COLORADO
Development of Salinity Control Technology in Grand Valley,
W75-11585 5G

Center Pivot Design Capacities in Eastern Colorado,
W75-11835 8A

COLORADO RIVER BASIN
Surface Water Supply of the United States, 1966-70: Part 9. Colorado River Basin--Volume 3. Lower Colorado River Basin.
W75-11488 7C

COLORIMETRY
Spectrophotometric Determination of Fluorine in Water, (In Russian).
W75-11433 5A

COLUMBIA RIVER
Hydraulic Model Studies of a Second Powerhouse at Rock Island Hydroelectric Project,
W75-11466 8B

Hydraulic Model Studies of a Second Powerhouse at Rock Island Hydroelectric Project, Cofferdam Tests,
W75-11467 8B

COLUMBIA RIVER

Water Quality Report: The Columbia River Below Longview, Washington, December 1971 - November 1972,
W75-11472 5B

COMBINED MUNICIPAL-INDUSTRIAL WASTE TREATMENT
Combined Treatment of Municipal and Industrial Wastewater,
W75-11733 5D

COMBINED SEWERS
Storm and Combined Sewer Abatement Technology in the United States--An Overview,
W75-11414 5D

Improvement of Combined Sewer System Storm Water Storage Pool (Goryu-shiki gesuido no kairyo, taisui ike hoshiki),
W75-11621 5D

Urban Runoff and Combined Sewer Overflow, (Literature Review),
W75-11710 5D

COMMERCIAL ESTABLISHMENTS
Forecasting Urban Water Use: Commercial Establishments,
W75-11795 6D

COMMERCIAL SHELLFISH
The Casco Bay Oil Spill: Problems of Cleanup and Disposal,
W75-11615 5G

COMMODITY ANALYSIS
Analysis of International Great Lakes Shipping and Hinterland,
W75-11576 6C

COMPACTED SOILS
Effect of Backfill on Drain Flow in Layered Soils,
W75-11834 8D

COMPREHENSIVE PLANNING
The Management of Land and Water Use in the Coastal Zone: A New Law is Enacted in North Carolina,
W75-11575 6E

The Status of Oiled Wildlife: Research and Planning,
W75-11617 5G

Procedure for Selecting a Minimal Environmental Impact Routing for a Water Conveyance Canal,
W75-11764 6G

Planning for Resources-Environmental Conservation,
W75-11781 6B

COMPUTER GRAPHICS
Procedure for Selecting a Minimal Environmental Impact Routing for a Water Conveyance Canal,
W75-11764 6G

COMPUTER MODELS
Transport Model, User's Manual,
W75-11468 5B

Variable Thickness Transient Groundwater Flow Model User's Manual,
W75-11469 2F

Storm Tide Frequency Analysis for the Coast of North Carolina, South of Cape Lookout,
W75-11560 2B

Storm Tide Frequency Analysis for the Coast of Puerto Rico,
W75-11561 2A

Solid Particle Settlement in Open-Channel Flow,
W75-11652 5B

Role of Computer Simulation in Administering an Urban Drainage Ordinance,
W75-11669 6E

Identification of Parameters in a Linear Equation of Groundwater Flow,
W75-11799 2F

A Computer Model for Optimizing Design of Improved Catchment,
W75-11813 3B

Opportunity for Harvesting Water from and Along Highways in Rangeland Areas of Wyoming,
W75-11826 3B

COMPUTER PROGRAMS
Transport Model, User's Manual,
W75-11468 5B

Variable Thickness Transient Groundwater Flow Model User's Manual,
W75-11469 2F

Simulation of Miscible Displacement in Soils,
W75-11590 2F

COMPUTERS
The Use of Computers for Forecasting the Sanitary Systems of Water Bodies (Primeneniye EVM dlya prognozirovaniya sanitarnogo sostoyaniya vodoyemov),
W75-11410 5D

Cost Benefit Analysis as Dimensioning Basis of Flood Control Measures: An Empirical Report (Nutzen-Kosten-Analyse als Grundlage der Dimensionierung von HW-Schutzmassnahmen-ein Erfahrungsbericht),
W75-11415 6B

Generation of Hydrologic Samples: Case Study of the Great Lakes,
W75-11476 2H

CONDENSATION
Desalination,
W75-11675 3A

CONDUITS
Turbulent Flow of Power-Law Fluids,
W75-11651 8B

CONFERENCES
Proceedings of Alabama Coastal Leaders Conference on Coastal Zone Management.
W75-11555 6E

Sludge Handling and Disposal Seminar, Conference Proceedings No. 2.
W75-11715 5D

CONSERVATION
Planning for Resources-Environmental Conservation,
W75-11781 6B

CONSTRUCTION COSTS
Providing Suburban Sewerage Despite Environmental and Construction Problems,
W75-11657 5D

CONSTRUCTION EQUIPMENT
Providing Suburban Sewerage Despite Enviro mental and Construction Problems.
W75-11657

CONSUMPTIVE USE
Quantity and Frequency of Trickle and Furr Irrigation for Efficient Cabbage Production,
W75-11839

CONTAMINATION ENCLAVES
A Topographic-Hydrogeologic Model for Sc Waste Landfill Siting,
W75-11644

CONTINENTAL SHELF
A Three-Dimensional Theory of Coastal C rents and Upwelling Over a Continental Shel
W75-11450

CONTINUOUS-FLOW THROUGH TESTS
A Method for Intermittent Chlorine Dosing Continuous-Flow Toxicity Tests,
W75-11754

CONTOUR FARMING
Runoff Utilization for Grain Production,
W75-11824

CONTRARY CREEK (MO)
Flood Plain Information: Contrary Creek, Joseph, Missouri.
W75-11791

CONTROL
Water Processing Plant to Controlled Acı Level,
W75-11421

COOLING TOWERS
Scale Effects on Cooling Tower Model Stuc
W75-11470

COONTAIL
Uptake, Distribution and Fate of 203 Hg-E mercuric Chloride in the Guppy and the C tail,
W75-11529

COPPER
Determination of the Apparent Comple Capacity of Lake Waters,
W75-11538

Catalytic-Coulometric Determination of Co at Microgram and Nanogram Levels,
W75-11540

Lead and Arsenic Levels of Dairy Catt Proximity to a Copper Smelter,
W75-11544

Copper and Zinc in Cancer Irroratus: Com tive Metabolism of the Molt Cycle, le Cuiv le Zinc Chez Cancer Irro (Crustace:Decapode): Metabolisme Cor au Cours du Cycle D'intermue,
W75-11752

Copper Uptake and Excretion by Bu Canaliculatum L.,
W75-11755

CORN (FIELD)
Comparative Efficiency of Soluble and trolled-Release Sulfur-Coated Urea Nit for Corn in Tropics,
W75-11601

Comparison of Fog Irrigation with Surfa rigation in Corn Production,
W75-11837

ROSION CONTROL
vage Treatment with Hydrogen Peroxide.
5-11443 5D

ANALYSIS
er Harvesting for Livestock, Wildlife, and
nestic Use,
5-11803 3B

-BENEFIT ANALYSIS
an Drainage and Flood Control Projects.
nomic, Legal and Financial Aspects,
5-11352 6B

t Benefit Analysis as Dimensioning Basis of
od Control Measures: An Empirical Report
tzen-Kosten-Analyse als Grundlage der
ensionierung von HW-Schutzmassnahmen-
Erfahrungsbericht),
-11415 6B

S
icient Water Supply and Sewer System,
Equitable Distribution of the Costs
strekkelige vann- og Kolakkanlegg-samt
erdig fordeling av kostnadene),
-11393 5D

ON
ce of Irrigation Timing Indicator for Nar-
Row Cotton,
-11840 3F

ct of Preplant-Only Irrigation on Cotton
ls,
-11842 3F

per and Zinc in Cancer Irroratus: Compara-
Metabolism of the Molt Cycle, le Cuivre et
Zinc Chez Cancer Irroratus
stace:Decapode): Metabolisme Compare
ours du Cycle D'intermue,
11752 5C

Disease in Crabs and Lobsters from New
Bight,
11606 5C

PRODUCTION
ation of Water in a Semi-Arid Region,
11356 3F

ure Availability and Crop Production,
11583 3F

Harvesting by Runoff Inducement for Ir-
on of an Almond Orchard in a Semiarid
te,
1818 3B

pitation Entrapment for Evaporation Sup-
on,
1822 3B

Production by Water Harvesting,
1823 3B

f Utilization for Grain Production,
1824 3B

Harvesting for Barley in a 30-CM Winter
ll Area,
1825 3B

tunity for Harvesting Water from and
Highways in Rangeland Areas of Wyom-
1826 3B

ent Soil Treatments for Harvesting Water
dish Production in the Mexico Valley,
1829 3B

Effects of Water Management and Soil Aggregation on the Growth and Nutrient Uptake of Rice,
W75-11832 3F

Comparison of Fog Irrigation with Surface Irrigation in Corn Production,
W75-11837 3F

Quantity and Frequency of Trickle and Furrow Irrigation for Efficient Cabbage Production,
W75-11839 3F

CROP RESPONSE
Rice Response to Nitrogen and Phosphorus in Flooded and Nonflooded Soils,
W75-11597 3F

Desert Strip Farming--Computer Simulation of an Ancient Water Harvesting Technique,
W75-11812 3B

Performance of Rice Varieties in a Highly Saline Sodic Soil as Influenced by Plant Population,
W75-11838 3C

Effect of Preplant-Only Irrigation on Cotton Yields,
W75-11842 3F

Variation in Effectiveness of Supplemental Irrigation on Sweet Corn Yield Components,
W75-11844 3F

CRUDE OIL
Design Criteria for Single-Point Mooring Terminals,
W75-11771 8C

CRUSTACEANS
Shell Disease in Crabs and Lobsters from New York Bight,
W75-11606 5C

Synergistic Effects of Salinity, Temperature and Heavy Metals on Mortality and Osmoregulation in Marine and Estuarine Isopods (Crustacea),
W75-11610 5C

Copper and Zinc in Cancer Irroratus: Comparative Metabolism of the Molt Cycle, le Cuivre et le Zinc Chez Cancer Irroratus (Crustace:Decapode): Metabolisme Compare au Cours du Cycle D'intermue,
W75-11752 5C

An Ecological Survey of the Rocky Coast Adjacent to a Bromine Extraction Works,
W75-11758 5C

CRYSTALLIZATION
Means for and Method of Purifying Contaminated Water,
W75-11672 5D

The Determination of Cadmium in Sea Water by Radioactivation,
W75-11798 5A

CRYSTALLOGRAPHY
The Crystal and Molecular Structure of Selected Pesticidal Water Pollutants,
W75-11351 5A

CULTURES
Is the Malachite Green Broth According to Habs and Kirchner Suitable for Serving as an Isolation Medium for Pseudomonas Aeruginosa from Water, (In German),
W75-11435 5B

CUMBERLAND ISLAND SEASHORE (GEO)
The Ecology of the Cumberland Island National Seashore Camden County, Georgia,
W75-11546 2L

CURRENT MEASUREMENTS
Current Measurements Using a Tilting Spar,
W75-11564 7B

CURRENT METERS
Current Measurements Using a Tilting Spar,
W75-11564 7B

Tracing Ocean Currents,
W75-11574 2E

CURRENTS (WATER)
Tracing Ocean Currents,
W75-11574 2E

Influence of Current on Statistical Properties of Waves,
W75-11772 2L

CYANIDE
Plating and Cyanide Wastes (Literature Review),
W75-11545 5D

CYANIDE WASTES
Plating and Cyanide Wastes, (Literature Review),
W75-11370 5D

CYANOPHYTA
Natural and Accelerated Phosphate Mobility, (In Dutch),
W75-11520 5C

CYCLONE TYPES
A Satellite Classification Technique for Subtropical Cyclones,
W75-11562 2B

CYCLONES
A Satellite Classification Technique for Subtropical Cyclones,
W75-11562 2B

CYTOLOGICAL STUDIES
Ultrastructural Effects of Acute Tetraethyllead Poisoning on Nerve Cells of the Rabbit Brain,
W75-11530 5C

CZECHOSLOVAKIA (JAKUBOVO)
Effects of Fish-Ponds Near Jakubovo on the Ornithocenose There, (In Czech),
W75-11535 5C

DANUBE-DNIESTER IRRIGATION CANAL
Hydrochemical and Hydrobiological Peculiarities of Limans in the Danube-Dniester Interfluve, (In Ukrainian),
W75-11847 2K

DATA COLLECTIONS
Water Quality Report: The Columbia River Below Longview, Washington, December 1971 - November 1972,
W75-11472 5B

Ground-Water Levels in Louisiana--For Wells Measured Through 1974.
W75-11499 7C

Data Requirements for the Optimization of Reservoir Design and Operating Rule Determination,
W75-11500 4A

A Bibliography of Biscayne Bay, Florida Monitoring and Research Programs,
W75-11557 10C

**DATA COLLECTIONS**

Sources of Water Quality, Lake Level, Ice, Water Temperature and Meteorological Data for the St. Lawrence Great Lakes,
W75-11567 2H

Mercer County Surface Water Resources,
W75-11622 4A

Vermilion County Surface Water Resources,
W75-11623 4A

Lawrence County Surface Water Resources,
W75-11624 4A

De Kalb County Surface Water Resources,
W75-11625 4A

Evaporation Data in Texas,
W75-11630 7C

**DATA MONITORING PROGRAMS**

A Bibliography of Biscayne Bay, Florida Monitoring and Research Programs,
W75-11557 10C

**DE KALB COUNTY (ILL)**

De Kalb County Surface Water Resources,
W75-11625 4A

**DEEP SHAFT EFFLUENT TREATMENT PROCESS**

Breakthrough in Sewage Treatment--Cash, Land, and Energy Saved.
W75-11413 5D

**DEEP-SHARFT EFFLUENT-TREATMENT PROCESS**

The Ici Deep-Shaft Effluent-Treatment Process.
W75-11706 5D

**DEHYDRATION**

Dehydrating Industrial Sludges by Filtration.
W75-11369 5D

**DEMODULATION TECHNIQUES**

Demodulation of Stream-Flow Series,
W75-11449 2E

**DENITRIFICATION**

Nitrification and Denitrification During Miscible Displacement in Unsaturated Soil,
W75-11596 3F

Phosphate Precipitation in Activated Sludge Plants with Sludge Stabilization and Dentrification (Phospatfaellung in Belebungsanlagen mit Schlammstabilisation und Denitrifikationsstufe-),
W75-11746 5D

**DENSITY**

Turbulent Entrainment Across Stable Density Step Structures,
W75-11451 2J

**DENSITY CURRENTS**

Analysis of Plunging Phenomena in Water Reservoirs,
W75-11655 4A

**DENSITY LAYERS**

Turbulent Entrainment Across Stable Density Step Structures,
W75-11451 2J

**DEPOSITION (SEDIMENTS**

Geochemistry of Surface Sediments in an Acid Stream Estuary,
W75-11531 2J

**DESALINATION**

Gypsum Solubility and Scaling Limits in Saline Waters,
W75-11473 3A

Desalination of Water.
W75-11515 3A

Desalination,
W75-11675 3A

Centrifugal Compressor-Melter for Desalination of Water.
W75-11676 3A

Sidrotherm Desalination,
W75-11707 5D

**DESALINATION APPARATUS**

Desalination,
W75-11675 3A

Centrifugal Compressor-Melter for Desalination of Water.
W75-11676 3A

**DESALINATION PROCESSES**

Calicum Sulfate Scaling in Reverse Osmosis (Hyper-filtration) of Brackish Waters by Hollow-Fiber and Spiral-Wound Modules,
W75-11505 3A

**DESIGN**

Dimensioning and Design of Small Waste Water Pumping Stations (Bemessung und Gestaltung von Klein-Abwasserpumpwerken),
W75-11744 8C

A Method for Intermittent Chlorine Dosing in Continuous-Flow Toxicity Tests,
W75-11754 5A

**DESIGN CRITERIA**

'Chamber Method' for Drip Irrigation System Design and Installation Procedures,
W75-11584 3F

Hydraulic Design of Vertical Stilling Wells,
W75-11650 8B

Design Criteria for Single-Point Mooring Terminals,
W75-11771 8C

**DEWATERING**

Sludge Dewatering Installation.
W75-11424 5D

Sewage Disposal Process,
W75-11522 5D

Design Information on Dewatering Properties of Wastewater Sludges,
W75-11722 5D

Effects of Control Variables and Sludge Characteristics on the Performance of Dewatering and Thickening Devices,
W75-11723 5D

Sludge Dewatering Using the Kruger Centrifuge,
W75-11726 5D

Vacuum Dewatering of Sewage Sludge,
W75-11727 5D

**DIATOMS**

A Method of Investigating Populations of Diatoms in Flowing Waters, (In German),
W75-11445 2I

**DIFFUSIVITY**

Determining Effective Soil Water Diffusivitie from One-Step Outflow Experiments.
W75-11592 2

Unsaturated Hydraulic Conductivity from Cu mulative Inflow Data,
W75-11593 2

**DISASTERS**

A Federal Plan for Natural Disaster Warnin and Preparedness, First Supplement FY 1976 1980.
W75-11553 2

**DISCHARGE (WATER)**

Determining Optimal Well Discharge,
W75-11768 4

**DISPERSION**

Wave Energy Transfer Mechanisms in Win Wave Tunnels,
W75-11774 8

Simulation of Dispersion of Suspended Par cles,
W75-11782 5

**DIURNAL DISTRIBUTION**

Diurnal Patterns of Water Potential in Abi Concolor and Pinus Ponderosa,
W75-11382

**DOCUMENTATION**

Coastal Zone Legal References (Selected) 197
W75-11548

**DOMESTIC WASTES**

A Case of Subterranean Water Pollutio Caused by the Public Refuse Disposal Groun (In Japanese),
W75-11432

Natural and Accelerated Phosphate Mobili (In Dutch),
W75-11520

**DOPPLER RADAR**

Cellular Snow Generation--A Doppler Rad Study,
W75-11634

**DRAG**

Turbulent Drag Coefficients of Sharp-Edg Objects,
W75-11654

**DRAG COEFFICIENTS**

Turbulent Drag Coefficients of Sharp-Ed Objects,
W75-11654

**DRAINAGE**

Field Test of Soil Water Flux Meters,
W75-11586

Agricultural Drainage Research Needs and orities, 1974,
W75-11632

Role of Computer Simulation in Administe an Urban Drainage Ordinance,
W75-11669

**DRAINAGE PRACTICES**

Effect of Backfill on Drain Flow in Laye Soils,
W75-11834

Analysis of Canal Seepage to Interce Drain,
W75-11846

AGE PROGRAMS
n Drainage and Flood Control Projects. omic, Legal and Financial Aspects, -11352 6B

AGE SYSTEMS
ary and Hygienic Evaluation of Seepage rs of Structures Protecting Reservoirs (In ian), 11412 5B

neering Aspects of Water Harvesting arch at the University of Arizona, 11802 3B

S
t of Backfill on Drain Flow in Layered 11834 8D

sis of Canal Seepage to Interceptor , 11846 8A

E SPOILING
sal of Sandy Pipeline Dredge Spoils by Dumping, 11566 5G

ING
cochemical Properties of Dredge Spoil, .1465 5B

sal of Sandy Pipeline Dredge Spoils by Dumping, 1566 5G

RIGATION
Sorghum Evapotranspiration and Water fficiency Under Trickle Irrigation, 1582 3F

ber Method' for Drip Irrigation System n and Installation Procedures, 1584 3F

ity and Frequency of Trickle and Furrow ion for Efficient Cabbage Production, 1839 3F

REAKUP
on and Breakup of Water Drops at Ter- Velocity, 1637 2B

OLLISIONS
on and Breakup of Water Drops at Ter- Velocity, 1637 2B

FLUIDS)
celeration System for Water Drops, 1636 2B

Collection Efficiency of Water Droplets the Influence of Electric Forces, I: Ex- ntal, Charge-Multipole Effects, 1639 2B

TTER PRODUCTION
bution to the Ecology of Indian cs: IV. Rate of Dry Matter Production of aves of Several Common Aquatic Plants akhpur (India), 386 2I

on the Treatment of Wastewaters from vel Dyeing Industry, 376 5D

DYNAMICS
A Geomorphic Shoreline Inventory with Management Considerations for Whatcom County, Washington, W75-11455 2L

EARTH-WATER INTERFACES
Boundary Shear in Channel with Flood Plain, W75-11463 8B

EASTERN BROWN PELICAN
The Brown Pelican and Certain Environmental Pollutants in Louisiana, W75-11757 5A

EASTERN GULF OF MEXICO BASINS
Quality of Surface Waters of the United States, 1970: Part 2. South Atlantic Slope and Eastern Gulf of Mexico Basins. W75-11480 7C

ECOLOGICAL DISTRIBUTION
The Ecology of the Cumberland Island National Seashore Camden County, Georgia, W75-11546 2L

ECONOMIC FEASIBILITY
Natural and Artificial Reefs in Mississippi Coastal Waters: Sport Fishing Pressure and Economic Considerations, W75-11558 6B

ECONOMIC JUSTIFICATION
Urban Drainage and Flood Control Projects. Economic, Legal and Financial Aspects, W75-11352 6B

ECONOMICS
Analysis of International Great Lakes Shipping and Hinterland, W75-11576 6C

ECOSYSTEMS
A Food Web Model for Lake Michigan Part 2- Model Formulation and Preliminary Verification, W75-11547 5C

EFFLUENT QUALITY STANDARDS
Tertiary Stage Added to Stratford Sewage Plant. W75-11705 5D

EFFLUENTS
Biological Considerations on the Use of Thermal Effluents for Finfish Aquaculture, W75-11759 5C

An Integrated Power Process Model of Water Use and Waste Water Treatment in Chlor-Alkali Production, W75-11765 5D

EISENIELLA-TETRAEDRA
Oligochaetes in the Bottom Fauna and Stomach Content of Trout, Salmo Trutta (L.), W75-11385 2H

EKMAN LAYERS
A Three-Dimensional Theory of Coastal Currents and Upwelling Over a Continental Shelf, W75-11450 2E

ELECTRIC FORCES
On the Collection Efficiency of Water Droplets Under the Influence of Electric Forces, I: Experimental, Charge-Multipole Effects, W75-11639 2B

ELECTRICAL PROPERTIES
On the Collection Efficiency of Water Droplets Under the Influence of Electric Forces, I: Experimental, Charge-Multipole Effects, W75-11639 2B

ELECTROLYTES
Detector of Trace Substance in Water, W75-11388 5A

ELECTROLYTIC CELLS
Instrumental Investigation of Biological Waste Water Treatment (A szennyvisek biologiai tisztitasanak muszeres vizsgalata), W75-11407 5D

ELECTROLYTIC CHLORINE
Electrolytic Chlorine Used to Purify Disintegrated Sewage. W75-11422 5D

EMBRYOPATHIC EFFECTS
Embryopathic Effects of Different Routes of Administration of Mercuric Acetate in the Hamster, W75-11524 5C

EMULSIONS
Separation of Emulsified Oil from Water, W75-11360 5D

END DUMPING
Disposal of Sandy Pipeline Dredge Spoils by End Dumping, W75-11566 5G

ENERGY
Energy-Wastewater Treatment and Solids Disposal, W75-11697 5D

ENERGY LOSS
Hydraulic Design of Vertical Stilling Wells, W75-11650 8B

ENERGY TRANSFER
Wave Energy Transfer Mechanisms in Wind-Wave Tunnels, W75-11774 8B

ENGLAND
The Rainfall Recorder Problem, W75-11448 2B

ENTEROHEPATIC CIRCULATION IN RATS
Biliary Excretion of Phenyl and Methyl Mercury Chlorides and Their Enterohepatic Circulation in Rats, W75-11525 5C

ENTEROVIRUSES
Some Problems of the Circulation of Enteroviruses in Environmental Objects, (In Russian), W75-11438 5B

Sanitary-Virological Study of the Effectiveness of Decontamination of Waste Waters on Irrigated Farm Yields, (In Russian), W75-11674 5B

ENVIRONMENT
Land Use and Environmental Planning: An Application in the South Carolina Coastal Zone, W75-11766 6G

ENVIRONMENTAL EFFECTS
Habitat Heterogeneity and Avian Community Structure in North American Grasslands, W75-11425 2I

**ENVIRONMENTAL EFFECTS**

Embryopathic Effects of Different Routes of Administration of Mercuric Acetate in the Hamster,
W75-11524 5C

Energy-Wastewater Treatment and Solids Disposal,
W75-11697 5D

Agricultural Use of Sludge,
W75-11720 5C

Disposal of Chemical Sewage Sludges on Land and Their Effects on Plants, Leachate and Soil Systems,
W75-11721 5E

Procedure for Selecting a Minimal Environmental Impact Routing for a Water Conveyance Canal,
W75-11764 6G

**ENVIRONMENTAL ENGINEERING**

Development Planning of Laguna de Bay--Philippines,
W75-11770 4A

Planning for Resources-Environmental Conservation,
W75-11781 6B

**ENVIRONMENTAL IMPACT ANALYSIS**

Procedure for Selecting a Minimal Environmental Impact Routing for a Water Conveyance Canal,
W75-11764 6G

**EQUILIBRIUM**

Kinetic and Equilibrium Studies of Boron Desorption from Soil,
W75-11600 2G

**EQUIPMENT**

Device and Method for Conducting Waste Liquid from a Receptacle to a Pneumatic Liquid Disposal System,
W75-11519 5D

**EQUIPOTENTIAL LINES**

Solution of a Free-Surface Boundary Value Problem Using an Inverse Formulation and the Finite Element Method,
W75-11447 2F

**ERROR DETECTION**

The Rainfall Recorder Problem,
W75-11448 2B

**ESTUARIES**

The Reduction of Artificial Boundary Reflexions in Numerically Modelled Estuaries,
W75-11452 2L

Phytoplankton Diversity and Chlorophyll-a in a Polluted Estuary,
W75-11607 5C

Pollution Detection and River Quality Management,
W75-11753 5A

**ESTUARINE ENVIRONMENT**

Mercury Cycling in a Small Hawaiian Estuary,
W75-11563 5C

**ESTUARINE FISHERIES**

An Inventory and Study of the Vermilion Bay-Atchafalaya Bay Complex; Area Description, Biology, Hydrology and Chemistry, and Sedimentology,
W75-11571 2L

**ESTUARINE SANCTUARIES**

State Regulation of Coastal Water Area Preserves,
W75-11568 6E

**ESTUARY**

Geochemistry of Surface Sediments in an Acid Stream Estuary,
W75-11531 2J

**EULERIAN LENGTH SCALE**

Solid Particle Settlement in Open-Channel Flow,
W75-11652 5B

**EUTROPHICATION**

Natural and Accelerated Phosphate Mobility, (In Dutch),
W75-11520 5C

**EVALUATION**

An Integrated Power Process Model of Water Use and Waste Water Treatment in Chlor-Alkali Production,
W75-11765 5D

**EVAPORATION**

Desalination of Water.
W75-11515 3A

Modified Penman Equation to Provide the Upper Boundary Condition in Computing Evaporation from Soil,
W75-11598 2D

Evaporation Data in Texas,
W75-11630 7C

**EVAPORATION CONTROL**

Evaporation Suppression for Conserving Water Supplies,
W75-11816 3B

An Analysis of the Efficiency of Microwatershed Systems,
W75-11820 3B

Precipitation Entrapment for Evaporation Suppression,
W75-11822 3B

**EVAPORATION DATA**

Evaporation Data in Texas,
W75-11630 7C

**EVAPORATION PANS**

Evaporation Data in Texas,
W75-11630 7C

**EVAPORATION STATIONS**

Evaporation Data in Texas,
W75-11630 7C

**EVAPOTRANSPIRATION**

Grain Sorghum Evapotranspiration and Water Use Efficiency Under Trickle Irrigation,
W75-11582 3F

Evapotranspiration and Soil Moisture in Upland Grass Catchments in the Eastern Pennines,
W75-11648 2D

Evapotranspiration by Subirrigated Alfalfa and Pasture in the East Central Great Plains,
W75-11841 3F

**EXCRETION**

Copper Uptake and Excretion by Busycon Canaliculatum L.,
W75-11755 5C

**FEDERAL WATER POLLUTION CONTROL ACT**

An Equitable Sewer Use Charge System,
W75-11391 5G

**FERTILIZERS**

A Comparison of 15N-Depleted and 15N-Enriched Fertilizers as Tracers.
W75-11591 3F

Sulfur and Manganese Release from Soil Treated with Prilled Sulfur and Sulfur Bentonite,
W75-11604 5F

Rate of Phosphorus Sorption by Five Oklahoma Soils,
W75-11836 3F

**FIBERS (PLANT)**

Sanitary and Bacteriological Evaluation of th Raw Material, Air and Wastewaters of Som Bast Fiber Plants in the Uzbek SSR, (In Russian),
W75-11406 5

**FIELD CROPS**

Infiltration and Runoff for Small Field Plot Under Constant Intensity Rainfall,
W75-11458 3

**FILMS**

Formation and Collapse of Surface Films,
W75-11642 2

**FILTERS**

Apparatus for Cleaning Loose Filtering Material in Slow Water Filled Water Supply Filters,
W75-11436 5

Vacuum Dewatering of Sewage Sludge,
W75-11727 5

Domestic Sewage Treatment by Underdrain Filter Systems,
W75-11751 5

**FILTRATION**

Dehydrating Industrial Sludges by Filtration.
W75-11369

Treating Sewage.
W75-11516

Metal Removal by Physical and Chemi Treatment Processes,
W75-11542

In-Line Filtration May Be Just for You,
W75-11698

Domestic Sewage Treatment by Underdrai Filter Systems,
W75-11751

**FINITE ELEMENT ANALYSIS**

Solution of a Free-Surface Boundary Va Problem Using an Inverse Formulation and Finite Element Method,
W75-11447

**FISH**

Fish Toxicants in Kraft Effluents,
W75-11358

Uptake, Distribution and Fate of 203 Hg-E mercuric Chloride in the Guppy and the C tail,
W75-11529

Biological Considerations on the Use of T mal Effluents for Finfish Aquaculture,
W75-11759

**H BEHAVIOR**
awning Grounds of the European Walleye
cioperca Lucioperca L. and Volga Walleye
cioperca Volgensis (Gmelin) in the Ural
ver (In Russian),
75-11668 2I

**H FARMING**
ological Considerations on the Use of Ther-
al Effluents for Finfish Aquaculture,
75-11759 5C

**H FOOD ORGANISMS**
igochaetes in the Bottom Fauna and Stomach
ntent of Trout, Salmo Trutta (L.),
75-11385 2H

**H PHYSIOLOGY**
rther Observations on the Effect of Sodium
lt of 2,4-D on Early Developmental Stages of
rp (Cyprinus Carpio L.),
75-11762 5C

**H PONDS**
fects of Fish-Ponds Near Jakubovo on the
nithocenose There, (In Czech),
75-11535 5C

**H REPRODUCTION**
awning Grounds of the European Walleye
cioperca Lucioperca L. and Volga Walleye
cioperca Volgensis (Gmelin) in the Ural
ver (In Russian),
75-11668 2I

**K POND**
dimentation Rates in a Long Island Marsh
termined by PB210 Dating,
75-11643 2L

**CCULATION**
ntinuous Treatment of Polluted Liquids.
75-11381 5D

dies of the Biochemical Factors Controlling
Flocculation of Activated Sludge, (In
anese),
75-11402 5D

en Water Purification System,
75-11419 5D

e of Oxidized Cationic Starch in Floccula-
n and Dewatering of Municipal Sludge,
5-11420 5D

uid Treatment Plant and Process Particu-
y for Waste Water,
5-11441 5D

**OD CONTROL**
st Benefit Analysis as Dimensioning Basis of
od Control Measures: An Empirical Report
tzen-Kosten-Analyse als Grundlage der
nensionierung von HW-Schutzmassnahmen-
Erfahrungsbericht),
5-11415 6B

velopment Planning of Laguna de Bay--
lippines,
5-11770 4A

od Plain Information: Ley Creek, Salina and
vitt Townships, Onondaga County, New
k.
5-11785 4A

od Plain Information: Northeast Stream
up, Stockton, California.
5-11789 4A

An Economic and Environmental Reconnaissance of the Possibilities for Small Watershed Development in Chenango County,
W75-11796 4D

**FLOOD DAMAGE**
Flood Plain Information: Flood Hazard Report of 4-7 July 1969 Flood, Huron River, Norwalk Creek, Ohio.
W75-11787 4A

Flood Plain Information: Plum Creek, Brunswick Hills and Medina Townships, Medina County, Ohio.
W75-11788 4A

Flood Plain Information: Northeast Stream Group, Stockton, California.
W75-11789 4A

Flood Plain Information: Ventura River, Ventura County, California.
W75-11790 4A

An Economic and Environmental Reconnaissance of the Possibilities for Small Watershed Development in Chenango County,
W75-11796 4D

**FLOOD DATA**
Floods in the Waiahole-Waikane Area, Oahu, Hawaii,
W75-11495 2E

Flood Plain Information: Contrary Creek, St. Joseph, Missouri.
W75-11791 4A

**FLOOD FLOW**
Prediction of Flood Volume from Small Humid Region Watersheds,
W75-11462 4A

**FLOOD FREQUENCY**
Floods in the Waiahole-Waikane Area, Oahu, Hawaii,
W75-11495 2E

Progress Report to the Arkansas State Highway Commission for Year Ending June 30, 1975,
W75-11501 8B

**FLOOD IRRIGATION**
Effects of Water Management and Soil Aggregation on the Growth and Nutrient Uptake of Rice,
W75-11832 3F

**FLOOD PLAINS**
Boundary Shear in Channel with Flood Plain,
W75-11463 8B

Flood Plain Information: Ley Creek, Salina and Dewitt Townships, Onondaga County, New York.
W75-11785 4A

Flood Plain Information: Plum Creek, Brunswick Hills and Medina Townships, Medina County, Ohio.
W75-11788 4A

Flood Plain Information: Northeast Stream Group, Stockton, California.
W75-11789 4A

Flood Plain Information: Ventura River, Ventura County, California.
W75-11790 4A

Flood Plain Information: Contrary Creek, St. Joseph, Missouri.
W75-11791 4A

**FLOOD PROFILE**
Flood Plain Information: Ventura River, Ventura County, California.
W75-11790 4A

**FLOOD PROFILES**
Flood Plain Information: Flood Hazard Report of 4-7 July 1969 Flood, Huron River, Norwalk Creek, Ohio.
W75-11787 4A

Flood Plain Information: Contrary Creek, St. Joseph, Missouri.
W75-11791 4A

**FLOOD PROTECTION**
Flood Plain Information: Northeast Stream Group, Stockton, California.
W75-11789 4A

Flood Plain Information: Chittenango Creek, Bridgeport, Onondaga and Madison Counties, New York.
W75-11792 4A

**FLOOD ROUTING**
Hymo Flood Routing,
W75-11647 4A

**FLOOD STAGES**
Flood Plain Information: Flood Hazard Report of 4-7 July 1969 Flood, Huron River, Norwalk Creek, Ohio.
W75-11787 4A

**FLOODING**
Flood Plain Information: Contrary Creek, St. Joseph, Missouri.
W75-11791 4A

Flood Plain Information: Chittenango Creek, Bridgeport, Onondaga and Madison Counties, New York.
W75-11792 4A

**FLOODS**
River Regime with Special Reference to River Nile,
W75-11464 2J

Floods in the Waiahole-Waikane Area, Oahu, Hawaii,
W75-11495 2E

Flood Plain Information: Ley Creek, Salina and Dewitt Townships, Onondaga County, New York.
W75-11785 4A

Flood Plain Information: Ventura River, Ventura County, California.
W75-11790 4A

Flood Plain Information: Contrary Creek, St. Joseph, Missouri.
W75-11791 4A

Flood Plain Information: Chittenango Creek, Bridgeport, Onondaga and Madison Counties, New York.
W75-11792 4A

**FLOODWAYS**
Flood Plain Information: Flood Hazard Report of 4-7 July 1969 Flood, Huron River, Norwalk Creek, Ohio.
W75-11787 4A

**FLORIDA**
A Bibliography of Biscayne Bay, Florida Monitoring and Research Programs,
W75-11557 10C

**FLORIDA**

Studies of Floodplain Vegetation and Water Level Fluctuation in the Kissimmee River Valley,
W75-11628 4A

**FLOTATION**
Process for Treating Waste Water,
W75-11387 5D

Flotation Aerator for Aerating and Moving Water,
W75-11439 5D

**FLOTATION AERATOR**
Flotation Aerator for Aerating and Moving Water,
W75-11439 5D

**FLOW**
Resistance to Flow in Alluvial Channels,
W75-11459 2E

Velocities Above Rough Bed in Oscillatory Flow,
W75-11763 8B

Friction--Frequency Dependence for Oscillatory Flows in Circular Pipe,
W75-11780 8B

Flood Plain Information: Ventura River, Ventura County, California.
W75-11790 4A

**FLOW AROUND OBJECTS**
Axisymmetric Seepage Flow Through Semi-Infinite Porous Media,
W75-11633 2F

**FLOW CONTROL**
Cavitation in Butterfly Valves,
W75-11777 8B

**FLOW PROFILES**
Analysis of Plunging Phenomena in Water Reservoirs,
W75-11655 4A

**FLOW RATES**
Surface Water Supply of the United States, 1966-70: Part 6. Missouri River Basin--Volume 3, Missouri River Basin from Sioux City, Iowa, to Nebraska City, Nebraska.
W75-11486 7C

Surface Water Supply of the United States, 1966-70: Part 8. Western Gulf of Mexico Basins--Volume 2. Basins from Lavaca River to Rio Grande.
W75-11487 7C

Surface Water Supply of the United States, 1966-70: Part 9. Colorado River Basin--Volume 3. Lower Colorado River Basin.
W75-11488 7C

Surface Water Supply of the United States, 1966-70: Part 10. The Great Basin.
W75-11489 7C

Surface Water Supply of the United States, 1966-70: Part 12. Pacific Slope Basins in Washington--Volume 1. Pacific slope Basins in Washington Except Columbia River Basin.
W75-11490 7C

Surface Water Supply of the United States, 1966-70: Part 13. Snake River Basin.
W75-11491 7C

**FLOW RETARDATION**
Generation of Hydrologic Samples: Case Study of the Great Lakes,
W75-11476 2H

**FLUID FLOW**
Velocities Above Rough Bed in Oscillatory Flow,
W75-11763 8B

**FLUID FRICTION**
Friction--Frequency Dependence for Oscillatory Flows in Circular Pipe,
W75-11780 8B

**FLUID MECHANICS**
Solution of a Free-Surface Boundary Value Problem Using an Inverse Formulation and the Finite Element Method,
W75-11447 2F

**FLUMES**
Resistance to Flow in Alluvial Channels,
W75-11459 2E

**FLUORIDES**
Geochemistry and Gensis of Fluoride-Containing Ground Waters in India,
W75-11645 2K

**FLUORINATION REACTIONS**
Kinetics of the Fluorination of Zinc,
W75-11629 5A

**FLUORINE**
Spectrophotometric Determination of Fluorine in Water, (In Russian).
W75-11433 5A

Kinetics of the Fluorination of Zinc,
W75-11629 5A

Methods of Detecting the Fluorine Ion in Air and Water, (In Russian),
W75-11794 5A

**FLUORITE**
Geochemistry and Gensis of Fluoride-Containing Ground Waters in India,
W75-11645 2K

**FLUOROMETRY**
The Determination of Traces of Lead (II) by Solid-State Luminescence,
W75-11541 5A

**FOG IRRIGATION**
Comparison of Fog Irrigation with Surface Irrigation in Corn Production,
W75-11837 3F

**FOOD CHAINS**
A Food Web Model for Lake Michigan Part 2-Model Formulation and Preliminary Verification,
W75-11547 5C

**FOOD WEBS**
A Food Web Model for Lake Michigan Part 2-Model Formulation and Preliminary Verification,
W75-11547 5C

**FORECASTING**
The Use of Computers for Forecasting the Sanitary Systems of Water Bodies (Primeneniye EVM dlya prognozirovaniya sanitarnogo sostoyaniya vodoyemov),
W75-11410 5D

Forecasting Urban Water Use: Commercial Establishments,
W75-11795 6D

**FOURIER ANALYSIS**
Demodulation of Stream-Flow Series,
W75-11449 2E

**FRANCE**
Novel Waste Treatment Variation Shows Great Promise,
W75-11702 5D

**FRANCE (GIENS GULF)**
The Growth of Posidonia and the Urban Pollution in the Gulf of Giens, (In French),
W75-11761 5C

**FREEZE-CRYSTALLIZATION**
Means for and Method of Purifying Contaminated Water,
W75-11672 5D

**FREQUENCY**
Demodulation of Stream-Flow Series,
W75-11449 2E

**FRICTION COEFFICIENT (HYDRAULIC)**
Friction--Frequency Dependence for Oscillatory Flows in Circular Pipe,
W75-11780 8B

**FROGS**
Effects of Methylmercury Chloride on Rana Pipiens Tadpoles,
W75-11527 5C

**FROUDE NUMBER**
Analysis of Plunging Phenomena in Water Reservoirs,
W75-11655 4A

**FUELS**
The Solubility Behaviour of No. 2 Fuel Oil in Sea Water,
W75-11565 5B

**FURROW IRRIGATION**
Comparison of Fog Irrigation with Surface Irrigation in Corn Production,
W75-11837 3F

**GABIONS**
Experimental Study of Wave Transimission,
W75-11773 8B

**GAGE CATCH**
Comparison of Precipitation Gage Catches with a Modified Alter and a Rigid Alter Type Windshield,
W75-11457 2B

**GAGING STATIONS**
Great Lakes Water Levels, 1974, Daily and Monthly Average Water Surface Elevations.
W75-11554 2H

**GARBAGE DUMPS**
A Case of Subterranean Water Pollution Caused by the Public Refuse Disposal Ground (In Japanese),
W75-11432 5

**GAS CHROMATOGRAPHY**
Quantitative Inorganic Analysis by Gas Chromatography, a Review,
W75-11528 5

The Solubility Behaviour of No. 2 Fuel Oil in Sea Water,
W75-11565 5

**GASTROPODS**
Copper Uptake and Excretion by Busycon Canaliculatum L.,
W75-11755 5

**GEOCHEMISTRY**
Regional Chemistry of Groundwater in the Wainwright Area, Alberta,
W75-11471

eochemistry and Gensis of Fluoride-Contain-g Ground Waters in India,
/75-11645 2K

DHYDROLOGIC UNITS
ydrogeology of the Wainwright Area, Al-erta,
/75-11475 4B

etermining Optimal Well Discharge,
/75-11768 4B

DLOGIC CONTROL
egional Chemistry of Groundwater in the 'ainwright Area, Alberta,
/75-11471 2F

DLOGIC FORMATIONS
eohydrologic Reconnaissance of the Upper otomac River Basin,
75-11493 2F

DLOGIC MAPPING
ydrogeology of the Wainwright Area, Al-rta,
75-11475 4B

OMORPHOLOGY
Geomorphic Shoreline Inventory with anagement Considerations for Whatcom unty, Washington,
75-11455 2L

RGIA
e Ecology of the Cumberland Island Na-nal Seashore Camden County, Georgia,
75-11546 2L

CIAL SEDIMENTS
diment Relations of Selected Alaskan Glaci-Fed Streams,
75-11477 2J

DUALLY VARIED FLOW
alysis of Plunging Phenomena in Water servoirs,
5-11655 4A

N (CROPS)
Comparative Study on Methods for Cadmi- Analysis of Grain with an Application to lution Evalu tion,
5-11539 5A

N SORGHUM
in Sorghum Evapotranspiration and Water Efficiency Under Trickle Irrigation,
5-11582 3F

ND VALLEY (COLO)
velopment of Salinity Control Technology in nd Valley,
5-11585 5G

ES
tipurpose Salt Treated Water Harvesting tem,
5-11828 3B

SLANDS
itat Heterogeneity and Avian Community cture in North American Grasslands,
5-11425 2I

ITY SEWERS
ironmental Constraints Challenge gners of Shoreline Community Near Kan-City, Missouri,
-11392 5D

GRAVITY STUDIES
Improved Application of Geophysics to Groundwater Resource Inventories in Glaciated Terrains,
W75-11355 2F

GRAYS HARBOR DRAINAGES (WASH)
Low-Flow Characteristics of Streams in the Grays Harbor Drainages, Washington,
W75-11502 2E

GREAT BASIN
Surface Water Supply of the United States, 1966-70: Part 10. The Great Basin.
W75-11489 7C

GREAT LAKES
Physicochemical Properties of Dredge Spoil,
W75-11465 5B

Generation of Hydrologic Samples: Case Study of the Great Lakes,
W75-11476 2H

Water Quality Relationships in the Great Lakes: Analysis of a Survey Questionnaire,
W75-11549 5B

Great Lakes Water Levels, 1974, Daily and Monthly Average Water Surface Elevations.
W75-11554 2H

Sources of Water Quality, Lake Level, Ice, Water Temperature and Meteorological Data for the St. Lawrence Great Lakes,
W75-11567 2H

The Coasts of Wisconsin,
W75-11569 2H

Great Lakes Ice Cover, Winter 1973-74,
W75-11572 2C

Analysis of International Great Lakes Shipping and Hinterland,
W75-11576 6C

GREAT LAKES REGION
Analysis of International Great Lakes Shipping and Hinterland,
W75-11576 6C

GREAT PLAINS
Hydrologic Aspects of Water Harvesting in the Northern Great Plains,
W75-11811 2A

Field Evaluation of Microwatershed and Vertical Mulch Systems,
W75-11819 3B

Evapotranspiration by Subirrigated Alfalfa and Pasture in the East Central Great Plains,
W75-11841 3F

GROUNDWATER
Improved Application of Geophysics to Groundwater Resource Inventories in Glaciated Terrains,
W75-11355 2F

Transport Model, User's Manual,
W75-11468 5B

Variable Thickness Transient Groundwater Flow Model User's Manual,
W75-11469 2F

Selenium in Waters in and Adjacent to the Kendrick Project, Natrona County, Wyoming,
W75-11492 5B

Well Pumping in Unconfined Aquifers: The Influence of the Unsaturated Zone,
W75-11631 4B

Geochemistry and Gensis of Fluoride-Containing Ground Waters in India,
W75-11645 2K

Theory of Ground-Water Recharge for a Strip Basin,
W75-11646 2F

Pollution Detection and River Quality Management,
W75-11753 5A

Determining Optimal Well Discharge,
W75-11768 4B

GROUNDWATER DISCHARGE FORECASTING
Predictive Modeling of Effects of the Planned Kindred Lake on Ground-Water Levels and Discharge, Southeastern North Dakota.
W75-11503 4A

GROUNDWATER LEVELS
Predictive Modeling of Effects of the Planned Kindred Lake on Ground-Water Levels and Discharge, Southeastern North Dakota,
W75-11503 4A

GROUNDWATER MOVEMENT
Regional Sewering and Groundwater Quality in the Southern San Joaquin Valley,
W75-11446 5D

Identification of Parameters in a Linear Equation of Groundwater Flow,
W75-11799 2F

GROUNDWATER RECHARGE
Response of Unconfined Aquifer Systems to Deep Percolation,
W75-11474 2F

Mathematical Models of Artificial Recharge Systems,
W75-11626 4B

Theory of Ground-Water Recharge for a Strip Basin,
W75-11646 2F

GROUNDWATER RESOURCES
Improved Application of Geophysics to Groundwater Resource Inventories in Glaciated Terrains,
W75-11355 2F

Digital-Simulation and Projection of Water-Level Declines in Basalt Aquifers of the Odessa-Lind Area, East-Central Washington,
W75-11494 2F

Ground-Water Data for Bolivar County, Mississippi,
W75-11496 7C

Ground-Water Data in the Harrisburg - Halsey Area, Central Willamette Valley, Oregon,
W75-11498 7C

Hydrology for Land-Use Planning: The Hillside Area, Anchorage, Alaska,
W75-11504 4A

GROWTH STAGES
The Brown Pelican and Certain Environmental Pollutants in Louisiana,
W75-11757 5A

GROWTH STAGES

Further Observations on the Effect of Sodium Salt of 2,4-D on Early Developmental Stages of Carp (Cyprinus Carpio L.).
W75-11762 5C

GULF COASTAL PLAIN

An Inventory and Study of the Vermilion Bay-Atchafalaya Bay Complex. Area Description. Biology, Hydrology and Chemistry, and Sedimentology.
W75-11571 2L

GULF OF MEXICO

Quality of Surface Waters of the United States, 1970: Part 2. South Atlantic Slope and Eastern Gulf of Mexico Basins
W75-11480 7C

Quality of Surface Waters of the United States, 1968: Part 8. Western Gulf of Mexico Basins.
W75-11484 7C

GULF OF MEXICO BASINS (WESTERN)

Quality of Surface Waters of the United States, 1968: Part 8. Western Gulf of Mexico Basins.
W75-11484 7C

GUPPY

Uptake, Distribution and Fate of 203 Hg-Ethylmercuric Chloride in the Guppy and the Coontail.
W75-11529 5C

GYPSUM

Gypsum Solubility and Scaling Limits in Saline Waters.
W75-11473 3A

HABITATS

Habitat Heterogeneity and Avian Community Structure in North American Grasslands.
W75-11425 2I

HALOGENATED PESTICIDES

Organochlorine Compounds in Several Marine Organisms from the North Sea and the Dutch Wadden Sea.
W75-11608 5B

HALOGENS

Kinetics of the Fluorination of Zinc.
W75-11629 5A

An Ecological Survey of the Rocky Coast Adjacent to a Bromine Extraction Works.
W75-11758 5C

HANGING MERCURY DROP ELECTRODE

Atomic-Absorption Spectrometric Determination of Cadmium, Lead, and Zinc in Salts or Salt Solutions by Hanging Mercury Drop Electrodeposition and Atomization in a Graphite Furnace.
W75-11536 5A

HARBORS

Physicochemical Properties of Dredge Spoil.
W75-11465 5B

Design Criteria for Single-Point Mooring Terminals.
W75-11771 8C

HARRISBURG - HALSEY AREA (OREG)

Ground-Water Data in the Harrisburg - Halsey Area, Central Willamette Valley, Oregon.
W75-11498 7C

HAWAII

Floods in the Waiahole-Waikane Area, Oahu, Hawaii.
W75-11495 2E

Mercury Cycling in a Small Hawaiian Estuary.
W75-11563 5C

Optimizing Water Utilization Through Multiple Crops Scheduling.
W75-11587 3F

Predicting Exchangeable Sodium Ratios in Irrigated Tropical Vertisols.
W75-11595 3C

Tropical Showers in an Axisymmetric Cloud Model.
W75-11635 2B

HEAD LOSS

'Chamber Method' for Drip Irrigation System Design and Installation Procedures.
W75-11584 3F

Energy Losses at 90 Degrees Pipe Junctions.
W75-11778 8B

HEAT TREATMENT

Heat Treatment of Sewage Sludge.
W75-11732 5D

HEAVY METALS

Plating and Cyanide Wastes. (Literature Review).
W75-11370 5D

Separating Ionised Materials from Aqueous Solutions.
W75-11397 5D

Influence of Lead on Calcium and Strontium Transfer Through the Duodenal Wall in Rats.
W75-11523 5C

Embryopathic Effects of Different Routes of Administration of Mercuric Acetate in the Hamster.
W75-11524 5C

Radioactive - Tracer Displacement Method for the Determination of Small Quantities of Nickel.
W75-11526 5A

Quantitative Inorganic Analysis by Gas Chromatography, a Review.
W75-11528 5A

Uptake, Distribution and Fate of 203 Hg-Ethylmercuric Chloride in the Guppy and the Coontail.
W75-11529 5C

Ultrastructural Effects of Acute Tetraethyllead Poisoning on Nerve Cells of the Rabbit Brain.
W75-11530 5C

Chemical Composition of Aegean Sea Sediments.
W75-11533 2J

Atomic-Absorption Spectrometric Determination of Cadmium, Lead, and Zinc in Salts or Salt Solutions by Hanging Mercury Drop Electrodeposition and Atomization in a Graphite Furnace.
W75-11536 5A

Kinetics of Lead Retention and Distribution in Suckling and Adult Rats.
W75-11537 5B

Determination of the Apparent Complexing Capacity of Lake Waters.
W75-11538 5B

A Comparative Study on Methods for Cadmium Analysis of Grain with an Application to Pollution Evaluation.
W75-11539

The Determination of Traces of Lead (II) by Solid-State Luminescence.
W75-11541

Metal Removal by Physical and Chemical Treatment Processes.
W75-11542

Loss of Trace Elements from Natural Waters During Storage. I. Behavior of 203 Hg and 65 Zn Added to Pond Water.
W75-11543

Lead and Arsenic Levels of Dairy Cattle in Proximity to a Copper Smelter.
W75-11544

Plating and Cyanide Wastes (Literature Review).
W75-11545

Mercury Cycling in a Small Hawaiian Estuary
W75-11563

Submicrogram Per Gram Concentrations of Mercury in Orchard Leaves Determined by Isotope Dilution and Spark-Source Mass Spectrometry.
W75-11581

Synergistic Effects of Salinity, Temperature and Heavy Metals on Mortality and Osmoregulation in Marine and Estuarine Isopods (Crustacea).
W75-11610

Barnacles: Possible Indicators of Zinc Pollution.
W75-11611

Recycling of Incinerator Ash.
W75-11714

Copper and Zinc in Cancer Irroratus: Comparative Metabolism of the Molt Cycle. le Cuivre le Zinc Chez Cancer Irroratus (Crustace:Decapode): Metabolisme Comparé au Cours du Cycle D'intermue.
W75-11752

The Behaviour of Tetramethylenedithiocarbamates in the Graphite-Tube Furnace for Atomic Absorption Spectrometry.
W75-11797

The Determination of Cadmium in Sea Water by Radioactivation.
W75-11798

HERBICIDES

Further Observations on the Effect of Sodium Salt of 2,4-D on Early Developmental Stages of Carp (Cyprinus Carpio L.).
W75-11762

Environmental Aspects of Aquatic Plant Control.
W75-11843

HISTORIC FLOODS

Flood Plain Information: Flood Hazard Data of 4-7 July 1969 Flood, Huron River, Norton Creek, Ohio.
W75-11787

ISTORY
Water Development in Management of Livestock and Wildlife on Mountain Wildlands.
W75-11804 3B

UMAN INFECTIONS (INTESTINAL)
Evaluation of the Quality of Surface Water for Developing Recommendations of Nonspecific Prophylaxis of Intestinal Infections. (In Russian).
W75-11512 5C

URON RIVER (OHIO)
Flood Plain Information: Flood Hazard Report of 4-7 July 1969 Flood, Huron River, Norwalk Creek, Ohio.
W75-11787 4A

URRICANE FACTORS
Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States.
W75-11556 2B

URRICANE LEVELS
Hurricane Experience Levels of Coastal County Populations - Texas to Maine.
W75-11570 2B

URRICANE ORIGIN
Further Studies on the Origin of Hurricanes.
W75-11559 2B

URRICANE SCALES
Hurricane Experience Levels of Coastal County Populations - Texas to Maine.
W75-11570 2B

URRICANES
Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States.
W75-11556 2B

Further Studies on the Origin of Hurricanes.
W75-11559 2B

Hurricane Experience Levels of Coastal County Populations - Texas to Maine.
W75-11570 2B

Central North Pacific Tropical Cyclones, 1974.
W75-11579 2B

YDRAULIC CONDUCTIVITY
Unsaturated Hydraulic Conductivity from Cumulative Inflow Data.
W75-11593 2G

YDRAULIC LOADING
Suspended Solids Removal Processes Studied in Metro Chicago.
W75-11741 5D

YDRAULIC MODELS
Hydraulic Model Studies of a Second Powerhouse at Rock Island Hydroelectric Project.
W75-11466 8B

Hydraulic Model Studies of a Second Powerhouse at Rock Island Hydroelectric Project, Cofferdam Tests.
W75-11467 8B

Scale Effects on Cooling Tower Model Studies.
W75-11470 8B

Hydraulic Design of Vertical Stilling Wells.
W75-11650 8B

YDRAULIC STRUCTURES
Hydraulic Model Studies of a Second Powerhouse at Rock Island Hydroelectric Project.
W75-11466 8B

Hydraulic Model Studies of a Second Powerhouse at Rock Island Hydroelectric Project, Cofferdam Tests.
W75-11467 8B

HYDRAULICS
Cavitation in Butterfly Valves.
W75-11777 8B

Energy Losses at 90 Degrees Pipe Junctions.
W75-11778 8B

Friction--Frequency Dependence for Oscillatory Flows in Circular Pipe.
W75-11780 8B

Simulation of Dispersion of Suspended Particles.
W75-11782 8B

HYDROBIOLOGY
Hydrochemical and Hydrobiological Peculiarities of Limans in the Danube-Dniester Interfluve. (In Ukrainian).
W75-11847 2K

HYDROCHEMICAL CONDITIONS
Hydrochemical and Hydrobiological Peculiarities of Limans in the Danube-Dniester Interfluve. (In Ukrainian).
W75-11847 2K

HYDROGEN ION CONCENTRATION
An Ecological Survey of the Rocky Coast Adjacent to a Bromine Extraction Works.
W75-11758 5C

HYDROGEN PEROXIDE
Sewage Treatment with Hydrogen Peroxide
W75-11443 5D

HYDROGEOLOGY
Regional Chemistry of Groundwater in the Wainwright Area, Alberta.
W75-11471 2F

Hydrogeology of the Wainwright Area, Alberta.
W75-11475 4B

Geohydrologic Reconnaissance of the Upper Potomac River Basin.
W75-11493 2F

A Topographic-Hydrogeologic Model for Solid Waste Landfill Siting.
W75-11644 5B

HYDROGRAPH ANALYSIS
Prediction of Flood Volume from Small Humic Region Watersheds.
W75-11462 4A

HYDROGRAPHS
Soil Moisture Accounting Component of the USDAHL-74 Model of Watershed Hydrology.
W75-11656 2G

HYDROGRAPHY
Sources of Water Quality, Lake Level, Ice, Water Temperature and Meteorological Data for the St. Lawrence Great Lakes.
W75-11567 2H

Design Criteria for Single-Point Mooring Terminals.
W75-11771 8C

HYDROLOGIC CYCLE
Man on the Hydrologic Cycle.
W75-11776 2A

HYDROLOGIC DATA
Ground-Water Data for Bolivar County, Mississippi.
W75-11496 7C

Data Requirements for the Optimization of Reservoir Design and Operating Rule Determination.
W75-11500 4A

Progress Report to the Arkansas State Highway Commission for Year Ending June 30, 1975.
W75-11501 8B

Low-Flow Characteristics of Streams in the Grays Harbor Drainages, Washington.
W75-11502 2E

Sources of Water Quality, Lake Level, Ice, Water Temperature and Meteorological Data for the St. Lawrence Great Lakes.
W75-11567 2H

Soil Moisture Accounting Component of the USDAHL-74 Model of Watershed Hydrology.
W75-11656 2G

Identification of Parameters in a Linear Equation of Groundwater Flow.
W75-11769 2F

HYMO COMPUTER PROGRAM
Hymo Flood Routing.
W75-11647 4A

ICE CHARTS
Great Lakes Ice Cover, Winter 1973-74.
W75-11572 2C

ICE COVER
Great Lakes Ice Cover, Winter 1973-74.
W75-11572 2C

ICE FLOES
Great Lakes Ice Cover, Winter 1973-74.
W75-11572 2C

ICED LAKES
Great Lakes Ice Cover, Winter 1973-74.
W75-11572 2C

IDAHO
Comparison of Precipitation Gage Catches with a Modified Alter and a Rigid Alter Type Windshield.
W75-11457 2B

ILLINOIS
Mercer County Surface Water Resources.
W75-11622 4A

Vermilion County Surface Water Resources.
W75-11623 4A

Lawrence County Surface Water Resources.
W75-11624 4A

De Kalb County Surface Water Resources.
W75-11625 4A

Metro Chicago Studies on Nitrification.
W75-11742 5D

IMMATURE GROWTH STAGE
Effects of Methylmercury Chloride on Rana Pipiens Tadpoles.
W75-11527 5C

IMPOUNDMENTS
An Economic and Environmental Reconnaissance of the Possibilities for Small Watershed Development in Chenango County.
W75-11796 4D

INCINERATION
Incinerator Device and a Method of Processing Residuals in Waste Water, Liquefied Sewage and Sludge,
W75-11440 5D

Recycling of Incinerator Ash,
W75-11714 5D

Aspects of Incinerating Chemical Sludges,
W75-11728 5D

INDIA
Geochemistry and Gensis of Fluoride-Containing Ground Waters in India,
W75-11645 2K

INDIA (GORAKHPUR)
Contribution to the Ecology of Indian Aquatics: IV. Rate of Dry Matter Production of the Leaves of Several Common Aquatic Plants of Gorakhpur (India),
W75-11386 2I

INDIANA
Comparative Analysis of Estimation Methods in Nonlinear Functional Models of the Rainfall-Runoff Process,
W75-11354 2A

Improved Application of Geophysics to Groundwater Resource Inventories in Glaciated Terrains,
W75-11355 2F

INDUCED POLARIZATION
Improved Application of Geophysics to Groundwater Resource Inventories in Glaciated Terrains,
W75-11355 2F

INDUSTRIAL PLANTS
Report of Analyses for Industrial Waste Water in Twenty-Eight Factories, (In Japanese),
W75-11671 5A

INDUSTRIAL WASTES
Methods and Equipment for the Treatment of Spent Oil Emulsions (Verfahren und Anlagen zur Behandlung Verbrauchter Oel-Emulsionen),
W75-11359 5D

Separation of Emulsified Oil from Water,
W75-11360 5D

Optimum Design of Sour Water Strippers,
W75-11361 5D

Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant-Activated Sludge Treatment, Lime Treatment and Activated Carbon Treatment, (In Japanese),
W75-11362 5D

Float-Wash Fractionator Saves Fibre and Water at Grand'Mere,
W75-11363 5D

New Effluent Treatment Plant Opened at Bristol for Board Mills.
W75-11364 5D

Land Spreading Effluent from a Secondary Facility,
W75-11365 5D

City, Industry Face Pollution Abatement Together,
W75-11366 5D

Method for Reclaiming Industrial Wastes and Eliminating Pollution,
W75-11367 5D

Watch That Water,
W75-11368 5D

Dehydrating Industrial Sludges by Filtration
W75-11369 5D

Plating and Cyanide Wastes, (Literature Review),
W75-11370 5D

Acceleration of Biochemical Treatment of Wastewater in Petroleum Refineries,
W75-11371 5D

Advanced Treatment of Waste Water from Machinery Works by Activated Carbon (Kasseitan ni yoru kikai kojo haisui no kodo shori),
W75-11372 5D

Studies on Recovery of Chemicals and Manufacture of Activated Substances from Pulping Waste Liquor, Part 2, Use of Softwood KP-Waste Liquor, (In Japanese),
W75-11373 5D

Treatment of Waste Water from Textile Dyeing Process (Senshoku haisui shori),
W75-11374 5D

Reduced Cost Flocculation of a Textile Dyeing Wastewater,
W75-11375 5D

Studies on the Treatment of Wastewaters from the Towel Dyeing Industry,
W75-11376 5D

Treatment and Disposal of Anodizing Effluents, Part I,
W75-11377 5D

Treatment and Disposal of Anodizing Effluents, Part II,
W75-11378 5D

Biological Purification of Town and Industrial Effluents.
W75-11429 5D

Subsurface Waste Injection in the United States: Fifteen Case Histories,
W75-11627 5D

Report of Analyses for Industrial Waste Water in Twenty-Eight Factories, (In Japanese),
W75-11671 5A

A Survey of the Tokyo Metropolitan Shin-Kashi Treatment Plant, (Tokyo-to Shinkashi shorijo no gaiyo),
W75-11743 5D

INFILTRATION
Infiltration and Runoff for Small Field Plots Under Constant Intensity Rainfall,
W75-11458 3B

Simulation of Miscible Displacement in Soils,
W75-11590 2F

Unsaturated Hydraulic Conductivity from Cumulative Inflow Data,
W75-11593 2G

Two-Dimensional Similarity Solution: Theory and Application to the Determination of Soil-Water Diffusivity,
W75-11640 2G

INFILTRATION RATES
Two-Dimensional Similarity Solution Theory and Application to the Determination of Soil-Water Diffusivity,
W75-11640 2G

INFLEXTION POINTS (MATHEMATICS)
Influence of Current on Statistical Properties of Waves,
W75-11772 2L

INFORMATION RETRIEVAL
Ocean Engineering--Selected References.
W75-11779 8B

INJECTION WELLS
Subsurface Waste Injection in the United States: Fifteen Case Histories,
W75-11627 5D

INLETS (WATERWAYS)
Closure Conditions Mouth of the Russian River,
W75-11454 2L

INORGANIC MERCURY CYCLING
Mercury Cycling in a Small Hawaiian Estuary,
W75-11563 5C

INSTRUMENTATION
Instrumental Investigation of Biological Waste Water Treatment (A szennyvisek biologiai tisztitasanak muszeres vizsgalata),
W75-11407 5D

Current Measurements Using a Tilting Spar,
W75-11564 7B

Tracing Ocean Currents,
W75-11574 2E

Field Test of Soil Water Flux Meters,
W75-11586 2G

INTERFERENCE STUDIES
Radioactive - Tracer Displacement Method for the Determination of Small Quantities of Nickel,
W75-11526 5A

INTERMITTENT DOSING
A Method for Intermittent Chlorine Dosing in Continuous-Flow Toxicity Tests,
W75-11754 5A

INTERNATIONAL LAW
Legal Measures Concerning Marine Pollution.
W75-11551 5G

ION EXCHANGE
Removal of Soluble Mercury from Waste Water by Complexing Techniques,
W75-11357 5D

Ammonia Removal from Municipal Wastewaters by Ion Exchange,
W75-11405 5D

Transport Model, User's Manual,
W75-11468 5B

Plating and Cyanide Wastes (Literature Review),
W75-11545 5D

IRON
Iron and Manganese Removal with Ozone, Part I,
W75-11693 5

Sludges Generated in Phosphate Removal Processes,
W75-11737 5

RADIATION
Irradiation Plant for Fluid Material, Particularly Sewage Sludge.
W75-11430 5D

Irradiation Plant for Fluid Matl Partic Sewage Sludge.
W75-11517 5D

RIGATION
Determining Optimal Well Discharge,
W75-11768 4B

RIGATION DESIGN
Chamber Method' for Drip Irrigation System Design and Installation Procedures,
W75-11584 3F

Center Pivot Design Capacities in Eastern Colorado,
W75-11835 8A

RIGATION PRACTICES
Grain Sorghum Evapotranspiration and Water Use Efficiency Under Trickle Irrigation,
W75-11582 3F

Basic Principles of Pulse Irrigation,
W75-11833 3F

Choice of Irrigation Timing Indicator for Narrow Row Cotton,
W75-11840 3F

RIGATION SYSTEMS
Basic Principles of Pulse Irrigation,
W75-11833 3F

RIGATION WATER
anitary-Virological Study of the Effectiveness f Decontamination of Waste Waters on Irgated Farm Yields, (In Russian),
W75-11674 5B

PODS
ynergistic Effects of Salinity, Temperature nd Heavy Metals on Mortality and Osmoregution in Marine and Estuarine Isopods Crustacea),
W75-11610 5C

TOPE FRACTIONATION
Steady-State Model of Isotopic Fractionation ccompanying Nitrogen Transformations in oil,
W75-11831 5B

TOPE STUDIES
ubmicrogram Per Gram Concentrations of ercury in Orchard Leaves Determined by otope Dilution and Spark-Source Mass Specometry,
W75-11581 5A

AEL (NEGEV)
ater Harvesting by Runoff Inducement for Irgation of an Almond Orchard in a Semiarid imate,
W75-11818 3B

AN
udies on the Treatment of Wastewaters from e Towel Dyeing Industry,
W75-11376 5D

eport of Analyses for Industrial Waste Water Twenty-Eight Factories, (In Japanese),
W75-11671 5A

tline of Tagawa Sewage Plant in Utsunomiya ty, (In Japanese),
W75-11686 5D

Studies on Advanced Waste Treatment,
W75-11734 5D

JAPAN (OBIHIRO CITY)
A Case of Subterranean Water Pollution Caused by the Public Refuse Disposal Ground, (In Japanese),
W75-11432 5B

JET FLOWS
Submerged Buoyant Jets in Quiescent Fluids,
W75-11461 8B

JETS
Scale Effects on Cooling Tower Model Studies,
W75-11470 8B

JUNCTIONS
Energy Losses at 90 Degrees Pipe Junctions,
W75-11778 8B

JUNIPER TREES
Establishing Windbreaks in Semiarid Areas by Altering the Microclimate or Supplying Additional Water,
W75-11827 3B

KERNEL FUNCTIONS
Comparative Analysis of Estimation Methods in Nonlinear Functional Models of the Rainfall-Runoff Process,
W75-11354 2A

KINETICS
Biliary Excretion of Phenyl and Methyl Mercury Chlorides and Their Enterohepatic Circulation in Rats,
W75-11525 5C

Kinetics of Lead Retention and Distribution in Suckling and Adult Rats,
W75-11537 5B

Kinetic and Equilibrium Studies of Boron Desorption from Soil,
W75-11600 2G

Kinetics of the Fluorination of Zinc,
W75-11629 5A

KISSIMMEE RIVER (FLA)
Studies of Floodplain Vegetation and Water Level Fluctuation in the Kissimmee River Valley,
W75-11628 4A

KYOTO (JAPAN)
Combined Treatment of Municipal and Industrial Wastewater,
W75-11733 5D

LABORATORY EQUIPMENT
An Acceleration System for Water Drops,
W75-11636 2B

LABORATORY TESTS
Resistance to Flow in Alluvial Channels,
W75-11459 2E

Collision and Breakup of Water Drops at Terminal Velocity,
W75-11637 2B

LAGOONS
Overview of Canadian Sludge Handling and Land Disposal Practices and Research,
W75-11716 5D

LAGUNA DE BAY (PHILIPPINES)
Development Planning of Laguna de Bay--Philippines,
W75-11770 4A

LAKE ERIE
Physicochemical Properties of Dredge Spoil,
W75-11465 5B

Generation of Hydrologic Samples: Case Study of the Great Lakes,
W75-11476 2H

LAKE MICHIGAN
A Food Web Model for Lake Michigan Part 2-Model Formulation and Preliminary Verification,
W75-11547 5C

The Coasts of Wisconsin,
W75-11569 2H

LAKE ONTARIO
Physicochemical Properties of Dredge Spoil,
W75-11465 5B

Generation of Hydrologic Samples: Case Study of the Great Lakes,
W75-11476 2H

LAKE SUPERIOR
The Coasts of Wisconsin,
W75-11569 2H

LAKE TROUT
Mercury Levels in Fish in the La Grande River Area, Northern Quebec,
W75-11756 5A

LAKES
Determination of the Apparent Complexing Capacity of Lake Waters,
W75-11538 5B

Water Quality Relationships in the Great Lakes: Analysis of a Survey Questionnaire,
W75-11549 5B

Sources of Water Quality, Lake Level, Ice, Water Temperature and Meteorological Data for the St. Lawrence Great Lakes,
W75-11567 2H

Development Planning of Laguna de Bay--Philippines,
W75-11770 4A

LAND APPLICATION
Experiences with sludge Handling in Texas,
W75-11736 5D

LAND DEVELOPMENT
Land Use and Environmental Planning: An Application in the South Carolina Coastal Zone,
W75-11766 6G

LAND USE
Hydrology for Land-Use Planning: The Hillside Area, Anchorage, Alaska,
W75-11504 4A

Agricultural Use of Sludge,
W75-11720 5C

Land Use and Environmental Planning: An Application in the South Carolina Coastal Zone,
W75-11766 6G

Flood Plain Information: Plum Creek, Brunswick Hills and Medina Townships, Medina County, Ohio.
W75-11788 4A

LANDFILLS
A Topographic-Hydrogeologic Model for Solid Waste Landfill Siting,
W75-11644 5B

**LANDFILLS**

Overview of Canadian Sludge Handling and Land Disposal Practices and Research,
W75-11716 5D

**LAW OF THE SEA**

Legal Measures Concerning Marine Pollution.
W75-11551 5G

**LAWRENCE COUNTY (ILL)**

Lawrence County Surface Water Resources,
W75-11624 4A

**LEACHING**

Nitrification and Denitrification During Miscible Displacement in Unsaturated Soil,
W75-11596 3F

**LEAD**

Influence of Lead on Calcium and Strontium Transfer Through the Duodenal Wall in Rats,
W75-11523 5C

Ultrastructural Effects of Acute Tetraethyllead Poisoning on Nerve Cells of the Rabbit Brain,
W75-11530 5C

Kinetics of Lead Retention and Distribution in Suckling and Adult Rats,
W75-11537 5B

The Determination of Traces of Lead (II) by Solid-State Luminescence,
W75-11541 5A

Lead and Arsenic Levels of Dairy Cattle in Proximity to a Copper Smelter,
W75-11544 5A

**LEAD (II)**

The Determination of Traces of Lead (II) by Solid-State Luminescence,
W75-11541 5A

**LEAD RADIOISOTOPES**

Sedimentation Rates in a Long Island Marsh Determined by PB210 Dating,
W75-11643 2L

**LEAVES**

Contribution to the Ecology of Indian Aquatics: IV. Rate of Dry Matter Production of the Leaves of Several Common Aquatic Plants of Gorakhpur (India),
W75-11386 2I

A Water Potential Threshold for the Increase of Abscisic Acid in Leaves,
W75-11394 2I

Submicrogram Per Gram Concentrations of Mercury in Orchard Leaves Determined by Isotope Dilution and Spark-Source Mass Spectrometry,
W75-11581 5A

**LEGAL ASPECTS**

Coastal Zone Legal References (Selected) 1975.
W75-11548 2L

**LEGAL REFERENCES**

Coastal Zone Legal References (Selected) 1975.
W75-11548 2L

**LEGISLATION**

Final Disposal of Municipal Sludge in Sweden,
W75-11403 5E

Wetlands - Related Legislation in the United States,
W75-11550 6E

Role of Computer Simulation in Administering an Urban Drainage Ordinance,
W75-11669 6E

Flood Plain Information: Ley Creek, Salina and Dewitt Townships, Onondaga County, New York.
W75-11785 4A

**LEVEES**

Flood Plain Information: Contrary Creek, St. Joseph, Missouri.
W75-11791 4A

**LEY CREEK (NY)**

Flood Plain Information: Ley Creek, Salina and Dewitt Townships, Onondaga County, New York.
W75-11785 4A

**LIGHT INTENSITIES**

Decomposition of Urea Associated with Photosynthesis of Phytoplankton in Coastal Waters,
W75-11612 5C

**LIGNANDS**

Determination of the Apparent Complexing Capacity of Lake Waters,
W75-11538 5B

**LIMANS (INTERFLUVE)**

Hydrochemical and Hydrobiological Peculiarities of Limans in the Danube-Dniester Interfluve, (In Ukrainian),
W75-11847 2K

**LIME**

Studies on Advanced Waste Treatment,
W75-11734 5D

Sludges Generated in Phosphate Removal Processes,
W75-11737 5D

Thickening of Unwanted Spent Lime Rejects,
W75-11848 5D

**LIME-MAGNESIUM CARBONATE PROCESS**

Sea Water Softening with the Lime-Magnesium Carbonate (LMC) Process,
W75-11699 5F

**LIMNOLOGY**

A Food Web Model for Lake Michigan Part 2-Model Formulation and Preliminary Verification,
W75-11547 5C

**LINEAR PROGRAMMING**

An Integrated Power Process Model of Water Use and Waste Water Treatment in Chlor-Alkali Production,
W75-11765 5D

**LININGS**

Engineering Aspects of Water Harvesting Research at the University of Arizona,
W75-11802 3B

Performance and Durability of Sheet Metal, Butyl Rubber, Asphalt Roofing and Bentonite for Harvesting Precipitation,
W75-11808 3B

**LIPIDS**

Organochlorine Compounds in Several Marine Organisms from the North Sea and the Dutch Wadden Sea,
W75-11608 5B

**LIQUID TURN-OVER DEVICE (LTD)**

Single Tank Sewage Treatment Plant,
W75-11399 5D

**LIQUID WASTES**

They're Packing up Waste Ponds
W75-11703 5D

**LITERATURE REVIEWS**

Plating and Cyanide Wastes (Literature Review),
W75-11545 5D

**LIVING FILTER CONCEPT**

Green Systems for Wastewater Treatment
W75-11401 5D

**LOBSTERS**

Shell Disease in Crabs and Lobsters from New York Bight,
W75-11606 5C

**LONG ISLAND (NY)**

Sedimentation Rates in a Long Island Marsh Determined by PB210 Dating,
W75-11643 2L

**LONGVIEW**

Water Quality Report: The Columbia River Below Longview, Washington, December 1971 - November 1972,
W75-11472 5B

**LOUISIANA**

Ground-Water Levels in Louisiana--For Well Measured Through 1974.
W75-11499 7C

An Inventory and Study of the Vermilion Bay Atchafalaya Bay Complex; Area Description Biology, Hydrology and Chemistry, and Sedimentology,
W75-11571 2

The Brown Pelican and Certain Environment Pollutants in Louisiana,
W75-11757 5

**LOW-FLOW FREQUENCY**

Low-Flow Characteristics of Streams in th Grays Harbor Drainages, Washington,
W75-11502 2

**LOWER MISSISSIPPI RIVER BASIN**

Quality of Surface Waters of the United State 1970: Part 7. Lower Mississippi River Basin.
W75-11483

**LT-50**

Synergistic Effects of Salinity, Temperatu and Heavy Metals on Mortality and Osmoreg lation in Marine and Estuarine Isopo (Crustacea),
W75-11610

**LUBBOCK (TEX)**

Water Quality Changes Related to the Devel ment of Anaerobic Conditions During Artifi Recharge,
W75-11497

**LUMINESCENT SPECTROSCOPY**

Studies of the Aromatic Compounds Conten Sea Water by Low-Temperature Luminesc Spectroscopy, (In Russian),
W75-11786

**MACHINERY FACTORIES**

Advanced Treatment of Waste Water f Machinery Works by Activated Car (Kasseitan ni yoru kikai kojo haisui no k shori),
W75-11372

MAFIC ROCKS
Chemical Composition of Aegean Sea Sediments,
W75-11533 2J

MAINE
The Casco Bay Oil Spill: Problems of Cleanup and Disposal,
W75-11615 5G

MAINTENANCE
Package Plant Owner Responsibility and Operation of Small Sewage Units,
W75-11688 5D

MANAGEMENT
The Management of Land and Water Use in the Coastal Zone: A New Law is Enacted in North Carolina,
W75-11575 6E

Planning for Resources-Environmental Conservation,
W75-11781 6B

MANGANESE
Sulfur and Manganese Release from Soils Treated with Prilled Sulfur and Sulfur-Bentonite,
W75-11604 5B

Iron and Manganese Removal with Ozone, Part I,
W75-11693 5F

MARINE ECOSYSTEMS
A Bibliography of Biscayne Bay, Florida Monitoring and Research Programs,
W75-11557 10C

MARINE RESOURCES LAW
Legal Measures Concerning Marine Pollution.
W75-11551 5G

MARKOV PROCESSES
Application of a Generalisation of Wald's Identity to Solving Certain Multi-Stream Storage Problems,
W75-11649 4A

MASS SPECTROMETRY
Submicrogram Per Gram Concentrations of Mercury in Orchard Leaves Determined by Isotope Dilution and Spark-Source Mass Spectrometry,
W75-11581 5A

MATHEMATICAL MODELS
Comparative Analysis of Estimation Methods in Nonlinear Functional Models of the Rainfall-Runoff Process,
W75-11354 2A

A Three-Dimensional Theory of Coastal Currents and Upwelling Over a Continental Shelf,
W75-11450 2E

Simulation of Crop Resonse to Energy Inputs,
W75-11588 3F

Mathematical Models of Artificial Recharge Systems,
W75-11626 4B

Evapotranspiration and Soil Moisture in Upland Grass Catchments in the Eastern Pennines,
W75-11648 2D

MATHEMATICAL STUDIES
Well Pumping in Unconfined Aquifers: The Influence of the Unsaturated Zone,
W75-11631 4B

Axisymmetric Seepage Flow Through Semi-Infinite Porous Media,
W75-11633 2F

A Steady-State Model of Isotopic Fractionation Accompanying Nitrogen Transformations in Soil,
W75-11831 5B

MATRIX INVERSION ROUTINE
Variable Thickness Transient Groundwater Flow Model User's Manual,
W75-11469 2F

MEASUREMENT
Field Test of Soil Water Flux Meters,
W75-11586 2G

MECHANICAL COOLING TOWERS
Scale Effects on Cooling Tower Model Studies,
W75-11470 8B

MEMBRANE PROCESSES
The Application of Membrane Processes in the Treatment of Sewage,
W75-11666 5D

MEMBRANES
Calicum Sulfate Scaling in Reverse Osmosis (Hyper-filtration) of Brackish Waters by Hollow-Fiber and Spiral-Wound Modules,
W75-11505 3A

MERCER COUNTY (ILL)
Mercer County Surface Water Resources,
W75-11622 4A

MERCURY
Embryopathic Effects of Different Routes of Administration of Mercuric Acetate in the Hamster,
W75-11524 5C

Biliary Excretion of Phenyl and Methyl Mercury Chlorides and Their Enterohepatic Circulation in Rats,
W75-11525 5C

Effects of Methylmercury Chloride on Rana Pipiens Tadpoles,
W75-11527 5C

Uptake, Distribution and Fate of 203 Hg-Ethylmercuric Chloride in the Guppy and the Coontail,
W75-11529 5C

The Occurrence of Mercury in Amphibia,
W75-11534 5A

Mercury Cycling in a Small Hawaiian Estuary,
W75-11563 5C

Submicrogram Per Gram Concentrations of Mercury in Orchard Leaves Determined by Isotope Dilution and Spark-Source Mass Spectrometry,
W75-11581 5A

Mercury Levels in Fish in the La Grande River Area, Northern Quebec,
W75-11756 5A

MERCURY ACETATE
Embryopathic Effects of Different Routes of Administration of Mercuric Acetate in the Hamster,
W75-11524 5C

MERCURY-ETHYLMERCURIC CHLORIDE
Uptake, Distribution and Fate of 203 Hg-Ethylmercuric Chloride in the Guppy and the Coontail,
W75-11529 5C

MERCURY REMOVAL
Removal of Soluble Mercury from Waste Water by Complexing Techniques,
W75-11357 5D

METABOLISM
Kinetics of Lead Retention and Distribution in Suckling and Adult Rats,
W75-11537 5B

The Brown Pelican and Certain Environmental Pollutants in Louisiana,
W75-11757 5A

METAL CARBAMATES
The Behaviour of Metal Tetramethylenedithiocarbamates in the Graphite-Tube Furnace for Atomic Absorption Spectrometry,
W75-11797 5A

METAL CHELATES
The Behaviour of Metal Tetramethylenedithiocarbamates in the Graphite-Tube Furnace for Atomic Absorption Spectrometry,
W75-11797 5A

METAL PLATING WASTES
Plating and Cyanide Wastes, (Literature Review),
W75-11370 5D

METALS
Method for Reclaiming Industrial Wastes and Eliminating Pollution,
W75-11367 5D

Treatment and Disposal of Anodizing Effluents, Part I,
W75-11377 5D

Treatment and Disposal of Anodizing Effluents, Part II,
W75-11378 5D

Quantitative Inorganic Analysis by Gas Chromatrography, a Review,
W75-11528 5A

High Copper Concentrations in Squid Livers in Association with Elevated Levels of Silver, Cadmium and Zinc,
W75-11609 5C

Copper Uptake and Excretion by Busycon Canaliculatum L.,
W75-11755 5C

The Brown Pelican and Certain Environmental Pollutants in Louisiana,
W75-11757 5A

METEOROLOGICAL DATA
Sources of Water Quality, Lake Level, Ice, Water Temperature and Meteorological Data for the St. Lawrence Great Lakes,
W75-11567 2H

METEOROLOGY
Sources of Water Quality, Lake Level, Ice, Water Temperature and Meteorological Data for the St. Lawrence Great Lakes,
W75-11567 2H

METHODOLOGY
Demodulation of Stream-Flow Series,
W75-11449 2E

Hydrocarbons Associated with Suspended Particulate Matter in San Francisco Bay Waters,
W75-11614 5A

**METHODOLOGY**

The Casco Bay Oil Spill: Problems of Cleanup and Disposal,
W75-11615 5G

Mathematical Models of Artificial Recharge Systems,
W75-11626 4B

A Method for Intermittent Chlorine Dosing in Continuous-Flow Toxicity Tests,
W75-11754 5A

**METHYL MERCURY CHLORIDE**
Biliary Excretion of Phenyl and Methyl Mercury Chlorides and Their Enterohepatic Circulation in Rats,
W75-11525 5C

**METHYLMERCURIC CHLORIDE**
Effects of Methylmercury Chloride on Rana Pipiens Tadpoles,
W75-11527 5C

**METHYLMERCURY**
The Occurrence of Mercury in Amphibia,
W75-11534 5A

**MEXICAN WHEAT**
Salt Tolerance of Mexican Wheat: II. Relation to Variable Sodium Chloride and Length of Growing Season,
W75-11603 3C

**MEXICO**
Different Soil Treatments for Harvesting Water for Radish Production in the Mexico Valley,
W75-11829 3B

**MICROCLIMATOLOGY**
Establishing Windbreaks in Semiarid Areas by Altering the Microclimate or Supplying Additional Water,
W75-11827 3B

**MICROORGANISMS**
Sanitary and Bacteriological Evaluation of the Raw Material, Air and Wastewaters of Some Bast Fiber Plants in the Uzbek SSR, (In Russian),
W75-11406 5B

Continuous Determination of Toxicity of Effluents.
W75-11431 5A

**MICROSCOPY**
A Method of Investigating Populations of Diatoms in Flowing Waters, (In German),
W75-11445 2I

**MICROSTRAINERS**
Suspended Solids Removal Processes Studied at Metro Chicago,
W75-11741 5D

**MINNESOTA**
Nutrient Transport in Surface Runoff as Influenced by Soil Cover and Seasonal Periods,
W75-11641 5B

**MISSISSIPPI**
Ground-Water Data for Bolivar County, Mississippi,
W75-11496 7C

Natural and Artificial Reefs in Mississippi Coastal Waters: Sport Fishing Pressure and Economic Considerations,
W75-11558 6B

**MISSISSIPPI RIVER BASIN**
Quality of Surface Waters of the United States, 1970: Part 7. Lower Mississippi River Basin
W75-11483 7C

**MISSISSIPPI SOUND**
Natural and Artificial Reefs in Mississippi Coastal Waters: Sport Fishing Pressure and Economic Considerations,
W75-11558 6B

**MISSOURI**
Flood Plain Information: Contrary Creek, St. Joseph, Missouri.
W75-11791 4A

**MISSOURI RIVER**
Quality of Surface Waters of the United States, 1969: Part 6. Missouri River Basin.
W75-11482 7C

Surface Water Supply of the United States, 1966-70: Part 6. Missouri River Basin--Volume 3, Missouri River Basin from Sioux City, Iowa, to Nebraska City, Nebraska.
W75-11486 7C

**MISSOURI RIVER BASIN**
Quality of Surface Waters of the United States, 1969: Part 6. Missouri River Basin.
W75-11482 7C

Surface Water Supply of the United States, 1966-70: Part 6. Missouri River Basin--Volume 3, Missouri River Basin from Sioux City, Iowa, to Nebraska City, Nebraska.
W75-11486 7C

**MIST IRRIGATION**
Comparison of Fog Irrigation with Surface Irrigation in Corn Production,
W75-11837 3F

**MIXING**
Turbulent Entrainment Across Stable Density Step Structures,
W75-11451 2J

**MODEL SENSITIVITY ANALYSIS**
Soil Moisture Accounting Component of the USDAHL-74 Model of Watershed Hydrology,
W75-11656 2G

**MODEL STUDIES**
A Three-Dimensional Theory of Coastal Currents and Upwelling Over a Continental Shelf,
W75-11450 2E

Scale Effects on Cooling Tower Model Studies,
W75-11470 8B

Digital-Simulation and Projection of Water-Level Declines in Basalt Aquifers of the Odessa-Lind Area, East-Central Washington,
W75-11494 2F

Predictive Modeling of Effects of the Planned Kindred Lake on Ground-Water Levels and Discharge, Southeastern North Dakota,
W75-11503 4A

Current Measurements Using a Tilting Spar,
W75-11564 7B

Tropical Showers in an Axisymmetric Cloud Model,
W75-11635 2B

A Topographic-Hydrogeologic Model for Solid Waste Landfill Siting,
W75-11644 5B

Soil Moisture Accounting Component of the USDAHL-74 Model of Watershed Hydrology,
W75-11656 2G

A Steady-State Model of Isotopic Fractionation Accompanying Nitrogen Transformations in Soil,
W75-11831 5B

**MOISTURE AVAILABILITY**
Moisture Availability and Crop Production,
W75-11583 3F

**MOISTURE PROFILE**
Two-Dimensional Similarity Solution: Theory and Application to the Determination of Soil-Water Diffusivity,
W75-11640 2G

**MOLECULAR STRUCTURE**
The Crystal and Molecular Structure of Selected Pesticidal Water Pollutants,
W75-11351 5A

**MOLLUSCS**
High Copper Concentrations in Squid Livers in Association with Elevated Levels of Silver, Cadmium and Zinc,
W75-11609 5C

**MONITORING**
The Continuous Monitoring of Water Quality,
W75-11667 5A

Continuous Monitoring, Automated Analysis and Sampling Procedures, (Literature Review),
W75-11711 5A

**MOUNDS**
Response of Unconfined Aquifer Systems to Deep Percolation,
W75-11474 2F

**MULCHING**
Field Evaluation of Microwatershed and Vertical Mulch Systems,
W75-11819 3B

An Analysis of the Efficiency of Microwatershed Systems,
W75-11820 3B

**MULLETS**
The Estimation of the Amount of Empire Mix Crude Oil in Mullet, Shrimp, and Oysters by Liquid Chromatography,
W75-11613 5A

**MUNICIPAL WASTES**
Land Spreading Effluent from a Secondary Facility,
W75-11365 5D

City, Industry Face Pollution Abatement Together,
W75-11366 5D

Biological Purification of Town and Industrial Effluents.
W75-11429 5D

Phase II Gives Hamilton Secondary Treatment.
W75-11692 5D

Treatment and Disposal of Sludge from Municipal Wastewater Plants in the United States,
W75-11735 5D

The Influence of Particle Size on Oxidation of Total, Soluble, and Particulate Municipal Wastewater Components by Ozone,
W75-11850 5D

MUSSELS
Hydrocarbons Associated with Suspended Particulate Matter in San Francisco Bay Waters,
W75-11614 5A

Elimination of Hydrocarbons by Mussels,
W75-11760 5C

MYTILUS EDULIS
Hydrocarbons Associated with Suspended Particulate Matter in San Francisco Bay Waters,
W75-11614 5A

MYTILUS GALLOPROVINCIALIS
Elimination of Hydrocarbons by Mussels,
W75-11760 5C

NANNOPLANKTON
Phytoplankton Diversity and Chlorophyll-a in a Polluted Estuary,
W75-11607 5C

NATRONA COUNTY (WYO)
Selenium in Waters in and Adjacent to the Kendrick Project, Natrona County, Wyoming,
W75-11492 5B

NATURAL DISASTERS WARNING
A Federal Plan for Natural Disaster Warning and Preparedness, First Supplement FY 1976 - 1980.
W75-11553 2B

NATURAL RESOURCES
A Bibliography of Biscayne Bay, Florida Monitoring and Research Programs,
W75-11557 10C

Coastal Resource Use: Decisions on Puget Sound,
W75-11573 6B

Planning for Resources-Environmental Conservation,
W75-11781 6B

NATURAL WATERCOURSES
Spectrophotometric Determination of Sugars in Natural Waters, (In Russian),
W75-11437 5A

NEBRASKA
Sulfur and Manganese Release from Soils Treated with Prilled Sulfur and Sulfur-Bentonite,
W75-11604 5B

NERVE CELLS
Ultrastructural Effects of Acute Tetraethyllead Poisoning on Nerve Cells of the Rabbit Brain,
W75-11530 5C

NETS
The Brown Pelican and Certain Environmental Pollutants in Louisiana,
W75-11757 5A

NETHERLANDS
Natural and Accelerated Phosphate Mobility, (In Dutch),
W75-11520 5C

NEUTRALIZATION
Method of Purifying Water,
W75-11379 5D

NEUTRON ACTIVATION ANALYSIS
The Determination of Cadmium in Sea Water by Radioactivation,
W75-11798 5A

NEW JERSEY
Phytoplankton Diversity and Chlorophyll-a in a Polluted Estuary,
W75-11607 5C

Innovative Water Plant Slated for New Jersey,
W75-11696 5F

NEW YORK
Sedimentation Rates in a Long Island Marsh Determined by PB210 Dating,
W75-11643 2L

Flood Plain Information: Ley Creek, Salina and Dewitt Townships, Onondaga County, New York.
W75-11785 4A

Flood Plain Information: Chittenango Creek, Bridgeport, Onondaga and Madison Counties, New York.
W75-11792 4A

An Economic and Environmental Reconnaissance of the Possibilities for Small Watershed Development in Chenango County,
W75-11796 4D

NEW YORK (NY)
A Plant Grows in Brooklyn,
W75-11701 5D

NICKEL
Radioactive - Tracer Displacement Method for the Determination of Small Quantities of Nickel,
W75-11526 5A

NILE RIVER
River Regime with Special Reference to River Nile,
W75-11464 2J

NITRATES
Relation Between Nitrate Absorption and Water Transpiration by Corn,
W75-11602 3F

NITRIFICATION
Nitrification and Denitrification During Miscible Displacement in Unsaturated Soil,
W75-11596 3F

Comparative Efficiency of Soluble and Controlled-Release Sulfur-Coated Urea Nitrogen for Corn in Tropics,
W75-11601 3F

Metro Chicago Studies on Nitrification,
W75-11742 5D

NITROGEN
A Comparison of 15N-Depleted and 15N-Enriched Fertilizers as Tracers,
W75-11591 3F

Rice Response to Nitrogen and Phosphorus in Flooded and Nonflooded Soils,
W75-11597 3F

Comparative Efficiency of Soluble and Controlled-Release Sulfur-Coated Urea Nitrogen for Corn in Tropics,
W75-11601 3F

A Steady-State Model of Isotopic Fractionation Accompanying Nitrogen Transformations in Soil,
W75-11831 5B

NITROGEN COMPOUNDS
Decomposition of Urea Associated with Photosynthesis of Phytoplankton in Coastal Waters,
W75-11612 5C

NONLINEAR MODELS
Comparative Analysis of Estimation Methods in Nonlinear Functional Models of the Rainfall-Runoff Process,
W75-11354 2A

NORTH ATLANTIC SLOP BASINS
Quality of Surface Waters of the United States, 1970: Part 1. North Atlantic Slope Basins.
W75-11479 7C

NORTH CAROLINA
County Combats Urban Storm Water Runoff Problems,
W75-11390 5G

The Management of Land and Water Use in the Coastal Zone: A New Law is Enacted in North Carolina,
W75-11575 6E

NORTH CAROLINA COAST
Storm Tide Frequency Analysis for the Coast of North Carolina, South of Cape Lookout,
W75-11560 2B

NORTH DAKOTA
Predictive Modeling of Effects of the Planned Kindred Lake on Ground-Water Levels and Discharge, Southeastern North Dakota,
W75-11503 4A

NORTH WALES
Geochemistry of Surface Sediments in an Acid Stream Estuary,
W75-11531 2J

NORTHEAST US
Quality of Surface Waters of the United States, 1970: Part 1. North Atlantic Slope Basins.
W75-11479 7C

NORWALK CREEK (OHIO)
Flood Plain Information: Flood Hazard Report of 4-7 July 1969 Flood, Huron River, Norwalk Creek, Ohio.
W75-11787 4A

NORWAY
Sufficient Water Supply and Sewer System, and Equitable Distribution of the Costs (Tillstrekkelige vann- og kolakkanlegg-samt rettferdig fordeling av kostnadene),
W75-11393 5D

NUMERICAL ANALYSIS
The Reduction of Artificial Boundary Reflexions in Numerically Modelled Estuaries,
W75-11452 2L

Simulation of Dispersion of Suspended Particles,
W75-11782 8B

NUTRIENT REMOVAL
Swedish Experiences in Chemical Treatment of Wastewater,
W75-11694 5D

Design Information on Dewatering Properties of Wastewater Sludges,
W75-11722 5D

Removal of Phosphates and Metals from Sewage Sludges,
W75-11729 5D

**NUTRIENT REMOVAL**

Sludges Generated in Phosphate Removal Processes,
W75-11737 5D

**NUTRIENT TRANSPORT**
Nutrient Transport in Surface Runoff as Influenced by Soil Cover and Seasonal Periods,
W75-11641 5B

**NUTRIENTS**
Interlaboratory Study of Methods for Chemical Analysis of Water,
W75-11409 5A

Nutrient Transport in Surface Runoff as Influenced by Soil Cover and Seasonal Periods,
W75-11641 5B

Effects of Water Management and Soil Aggregation on the Growth and Nutrient Uptake of Rice,
W75-11832 3F

**OAHU (HAWAII)**
Floods in the Waiahole-Waikane Area, Oahu, Hawaii,
W75-11495 2E

**OBSTRUCTIONS TO FLOW**
Flood Plain Information: Ventura River, Ventura County, California.
W75-11790 4A

**OCEAN CIRCULATION**
A Three-Dimensional Theory of Coastal Currents and Upwelling Over a Continental Shelf,
W75-11450 2E

**OCEAN CURRENTS**
Current Measurements Using a Tilting Spar,
W75-11564 7B

**OCEAN ENGINEERING**
Ocean Engineering -Selected References,
W75-11779 8B

**OCEAN WAVES**
Ocean Engineering--Selected References,
W75-11779 8B

**ODESSA-LIND AREA (WASH)**
Digital-Simulation and Projection of Water-Level Declines in Basalt Aquifers of the Odessa-Lind Area, East-Central Washington,
W75-11494 2F

**ODORS**
Sewage Treatment with Hydrogen Peroxide.
W75-11443 5D

**OFFSHORE STRUCTURES**
Design Criteria for Single-Point Mooring Terminals,
W75-11771 8C

**OHIO**
Prediction of Flood Volume from Small Humid Region Watersheds,
W75-11462 4A

Flood Plain Information: Flood Hazard Report of 4-7 July 1969 Flood, Huron River, Norwalk Creek, Ohio.
W75-11787 4A

Flood Plain Information: Plum Creek, Brunswick Hills and Medina Townships, Medina County, Ohio.
W75-11788 4A

**OHIO RIVER**
Quality of Surface Waters of the United States, 1968: Part 3. Ohio River Basin.
W75-11481 7C

Models of the Stochastic and Chronologic Structure, Prediction and Simulation of Runoff Sequences - Application to the Lower Ohio Basin,
W75-11783 2E

**OHIO RIVER BASIN**
Quality of Surface Waters of the United States, 1968: Part 3. Ohio River Basin.
W75-11481 7C

**OIL**
The Solubility Behaviour of No. 2 Fuel Oil in Sea Water,
W75-11565 5B

Elimination of Hydrocarbons by Mussels,
W75-11760 5C

**OIL INDUSTRY**
Optimum Design of Sour Water Strippers,
W75-11361 5D

Acceleration of Biochemical Treatment of Wastewater in Petroleum Refineries,
W75-11371 5D

**OIL POLLUTION**
The Solubility Behaviour of No. 2 Fuel Oil in Sea Water,
W75-11565 5B

The Estimation of the Amount of Empire Mix Crude Oil in Mullet, Shrimp, and Oysters by Liquid Chromatography,
W75-11613 5A

Hydrocarbons Associated with Suspended Particulate Matter in San Francisco Bay Waters,
W75-11614 5A

The Casco Bay Oil Spill: Problems of Cleanup and Disposal,
W75-11615 5G

Rehabilitating Oiled Aquatic Birds,
W75-11616 5G

The Status of Oiled Wildlife: Research and Planning,
W75-11617 5G

**OIL SPILLS**
Open Water Purification System,
W75-11419 5D

The Solubility Behaviour of No. 2 Fuel Oil in Sea Water,
W75-11565 5B

The Casco Bay Oil Spill: Problems of Cleanup and Disposal,
W75-11615 5G

Rehabilitating Oiled Aquatic Birds,
W75-11616 5G

The Status of Oiled Wildlife: Research and Planning,
W75-11617 5G

**OIL WASTES**
Method for Combatting Pollution Using a Chromium Complex,
W75-11506 5G

**OIL-WATER INTERFACES**
Method for Combatting Pollution Using a Chromium Complex,
W75-11506 5G

The Solubility Behaviour of No. 2 Fuel Oil in Sea Water,
W75-11565 5B

**OIL-WATER SEPARATION**
Method for Combatting Pollution Using a Chromium Complex,
W75-11506 5G

**OKLAHOMA**
Soil Moisture Accounting Component of the USDAHL-74 Model of Watershed Hydrology
W75-11656 2G

Rate of Phosphorus Sorption by Five Oklahoma Soils,
W75-11836 3F

**OLIGOCHAETES**
Oligochaetes in the Bottom Fauna and Stomach Content of Trout, Salmo Trutta (L.),
W75-11385 2H

**ON-SITE TESTS**
Field Test of Soil Water Flux Meters.
W75-11586 2G

**OPEN CHANNEL FLOW**
Simulation of Dispersion of Suspended Particles,
W75-11782 8B

**OPERATIONS**
Package Plant Owner Responsibility and Operation of Small Sewage Units,
W75-11688 5D

**OPTIMIZATION**
Optimizing Water Utilization Through Multiple Crops Scheduling,
W75-11587 3F

**OPTIMUM USE**
Determining Optimal Well Discharge,
W75-11768 4B

**OREGON**
Ground-Water Data in the Harrisburg - Halsey Area, Central Willamette Valley, Oregon,
W75-11498 7C

Advanced Wastewater Treatment Plant with Designed-In Reliability,
W75-11700 5D

**OREGON COAST RANGE**
Soil and Hydrologic Factors Affecting the Stability of Natural Slopes in the Oregon Coast Range,
W75-11353 2G

**OREOXEROPHYTES**
Transpiration of Some Oreoxerophytes of the Central Caucasus, (In Georgian),
W75-11442 2D

**ORGANIC COMPOUNDS**
Organochlorine Compounds in Several Marine Organisms from the North Sea and the Dutch Wadden Sea,
W75-11608 5B

Hydrocarbons Associated with Suspended Particulate Matter in San Francisco Bay Waters,
W75-11614 5A

The Brown Pelican and Certain Environmental Pollutants in Louisiana,
W75-11757 5A

Elimination of Hydrocarbons by Mussels,
W75-11760 5C

Studies of the Aromatic Compounds Content in Sea Water by Low-Temperature Luminescen Spectroscopy, (In Russian),
W75-11786 5A

**ORGANIC FILMS**
Formation and Collapse of Surface Films,
W75-11642 2K

**ORGANIC PESTICIDES**
Influence of Some Biocides Employed in the Wood-Processing Industry on Growth of Green Algae,
W75-11605 5C

**ORGANIC WASTES**
Elimination of Water Surface Pollution.
W75-11416 5D

**ORNITHOCENOSIS**
Effects of Fish-Ponds Near Jakubovo on the Ornithocenose There, (In Czech),
W75-11535 5C

**OSMOREGULATION**
Synergistic Effects of Salinity, Temperature and Heavy Metals on Mortality and Osmoregulation in Marine and Estuarine Isopods (Crustacea),
W75-11610 5C

**OVERLAY MAPPING**
Procedure for Selecting a Minimal Environmental Impact Routing for a Water Conveyance Canal,
W75-11764 6G

**OXIDATION**
Sewage Oxidation Treatment Apparatus,
W75-11395 5D

Domestic Sewage System,
W75-11509 5D

Iron and Manganese Removal with Ozone, Part I,
W75-11693 5F

The Influence of Temperature on the Biological Oxidation of Urban Waste Waters by Means of an Activated Sludge (Influenza Della Temperature Nella Ossidazion Biologica dei Liquami Urbani Mediante Fanghi Attivi),
W75-11745 5D

A Design and Economic Evaluation of Wet-Air and Catalytic Oxidation of Sewage Sludge,
W75-11784 5D

The Influence of Particle Size on Oxidation of Total, Soluble, and Particulate Municipal Wastewater Components by Ozone,
W75-11850 5D

**OXYGEN**
EPA Experiences in Oxygen-Activated Sludge,
W75-11738 5D

**OXYGENATION**
Oxygenation of Waste Water,
W75-11681 5D

**OYSTERS**
The Estimation of the Amount of Empire Mix Crude Oil in Mullet, Shrimp, and Oysters by Liquid Chromatography,
W75-11613 5A

**OZONE**
Waste Water Treatment System With An Ozone Generator,
W75-11426 5D

Domestic Water Purification Method and System,
W75-11427 5D

Iron and Manganese Removal with Ozone, Part I,
W75-11693 5F

The Influence of Particle Size on Oxidation of Total, Soluble, and Particulate Municipal Wastewater Components by Ozone,
W75-11850 5D

**OZONE GENERATOR**
Waste Water Treatment System With An Ozone Generator,
W75-11426 5D

Domestic Water Purification Method and System,
W75-11427 5D

**PACIFIC OCEAN**
Western North Pacific Typhoons, 1974,
W75-11578 2B

Central North Pacific Tropical Cyclones, 1974,
W75-11579 2B

**PACIFIC SLOPE BASINS (CALIF)**
Quality of Surface Waters of the United States, 1970: Part II. Pacific Slope Basins in California.
W75-11485 7C

**PACIFIC SLOPE BASINS (WASH)**
Surface Water Supply of the United States, 1966-70: Part 12. Pacific Slope Basins in Washington--Volume 1. Pacific slope Basins in Washington Except Columbia River Basin.
W75-11490 7C

**PACKAGE PLANT SEWAGE UNITS**
Package Plant Owner Responsibility and Operation of Small Sewage Units,
W75-11688 5D

**PACKAGE TREATMENT PLANTS**
Sewage Treatment.
W75-11398 5D

**PACKED BEDS**
They're Packing up Waste Ponds.
W75-11703 5D

**PADAN**
The Crystal and Molecular Structure of Selected Pesticidal Water Pollutants,
W75-11351 5A

**PASTEURIZATION**
Pasteurization of Sapropel (Pasteurisierung von Faulschlamm),
W75-11750 5D

**PATENTS**
Method for Reclaiming Industrial Wastes and Eliminating Pollution,
W75-11367 5D

Dehydrating Industrial Sludges by Filtration.
W75-11369 5D

Method of Purifying Water,
W75-11379 5D

Continuous Treatment of Polluted Liquids.
W75-11381 5D

Process for Treating Waste Water,
W75-11387 5D

Detector of Trace Substance in Water,
W75-11388 5A

Sewage Oxidation Treatment Apparatus,
W75-11395 5D

Activated Sludge Sewage Treatment for Seasonally Variable Throughput,
W75-11396 5D

Separating Ionised Materials from Aqueous Solutions.
W75-11397 5D

Sewage Treatment.
W75-11398 5D

Single Tank Sewage Treatment Plant,
W75-11399 5D

Elimination of Water Surface Pollution.
W75-11416 5D

Valve for Controlling Liquid Discharge.
W75-11417 8C

Filtration and Purification of Contaminated Water,
W75-11418 5D

Open Water Purification System,
W75-11419 5D

Use of Oxidized Cationic Starch in Flocculation and Dewatering of Municipal Sludge,
W75-11420 5D

Water Processing Plant to Controlled Acidity Level,
W75-11421 5F

Electrolytic Chlorine Used to Purify Disintegrated Sewage.
W75-11422 5D

Sludge Dewatering Installation.
W75-11424 5D

Waste Water Treatment System With An Ozone Generator.
W75-11426 5D

Domestic Water Purification Method and System,
W75-11427 5D

Removing Solids From Sewage.
W75-11428 5D

Irradiation Plant for Fluid Material, Particularly Sewage Sludge.
W75-11430 5D

Continuous Determination of Toxicity of Effluents.
W75-11431 5A

Apparatus for Providing a Statistical Count of Particulate Material in a Fluid,
W75-11434 5A

Apparatus for Cleaning Loose Filtering Material in Slow Water Filled Water Supply Filters,
W75-11436 5F

Flotation Aerator for Aerating and Moving Water,
W75-11439 5D

Incinerator Device and a Method of Processing Residuals in Waste Water, Liquefied Sewage and Sludge,
W75-11440 5D

Liquid Treatment Plant and Process Particularly for Waste Water.
W75-11441 5D

Sewage Treatment with Hydrogen Peroxide.
W75-11443 5D

**PATENTS**

Treating Effluent.
W75-11444 5D

Method for Combatting Pollution Using a Chromium Complex,
W75-11506 5G

Aerobic Sewage Treatment System,
W75-11507 5D

Sewage Treatment Device,
W75-11508 5D

Domestic Sewage System,
W75-11509 5D

Sewage Treatment System,
W75-11510 5D

Sewage Disposal System,
W75-11511 5D

Apparatus for Sewer Treatment to Kill Three Roots and Other Organic Growth Therewithin,
W75-11513 5G

Sewage and Garbage Disposal.
W75-11514 5D

Desalination of Water.
W75-11515 3A

Treating Sewage.
W75-11516 5D

Irradiation Plant for Fluid Matl Partic Sewage Sludge.
W75-11517 5D

Horizontal Reactor for Polymsn. Sewage Oxidation Etc.,
W75-11518 5D

Device and Method for Conducting Waste Liquid from a Receptacle to a Pneumatic Liquid Disposal System,
W75-11519 5D

Liquid Treatment Apparatus Having Combined Reaction Basin and Clarifier,
W75-11521 5D

Sewage Disposal Process,
W75-11522 5D

Sewage Biological Processing,
W75-11658 5D

Waste Water and Sewage Purification.
W75-11659 5D

Biological and Chemical Purification Plant.
W75-11660 5D

Domestic Waste Water and Sewage Evacuation Device.
W75-11661 5D

Solidification of Sewage Sludge to a Hard Material.
W75-11662 5D

Waste Water Purification.
W75-11663 5D

Sewage Treatment Plant Equipped With an Aeration Impeller,
W75-11670 5D

Means for and Method of Purifying Contaminated Water,
W75-11672 5D

Purifying Plant for Sewage,
W75-11673 5D

Desalination,
W75-11675 3A

Centrifugal Compressor-Melter for Desalination of Water.
W75-11676 3A

Sewer Branch Saddle Connector,
W75-11677 8C

Centrifugal Pump for Processing Liquids Containing Abrasive Constitutents, More Particularly, a Sand Pump of a Wastewater Pumper,
W75-11679 5D

Air Driven Rotating Biological Contactor Apparatus,
W75-11680 5D

Oxygenation of Waste Water,
W75-11681 5D

Biological Purification of Waste Water.
W75-11683 5D

Sewer Line Blow-Out Plug,
W75-11684 8C

Sewage Treatment Process,
W75-11685 5D

**PATH OF POLLUTANTS**

Transport Model, User's Manual,
W75-11468 5B

Selenium in Waters in and Adjacent to the Kendrick Project, Natrona County, Wyoming,
W75-11492 5B

Geochemistry of Surface Sediments in an Acid Stream Estuary,
W75-11531 2J

Kinetics of Lead Retention and Distribution in Suckling and Adult Rats,
W75-11537 5B

Copper Uptake and Excretion by Busycon Canaliculatum L.,
W75-11755 5C

A Steady-State Model of Isotopic Fractionation Accompanying Nitrogen Transformations in Soil,
W75-11831 5B

**PEAK DISCHARGE**

Progress Report to the Arkansas State Highway Commission for Year Ending June 30, 1975,
W75-11501 8B

**PEANUTS**

Effects of Soil Temperature and Soil Moisture in Podding Zone on Pod Development of Peanut Plants, (In Japanese),
W75-11456 3F

**PELICANS**

The Brown Pelican and Certain Environmental Pollutants in Louisiana,
W75-11757 5A

**PENMAN'S EQUATION**

Modified Penman Equation to Provide the Upper Boundary Condition in Computing Evaporation from Soil,
W75-11598 2D

**PENNINES**

Evapotranspiration and Soil Moisture in Upland Grass Catchments in the Eastern Pennines,
W75-11648 2D

**PENNSYLVANIA**

Prediction of Flood Volume from Small Humid Region Watersheds.
W75-11462 4A

**PERFORMANCE**

Water Harvesting Catchments on Indian Lands in the Southwest,
W75-11809 3B

**PESTICIDES**

The Crystal and Molecular Structure of Selected Pesticidal Water Pollutants,
W75-11351 5A

Influence of Some Biocides Employed in the Wood-Processing Industry on Growth of Green Algae,
W75-11605 5C

**PHENYL MERCURY CHLORIDE**

Biliary Excretion of Phenyl and Methyl Mercury Chlorides and Their Enterohepatic Circulation in Rats,
W75-11525 5C

**PHOSPHATE REMOVAL**

Removal of Phosphates and Metals from Sewage Sludges,
W75-11729 5D

**PHOSPHATES**

Natural and Accelerated Phosphate Mobility, (In Dutch),
W75-11520 5C

Sludges Generated in Phosphate Removal Processes,
W75-11737 5D

**PHOSPHOROUS**

Swedish Experiences in Chemical Treatment of Wastewater,
W75-11694 5D

**PHOSPHORUS**

Liquid Treatment Plant and Process Particularly for Waste Water,
W75-11441 5D

Rice Response to Nitrogen and Phosphorus in Flooded and Nonflooded Soils,
W75-11597 3F

Recycling of Incinerator Ash,
W75-11714 5E

Rate of Phosphorus Sorption by Five Oklahoma Soils,
W75-11836 3E

**PHOTOSYNTHESIS**

Decomposition of Urea Associated with Photosynthesis of Phytoplankton in Coastal Waters,
W75-11612 5C

Effect of Water Stress, Temperature, and Light on Photosynthesis in Alder Seedlings,
W75-11691 2

**PHYSICAL-CHEMICAL PROCESSES**

Metal Removal by Physical and Chemical Treatment Processes,
W75-11542 5

**PHYSICO-CHEMICAL TREATMENT**

An Evaluation of the Effectiveness and Applicability of Physical-Chemical Treatment of Urban Land Runoff,
W75-11389 5

The Physico-Chemical Treatment of Crude Sewage,
W75-11404 5D

**PHYSICOCHEMICAL PROPERTIES**
Physicochemical Properties of Dredge Spoil,
W75-11465 5B

**PHYTOPLANKTON**
Phytoplankton in Lake Mascardi (Rio Negro, Argentina), (In Spanish),
W75-11532 5C

Phytoplankton Diversity and Chlorophyll-a in a Polluted Estuary,
W75-11607 5C

Decomposition of Urea Associated with Photosynthesis of Phytoplankton in Coastal Waters,
W75-11612 5C

**PICRAMINE-EPSILON**
Spectrophotometric Determination of Sugars in Natural Waters, (In Russian),
W75-11437 5A

**PIKES**
Mercury Levels in Fish in the La Grande River Area, Northern Quebec,
W75-11756 5A

**PILOT PLANTS**
The Physico-Chemical Treatment of Crude Sewage,
W75-11404 5D

Breakthrough in Sewage Treatment--Cash, Land, and Energy Saved.
W75-11413 5D

Suspended Solids Removal Processes Studied at Metro Chicago,
W75-11741 5D

**PIPE FLOW**
Water Hammer in Coaxial Pipe Systems,
W75-11460 8B

Cavitation in Butterfly Valves,
W75-11777 8B

Energy Losses at 90 Degrees Pipe Junctions,
W75-11778 8B

**PIPELINE DREDGE SPOILS**
Disposal of Sandy Pipeline Dredge Spoils by End Dumping,
W75-11566 5G

**PIPELINES**
Large Diameter Submarine Steel Pipeline Crossings,
W75-11380 8A

Sewer Branch Saddle Connector,
W75-11677 8C

Sewer Line Blow-Out Plug,
W75-11684 8C

Balancing Reservoir--A Key Element in Water Supply Plan,
W75-11687 4A

**PIPES**
Large Diameter Submarine Steel Pipeline Crossings,
W75-11380 8A

Apparatus for Sewer Treatment to Kill Three Roots and Other Organic Growth Therewithin.
W75-11513 5G

Sewer Line Blow-Out Plug,
W75-11684 8C

**PIPING SYSTEMS**
Pipe Insertion Renews Sewers with Little Excavation.
W75-11620 5D

**PLANNING**
Hydrology for Land-Use Planning: The Hillside Area, Anchorage, Alaska,
W75-11504 4A

Advanced Wastewater Treatment Plant with Designed-In Reliability,
W75-11700 5D

Land Use and Environmental Planning: An Application in the South Carolina Coastal Zone,
W75-11766 6G

Water Resources Planning in Urban Areas.
W75-11769 5D

Development Planning of Laguna de Bay--Philippines,
W75-11770 4A

Flood Plain Information: Plum Creek, Brunswick Hills and Medina Townships, Medina County, Ohio.
W75-11788 4A

Forecasting Urban Water Use: Commercial Establishments,
W75-11795 6D

Water Development in Management of Livestock and Wildlife on Mountain Wildlands,
W75-11804 3B

**PLANT GROWTH**
Establishing Windbreaks in Semiarid Areas by Altering the Microclimate or Supplying Additional Water,
W75-11827 3B

Effect of Preplant-Only Irrigation on Cotton Yields,
W75-11842 3F

**PLANT PHYSIOLOGY**
Contribution to the Ecology of Indian Aquatics: IV. Rate of Dry Matter Production of the Leaves of Several Common Aquatic Plants of Gorakhpur (India),
W75-11386 2I

A Water Potential Threshold for the Increase of Abscisic Acid in Leaves,
W75-11394 2I

**PLASTIC PIPES**
Mile of Sewer Line Renewed with Plastic Piping.
W75-11619 5D

**PLASTICS**
Treating Effluent.
W75-11444 5D

Using Paraffin and Polythylene to Harvest Water for Growing Shrubs,
W75-11821 3B

**PLATING WASTES**
Plating and Cyanide Wastes (Literature Review),
W75-11545 5D

**PLUM CREEK (OHIO)**
Flood Plain Information: Plum Creek, Brunswick Hills and Medina Townships, Medina County, Ohio.
W75-11788 4A

**PLUMES**
Submerged Buoyant Jets in Quiescent Fluids,
W75-11461 8B

**PLUNGING FLOW**
Analysis of Plunging Phenomena in Water Reservoirs,
W75-11655 4A

**PODS (PEANUTS)**
Effects of Soil Temperature and Soil Moisture in Podding Zone on Pod Development of Peanut Plants, (In Japanese),
W75-11456 3F

**POISONS**
Ultrastructural Effects of Acute Tetraethyllead Poisoning on Nerve Cells of the Rabbit Brain.
W75-11530 5C

**POLLUTANT IDENTIFCATION**
The Determination of Traces of Lead (II) by Solid-State Luminescence,
W75-11541 5A

**POLLUTANT IDENTIFICATION**
The Crystal and Molecular Structure of Selected Pesticidal Water Pollutants,
W75-11351 5A

An Automated Spectrophotometric Suspended Solids Analysis for Activated Sludge,
W75-11408 5D

Interlaboratory Study of Methods for Chemical Analysis of Water,
W75-11409 5A

The Use of Computers for Forecasting the Sanitary Systems of Water Bodies (Primeneniye EVM dlya prognozirovaniya sanitarnogo sostoyaniya vodoyemov),
W75-11410 5D

Spectrophotometric Determination of Fluorine in Water, (In Russian).
W75-11433 5A

Apparatus for Providing a Statistical Count of Particulate Material in a Fluid,
W75-11434 5A

Is the Malachite Green Broth According to Habs and Kirchner Suitable for Serving as an Isolation Medium for Pseudomonas Aeruginosa from Water, (In German),
W75-11435 5B

Spectrophotometric Determination of Sugars in Natural Waters, (In Russian),
W75-11437 5A

Biliary Excretion of Phenyl and Methyl Mercury Chlorides and Their Enterohepatic Circulation in Rats,
W75-11525 5C

Radioactive - Tracer Displacement Method for the Determination of Small Quantities of Nickel,
W75-11526 5A

Chemical Composition of Aegean Sea Sediments,
W75-11533 2J

The Occurrence of Mercury in Amphibia,
W75-11534 5A

Atomic-Absorption Spectrometric Determination of Cadmium, Lead, and Zinc in Salts or Salt Solutions by Hanging Mercury Drop Electrodeposition and Atomization in a Graphite Furnace,
W75-11536 5A

A Comparative Study on Methods for Cadmium Analysis of Grain with an Application to Pollution Evaluation,
W75-11539 5A

Catalytic-Coulometric Determination of Copper at Microgram and Nanogram Levels,
W75-11540 5A

Loss of Trace Elements from Natural Water During Storage. I. Behavior of 203 Hg and 65 Zn Added to Pond Water,
W75-11543 5A

Lead and Arsenic Levels of Dairy Cattle in Proximity to a Copper Smelter,
W75-11544 5A

Plating and Cyanide Wastes (Literature Review),
W75-11545 5D

Submicrogram Per Gram Concentrations of Mercury in Orchard Leaves Determined by Isotope Dilution and Spark-Source Mass Spectrometry,
W75-11581 5A

The Estimation of the Amount of Empire Mix Crude Oil in Mullet, Shrimp, and Oysters by Liquid Chromatography,
W75-11613 5A

Pollution Detection and River Quality Management,
W75-11753 5A

Mercury Levels in Fish in the La Grande River Area, Northern Quebec,
W75-11756 5A

The Brown Pelican and Certain Environmental Pollutants in Louisiana,
W75-11757 5A

Methods of Detecting the Fluorine Ion in Air and Water, (In Russian),
W75-11794 5A

The Behaviour of Metal Tetramethylenedithiocarbamates in the Graphite-Tube Furnace for Atomic Absorption Spectrometry,
W75-11797 5A

The Determination of Cadmium in Sea Water by Radioactivation,
W75-11798 5A

**POLLUTION ABATEMENT**

On Taxation and Firms Choice of Waste Water Treatment Technology,
W75-11767 5G

**POLLUTION TAXES (CHARGES)**

An Equitable Sewer Use Charge System,
W75-11391 5G

Sufficient Water Supply and Sewer System, and Equitable Distribution of the Costs (Tillstrekkelige vann- og Kolakkanlegg-samt rettferdig fordeling av kostnadene),
W75-11393 5D

On Taxation and Firms Choice of Waste Water Treatment Technology,
W75-11767 5G

**POLYCHLORINATED BIPHENYLS**

The Brown Pelican and Certain Environmental Pollutants in Louisiana,
W75-11757 5A

**PONDEROSA PINE TREES**

Diurnal Patterns of Water Potential in Abies Concolor and Pinus Ponderosa,
W75-11382 2I

**POPULATIONS**

Habitat Heterogeneity and Avian Community Structure in North American Grasslands,
W75-11425 2I

**POROUS MEDIA**

Simulation of Miscible Displacement in Soils,
W75-11590 2F

Axisymmetric Seepage Flow Through Semi-Infinite Porous Media,
W75-11633 2F

**POSIDONIA**

The Growth of Posidonia and the Urban Pollution in the Gulf of Giens, (In French),
W75-11761 5C

**POTABLE WATER**

Sanitary and Hygienic Evaluation of Seepage Waters of Structures Protecting Reservoirs (In Russian),
W75-11412 5B

**POTOMAC RIVER**

Geohydrologic Reconnaissance of the Upper Potomac River Basin,
W75-11493 2F

**POWER-LAW FLUIDS**

Turbulent Flow of Power-Law Fluids,
W75-11651 8B

**PRE-IMPOUNDMENT**

Predictive Modeling of Effects of the Planned Kindred Lake on Ground-Water Levels and Discharge, Southeastern North Dakota,
W75-11503 4A

**PRE-TREATMENT**

Combined Treatment of Municipal and Industrial Wastewater,
W75-11733 5D

**PRECIPITATION GAGES**

The Rainfall Recorder Problem,
W75-11448 2B

Comparison of Precipitation Gage Catches with a Modified Alter and a Rigid Alter Type Windshield,
W75-11457 2B

**PRESERVATION**

State Regulation of Coastal Water Area Preserves,
W75-11568 6E

**PRESSURE SEWERS**

Environmental Constraints Challenge Designers of Shoreline Community Near Kansas City, Missouri,
W75-11392 5D

**PRESTON TUBE**

Boundary Shear in Channel with Flood Plain,
W75-11463 8B

**PROGRAMS**

Cooperation in Water Resources Programs: Alaska's Example,
W75-11775 6B

**PROJECT BENEFITS**

Urban Drainage and Flood Control Projects Economic, Legal and Financial Aspects
W75-11352 6B

**PSEUDOMONAS**

Is the Malachite Green Broth According to Habs and Kirchner Suitable for Serving as an Isolation Medium for Pseudomonas Aeruginosa from Water, (In German),
W75-11435 5B

**PSEUDOMONAS-AERUGINOSA**

Is the Malachite Green Broth According to Habs and Kirchner Suitable for Serving as an Isolation Medium for Pseudomonas Aeruginosa from Water, (In German),
W75-11435 5B

**PUERTO RICO COAST**

Storm Tide Frequency Analysis for the Coast of Puerto Rico,
W75-11561 2A

**PUGET SOUND (WA)**

Coastal Resource Use: Decisions on Puget Sound,
W75-11573 6B

**PUGET SOUND (WASH)**

Lead and Arsenic Levels of Dairy Cattle in Proximity to a Copper Smelter,
W75-11544 5A

**PULP AND PAPER INDUSTRY**

Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant-Activated Sludge Treatment, Lime Treatment and Activated Carbon Treatment, (In Japanese),
W75-11362 5D

Float-Wash Fractionator Saves Fibre and Water at Grand'Mere,
W75-11363 5D

New Effluent Treatment Plant Opened at Bristol for Board Mills.
W75-11364 5D

Studies on Recovery of Chemicals and Manufacture of Activated Substances from Pulping Waste Liquor, Part 2, Use of Softwood KP-Waste Liquor, (In Japanese),
W75-11373 5D

**PULP WASTES**

Fish Toxicants in Kraft Effluents,
W75-11358 5C

Distribution of Lignin in the Waters of Lourizan Inlet, as a Measurement of Contamination Due to Dumping of Ligninsulfonic Lyes, Resulting from Production of Cellulose Pulp, (In Spanish),
W75-11678 5B

**PULSE IRRIGATION**

Basic Principles of Pulse Irrigation,
W75-11833 3F

**PUMPING**

Determining Optimal Well Discharge,
W75-11768 4B

**PUMPING PLANTS**

Dimensioning and Design of Small Waste Water Pumping Stations (Bemessung und Gestaltung von Klein-Abwasserpumpwerken),
W75-11744 8C

PUMPS
Environmental Constraints Challenge Designers of Shoreline Community Near Kansas City, Missouri,
W75-11392 5D

Centrifugal Pump for Processing Liquids Containing Abrasive Constitutents, More Particularly, a Sand Pump of a Wastewater Pumper,
W75-11679 5D

Dimensioning and Design of Small Waste Water Pumping Stations (Bemessung und Gestaltung von Klein-Abwasserpumpwerken),
W75-11744 8C

QUANTITATIVE INORGANIC ANALYSIS
Quantitative Inorganic Analysis by Gas Chromatrography, a Review,
W75-11528 5A

RADAR
The Rainfall Recorder Problem,
W75-11448 2B

Cellular Snow Generation--A Doppler Radar Study,
W75-11634 2B

RADIOACTIVE DATING
Sedimentation Rates in a Long Island Marsh Determined by PB210 Dating,
W75-11643 2L

RADIOACTIVITY
Uptake, Distribution and Fate of 203 Hg-Ethylmercuric Chloride in the Guppy and the Coontail,
W75-11529 5C

RADISHES
Different Soil Treatments for Harvesting Water for Radish Production in the Mexico Valley,
W75-11829 3B

RAIN GAGES
The Rainfall Recorder Problem,
W75-11448 2B

RAIN RECORDERS
The Rainfall Recorder Problem,
W75-11448 2B

RAIN WATER
Utilization of Water in a Semi-Arid Region,
W75-11356 3F

RAINDROP SIMULATION
An Acceleration System for Water Drops,
W75-11636 2B

RAINDROPS
Collision and Breakup of Water Drops at Terminal Velocity,
W75-11637 2B

Collision Efficiency of Water Drops in the Atmosphere,
W75-11638 2B

RAINFALL
The Rainfall Recorder Problem,
W75-11448 2B

Infiltration and Runoff for Small Field Plots Under Constant Intensity Rainfall,
W75-11458 3B

Improvement of Combined Sewer System Storm Water Storage Pool (Goryu-shiki gesuido no kairyo, taisui ike hoshiki),
W75-11621 5D

Tropical Showers in an Axisymmetric Cloud Model,
W75-11635 2B

Meteorological, Topographical, and Construction Influence on the Rain Runoff in Sewer Systems (Meteorologische, Topographische und Bautechnische Einfluesse auf den Regenabfluss in Kanal-Isationsnetzen),
W75-11712 5D

RAINFALL INTENSITY
The Value of the Peak Runoff Coefficient PSIS (Ueber den Aussagewert des Spitzenabflussbeiwertes PSIS),
W75-11713 2A

RAINFALL-RUNOFF PROCESSES
Models of the Stochastic and Chronologic Structure, Prediction and Simulation of Runoff Sequences - Application to the Lower Ohio Basin,
W75-11783 2E

RAINFALL-RUNOFF RELATIONSHIPS
Comparative Analysis of Estimation Methods in Nonlinear Functional Models of the Rainfall-Runoff Process,
W75-11354 2A

Hymo Flood Routing,
W75-11647 4A

Meteorological, Topographical, and Construction Influence on the Rain Runoff in Sewer Systems (Meteorologische, Topographische und Bautechnische Einfluesse auf den Regenabfluss in Kanal-Isationsnetzen),
W75-11712 5D

The Value of the Peak Runoff Coefficient PSIS (Ueber den Aussagewert des Spitzenabflussbeiwertes PSIS),
W75-11713 2A

Proceedings of the Water Harvesting Symposium, Phoenix, Arizona, March 26-28, 1974.
W75-11800 3B

Performance and Durability of Sheet Metal, Butyl Rubber, Asphalt Roofing and Bentonite for Harvesting Precipitation,
W75-11808 3B

Hydrologic Aspects of Water Harvesting in the Northern Great Plains,
W75-11811 2A

The Design of Roaded Catchments for Maximum Runoff,
W75-11817 3B

Water Harvesting for Barley in a 30-CM Winter Rainfall Area,
W75-11825 3B

Opportunity for Harvesting Water from and Along Highways in Rangeland Areas of Wyoming,
W75-11826 3B

Parameters for Estimating Annual Runoff and Soil Loss from Agricultural Lands in Rhodesia,
W75-11830 4A

RANDOM WALK MODEL
Solid Particle Settlement in Open-Channel Flow,
W75-11652 5B

RECHARGE
Theory of Ground-Water Recharge for a Strip Basin,
W75-11646 2F

RECHARGE BASIN
Theory of Ground-Water Recharge for a Strip Basin,
W75-11646 2F

RECYCLING
Watch That Water,
W75-11368 5D

Novel Waste Treatment Variation Shows Great Promise,
W75-11702 5D

REEFS
Natural and Artificial Reefs in Mississippi Coastal Waters: Sport Fishing Pressure and Economic Considerations,
W75-11558 6B

REFINERY WASTES
Optimum Design of Sour Water Strippers,
W75-11361 5D

REFLECTANCE
Evaporation Suppression for Conserving Water Supplies,
W75-11816 3B

REGIME THEORY
River Regime with Special Reference to River Nile,
W75-11464 2J

REGIONAL PLANNING
Planning for Resources-Environmental Conservation,
W75-11781 6B

REGIONAL SEWERING
Regional Sewering and Groundwater Quality in the Southern San Joaquin Valley,
W75-11446 5D

REGULATION
State Regulation of Coastal Water Area Preserves,
W75-11568 6E

The Management of Land and Water Use in the Coastal Zone: A New Law is Enacted in North Carolina,
W75-11575 6E

REGULATION SURFACE WATERS
Revision of the Regulations 'Planning of Sanitary Protection Zones of a Central Water Supply System and Water Sources' (In Russian),
W75-11682 5G

REHABILITATION
Rehabilitating Oiled Aquatic Birds,
W75-11616 5G

REMOTE SENSING
A Satellite Classification Technique for Subtropical Cyclones,
W75-11562 2B

Tropical Cyclone Intensity Analysis and Forecasting from Satellite Imagery,
W75-11577 2B

RESEARCH AND DEVELOPMENT
Directory of Water Resources Expertise, Water Research Faculty and Staff Scientists.
W75-11580 10C

The Status of Oiled Wildlife: Research and Planning,
W75-11617 5G

**RESEARCH PRIORITIES**
Agricultural Drainage Research Needs and Priorities, 1974,
W75-11632 4A

**RESERVOIR DESIGN**
Data Requirements for the Optimization of Reservoir Design and Operating Rule Determination,
W75-11500 4A

**RESERVOIR EVAPORATION**
Evaporation Suppression for Conserving Water Supplies,
W75-11816 3B

**RESERVOIR OPERATION**
Data Requirements for the Optimization of Reservoir Design and Operating Rule Determination,
W75-11500 4A

Optimizing Water Utilization Through Multiple Crops Scheduling,
W75-11587 3F

Application of a Generalisation of Wald's Identity to Solving Certain Multi-Stream Storage Problems,
W75-11649 4A

**RESERVOIR SITES**
Predictive Modeling of Effects of the Planned Kindred Lake on Ground-Water Levels and Discharge, Southeastern North Dakota,
W75-11503 4A

**RESERVOIRS**
Sanitary and Hygienic Evaluation of Seepage Waters of Structures Protecting Reservoirs (In Russian),
W75-11412 5B

Balancing Reservoir--A Key Element in Water Supply Plan,
W75-11687 4A

**RESISTANCE**
Resistance to Flow in Alluvial Channels,
W75-11459 2E

**RESOURCES DEVELOPMENT**
Coastal Resource Use: Decisions on Puget Sound,
W75-11573 6B

**REVERSE OSMOSIS**
Calicum Sulfate Scaling in Reverse Osmosis (Hyper-filtration) of Brackish Waters by Hollow-Fiber and Spiral-Wound Modules,
W75-11505 3A

The Application of Membrane Processes in the Treatment of Sewage,
W75-11666 5D

**REVIEWS**
Separation of Emulsified Oil from Water,
W75-11360 5D

Plating and Cyanide Wastes, (Literature Review),
W75-11370 5D

Sediment Transport Theories: A Review,
W75-11453 2J

Quantitative Inorganic Analysis by Gas Chromatography, a Review,
W75-11528 5A

Plating and Cyanide Wastes (Literature Review),
W75-11545 5D

Urban Runoff and Combined Sewer Overflow, (Literature Review),
W75-11710 5D

Continuous Monitoring, Automated Analysis and Sampling Procedures, (Literature Review),
W75-11711 5A

**REYNOLDS STRESS**
Turbulent Flow of Power-Law Fluids,
W75-11651 8B

**RHODESIA**
The Physico-Chemical Treatment of Crude Sewage,
W75-11404 5D

Parameters for Estimating Annual Runoff and Soil Loss from Agricultural Lands in Rhodesia,
W75-11830 4A

**RHODOPHYTA**
An Ecological Survey of the Rocky Coast Adjacent to a Bromine Extraction Works,
W75-11758 5C

**RICE**
Rice Response to Nitrogen and Phosphorus in Flooded and Nonflooded Soils,
W75-11597 3F

Effects of Water Management and Soil Aggregation on the Growth and Nutrient Uptake of Rice,
W75-11832 3F

Performance of Rice Varieties in a Highly Saline Sodic Soil as Influenced by Plant Population,
W75-11838 3C

**RIVER BLYTHE (ENGLAND)**
Demodulation of Stream-Flow Series,
W75-11449 2E

**RIVERS**
Closure Conditions Mouth of the Russian River,
W75-11454 2L

Pollution Detection and River Quality Management,
W75-11753 5A

**ROADED CATCHMENTS**
Design and Construction of Roaded Catchments,
W75-11810 3B

The Design of Roaded Catchments for Maximum Runoff,
W75-11817 3B

**ROCK CRABS**
Shell Disease in Crabs and Lobsters from New York Bight,
W75-11606 5C

**ROCK FILL**
Experimental Study of Wave Transimission,
W75-11773 8B

**ROCK ISLAND HYDROELECTRIC PROJECT (WASH)**
Hydraulic Model Studies of a Second Powerhouse at Rock Island Hydroelectric Project,
W75-11466 8B

Hydraulic Model Studies of a Second Powerhouse at Rock Island Hydroelectric Project, Cofferdam Tests,
W75-11467 8B

**ROUGHNESS (HYDRAULIC)**
River Regime with Special Reference to River Nile,
W75-11464 2J

**RUBBER**
Performance and Durability of Sheet Metal, Butyl Rubber, Asphalt Roofing and Bentonite for Harvesting Precipitation,
W75-11808 3B

**RUNOFF**
Infiltration and Runoff for Small Field Plots Under Constant Intensity Rainfall,
W75-11458 3B

Nutrient Transport in Surface Runoff as Influenced by Soil Cover and Seasonal Periods,
W75-11641 5B

Parameters for Estimating Annual Runoff and Soil Loss from Agricultural Lands in Rhodesia,
W75-11830 4A

**RUNOFF FORECASTING**
Prediction of Flood Volume from Small Humid Region Watersheds,
W75-11462 4A

Parameters for Estimating Annual Runoff and Soil Loss from Agricultural Lands in Rhodesia,
W75-11830 4A

**RUSSIAN RIVER (CALIF)**
Closure Conditions Mouth of the Russian River,
W75-11454 2L

**RYEGRASS**
A Comparison of 15N-Depleted and 15N-Enriched Fertilizers as Tracers,
W75-11591 3F

**SALINE SOILS**
Development of Salinity Control Technology in Grand Valley,
W75-11585 5C

Performance of Rice Varieties in a Highly Saline Sodic Soil as Influenced by Plant Population,
W75-11838 3C

Irrigation Management for Salt Control,
W75-11845 3C

**SALINE WATER**
Gypsum Solubility and Scaling Limits in Saline Waters,
W75-11473 3

Development of Salinity Control Technology in Grand Valley,
W75-11585 5

**SALINITY**
Salt Tolerance of Mexican Wheat: II. Relation to Variable Sodium Chloride and Length of Growing Season,
W75-11603 3

Synergistic Effects of Salinity, Temperature and Heavy Metals on Mortality and Osmoregulation in Marine and Estuarine Isopods (Crustacea),
W75-11610

Performance of Rice Varieties in a Highly Saline Sodic Soil as Influenced by Plant Population,
W75-11838 3C

Irrigation Management for Salt Control,
W75-11845 3C

SALINITY CONTROL
Development of Salinity Control Technology in Grand Valley,
W75-11585 5G

SALMONIDS
Mercury Levels in Fish in the La Grande River Area, Northern Quebec,
W75-11756 5A

SALT TOLERANCE
Salt Tolerance of Mexican Wheat: II. Relation to Variable Sodium Chloride and Length of Growing Season,
W75-11603 3C

SALTS
Further Observations on the Effect of Sodium Salt of 2,4-D on Early Developmental Stages of Carp (Cyprinus Carpio L.),
W75-11762 5C

SAMPLES
Apparatus for Providing a Statistical Count of Particulate Material in a Fluid,
W75-11434 5A

SAMPLING
Sampling Tool for Taking Undisturbed Soil Cores,
W75-11599 2G

Hydrocarbons Associated with Suspended Particulate Matter in San Francisco Bay Waters,
W75-11614 5A

Continuous Monitoring, Automated Analysis and Sampling Procedures, (Literature Review),
W75-11711 5A

SAN FRANCISCO BAY (CALIF)
Hydrocarbons Associated with Suspended Particulate Matter in San Francisco Bay Waters,
W75-11614 5A

SAN JOAQUIN VALLEY (CALIF)
Regional Sewering and Groundwater Quality in the Southern San Joaquin Valley,
W75-11446 5D

SANCTUARIES
State Regulation of Coastal Water Area Preserves,
W75-11568 6E

SANDS
The Casco Bay Oil Spill: Problems of Cleanup and Disposal,
W75-11615 5G

SAPROPEL
Pasteurization of Sapropel (Pasteurisierung von Faulschlamm),
W75-11750 5D

SARGASSO SEA
Formation and Collapse of Surface Films,
W75-11642 2K

SATELLITE IMAGERY
Tropical Cyclone Intensity Analysis and Forecasting from Satellite Imagery,
W75-11577 2B

SATELLITES (ARTIFICIAL)
A Satellite Classification Technique for Subtropical Cyclones,
W75-11562 2B

Tropical Cyclone Intensity Analysis and Forecasting from Satellite Imagery,
W75-11577 2B

SATURATED FLOW
Variable Thickness Transient Groundwater Flow Model User's Manual,
W75-11469 2F

SCALE EFFECTS (MODELS)
Scale Effects on Cooling Tower Model Studies,
W75-11470 8B

SCALING
Gypsum Solubility and Scaling Limits in Saline Waters,
W75-11473 3A

Calicum Sulfate Scaling in Reverse Osmosis (Hyper-filtration) of Brackish Waters by Hollow-Fiber and Spiral-Wound Modules,
W75-11505 3A

SCALING LIMITS
Gypsum Solubility and Scaling Limits in Saline Waters,
W75-11473 3A

SCALING THRESHOLDS
Gypsum Solubility and Scaling Limits in Saline Waters,
W75-11473 3A

SCHEDULING
Optimizing Water Utilization Through Multiple Crops Scheduling,
W75-11587 3F

SCIENTIFIC PERSONNEL
Directory of Water Resources Expertise, Water Research Faculty and Staff Scientists.
W75-11580 10C

SCOTCH PINE TREES
Establishing Windbreaks in Semiarid Areas by Altering the Microclimate or Supplying Additional Water,
W75-11827 3B

SEA WATER
State Regulation of Coastal Water Area Preserves,
W75-11568 6E

Sea Water Softening with the Lime-Magnesium Carbonate (LMC) Process,
W75-11699 5F

SEASHORES
The Ecology of the Cumberland Island National Seashore Camden County, Georgia,
W75-11546 2L

SEASONS
Phytoplankton Diversity and Chlorophyll-a in a Polluted Estuary,
W75-11607 5C

SEAWEEDS
The Casco Bay Oil Spill: Problems of Cleanup and Disposal,
W75-11615 5G

SEDIMENT CONTROL
The Growth of Posidonia and the Urban Pollution in the Gulf of Giens, (In French),
W75-11761 5C

SEDIMENT DISCHARGE
Sediment Transport Theories: A Review,
W75-11453 2J

SEDIMENT DISTRIBUTION
Chemical Composition of Aegean Sea Sediments,
W75-11533 2J

SEDIMENT TRANSPORT
Sediment Transport Theories: A Review,
W75-11453 2J

River Regime with Special Reference to River Nile,
W75-11464 2J

Sediment Relations of Selected Alaskan Glacier-Fed Streams,
W75-11477 2J

Quality of Surface Waters of the United States, 1970: Part 1. North Atlantic Slope Basins.
W75-11479 7C

Quality of Surface Waters of the United States, 1970: Part 2. South Atlantic Slope and Eastern Gulf of Mexico Basins.
W75-11480 7C

Quality of Surface Waters of the United States, 1968: Part 3. Ohio River Basin.
W75-11481 7C

Quality of Surface Waters of the United States, 1969: Part 6. Missouri River Basin.
W75-11482 7C

Quality of Surface Waters of the United States, 1970: Part 7. Lower Mississippi River Basin.
W75-11483 7C

Quality of Surface Waters of the United States, 1968: Part 8. Western Gulf of Mexico Basins.
W75-11484 7C

Quality of Surface Waters of the United States, 1970: Part II. Pacific Slope Basins in California.
W75-11485 7C

Simulation of Dispersion of Suspended Particles,
W75-11782 8B

SEDIMENT TRANSPORT THEORIES
Sediment Transport Theories: A Review,
W75-11453 2J

SEDIMENT YIELD
Sediment Relations of Selected Alaskan Glacier-Fed Streams,
W75-11477 2J

SEDIMENTATION
Metal Removal by Physical and Chemical Treatment Processes,
W75-11542 5D

Up-Rating Hydraulically Overloaded Sedimentation Tanks by Inclined Plates,
W75-11695 5D

SEDIMENTATION RATES
Sediment Transport Theories: A Review,
W75-11453 2J

Sedimentation Rates in a Long Island Marsh Determined by PB210 Dating,
W75-11643 2L

Solid Particle Settlement in Open-Channel Flow,
W75-11652 5B

SEDIMENTATION TANKS
Up-Rating Hydraulically Overloaded Sedimentation Tanks by Inclined Plates,
W75-11695 5D

SEDIMENTS
Nutrient Transport in Surface Runoff as Influenced by Soil Cover and Seasonal Periods,
W75-11641 5B

SEEDS
Effect of Water Stress, Temperature, and Light on Photosynthesis in Alder Seedlings,
W75 11691 2I

SEEPAGE
Sanitary and Hygienic Evaluation of Seepage Waters of Structures Protecting Reservoirs (In Russian),
W75-11412 5B

Regional Sewering and Groundwater Quality in the Southern San Joaquin Valley,
W75-11446 5D

Solution of a Free-Surface Boundary Value Problem Using an Inverse Formulation and the Finite Element Method,
W75-11447 2F

Axisymmetric Seepage Flow Through Semi-Infinite Porous Media,
W75-11633 2F

SEEPAGE CONTROL
Storage Systems for Harvested Water,
W75-11815 3B

Analysis of Canal Seepage to Interceptor Drain,
W75-11846 8A

SELENIUM
Selenium in Waters in and Adjacent to the Kendrick Project, Natrona County, Wyoming,
W75-11492 5B

SEMI-INFINITE FLOW
Axisymmetric Seepage Flow Through Semi-Infinite Porous Media,
W75-11633 2F

SEMIARID CLIMATES
Using Paraffin and Polythylene to Harvest Water for Growing Shrubs,
W75-11821 3B

Multipurpose Salt Treated Water Harvesting System,
W75-11828 3B

Parameters for Estimating Annual Runoff and Soil Loss from Agricultural Lands in Rhodesia,
W75-11830 4A

SEPARATION TECHNIQUES
Separation of Emulsified Oil from Water,
W75-11360 5D

Separating Ionised Materials from Aqueous Solutions.
W75-11397 5D

Method for Combatting Pollution Using a Chromium Complex,
W75-11506 5G

Sewage Treatment System,
W75-11510 5D

Metal Removal by Physical and Chemical Treatment Processes,
W75-11542 5D

SEPTIC TANKS
Domestic Sewage Treatment by Underdrained Filter Systems,
W75-11751 5D

SERMIARID CLIMATES
Water Harvesting by Runoff Inducement for Irrigation of an Almond Orchard in a Semiarid Climate,
W75-11818 3B

SETTLING BASINS
Up-Rating Hydraulically Overloaded Sedimentation Tanks by Inclined Plates,
W75-11695 5D

Novel Waste Treatment Variation Shows Great Promise,
W75-11702 5D

SETTLING VELOCITY
Solid Particle Settlement in Open-Channel Flow,
W75-11652 5B

SEVERE STORMS
Hurricane Experience Levels of Coastal County Populations - Texas to Maine,
W75-11570 2B

SEW WATER
Studies of the Aromatic Compounds Content in Sea Water by Low-Temperature Luminescent Spectroscopy, (In Russian),
W75-11786 5A

SEWAGE
Continuous Determination of Toxicity of Effluents.
W75-11431 5A

Shell Disease in Crabs and Lobsters from New York Bight,
W75-11606 5C

Novel Waste Treatment Variation Shows Great Promise,
W75-11702 5D

SEWAGE DISPOSAL
Environmental Constraints Challenge Designers of Shoreline Community Near Kansas City, Missouri,
W75-11392 5D

Regional Sewering and Groundwater Quality in the Southern San Joaquin Valley,
W75-11446 5D

Sewage Disposal System,
W75-11511 5D

Sewage and Garbage Disposal.
W75-11514 5D

Device and Method for Conducting Waste Liquid from a Receptacle to a Pneumatic Liquid Disposal System,
W75-11519 5D

Sewage Disposal Process,
W75-11522 5D

SEWAGE SLUDGE
Solidification of Sewage Sludge to a Hard Material.
W75-11662 5D

Disposal of Chemical Sewage Sludges on Land and Their Effects on Plants, Leachate and Soil Systems,
W75-11721 5E

Sludge Dewatering Using the Kruger Centrifuge,
W75-11726 5D

SEWAGE TREATMENT
Method of Purifying Water,
W75-11379 5D

Sewage Oxidation Treatment Apparatus,
W75-11395 5D

Sewage Treatment.
W75-11398 5D

Single Tank Sewage Treatment Plant,
W75-11399 5D

Studies of the Biochemical Factors Controlling the Flocculation of Activated Sludge. (In Japanese),
W75-11402 5D

The Physico-Chemical Treatment of Crude Sewage,
W75-11404 5D

Breakthrough in Sewage Treatment--Cash, Land, and Energy Saved.
W75-11413 5D

Use of Oxidized Cationic Starch in Flocculation and Dewatering of Municipal Sludge,
W75-11420 5D

Electrolytic Chlorine Used to Purify Disintegrated Sewage.
W75-11422 5D

Sludge Dewatering Installation.
W75-11424 5D

Removing Solids From Sewage.
W75-11428 5D

Irradiation Plant for Fluid Material, Particularly Sewage Sludge.
W75-11430 5D

Sewage Treatment with Hydrogen Peroxide.
W75-11443 5D

Treating Effluent.
W75-11444 5D

Aerobic Sewage Treatment System,
W75-11507 5D

Sewage Treatment Device,
W75-11508 5D

Domestic Sewage System,
W75-11509 5D

Sewage Treatment System,
W75-11510 5D

Sewage Disposal System,
W75-11511 5D

Sewage and Garbage Disposal.
W75-11514 5D

Treating Sewage.
W75-11516 5D

Irradiation Plant for Fluid Matl Partic Sewage Sludge.
W75-11517 5D

Horizontal Reactor for Polymsn. Sewage Oxidation Etc.,
W75-11518 5D

pe Insertion Renews Sewers with Little Ex-ivation.
75-11620 5D

wage Biological Processing,
75-11658 5D

lidification of Sewage Sludge to a Hard terial.
75-11662 5D

e Application of Membrane Processes in the eatment of Sewage,
75-11666 5D

wage Treatment Plant Equipped With an ration Impeller,
5-11670 5D

ifying Plant for Sewage,
5-11673 5D

ygenation of Waste Water,
5-11681 5D

wage Treatment Process,
5-11685 5D

line of Tagawa Sewage Plant in Utsunomiya , (In Japanese),
5-11686 5D

kage Plant Owner Responsibility and ration of Small Sewage Units,
5-11688 5D

kage Plants: The Contractor's Point of w,
5-11689 5D

se II Gives Hamilton Secondary Treatment.
5-11692 5D

lant Grows in Brooklyn,
-11701 5D

of Sewage Sludge in Agriculture with quate Environmental Safeguards,
-11718 5D

t Treatment of Sewage Sludge,
-11732 5D

tment and Disposal of Sludge from Mu-al Wastewater Plants in the United States,
-11735 5D

Experiences in Oxygen-Activated Sludge,
-11738 5D

urvey of the Tokyo Metropolitan Shin-i Treatment Plant, (Tokyo-to Shinkashi jo no gaiyo),
-11743 5D

rience of the Ruhrverband with the Treat- of Sewage Sludge (Erfahrungen des Ruhr-ndes bei der Klaerschlammbehandlung),
11747 5D

posting Plant for Refuse-Sewage Sludge in District of Gross-Gerau (Muell-rschlamm-Kompostierungsanlage fuer den Gross-Gerau),
11749 5D

estic Sewage Treatment by Underdrained Systems,
11751 5D

Resources Planning in Urban Areas,
11769 5D

**SEWAGE TREATMENT PACKAGE PLANTS**
Package Plants: The Contractor's Point of View,
W75-11689 5D

**SEWER CONNECTIONS**
Sewer Branch Saddle Connector,
W75-11677 8C

**SEWER USE CHARGES**
An Equitable Sewer Use Charge System,
W75-11391 5G

Sufficient Water Supply and Sewer System, and Equitable Distribution of the Costs (Tillstrekkelige vann- og Kolakkanlegg-samt rettferdig fordeling av kostnadene),
W75-11393 5D

**SEWERAGE**
Large Diameter Submarine Steel Pipeline Crossings,
W75-11380 8A

Apparatus for Sewer Treatment to Kill Three Roots and Other Organic Growth Therewithin,
W75-11513 5G

Mile of Sewer Line Renewed with Plastic Piping.
W75-11619 5D

Pipe Insertion Renews Sewers with Little Excavation.
W75-11620 5D

Providing Suburban Sewerage Despite Environmental and Construction Problems,
W75-11657 5D

Sewer Branch Saddle Connector,
W75-11677 8C

Sewer Line Blow-Out Plug,
W75-11684 8C

Sludge Handling and Disposal Practices in Metropolitan Toronto,
W75-11731 5D

**SEWERS**
Vacuum System for Sewage Discharge in Krempel (District of Dithmarschen)-Experience with a New Kind of Sewerage (Vakuumentwaesserung Krempel/Dithmarschen- Erfahrungsbericht Ueber Eine Neuartige Kanalisation),
W75-11383 5D

The Space/Time Coeefficient Method for Calculation of Rainwater Runoff (Das Raumzeit-beiwertverfahren fuer die Berechnung von Regenwasserabfluessen),
W75-11384 5D

Sufficient Water Supply and Sewer System, and Equitable Distribution of the Costs (Tillstrekkelige vann- og Kolakkanlegg-samt rettferdig fordeling av kostnadene),
W75-11393 5D

Open Cut Method Used for Major Sewer.
W75-11618 5D

Sewer Branch Saddle Connector,
W75-11677 8C

Meteorological, Topographical, and Construction Influence on the Rain Runoff in Sewer Systems (Meteorologische, Topographische und Bautechnische Einfluesse auf den Regenabfluss in Kanal-Isationsnetzen),
W75-11712 5D

**SHEAR STRESS**
Boundary Shear in Channel with Flood Plain,
W75-11463 8B

**SHIPPING**
Analysis of International Great Lakes Shipping and Hinterland,
W75-11576 6C

**SHOCK LOADING**
Response of Completely Mixed Activated Sludge Systems to Changes in the Environment,
W75-11478 5D

**SHORE PROTECTION**
Water Quality Relationships in the Great Lakes: Analysis of a Survey Questionnaire,
W75-11549 5B

**SHORELINES**
Closure Conditions Mouth of the Russian River,
W75-11454 2L

A Geomorphic Shoreline Inventory with Management Considerations for Whatcom County, Washington,
W75-11455 2L

**SHORES**
Closure Conditions Mouth of the Russian River,
W75-11454 2L

A Geomorphic Shoreline Inventory with Management Considerations for Whatcom County, Washington,
W75-11455 2L

**SHRIMP**
The Estimation of the Amount of Empire Mix Crude Oil in Mullet, Shrimp, and Oysters by Liquid Chromatography,
W75-11613 5A

**SIMULATION ANALYSIS**
Role of Computer Simulation in Administering an Urban Drainage Ordinance,
W75-11669 6E

Simulation of Dispersion of Suspended Particles,
W75-11782 8B

Hydrologic Aspects of Water Harvesting in the Northern Great Plains,
W75-11811 2A

**SIROTHERM PROCESS**
Sidrotherm Desalination,
W75-11707 5D

**SKIMMING**
Method for Combatting Pollution Using a Chromium Complex,
W75-11506 5G

**SLEEVE VALVES**
Hydraulic Design of Vertical Stilling Wells,
W75-11650 8B

**SLIMICIDES**
Influence of Some Biocides Employed in the Wood-Processing Industry on Growth of Green Algae,
W75-11605 5C

**SLOPE STABILITY**
Soil and Hydrologic Factors Affecting the Stability of Natural Slopes in the Oregon Coast Range,
W75-11353 2G

SLUDGE
An Evaluation of the Effectiveness and Applicability of Physical-Chemical Treatment of Urban Land Runoff,
W75-11389 5D

Shell Disease in Crabs and Lobsters from New York Bight,
W75-11606 5C

Sludge Handling and Disposal Practices in England,
W75-11717 5D

Agricultural Use of Sludge,
W75-11720 5C

Centrifuges - Types and Applications,
W75-11725 5D

Vacuum Dewatering of Sewage Sludge,
W75-11727 5D

SLUDGE CONDITIONING
Treatment and Disposal of Sludge from Municipal Wastewater Plants in the United States,
W75-11735 5D

SLUDGE DISPOSAL
Sludge Handling and Disposal Seminar, Conference Proceedings No. 2.
W75-11715 5D

Overview of Canadian Sludge Handling and Land Disposal Practices and Research,
W75-11716 5D

Sludge Handling and Disposal Practices in England,
W75-11717 5D

Use of Sewage Sludge in Agriculture with Adequate Environmental Safeguards,
W75-11718 5D

Disposal of Chemical Sewage Sludges on Land and Their Effects on Plants, Leachate and Soil Systems,
W75-11721 5E

Aspects of Incinerating Chemical Sludges,
W75-11728 5D

Sludge Handling and Disposal Practices in the Regional Municipality of Niagara,
W75-11730 5D

Sludge Handling and Disposal Practices in Metropolitan Toronto,
W75-11731 5D

Experiences with sludge Handling in Texas,
W75-11736 5D

Experience of the Ruhrverband with the Treatment of Sewage Sludge (Erfahrungen des Ruhrverbandes bei der Klaerschlammbehandlung),
W75-11747 5D

Planning and Construction of Sludge Treatment Plants (Planung und bau von Schlammbehandlungsanlagen),
W75-11748 5D

A Design and Economic Evaluation of Wet-Air and Catalytic Oxidation of Sewage Sludge,
W75-11784 5D

SLUDGE HANDLING
Final Disposal of Municipal Sludge in Sweden,
W75-11403 5E

Sludge Handling and Disposal Seminar, Conference Proceedings No. 2.
W75-11715 5D

Experiences with sludge Handling in Texas,
W75-11736 5D

SLUDGE THICKENING
Thickening of Unwanted Spent Lime Rejects,
W75-11848 5D

SLUDGE TREATMENT
Dehydrating Industrial Sludges by Filtration.
W75-11369 5D

Use of Oxidized Cationic Starch in Flocculation and Dewatering of Municipal Sludge,
W75-11420 5D

Sludge Dewatering Installation.
W75-11424 5D

Irradiation Plant for Fluid Material, Particularly Sewage Sludge.
W75-11430 5D

Irradiation Plant for Fluid Matl Partic Sewage Sludge.
W75-11517 5D

Waste Water Purification.
W75-11663 5D

Coagulant Recovery Takes Planning,
W75-11665 5D

Thermophilic Digestion at the Hyperion Treatment Plant,
W75-11690 5D

The Effect of Temperature on the Aerobic Digestion of Wastewater Sludge,
W75-11708 5D

Aerobic Digestion of Wastewater Sludge Under Low Temperature Conditions,
W75-11709 5D

Recycling of Incinerator Ash,
W75-11714 5D

Aerobic and Anaerobic Sludge Digestion,
W75-11719 5D

Design Information on Dewatering Properties of Wastewater Sludges,
W75-11722 5D

The Use of Physicochemical Sludge Characteristics and Bench Dewatering Tests in Predicting the Efficiency of Thickening and Dewatering Processes,
W75-11724 5D

Heat Treatment of Sewage Sludge,
W75-11732 5D

Treatment and Disposal of Sludge from Municipal Wastewater Plants in the United States,
W75-11735 5D

Experiences with sludge Handling in Texas,
W75-11736 5D

Oxygen Activated Sludge Systems in Texas,
W75-11740 5D

Planning and Construction of Sludge Treatment Plants (Planung und bau von Schlammbehandlungsanlagen),
W75-11748 5D

Pasteurization of Sapropel (Pasteurisierung von Faulschlamm),
W75-11750 5D

A Design and Economic Evaluation of Wet-Air and Catalytic Oxidation of Sewage Sludge.
W75-11784 5D

Thickening of Unwanted Spent Lime Rejects.
W75-11848 5D

SLUDGE VOLUME INDEX
An Automated Spectrophotometric Suspended Solids Analysis for Activated Sludge.
W75-11408 5D

SMALL WATERSHEDS
Prediction of Flood Volume from Small Humid Region Watersheds,
W75-11462 4A

SNAILS
Copper Uptake and Excretion by Busycon Canaliculatum L.,
W75-11755 5C

SNAKE RIVER BASIN
Surface Water Supply of the United States, 1966-70: Part 13. Snake River Basin.
W75-11491 7C

SNOW
Cellular Snow Generation--A Doppler Radar Study,
W75-11634 2B

SODIC SOILS
Performance of Rice Varieties in a Highly Saline Sodic Soil as Influenced by Plant Population,
W75-11838 3C

SODIUM
Predicting Exchangeable Sodium Ratios in Irrigated Tropical Vertisols,
W75-11595 3C

SODIUM COMPOUNDS
Further Observations on the Effect of Sodium Salt of 2,4-D on Early Developmental Stages of Carp (Cyprinus Carpio L.),
W75-11762 5C

SOIL AGGREGATES
Soil and Hydrologic Factors Affecting the Stability of Natural Slopes in the Oregon Coast Range,
W75-11353 2C

Effects of Water Management and Soil Aggregation on the Growth and Nutrient Uptake of Rice,
W75-11832 3

SOIL CHEMISTRY
Kinetic and Equilibrium Studies of Boron Desorption from Soil,
W75-11600 2

SOIL EROSION
Parameters for Estimating Annual Runoff and Soil Loss from Agricultural Lands in Rhodesia
W75-11830 4

SOIL INVESTIGATIONS
Sampling Tool for Taking Undisturbed Soil Cores,
W75-11599 7

SOIL MOISTURE
Effects of Soil Temperature and Soil Moisture in Podding Zone on Pod Development of Peanut Plants, (In Japanese),
W75-11456

Field Test of Soil Water Flux Meters,
W75-11586

Evapotranspiration and Soil Moisture in Upland Grass Catchments in the Eastern Pennines,
W75-11648 2D

Soil Moisture Accounting Component of the USDAHL-74 Model of Watershed Hydrology,
W75-11656 2G

Desert Strip Farming--Computer Simulation of an Ancient Water Harvesting Technique,
W75-11812 3B

Field Evaluation of Microwatershed and Vertical Mulch Systems,
W75-11819 3B

Precipitation Entrapment for Evaporation Suppression,
W75-11822 3B

Choice of Irrigation Timing Indicator for Narrow Row Cotton,
W75-11840 3F

**IL PHYSICAL PROPERTIES**
Soil and Hydrologic Factors Affecting the Stability of Natural Slopes in the Oregon Coast Range,
W75-11353 2G

**IL PROFILES**
Effect of Backfill on Drain Flow in Layered Soils,
W75-11834 8D

**L PROPERTIES**
gricultural Use of Sludge,
75-11720 5C

**L SEALANTS**
itumen, Oil, and Clay Surfaces on a Deep and to Increase Runoff from Catchments for xcavated Tanks in Western Australia,
75-11805 3B

il Treatment with Silicones for Water Harsting,
75-11806 3B

emical Water Harvesting,
75-11807 3B

aling Leaking Excavated Tanks on Farms in estern Australia,
75-11814 3B

ater Harvesting by Runoff Inducement for Iration of an Almond Orchard in a Semiarid imate,
75-11818 3B

**STABILITY**
il and Hydrologic Factors Affecting the Staity of Natural Slopes in the Oregon Coast nge,
75-11353 2G

**TEMPERATURE**
fects of Soil Temperature and Soil Moisture Podding Zone on Pod Development of Peut Plants, (In Japanese),
5-11456 3F

**TREATMENT**
fur and Manganese Release from Soils ated with Prilled Sulfur and Sulfurntonite,
5-11604 5B

fferent Soil Treatments for Harvesting Water Radish Production in the Mexico Valley,
5-11829 3B

**SOIL WATER**
Two-Dimensional Similarity Solution: Theory and Application to the Determination of Soil-Water Diffusivity,
W75-11640 2G

**SOIL-WATER DIFFUSIVITY**
Two-Dimensional Similarity Solution: Theory and Application to the Determination of Soil-Water Diffusivity,
W75-11640 2G

**SOIL WATER MOVEMENT**
Field Test of Soil Water Flux Meters,
W75-11586 2G

Simulation of Miscible Displacement in Soils,
W75-11590 2F

Determining Effective Soil Water Diffusivities from One-Step Outflow Experiments,
W75-11592 2G

Chloride and Tritiated Water Flow in Disturbed and Undisturbed Soil Cores,
W75-11594 2G

Modified Penman Equation to Provide the Upper Boundary Condition in Computing Evaporation from Soil,
W75-11598 2D

**SOIL WATER POTENTIAL**
Two-Dimensional Similarity Solution: Theory and Application to the Determination of Soil-Water Diffusivity,
W75-11640 2G

**SOILS**
Rate of Phosphorus Sorption by Five Oklahoma Soils,
W75-11836 3F

**SOLID WASTES**
A Topographic-Hydrogeologic Model for Solid Waste Landfill Siting,
W75-11644 5B

**SOLUBILITY**
Gypsum Solubility and Scaling Limits in Saline Waters,
W75-11473 3A

The Solubility Behaviour of No. 2 Fuel Oil in Sea Water,
W75-11565 5B

**SORGHUM**
Utilization of Water in a Semi-Arid Region,
W75-11356 3F

**SORPTION**
Rate of Phosphorus Sorption by Five Oklahoma Soils,
W75-11836 3F

**SOUR WATER STRIPPERS**
Optimum Design of Sour Water Strippers,
W75-11361 5D

**SOUTH ATLANTIC SLOPE BASINS**
Quality of Surface Waters of the United States, 1970: Part 2. South Atlantic Slope and Eastern Gulf of Mexico Basins.
W75-11480 7C

**SOUTH CAROLINA**
Land Use and Environmental Planning: An Application in the South Carolina Coastal Zone,
W75-11766 6G

**SOUTHEAST US RIVER BASINS**
Quality of Surface Waters of the United States, 1970: Part 2. South Atlantic Slope and Eastern Gulf of Mexico Basins.
W75-11480 7C

**SOUTHERN HIGH PLAINS (NMEX)**
Utilization of Water in a Semi-Arid Region,
W75-11356 3F

**SPAIN**
Distribution of Lignin in the Waters of Lourizan Inlet, as a Measurement of Contamination Due to Dumping of Ligninsulfonic Lyes, Resulting from Production of Cellulose Pulp, (In Spanish),
W75-11678 5B

**SPAWNING**
Spawning Grounds of the European Walleye Lucioperca Lucioperca L. and Volga Walleye Lucioperca Volgensis (Gmelin) in the Ural River (In Russian),
W75-11668 2I

**SPECTROPHOTOMETRY**
An Automated Spectrophotometric Suspended Solids Analysis for Activated Sludge,
W75-11408 5D

Spectrophotometric Determination of Fluorine in Water, (In Russian).
W75-11433 5A

Spectrophotometric Determination of Sugars in Natural Waters, (In Russian),
W75-11437 5A

A Comparative Study on Methods for Cadmium Analysis of Grain with an Application to Pollution Evaluation,
W75-11539 5A

Lead and Arsenic Levels of Dairy Cattle in Proximity to a Copper Smelter,
W75-11544 5A

The Behaviour of Metal Tetramethylenedithiocarbamates in the Graphite-Tube Furnace for Atomic Absorption Spectrometry,
W75-11797 5A

**SPECTROSCOPY**
Loss of Trace Elements from Natural Water During Storage. I. Behavior of 203 Hg and 65 Zn Added to Pond Water,
W75-11543 5A

Studies of the Aromatic Compounds Content in Sea Water by Low-Temperature Luminescent Spectroscopy, (In Russian),
W75-11786 5A

**SPORT FISHING**
Natural and Artificial Reefs in Mississippi Coastal Waters: Sport Fishing Pressure and Economic Considerations,
W75-11558 6B

**SPRING WATERS**
Hygienic Evaluation of Spring Cappings Used on the Southern Shore of Crimea, (In Russian),
W75-11793 5G

**SPRINKLER IRRIGATION**
Comparing Trickle, Subsurface and Sprinkler Irrigation Systems,
W75-11589 3F

Center Pivot Design Capacities in Eastern Colorado,
W75-11835 8A

SQUIDS
High Copper Concentrations in Squid Livers in Association with Elevated Levels of Silver, Cadmium and Zinc,
W75-11609 5C

STABILITY
Velocities Above Rough Bed in Oscillatory Flow,
W75-11763 8B

STANDARDS
An Integrated Power Process Model of Water Use and Waste Water Treatment in Chlor-Alkali Production,
W75-11765 5D

STANDING WATERS
Loss of Trace Elements from Natural Water During Storage. I. Behavior of 203 Hg and 65 Zn Added to Pond Water,
W75-11543 5A

STARCHES
Use of Oxidized Cationic Starch in Flocculation and Dewatering of Municipal Sludge,
W75-11420 5D

STATISTICAL MODELS
Models of the Stochastic and Chronologic Structure, Prediction and Simulation of Runoff Sequences - Application to the Lower Ohio Basin,
W75-11783 2E

STATISTICS
Influence of Current on Statistical Properties of Waves,
W75-11772 2L

STEADY FLOW
Axisymmetric Seepage Flow Through Semi-Infinite Porous Media,
W75-11633 2F

STEEL MANUFACTURING INDUSTRY
Watch That Water,
W75-11368 5D

STOCHASTIC PROCESSES
Application of a Generalisation of Wald's Identity to Solving Certain Multi-Stream Storage Problems,
W75-11649 4A

Solid Particle Settlement in Open-Channel Flow,
W75-11652 5B

Models of the Stochastic and Chronologic Structure, Prediction and Simulation of Runoff Sequences - Application to the Lower Ohio Basin,
W75-11783 2E

STOCK WATER
Bitumen, Oil, and Clay Surfaces on a Deep Sand to Increase Runoff from Catchments for Excavated Tanks in Western Australia,
W75-11805 3B

Water Harvesting Catchments on Indian Lands in the Southwest,
W75-11809 3B

STORM DRAINS
Urban Drainage and Flood Control Projects. Economic, Legal and Financial Aspects,
W75-11352 6B

STORM RUNOFF
An Evaluation of the Effectiveness and Applicability of Physical-Chemical Treatment of Urban Land Runoff,
W75-11389 5D

County Combats Urban Storm Water Runoff Problems,
W75-11390 5G

Storm and Combined Sewer Abatement Technology in the United States--An Overview,
W75-11414 5D

Urban Runoff and Combined Sewer Overflow, (Literature Review),
W75-11710 5D

Meteorological, Topographical, and Construction Influence on the Rain Runoff in Sewer Systems (Meteorologische, Topographische und Bautechnische Einfluesse auf den Regenabfluss in Kanal-Isationsnetzen),
W75-11712 5D

STORM SURGE
Storm Tide Frequency Analysis for the Coast of North Carolina, South of Cape Lookout,
W75-11560 2B

Storm Tide Frequency Analysis for the Coast of Puerto Rico,
W75-11561 2A

STORM WATER
Improvement of Combined Sewer System Storm Water Storage Pool (Goryu-shiki gesuido no kairyo, taisui ike hoshiki),
W75-11621 5D

STORMS
Comparison of Precipitation Gage Catches with a Modified Alter and a Rigid Alter Type Windshield,
W75-11457 2B

A Federal Plan for Natural Disaster Warning and Preparedness, First Supplement FY 1976 - 1980.
W75-11553 2B

Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States,
W75-11556 2B

Further Studies on the Origin of Hurricanes,
W75-11559 2B

Hurricane Experience Levels of Coastal County Populations - Texas to Maine,
W75-11570 2B

STREAMFLOW
Demodulation of Stream-Flow Series,
W75-11449 2E

Surface Water Supply of the United States, 1966-70: Part 6. Missouri River Basin--Volume 3, Missouri River Basin from Sioux City, Iowa, to Nebraska City, Nebraska.
W75-11486 7C

Surface Water Supply of the United States, 1966-70: Part 8. Western Gulf of Mexico Basins--Volume 2. Basins from Lavaca River to Rio Grande.
W75-11487 7C

Surface Water Supply of the United States, 1966-70: Part 9. Colorado River Basin--Volume 3. Lower Colorado River Basin.
W75-11488 7C

Surface Water Supply of the United States, 1966-70: Part 10. The Great Basin
W75-11489 7C

Surface Water Supply of the United States, 1966-70: Part 12. Pacific Slope Basins in Washington--Volume 1. Pacific Slope Basins in Washington Except Columbia River Basin
W75-11490 7C

Surface Water Supply of the United States, 1966-70: Part 13. Snake River Basin
W75-11491 7C

Low-Flow Characteristics of Streams in the Grays Harbor Drainages, Washington,
W75-11502 2E

STREAMFLOW FORECASTING
Models of the Stochastic and Chronologic Structure, Prediction and Simulation of Runoff Sequences - Application to the Lower Ohio Basin,
W75-11783 2E

STREAMS
Quality of Surface Waters of the United States, 1970: Part 2. South Atlantic Slope and Eastern Gulf of Mexico Basins.
W75-11480 7C

Quality of Surface Waters of the United States, 1970: Part II. Pacific Slope Basins in California
W75-11485 7C

STREPTOCOCCHUS
Sanitary and Bacteriological Evaluation of the Raw Material, Air and Wastewaters of Some Bast Fiber Plants in the Uzbek SSR, (In Russian),
W75-11406 5

STRIP BASIN
Theory of Ground-Water Recharge for a Strip Basin,
W75-11646

STRIP CROPPING
Desert Strip Farming--Computer Simulation of an Ancient Water Harvesting Technique,
W75-11812

STRIPPING VOLTAMMETRY
Atomic-Absorption Spectrometric Determination of Cadmium, Lead, and Zinc in Salts and Salt Solutions by Hanging Mercury Drop Electrodeposition and Atomization in a Graphite Furnace,
W75-11536

STRIPPING VOLTAMMETRY (ANODIC)
Determination of the Apparent Complexing Capacity of Lake Waters,
W75-11538

STRONTIUM
Influence of Lead on Calcium and Strontium Transfer Through the Duodenal Wall in Rats
W75-11523

SUBMARINE PIPELINE CROSSINGS
Large Diameter Submarine Steel Pipeline Crossings,
W75-11380

SUBSURFACE IRRIGATION
Comparing Trickle, Subsurface and Sprinkler Irrigation Systems,
W75-11589

Evapotranspiration by Subirrigated Alfalfa Pasture in the East Central Great Plains,
W75-11841

SURFACE WATERS
Case of Subterranean Water Pollution aused by the Public Refuse Disposal Ground, n Japanese),
75-11432 5B

TROPICAL CYCLONES
Satellite Classification Technique for Sub-opical Cyclones,
75-11562 2B

ARS
ectrophotometric Determination of Sugars in atural Waters, (In Russian),
75-11437 5A

FUR
lfur and Manganese Release from Soils eated with Prilled Sulfur and Sulfur-ntonite,
75-11604 5B

FUR-BENTONITE
lfur and Manganese Release from Soils eated with Prilled Sulfur and Sulfur-ntonite,
75-11604 5B

PLEMENTAL IRRIGATION
riation in Effectiveness of Supplemental Ir-ation on Sweet Corn Yield Components,
5-11844 3F

FACE IRRIGATION
mparison of Fog Irrigation with Surface Ir-ation in Corn Production,
5-11837 3F

FACE RUNOFF
diction of Flood Volume from Small Humid gion Watersheds,
5-11462 4A

FACE SEALING
Treatment with Silicones for Water Har-ting,
5-11806 3B

mical Water Harvesting,
5-11807 3B

ablishing Windbreaks in Semiarid Areas by ring the Microclimate or Supplying Addi-al Water,
5-11827 3B

erent Soil Treatments for Harvesting Water Radish Production in the Mexico Valley,
5-11829 3B

ACE TENSION
nation and Collapse of Surface Films,
-11642 2K

ACE WATERS
lity of Surface Waters of the United States, : Part 1. North Atlantic Slope Basins.
-11479 7C

ity of Surface Waters of the United States, : Part 7. Lower Mississippi River Basin.
-11483 7C

ity of Surface Waters of the United States, : Part 8. Western Gulf of Mexico Basins.
-11484 7C

ice Water Supply of the United States, 70: Part 8. Western Gulf of Mexico is--Volume 2. Basins from Lavaca River to Grande.
11487 7C

Surface Water Supply of the United States, 1966-70: Part 12. Pacific Slope Basins in Washington--Volume 1. Pacific slope Basins in Washington Except Columbia River Basin.
W75-11490 7C

Surface Water Supply of the United States, 1966-70: Part 13. Snake River Basin.
W75-11491 7C

Selenium in Waters in and Adjacent to the Kendrick Project, Natrona County, Wyoming,
W75-11492 5B

Mercer County Surface Water Resources,
W75-11622 4A

Vermilion County Surface Water Resources,
W75-11623 4A

Lawrence County Surface Water Resources,
W75-11624 4A

De Kalb County Surface Water Resources,
W75-11625 4A

SUSPENDED LOAD
Hydrocarbons Associated with Suspended Particulate Matter in San Francisco Bay Waters,
W75-11614 5A

SUSPENDED SOLIDS
An Automated Spectrophotometric Suspended Solids Analysis for Activated Sludge,
W75-11408 5D

Apparatus for Providing a Statistical Count of Particulate Material in a Fluid,
W75-11434 5A

Hydrocarbons Associated with Suspended Particulate Matter in San Francisco Bay Waters,
W75-11614 5A

Suspended Solids Removal Processes Studied at Metro Chicago,
W75-11741 5D

SWEDEN
Final Disposal of Municipal Sludge in Sweden,
W75-11403 5E

Interlaboratory Study of Methods for Chemical Analysis of Water,
W75-11409 5A

SWEET CORN
Variation in Effectiveness of Supplemental Irrigation on Sweet Corn Yield Components,
W75-11844 3F

SYNEDRA-ULNA
A Method of Investigating Populations of Diatoms in Flowing Waters, (In German),
W75-11445 2I

SYNERGISTIC EFFECTS
Synergistic Effects of Salinity, Temperature and Heavy Metals on Mortality and Osmoregulation in Marine and Estuarine Isopods (Crustacea),
W75-11610 5C

SYNOPTIC ANALYSIS
Western North Pacific Typhoons, 1974,
W75-11578 2B

SYNTHETIC HYDROLOGY
Generation of Hydrologic Samples: Case Study of the Great Lakes,
W75-11476 2H

Hymo Flood Routing,
W75-11647 4A

SYSTEMATICS
A Method of Investigating Populations of Diatoms in Flowing Waters, (In German),
W75-11445 2I

SYSTEMS ANALYSIS
Identification of Parameters in a Linear Equation of Groundwater Flow,
W75-11799 2F

SYSTEMS ENGINEERING
Planning for Resources-Environmental Conservation,
W75-11781 6B

TADPOLES
Effects of Methylmercury Chloride on Rana Pipiens Tadpoles,
W75-11527 5C

TANNERY HAIR
Removal of Soluble Mercury from Waste Water by Complexing Techniques,
W75-11357 5D

TAXES
On Taxation and Firms Choice of Waste Water Treatment Technology,
W75-11767 5G

TEES
Energy Losses at 90 Degrees Pipe Junctions,
W75-11778 8B

TEMPERATURE
Submerged Buoyant Jets in Quiescent Fluids,
W75-11461 8B

Scale Effects on Cooling Tower Model Studies,
W75-11470 8B

Synergistic Effects of Salinity, Temperature and Heavy Metals on Mortality and Osmoregulation in Marine and Estuarine Isopods (Crustacea),
W75-11610 5C

Thermophilic Digestion at the Hyperion Treatment Plant,
W75-11690 5D

The Effect of Temperature on the Aerobic Digestion of Wastewater Sludge,
W75-11708 5D

Aerobic Digestion of Wastewater Sludge Under Low Temperature Conditions,
W75-11709 5D

Biological Considerations on the Use of Thermal Effluents for Finfish Aquaculture,
W75-11759 5C

TERTIARY TREATMENT
Advanced Treatment of Waste Water from Machinery Works by Activated Carbon (Kasseitan ni yoru kikai kojo haisui no kodo shori),
W75-11372 5D

Advanced Treatment of Waste Water After Second Stage Treatment. Experimental Results at the Water Treatment Plant of Kawasaki City (Gesui niji shorisui no kodo shori, Kawasaki-shi gesui shorijo ni okeru jikken hokoku).
W75-11664 5D

Advanced Wastewater Treatment Plant with Designed-In Reliability,
W75-11700 5D

Tertiary Stage Added to Stratford Sewage Plant.
W75-11705 5D

**TERTIARY TREATMENT**

Studies on Advanced Waste Treatment, W75-11734 5D

**TETRAETHYLLEAD POISONING**
Ultrastructural Effects of Acute Tetraethyllead Poisoning on Nerve Cells of the Rabbit Brain, W75-11530 5C

**TEXAS**
Water Quality Changes Related to the Development of Anaerobic Conditions During Artificial Recharge, W75-11497 5B

Evaporation Data in Texas, W75-11630 7C

Balancing Reservoir--A Key Element in Water Supply Plan, W75-11687 4A

Experiences with sludge Handling in Texas, W75-11736 5D

Oxygen Activated Sludge Systems in Texas, W75-11740 5D

Runoff Utilization for Grain Production, W75-11824 3B

**TEXTILES**
Treatment of Waste Water from Textile Dyeing Process (Senshoku haisui shori), W75-11374 5D

Reduced Cost Flocculation of a Textile Dyeing Wastewater, W75-11375 5D

Studies on the Treatment of Wastewaters from the Towel Dyeing Industry, W75-11376 5D

**THAMES ESTUARY (ENGLAND)**
The Reduction of Artificial Boundary Reflexions in Numerically Modelled Estuaries, W75-11452 2L

**THERMAL POLLUTION**
Biological Considerations on the Use of Thermal Effluents for Finfish Aquaculture, W75-11759 5C

**THERMOCLINE *ENTRAINMENT**
Turbulent Entrainment Across Stable Density Step Structures, W75-11451 2J

**THERMODYNAMICS**
Kinetics of the Fluorination of Zinc, W75-11629 5A

**THERMOPHILIC DIGESTION**
Thermophilic Digestion at the Hyperion Treatment Plant, W75-11690 5D

**TIDAL EFFECTS**
The Reduction of Artificial Boundary Reflexions in Numerically Modelled Estuaries, W75-11452 2L

**TIDAL STREAMS**
Closure Conditions Mouth of the Russian River, W75-11454 2L

**TIDES**
The Reduction of Artificial Boundary Reflexions in Numerically Modelled Estuaries, W75-11452 2L

**TILTING SPAR**
Current Measurements Using a Tilting Spar, W75-11564 7B

**TIME SERIES ANALYSIS**
Demodulation of Stream-Flow Series, W75-11449 2E

Generation of Hydrologic Samples: Case Study of the Great Lakes, W75-11476 2H

**TISSUE ANALYSIS**
Organochlorine Compounds in Several Marine Organisms from the North Sea and the Dutch Wadden Sea, W75-11608 5B

Copper and Zinc in Cancer Irroratus: Comparative Metabolism of the Molt Cycle, le Cuivre et le Zinc Chez Cancer Irroratus (Crustace:Decapode): Metabolisme Compare au Cours du Cycle D'intermue, W75-11752 5C

Mercury Levels in Fish in the La Grande River Area, Northern Quebec, W75-11756 5A

Elimination of Hydrocarbons by Mussels, W75-11760 5C

**TISSUE (ANIMAL)**
Studies of the Aromatic Compounds Content in Sea Water by Low-Temperature Luminescent Spectroscopy, (In Russian), W75-11786 5A

**TOKYO (JAPAN)**
A Survey of the Tokyo Metropolitan Shin-Kashi Treatment Plant, (Tokyo-to Shinkashi shorijo no gaiyo), W75-11743 5D

**TORONTO (CANADA)**
Sludge Handling and Disposal Practices in Metropolitan Toronto, W75-11731 5D

**TOXICITY**
Fish Toxicants in Kraft Effluents, W75-11358 5C

Continuous Determination of Toxicity of Effluents. W75-11431 5A

Influence of Some Biocides Employed in the Wood-Processing Industry on Growth of Green Algae, W75-11605 5C

A Method for Intermittent Chlorine Dosing in Continuous-Flow Toxicity Tests, W75-11754 5A

**TOXINS**
Fish Toxicants in Kraft Effluents, W75-11358 5C

**TOXOCITY**
Biliary Excretion of Phenyl and Methyl Mercury Chlorides and Their Enterohepatic Circulation in Rats, W75-11525 5C

**TRACE ELEMENTS**
Geochemistry of Surface Sediments in an Acid Stream Estuary, W75-11531 2J

Chemical Composition of Aegean Sea Sediments, W75-11533 2J

Determination of the Apparent Complexing Capacity of Lake Waters. W75-11538 5B

Metal Removal by Physical and Chemical Treatment Processes, W75-11542 5D

Loss of Trace Elements from Natural Water During Storage. I Behavior of 203 Hg and 6 Zn Added to Pond Water, W75-11543 5A

**TRACERS**
A Comparison of 15N-Depleted and 15N-Enriched Fertilizers as Tracers, W75-11591 3

Copper Uptake and Excretion by Busyco Canaliculatum L., W75-11755 5

**TRADE**
Analysis of International Great Lakes Shippin and Hinterland, W75-11576 6

**TRANSITION METALS**
Radioactive - Tracer Displacement Method f the Determination of Small Quantities Nickel, W75-11526 5

**TRANSPIRATION**
Transpiration of Some Oreoxerophytes of t Central Caucasus, (In Georgian), W75-11442

Relation Between Nitrate Absorption a Water Transpiration by Corn, W75-11602

**TRANSPORT MODELS**
Transport Model, User's Manual, W75-11468

**TREATMENT FACILITIES**
Single Tank Sewage Treatment Plant, W75-11399

Water Processing Plant to Controlled Acid Level, W75-11421

Irradiation Plant for Fluid Material, Particul Sewage Sludge. W75-11430

Irradiation Plant for Fluid Matl Partic Sew Sludge. W75-11517

Biological and Chemical Purification Plant. W75-11660

Outline of Tagawa Sewage Plant in Utsuno City, (In Japanese), W75-11686

Package Plant Owner Responsibility Operation of Small Sewage Units, W75-11688

Phase II Gives Hamilton Secondary Treatm W75-11692

Innovative Water Plant Slated for New Jer W75-11696

Energy-Wastewater Treatment and Disposal, W75-11697

dvanced Wastewater Treatment Plant with esigned-In Reliability,
/75-11700 5D

Plant Grows in Brooklyn,
/75-11701 5D

ertiary Stage Added to Stratford Sewage lant.
/75-11705 5D

ffects of Control Variables and Sludge haracteristics on the Performance of De-atering and Thickening Devices,
75-11723 5D

ne Use of Physicochemical Sludge Charac-ristics and Bench Dewatering Tests in Pre-cting the Efficiency of Thickening and De-atering Processes,
75-11724 5D

entrifuges - Types and Applications,
75-11725 5D

emoval of Phosphates and Metals from wage Sludges,
75-11729 5D

idge Handling and Disposal Practices in the gional Municipality of Niagara,
75-11730 5D

idge Handling and Disposal Practices in tropolitan Toronto,
75-11731 5D

tro Chicago Studies on Nitrification,
75-11742 5D

perience of the Ruhrverband with the Treat-nt of Sewage Sludge (Erfahrungen des Ruhr-bandes bei der Klaerschlammbehandlung),
5-11747 5D

nning and Construction of Sludge Treatment nts (Planung und bau von Schlammbehan-ngsanlagen),
5-11748 5D

mposting Plant for Refuse-Sewage Sludge in District of Gross-Gerau (Muell-erschlamm-Kompostierungsanlage fuer den is Gross-Gerau),
5-11749 5D

rating and Redesign of Water Treatment nts, Part II,
5-11849 5F

**KLE IRRIGATION**
in Sorghum Evapotranspiration and Water Efficiency Under Trickle Irrigation,
5-11582 3F

amber Method' for Drip Irrigation System ign and Installation Procedures,
5-11584 3F

mparing Trickle, Subsurface and Sprinkler ation Systems,
-11589 3F

ntity and Frequency of Trickle and Furrow ation for Efficient Cabbage Production,
-11839 3F

**KLING FILTERS**
ation and Purification of Contaminated er,
-11418 5D

**TRITIATED WATER**
Chloride and Tritiated Water Flow in Disturbed and Undisturbed Soil Cores,
W75-11594 2G

**TROPICAL CYCLONE ACTIVITY**
Western North Pacific Typhoons, 1974,
W75-11578 2B

Central North Pacific Tropical Cyclones, 1974,
W75-11579 2B

**TROPICAL CYCLONE INTENSITY**
Tropical Cyclone Intensity Analysis and Forecasting from Satellite Imagery,
W75-11577 2B

**TROPICAL CYCLONES**
Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States,
W75-11556 2B

Further Studies on the Origin of Hurricanes,
W75-11559 2B

A Satellite Classification Technique for Subtropical Cyclones,
W75-11562 2B

Hurricane Experience Levels of Coastal County Populations - Texas to Maine,
W75-11570 2B

Tropical Cyclone Intensity Analysis and Forecasting from Satellite Imagery,
W75-11577 2B

Central North Pacific Tropical Cyclones, 1974,
W75-11579 2B

**TURBULENCE**
Turbulent Entrainment Across Stable Density Step Structures,
W75-11451 2J

Turbulent Flow of Power-Law Fluids,
W75-11651 8B

Wall Shear Measurement in Sand-Water Mixture Flows,
W75-11653 8B

Turbulent Drag Coefficients of Sharp-Edged Objects,
W75-11654 8B

Velocities Above Rough Bed in Oscillatory Flow,
W75-11763 8B

**TURBULENCE INTENSITY**
Turbulent Drag Coefficients of Sharp-Edged Objects,
W75-11654 8B

**TURBULENCE SCALE**
Turbulent Drag Coefficients of Sharp-Edged Objects,
W75-11654 8B

**TURBULENT ENTRAINMENT**
Turbulent Entrainment Across Stable Density Step Structures,
W75-11451 2J

**TURBULENT FLOW**
Turbulent Flow of Power-Law Fluids,
W75-11651 8B

**TYPHOONS**
Western North Pacific Typhoons, 1974,
W75-11578 2B

**ULTIMATE DISPOSAL**
Final Disposal of Municipal Sludge in Sweden,
W75-11403 5E

**UNDERGROUND DISPOSAL**
Breakthrough in Sewage Treatment--Cash, Land, and Energy Saved.
W75-11413 5D

**UNIFORM FLOW**
Simulation of Dispersion of Suspended Particles,
W75-11782 8B

**UNITED KINGDOM**
Pollution Detection and River Quality Management,
W75-11753 5A

**UNITED STATES**
Subsurface Waste Injection in the United States: Fifteen Case Histories,
W75-11627 5D

Use of Sewage Sludge in Agriculture with Adequate Environmental Safeguards,
W75-11718 5D

**UNOX PROCESS**
Oxygen Activated Sludge Systems in Texas,
W75-11740 5D

**UNSATURATED FLOW**
Well Pumping in Unconfined Aquifers: The Influence of the Unsaturated Zone,
W75-11631 4B

**UNSTEADY FLOW**
Variable Thickness Transient Groundwater Flow Model User's Manual,
W75-11469 2F

Well Pumping in Unconfined Aquifers: The Influence of the Unsaturated Zone,
W75-11631 4B

**UPLAND GRASS CATCHMENTS**
Evapotranspiration and Soil Moisture in Upland Grass Catchments in the Eastern Pennines,
W75-11648 2D

**UPPER POTOMAC RIVER BASIN**
Geohydrologic Reconnaissance of the Upper Potomac River Basin,
W75-11493 2F

**URBAN AREAS**
Storm and Combined Sewer Abatement Technology in the United States--An Overview,
W75-11414 5D

Water Resources Planning in Urban Areas,
W75-11769 5D

**URBAN DRAINAGE**
Urban Drainage and Flood Control Projects. Economic, Legal and Financial Aspects,
W75-11352 6B

**URBAN POLLUTION**
The Growth of Posidonia and the Urban Pollution in the Gulf of Giens, (In French),
W75-11761 5C

**URBAN RUNOFF**
Comparative Analysis of Estimation Methods in Nonlinear Functional Models of the Rainfall-Runoff Process,
W75-11354 2A

Urban Runoff and Combined Sewer Overflow, (Literature Review),
W75-11710 5D

URBANIZATION
County Combats Urban Storm Water Runoff Problems,
W75-11390 5G

The Growth of Posidonia and the Urban Pollution in the Gulf of Giens, (In French),
W75-11761 5C

UREA
Comparative Efficiency of Soluble and Controlled-Release Sulfur-Coated Urea Nitrogen for Corn in Tropics,
W75-11601 3F

UREAS
Decomposition of Urea Associated with Photosynthesis of Phytoplankton in Coastal Waters,
W75-11612 5C

USER'S MANUAL
Variable Thickness Transient Groundwater Flow Model User's Manual,
W75-11469 2F

USSR
The Use of Computers for Forecasting the Sanitary Systems of Water Bodies (Primeneniye EVM dlya prognozirovaniya sanitarnogo sostoyaniya vodoyemov),
W75-11410 5D

Spawning Grounds of the European Walleye Lucioperca Lucioperca L. and Volga Walleye Lucioperca Volgensis (Gmelin) in the Ural River (In Russian),
W75-11668 2I

Revision of the Regulations 'Planning of Sanitary Protection Zones of a Central Water Supply System and Water Sources' (In Russian),
W75-11682 5G

USSR (CENTRAL CAUCASUS)
Transpiration of Some Oreoxerophytes of the Central Caucasus, (In Georgian),
W75-11442 2D

USSR (CRIMEA)
Hygienic Evaluation of Spring Cappings Used on the Southern Shore of Crimea, (In Russian),
W75-11793 5G

USSR (RSFSR)
Field Experience in Disinfecting Water Mains (In Russian),
W75-11411 5F

USSR (UZBEKISTAN)
Sanitary-Virological Study of the Effectiveness of Decontamination of Waste Waters on Irrigated Farm Yields, (In Russian),
W75-11674 5B

VACUUM FILTERS
Vacuum Dewatering of Sewage Sludge,
W75-11727 5D

VACUUM SEWERS
Vacuum System for Sewage Discharge in Krempel (District of Dithmarschen)-Experience with a New Kind of Sewerage (Vakuumentwaesserung Krempel/Dithmarschen- Erfahrungsbericht Ueber Eine Neuartige Kanalisation),
W75-11383 5D

VALVES
Valve for Controlling Liquid Discharge.
W75-11417 8C

VARIABLE TRAVEL TIME (VTT) FLOOD ROUTING
Hymo Flood Routing,
W75-11647 4A

VEGETATION
Effects of Fish-Ponds Near Jakubovo on the Ornithocenose There, (In Czech),
W75-11535 5C

Studies of Floodplain Vegetation and Water Level Fluctuation in the Kissimmee River Valley,
W75-11628 4A

VELOCITY
Velocities Above Rough Bed in Oscillatory Flow,
W75-11763 8B

VENTURA RIVER (CALIF)
Flood Plain Information: Ventura River, Ventura County, California.
W75-11790 4A

VERMILION BAY
An Inventory and Study of the Vermilion Bay-Atchafalaya Bay Complex; Area Description, Biology, Hydrology and Chemistry, and Sedimentology,
W75-11571 2L

VERMILION COUNTY (ILL)
Vermilion County Surface Water Resources,
W75-11623 4A

VERMILION RIVER
An Inventory and Study of the Vermilion Bay-Atchafalaya Bay Complex; Area Description, Biology, Hydrology and Chemistry, and Sedimentology,
W75-11571 2L

VERTICAL STILLING WELLS
Hydraulic Design of Vertical Stilling Wells,
W75-11650 8B

VIRUSES
Some Problems of the Circulation of Enteroviruses in Environmental Objects, (In Russian),
W75-11438 5B

VOLUMETRIC ANALYSIS
Catalytic-Coulometric Determination of Copper at Microgram and Nanogram Levels,
W75-11540 5A

WALD'S IDENTITY
Application of a Generalisation of Wald's Identity to Solving Certain Multi-Stream Storage Problems,
W75-11649 4A

WALES
The Rainfall Recorder Problem,
W75-11448 2B

WALLEYE
Spawning Grounds of the European Walleye Lucioperca Lucioperca L. and Volga Walleye Lucioperca Volgensis (Gmelin) in the Ural River (In Russian),
W75-11668 2I

WARM-WATER FISH
Biological Considerations on the Use of Thermal Effluents for Finfish Aquaculture,
W75-11759 5C

WARNING SYSTEMS
A Federal Plan for Natural Disaster Warning and Preparedness. First Supplement FY 1976 1980
W75-11553 2B

The Continuous Monitoring of Water Quality.
W75-11667 5A

WASHINGTON
A Geomorphic Shoreline Inventory with Management Considerations for Whatcom County, Washington,
W75-11455 2L

Hydraulic Model Studies of a Second Powerhouse at Rock Island Hydroelectric Project,
W75-11466 8B

Hydraulic Model Studies of a Second Powerhouse at Rock Island Hydroelectric Project, Cofferdam Tests,
W75-11467 8B

Water Quality Report The Columbia River Below Longview, Washington, December 1971 - November 1972.
W75-11472 5B

Surface Water Supply of the United States 1966-70: Part 12. Pacific Slope Basins in Washington--Volume 1. Pacific slope Basins in Washington Except Columbia River Basin.
W75-11490 7C

Digital-Simulation and Projection of Water Level Declines in Basalt Aquifers of the Odessa-Lind Area, East-Central Washington,
W75-11494 2

Low-Flow Characteristics of Streams in the Grays Harbor Drainages, Washington,
W75-11502 2

Coastal Resource Use: Decisions on Puget Sound,
W75-11573 6

WASTE DISPOSAL
Environmental Constraints Challenge Designers of Shoreline Community Near Kansas City, Missouri,
W75-11392 5

Sufficient Water Supply and Sewer System and Equitable Distribution of the Cost (Tillstrekkelige vann- og Kolakkanlegg-sa rettferdig fordeling av kostnadene),
W75-11393

Proposed Standards: Land Disposal of Effluents,
W75-11400

Breakthrough in Sewage Treatment--Cash, Land, and Energy Saved.
W75-11413

Sewage and Garbage Disposal.
W75-11514

Disposal of Sandy Pipeline Dredge Spoils by End Dumping,
W75-11566

A Topographic-Hydrogeologic Model for Solid Waste Landfill Siting,
W75-11644

Energy-Wastewater Treatment and Solids Disposal,
W75-11697

isposal of Chemical Sewage Sludges on Land
nd Their Effects on Plants, Leachate and Soil
ystems,
75-11721 5E

udge Handling and Disposal Practices in
etropolitan Toronto,
75-11731 5D

anning and Construction of Sludge Treatment
ants (Planung und bau von Schlammbehan-
ungsanlagen),
75-11748 5D

STE DISPOSAL WELLS
bsurface Waste Injection in the United
ates: Fifteen Case Histories,
75-11627 5D

STE DUMPS
Case of Subterranean Water Pollution
used by the Public Refuse Disposal Ground,
Japanese),
75-11432 5B

STE TREATMENT
ckage Plants: The Contractor's Point of
ew,
75-11689 5D

dge Handling and Disposal Practices in En-
nd,
75-11717 5D

e Use of Physicochemical Sludge Charac-
stics and Bench Dewatering Tests in Pre-
ting the Efficiency of Thickening and De-
ering Processes,
5-11724 5D

ects of Incinerating Chemical Sludges,
5-11728 5D

TE WATER DISPOSAL
d Spreading Effluent from a Secondary
ility,
5-11365 5D

atment and Disposal of Anodizing Ef-
nts, Part II,
5-11378 5D

E WATER TREATMENT
noval of Soluble Mercury from Waste
er by Complexing Techniques,
5-11357 5D

hods and Equipment for the Treatment of
t Oil Emulsions (Verfahren und Anlagen
Behandlung Verbrauchter Oel-Emul-
en),
-11359 5D

ration of Emulsified Oil from Water,
-11360 5D

mum Design of Sour Water Strippers,
-11361 5D

ential Treatment of Kraft Pulp Washing
tewater by Pilot Plant-Activated Sludge
tment, Lime Treatment and Activated Car-
Treatment, (In Japanese),
-11362 5D

-Wash Fractionator Saves Fibre and
r at Grand'Mere,
11363 5D

Effluent Treatment Plant Opened at
ol for Board Mills.
11364 5D

Land Spreading Effluent from a Secondary Facility,
W75-11365 5D

City, Industry Face Pollution Abatement Together,
W75-11366 5D

Method for Reclaiming Industrial Wastes and Eliminating Pollution,
W75-11367 5D

Watch That Water,
W75-11368 5D

Dehydrating Industrial Sludges by Filtration.
W75-11369 5D

Plating and Cyanide Wastes, (Literature Review),
W75-11370 5D

Acceleration of Biochemical Treatment of Wastewater in Petroleum Refineries,
W75-11371 5D

Advanced Treatment of Waste Water from Machinery Works by Activated Carbon (Kasseitan ni yoru kikai kojo haisui no kodo shori),
W75-11372 5D

Studies on Recovery of Chemicals and Manufacture of Activated Substances from Pulping Waste Liquor, Part 2, Use of Softwood KP-Waste Liquor, (In Japanese),
W75-11373 5D

Treatment of Waste Water from Textile Dyeing Process (Senshoku haisui shori),
W75-11374 5D

Reduced Cost Flocculation of a Textile Dyeing Wastewater,
W75-11375 5D

Studies on the Treatment of Wastewaters from the Towel Dyeing Industry,
W75-11376 5D

Treatment and Disposal of Anodizing Effluents, Part I,
W75-11377 5D

Treatment and Disposal of Anodizing Effluents, Part II,
W75-11378 5D

Method of Purifying Water,
W75-11379 5D

Continuous Treatment of Polluted Liquids.
W75-11381 5D

Process for Treating Waste Water,
W75-11387 5D

An Evaluation of the Effectiveness and Applicability of Physical-Chemical Treatment of Urban Land Runoff,
W75-11389 5D

Environmental Constraints Challenge Designers of Shoreline Community Near Kansas City, Missouri,
W75-11392 5D

Sewage Oxidation Treatment Apparatus,
W75-11395 5D

Activated Sludge Sewage Treatment for Seasonally Variable Throughput,
W75-11396 5D

Separating Ionised Materials from Aqueous Solutions.
W75-11397 5D

Sewage Treatment.
W75-11398 5D

Single Tank Sewage Treatment Plant,
W75-11399 5D

Proposed Standards: Land Disposal of Effluents,
W75-11400 5D

Green Systems for Wastewater Treatment.
W75-11401 5D

Studies of the Biochemical Factors Controlling the Flocculation of Activated Sludge, (In Japanese),
W75-11402 5D

The Physico-Chemical Treatment of Crude Sewage,
W75-11404 5D

Ammonia Removal from Municipal Wastewaters by Ion Exchange,
W75-11405 5D

Instrumental Investigation of Biological Waste Water Treatment (A szennyvisek biologiai tisztitasanak muszeres vizsgalata),
W75-11407 5D

An Automated Spectrophotometric Suspended Solids Analysis for Activated Sludge,
W75-11408 5D

The Use of Computers for Forecasting the Sanitary Systems of Water Bodies (Primeneniye EVM dlya prognozirovaniya sanitarnogo sostoyaniya vodoyemov),
W75-11410 5D

Breakthrough in Sewage Treatment--Cash, Land, and Energy Saved.
W75-11413 5D

Storm and Combined Sewer Abatement Technology in the United States--An Overview,
W75-11414 5D

Elimination of Water Surface Pollution.
W75-11416 5D

Filtration and Purification of Contaminated Water,
W75-11418 5D

Use of Oxidized Cationic Starch in Flocculation and Dewatering of Municipal Sludge,
W75-11420 5D

Electrolytic Chlorine Used to Purify Disintegrated Sewage.
W75-11422 5D

Sludge Dewatering Installation.
W75-11424 5D

Removing Solids From Sewage.
W75-11428 5D

Incinerator Device and a Method of Processing Residuals in Waste Water, Liquefied Sewage and Sludge,
W75-11440 5D

Sewage Treatment with Hydrogen Peroxide.
W75-11443 5D

## WASTE WATER TREATMENT


Response of Completely Mixed Activated Sludge Systems to Changes in the Environment,
W75-11478 5D

Method for Combatting Pollution Using a Chromium Complex,
W75-11506 5G

Aerobic Sewage Treatment System,
W75-11507 5D

Sewage Treatment System,
W75-11510 5D

Sewage Disposal System,
W75-11511 5D

Sewage and Garbage Disposal.
W75-11514 5D

Desalination of Water.
W75-11515 3A

Treating Sewage.
W75-11516 5D

Irradiation Plant for Fluid Matl Partic Sewage Sludge.
W75-11517 5D

Horizontal Reactor for Polymsn. Sewage Oxidation Etc.,
W75-11518 5D

Liquid Treatment Apparatus Having Combined Reaction Basin and Clarifier,
W75-11521 5D

Sewage Disposal Process,
W75-11522 5D

Plating and Cyanide Wastes (Literature Review),
W75-11545 5D

Open Cut Method Used for Major Sewer.
W75-11618 5D

Mile of Sewer Line Renewed with Plastic Piping.
W75-11619 5D

Pipe Insertion Renews Sewers with Little Excavation.
W75-11620 5D

Improvement of Combined Sewer System Storm Water Storage Pool (Goryu-shiki gesuido no kairyo, taisui ike hoshiki),
W75-11621 5D

Providing Suburban Sewerage Despite Environmental and Construction Problems,
W75-11657 5D

Sewage Biological Processing,
W75-11658 5D

Waste Water and Sewage Purification.
W75-11659 5D

Biological and Chemical Purification Plant.
W75-11660 5D

Domestic Waste Water and Sewage Evacuation Device.
W75-11661 5D

Solidification of Sewage Sludge to a Hard Material.
W75-11662 5D

Waste Water Purification.
W75-11663 5D

Advanced Treatment of Waste Water After Second Stage Treatment. Experimental Results at the Water Treatment Plant of Kawasaki City (Gesui niji shorisui no kodo shori, Kawasaki-shi gesui shorijo ni okeru jikken hokoku).
W75-11664 5D

Coagulant Recovery Takes Planning,
W75-11665 5D

The Application of Membrane Processes in the Treatment of Sewage,
W75-11666 5D

Sewage Treatment Plant Equipped With an Aeration Impeller,
W75-11670 5D

Means for and Method of Purifying Contaminated Water,
W75-11672 5D

Purifying Plant for Sewage,
W75-11673 5D

Sanitary-Virological Study of the Effectiveness of Decontamination of Waste Waters on Irrigated Farm Yields, (In Russian),
W75-11674 5B

Centrifugal Pump for Processing Liquids Containing Abrasive Constitutents, More Particularly, a Sand Pump of a Wastewater Pumper,
W75-11679 5D

Air Driven Rotating Biological Contactor Apparatus,
W75-11680 5D

Oxygenation of Waste Water,
W75-11681 5D

Biological Purification of Waste Water.
W75-11683 5D

Sewage Treatment Process,
W75-11685 5D

Outline of Tagawa Sewage Plant in Utsunomiya City, (In Japanese),
W75-11686 5D

Package Plant Owner Responsibility and Operation of Small Sewage Units,
W75-11688 5D

Thermophilic Digestion at the Hyperion Treatment Plant,
W75-11690 5D

Phase II Gives Hamilton Secondary Treatment.
W75-11692 5D

Swedish Experiences in Chemical Treatment of Wastewater,
W75-11694 5D

Up-Rating Hydraulically Overloaded Sedimentation Tanks by Inclined Plates,
W75-11695 5D

Innovative Water Plant Slated for New Jersey,
W75-11696 5F

Energy-Wastewater Treatment and Solids Disposal,
W75-11697 5D

In-Line Filtration May Be Just for You,
W75-11698 5D

Advanced Wastewater Treatment Plant with Designed-In Reliability,
W75-11700 5D

A Plant Grows in Brooklyn,
W75-11701 5D

Novel Waste Treatment Variation Shows Great Promise,
W75-11702 5D

They're Packing up Waste Ponds
W75-11703 5D

Aluminum Sulphate for Water Treatment.
W75-11704 5D

Tertiary Stage Added to Stratford Sewage Plant.
W75-11705 5D

The Ici Deep-Shaft Effluent-Treatment Process.
W75-11706 5D

Sidrotherm Desalination.
W75-11707 5D

The Effect of Temperature on the Aerobic Digestion of Wastewater Sludge,
W75-11708 5D

Aerobic Digestion of Wastewater Sludge Under Low Temperature Conditions,
W75-11709 5D

Urban Runoff and Combined Sewer Overflow (Literature Review),
W75-11710 5D

Meteorological, Topographical, and Construction Influence on the Rain Runoff in Sewer Systems (Meteorologische, Topographische und Bautechnische Einfluesse auf den Regenabfluss in Kanal-Isationsnetzen),
W75-11712 5D

Sludge Handling and Disposal Seminar, Conference Proceedings No. 2.
W75-11715 5D

Overview of Canadian Sludge Handling and Land Disposal Practices and Research,
W75-11716 5D

Use of Sewage Sludge in Agriculture with Adequate Environmental Safeguards,
W75-11718 5

Aerobic and Anaerobic Sludge Digestion,
W75-11719 5

Design Information on Dewatering Properties of Wastewater Sludges,
W75-11722 5

Effects of Control Variables and Sludge Characteristics on the Performance of Dewatering and Thickening Devices,
W75-11723 5

Centrifuges - Types and Applications,
W75-11725 5

Sludge Dewatering Using the Kruger Centrifuge,
W75-11726

Vacuum Dewatering of Sewage Sludge.
W75-11727

Removal of Phosphates and Metals from Sewage Sludges,
W75-11729

Sludge Handling and Disposal Practices in Metropolitan Toronto,
W75-11731

t Treatment of Sewage Sludge,
-11732 5D

bined Treatment of Municipal and Indus- Wastewater,
-11733 5D

ies on Advanced Waste Treatment,
-11734 5D

tment and Disposal of Sludge from Mu- al Wastewater Plants in the United States,
-11735 5D

eriences with sludge Handling in Texas,
-11736 5D

ges Generated in Phosphate Removal esses,
-11737 5D

Experiences in Oxygen-Activated Sludge,
11738 5D

tion Systems for Metro Chicago,
11739 5D

en Activated Sludge Systems in Texas,
11740 5D

ended Solids Removal Processes Studied tro Chicago,
11741 5D

o Chicago Studies on Nitrification,
11742 5D

rvey of the Tokyo Metropolitan Shin- Treatment Plant, (Tokyo-to Shinkashi o no gaiyo),
11743 5D

nfluence of Temperature on the Biological tion of Urban Waste Waters by Means of tivated Sludge (Influenza Della Tempera- Nella Ossidazion Biologica dei Liquami i Mediante Fanghi Attivi),
1745 5D

hate Precipitation in Activated Sludge with Sludge Stabilization and Denitrifica- Phospatfaellung in Belebungsanlagen mit nmstabilisation und Denitrifikationss-
1746 5D

ience of the Ruhrverband with the Treat- of Sewage Sludge (Erfahrungen des Ruhr- ides bei der Klaerschlammbehandlung),
1747 5D

ng and Construction of Sludge Treatment (Planung und bau von Schlammbehan- anlagen),
1748 5D

sting Plant for Refuse-Sewage Sludge in District of Gross-Gerau (Muell- chlamm-Kompostierungsanlage fuer den Gross-Gerau),
1749 5D

rization of Sapropel (Pasteurisierung von hlamm),
750 5D

tic Sewage Treatment by Underdrained Systems,
751 5D

egrated Power Process Model of Water d Waste Water Treatment in Chlor-Al- oduction,
765 5D

An Integrated Power Process Model of Water Use and Waste Water Treatment in Chlor-Alkali Production,
W75-11765 5D

On Taxation and Firms Choice of Waste Water Treatment Technology,
W75-11767 5G

Water Resources Planning in Urban Areas,
W75-11769 5D

Thickening of Unwanted Spent Lime Rejects,
W75-11848 5D

The Influence of Particle Size on Oxidation of Total, Soluble, and Particulate Municipal Wastewater Components by Ozone,
W75-11850 5D

**WASTE WATER TREATMENT**
Waste Water Treatment System With An Ozone Generator,
W75-11426 5D

**WASTE WATER TREATMENT**
Domestic Water Purification Method and System,
W75-11427 5D

Biological Purification of Town and Industrial Effluents.
W75-11429 5D

Irradiation Plant for Fluid Material, Particularly Sewage Sludge.
W75-11430 5D

Flotation Aerator for Aerating and Moving Water,
W75-11439 5D

Liquid Treatment Plant and Process Particularly for Waste Water,
W75-11441 5D

Treating Effluent.
W75-11444 5D

Sewage Treatment Device,
W75-11508 5D

Domestic Sewage System,
W75-11509 5D

Device and Method for Conducting Waste Liquid from a Receptacle to a Pneumatic Liquid Disposal System,
W75-11519 5D

Metal Removal by Physical and Chemical Treatment Processes,
W75-11542 5D

**WASTES**
Shell Disease in Crabs and Lobsters from New York Bight,
W75-11606 5C

**WASTES DISPOSAL**
Treatment and Disposal of Sludge from Municipal Wastewater Plants in the United States,
W75-11735 5D

**WATER ANALYSIS**
Interlaboratory Study of Methods for Chemical Analysis of Water,
W75-11409 5A

**WATER CHEMISTRY**
Determination of the Apparent Complexing Capacity of Lake Waters,
W75-11538 5B

**WATER CONSERVATION**
Water Quality Relationships in the Great Lakes: Analysis of a Survey Questionnaire,
W75-11549 5B

State Regulation of Coastal Water Area Preserves,
W75-11568 6E

Evaporation Suppression for Conserving Water Supplies,
W75-11816 3B

Field Evaluation of Microwatershed and Vertical Mulch Systems,
W75-11819 3B

An Analysis of the Efficiency of Microwatershed Systems,
W75-11820 3B

Multipurpose Salt Treated Water Harvesting System,
W75-11828 3B

**WATER CONTROL**
State Regulation of Coastal Water Area Preserves,
W75-11568 6E

**WATER DEMAND**
Forecasting Urban Water Use: Commercial Establishments,
W75-11795 6D

**WATER DISTRIBUTION (APPLIED)**
Forecasting Urban Water Use: Commercial Establishments,
W75-11795 6D

**WATER HAMMER**
Water Hammer in Coaxial Pipe Systems,
W75-11460 8B

**WATER HARVESTING**
Proceedings of the Water Harvesting Symposium, Phoenix, Arizona, March 26-28, 1974.
W75-11800 3B

Water Harvesting for Livestock in Western Australia,
W75-11801 3B

Engineering Aspects of Water Harvesting Research at the University of Arizona,
W75-11802 3B

Water Harvesting for Livestock, Wildlife, and Domestic Use,
W75-11803 3B

Bitumen, Oil, and Clay Surfaces on a Deep Sand to Increase Runoff from Catchments for Excavated Tanks in Western Australia,
W75-11805 3B

Soil Treatment with Silicones for Water Harvesting,
W75-11806 3B

Chemical Water Harvesting,
W75-11807 3B

Performance and Durability of Sheet Metal, Butyl Rubber, Asphalt Roofing and Bentonite for Harvesting Precipitation,
W75-11808 3B

Water Harvesting Catchments on Indian Lands in the Southwest,
W75-11809 3B

**WATER HARVESTING**

Design and Construction of Roaded Catchments,
W75-11810 3B

Hydrologic Aspects of Water Harvesting in the Northern Great Plains,
W75-11811 2A

Desert Strip Farming--Computer Simulation of an Ancient Water Harvesting Technique,
W75-11812 3B

A Computer Model for Optimizing Design of Improved Catchment,
W75-11813 3B

Sealing Leaking Excavated Tanks on Farms in Western Australia,
W75-11814 3B

Storage Systems for Harvested Water,
W75-11815 3B

Evaporation Suppression for Conserving Water Supplies,
W75-11816 3B

The Design of Roaded Catchments for Maximum Runoff,
W75-11817 3B

Water Harvesting by Runoff Inducement for Irrigation of an Almond Orchard in a Semiarid Climate,
W75-11818 3B

Field Evaluation of Microwatershed and Vertical Mulch Systems,
W75-11819 3B

An Analysis of the Efficiency of Microwatershed Systems,
W75-11820 3B

Using Paraffin and Polythylene to Harvest Water for Growing Shrubs,
W75-11821 3B

Precipitation Entrapment for Evaporation Suppression,
W75-11822 3B

Crop Production by Water Harvesting,
W75-11823 3B

Runoff Utilization for Grain Production,
W75-11824 3B

Water Harvesting for Barley in a 30-CM Winter Rainfall Area,
W75-11825 3B

Opportunity for Harvesting Water from and Along Highways in Rangeland Areas of Wyoming,
W75-11826 3B

Establishing Windbreaks in Semiarid Areas by Altering the Microclimate or Supplying Additional Water,
W75-11827 3B

Multipurpose Salt Treated Water Harvesting System,
W75-11828 3B

Different Soil Treatments for Harvesting Water for Radish Production in the Mexico Valley,
W75-11829 3B

**WATER LAW**

Wetlands - Related Legislation in the United States,
W75-11550 6E

Proceedings of Alabama Coastal Leaders Conference on Coastal Zone Management.
W75-11555 6E

The Management of Land and Water Use in the Coastal Zone: A New Law is Enacted in North Carolina,
W75-11575 6E

**WATER LEVEL FLUCTUATIONS**

Studies of Floodplain Vegetation and Water Level Fluctuation in the Kissimmee River Valley,
W75-11628 4A

**WATER LEVEL GAGES**

Great Lakes Water Levels, 1974, Daily and Monthly Average Water Surface Elevations.
W75-11554 2H

**WATER LEVELS**

Ground-Water Levels in Louisiana--For Wells Measured Through 1974.
W75-11499 7C

Predictive Modeling of Effects of the Planned Kindred Lake on Ground-Water Levels and Discharge, Southeastern North Dakota,
W75-11503 4A

Great Lakes Water Levels, 1974, Daily and Monthly Average Water Surface Elevations.
W75-11554 2H

**WATER LEVELS FLUCTUATION**

Great Lakes Water Levels, 1974, Daily and Monthly Average Water Surface Elevations.
W75-11554 2H

**WATER MANAGEMENT**

Flood Plain Information: Ley Creek, Salina and Dewitt Townships, Onondaga County, New York.
W75-11785 4A

**WATER MANAGEMENT (APPLIED)**

County Combats Urban Storm Water Runoff Problems,
W75-11390 5G

Water Quality Relationships in the Great Lakes: Analysis of a Survey Questionnaire,
W75-11549 5B

State Regulation of Coastal Water Area Preserves,
W75-11568 6E

Water Development in Management of Livestock and Wildlife on Mountain Wildlands,
W75-11804 3B

Effects of Water Management and Soil Aggregation on the Growth and Nutrient Uptake of Rice,
W75-11832 3F

Irrigation Management for Salt Control,
W75-11845 3C

**WATER MEASUREMENT**

Tracing Ocean Currents,
W75-11574 2E

**WATER POLICY**

The Management of Land and Water Use in the Coastal Zone: A New Law is Enacted in North Carolina,
W75-11575 6E

**WATER POLLUTION**

Regional Sewering and Groundwater Quality in the Southern San Joaquin Valley,
W75-11446 5D

A Topographic-Hydrogeologic Model for Solid Waste Landfill Siting,
W75-11644 5B

Water Resources Planning in Urban Areas,
W75-11769 5D

**WATER POLLUTION CONTROL**

Elimination of Water Surface Pollution.
W75-11416 5D

Method for Combatting Pollution Using a Chromium Complex,
W75-11506 5G

Legal Measures Concerning Marine Pollution.
W75-11551 5G

An Integrated Power Process Model of Water Use and Waste Water Treatment in Chlor-Alkali Production,
W75-11765 5D

**WATER POLLUTION EFFECTS**

Effects of Methylmercury Chloride on Rana Pipiens Tadpoles,
W75-11527 5C

Uptake, Distribution and Fate of 203 Hg-Ethylmercuric Chloride in the Guppy and the Coontail,
W75-11529 5C

**WATER POLLUTION SOURCES**

Sanitary and Bacteriological Evaluation of the Raw Material, Air and Wastewaters of Some Bast Fiber Plants in the Uzbek SSR, (In Russian),
W75-11406 5B

Sanitary and Hygienic Evaluation of Seepage Waters of Structures Protecting Reservoirs (In Russian),
W75-11412 5B

A Case of Subterranean Water Pollution Caused by the Public Refuse Disposal Ground (In Japanese),
W75-11432 5

Some Problems of the Circulation of Enteroviruses in Environmental Objects, (In Russian),
W75-11438 5

Selenium in Waters in and Adjacent to the Kendrick Project, Natrona County, Wyoming,
W75-11492 5

Natural and Accelerated Phosphate Mobility (In Dutch),
W75-11520 5

Report of Analyses for Industrial Waste Water in Twenty-Eight Factories, (In Japanese),
W75-11671 5

Distribution of Lignin in the Waters of Lorizan Inlet, as a Measurement of Contamination Due to Dumping of Ligninsulfonic Lye Resulting from Production of Cellulose Pulp (In Spanish),
W75-11678

Elimination of Hydrocarbons by Mussels,
W75-11760

The Growth of Posidonia and the Urban Pollution in the Gulf of Giens, (In French),
W75-11761

Studies of the Aromatic Compounds Content in Sea Water by Low-Temperature Luminescent Spectroscopy, (In Russian),
W75-11786 5A

ATER POLLUTION TREATMENT
Distribution of Lignin in the Waters of Lourizan Inlet, as a Measurement of Contamination Due to Dumping of Ligninsulfonic Lyes, Resulting from Production of Cellulose Pulp, (In Spanish),
W75-11678 5B

The Growth of Posidonia and the Urban Pollution in the Gulf of Giens, (In French),
W75-11761 5C

ATER PROCESSING PLANT
Water Processing Plant to Controlled Acidity Level,
W75-11421 5F

ATER PURIFICATION
Open Water Purification System,
W75-11419 5D

Domestic Water Purification Method and System,
W75-11427 5D

Horizontal Reactor for Polymsn. Sewage Oxdation Etc.,
W75-11518 5D

Advanced Treatment of Waste Water After Second Stage Treatment. Experimental Results at the Water Treatment Plant of Kawasaki City Gesui niji shorisui no kodo shori, Kawasakihi gesui shorijo ni okeru jikken hokoku).
W75-11664 5D

Distribution of Lignin in the Waters of Louizan Inlet, as a Measurement of Contamination Due to Dumping of Ligninsulfonic Lyes, Resulting from Production of Cellulose Pulp, (In Spanish),
W75-11678 5B

ATER QUALITY
Regional Sewering and Groundwater Quality in he Southern San Joaquin Valley,
W75-11446 5D

Transport Model, User's Manual,
W75-11468 5B

Water Quality Report: The Columbia River elow Longview, Washington, December 1971 November 1972,
W75-11472 5B

Quality of Surface Waters of the United States, 970: Part 1. North Atlantic Slope Basins.
W75-11479 7C

uality of Surface Waters of the United States, 970: Part 2. South Atlantic Slope and Eastern ulf of Mexico Basins.
W75-11480 7C

uality of Surface Waters of the United States, 968: Part 3. Ohio River Basin.
W75-11481 7C

uality of Surface Waters of the United States, 969: Part 6. Missouri River Basin.
W75-11482 7C

uality of Surface Waters of the United States, 970: Part 7. Lower Mississippi River Basin.
W75-11483 7C

Quality of Surface Waters of the United States, 1968: Part 8. Western Gulf of Mexico Basins.
W75-11484 7C

Quality of Surface Waters of the United States, 1970: Part II. Pacific Slope Basins in California.
W75-11485 7C

Ground-Water Data for Bolivar County, Mississippi,
W75-11496 7C

Water Quality Changes Related to the Development of Anaerobic Conditions During Artificial Recharge,
W75-11497 5B

Ground-Water Data in the Harrisburg - Halsey Area, Central Willamette Valley, Oregon,
W75-11498 7C

Sources of Water Quality, Lake Level, Ice, Water Temperature and Meteorological Data for the St. Lawrence Great Lakes,
W75-11567 2H

The Continuous Monitoring of Water Quality,
W75-11667 5A

Continuous Monitoring, Automated Analysis and Sampling Procedures, (Literature Review),
W75-11711 5A

Effects of Control Variables and Sludge Characteristics on the Performance of Dewatering and Thickening Devices,
W75-11723 5D

Pollution Detection and River Quality Management,
W75-11753 5A

Development Planning of Laguna de Bay--Philippines,
W75-11770 4A

WATER QUALITY CONTROL
Field Experience in Disinfecting Water Mains (In Russian),
W75-11411 5F

Water Quality Relationships in the Great Lakes: Analysis of a Survey Questionnaire,
W75-11549 5B

Revision of the Regulations 'Planning of Sanitary Protection Zones of a Central Water Supply System and Water Sources' (In Russian),
W75-11682 5G

On Taxation and Firms Choice of Waste Water Treatment Technology,
W75-11767 5G

Hygienic Evaluation of Spring Cappings Used on the Southern Shore of Crimea, (In Russian),
W75-11793 5G

WATER QUALITY STANDARDS
Proposed Standards: Land Disposal of Effluents,
W75-11400 5D

Report of Analyses for Industrial Waste Water in Twenty-Eight Factories, (In Japanese),
W75-11671 5A

Revision of the Regulations 'Planning of Sanitary Protection Zones of a Central Water Supply System and Water Sources' (In Russian),
W75-11682 5G

Tertiary Stage Added to Stratford Sewage Plant.
W75-11705 5D

WATER REQUIREMENTS
Water Harvesting for Livestock, Wildlife, and Domestic Use,
W75-11803 3B

WATER RESOURCES
Mercer County Surface Water Resources,
W75-11622 4A

Vermilion County Surface Water Resources,
W75-11623 4A

Lawrence County Surface Water Resources,
W75-11624 4A

De Kalb County Surface Water Resources,
W75-11625 4A

Water Resources Planning in Urban Areas,
W75-11769 5D

Planning for Resources-Environmental Conservation,
W75-11781 6B

Water Development in Management of Livestock and Wildlife on Mountain Wildlands,
W75-11804 3B

WATER RESOURCES DEVELOPMENT
Geohydrologic Reconnaissance of the Upper Potomac River Basin,
W75-11493 2F

Hydrology for Land-Use Planning: The Hillside Area, Anchorage, Alaska,
W75-11504 4A

Procedure for Selecting a Minimal Environmental Impact Routing for a Water Conveyance Canal,
W75-11764 6G

Cooperation in Water Resources Programs: Alaska's Example,
W75-11775 6B

Water Development in Management of Livestock and Wildlife on Mountain Wildlands,
W75-11804 3B

WATER REUSE
Watch That Water,
W75-11368 5D

Water Quality Changes Related to the Development of Anaerobic Conditions During Artificial Recharge,
W75-11497 5B

Waste Water Purification.
W75-11663 5D

Advanced Treatment of Waste Water After Second Stage Treatment. Experimental Results at the Water Treatment Plant of Kawasaki City (Gesui niji shorisui no kodo shori, Kawasakishi gesui shorijo ni okeru jikken hokoku).
W75-11664 5D

WATER SAMPLING
Hydrocarbons Associated with Suspended Particulate Matter in San Francisco Bay Waters,
W75-11614 5A

WATER SOFTENING
Sea Water Softening with the Lime-Magnesium Carbonate (LMC) Process,
W75-11699 5F

WATER SPREADING
Water Quality Changes Related to the Development of Anaerobic Conditions During Artificial Recharge,
W75-11497 5B

WATER STORAGE
Proceedings of the Water Harvesting Symposium, Phoenix, Arizona, March 26-28, 1974.
W75-11800 3B

Engineering Aspects of Water Harvesting Research at the University of Arizona,
W75-11802 3B

Water Harvesting for Livestock, Wildlife, and Domestic Use,
W75-11803 3B

Hydrologic Aspects of Water Harvesting in the Northern Great Plains,
W75-11811 2A

A Computer Model for Optimizing Design of Improved Catchment,
W75-11813 3B

Storage Systems for Harvested Water,
W75-11815 3B

WATER SUPPLY
Apparatus for Cleaning Loose Filtering Material in Slow Water Filled Water Supply Filters,
W75-11436 5F

The Continuous Monitoring of Water Quality,
W75-11667 5A

Balancing Reservoir--A Key Element in Water Supply Plan,
W75-11687 4A

Development Planning of Laguna de Bay--Philippines,
W75-11770 4A

Proceedings of the Water Harvesting Symposium, Phoenix, Arizona, March 26-28, 1974.
W75-11800 3B

Water Harvesting for Livestock in Western Australia,
W75-11801 3B

Bitumen, Oil, and Clay Surfaces on a Deep Sand to Increase Runoff from Catchments for Excavated Tanks in Western Australia,
W75-11805 3B

Design and Construction of Roaded Catchments,
W75-11810 3B

Hydrologic Aspects of Water Harvesting in the Northern Great Plains,
W75-11811 2A

A Computer Model for Optimizing Design of Improved Catchment,
W75-11813 3B

Sealing Leaking Excavated Tanks on Farms in Western Australia,
W75-11814 3B

Storage Systems for Harvested Water,
W75-11815 3B

The Design of Roaded Catchments for Maximum Runoff,
W75-11817 3B

Crop Production by Water Harvesting,
W75-11823 3B

Water Harvesting for Barley in a 30-CM Winter Rainfall Area,
W75-11825 3B

Multipurpose Salt Treated Water Harvesting System,
W75-11828 3B

Different Soil Treatments for Harvesting Water for Radish Production in the Mexico Valley,
W75-11829 3B

Uprating and Redesign of Water Treatment Plants, Part II,
W75-11849 5F

WATER TABLE
Response of Unconfined Aquifer Systems to Deep Percolation,
W75-11474 2F

WATER TABLE AQUIFERS
Well Pumping in Unconfined Aquifers: The Influence of the Unsaturated Zone,
W75-11631 4B

WATER TANKS
Sealing Leaking Excavated Tanks on Farms in Western Australia,
W75-11814 3B

Storage Systems for Harvested Water,
W75-11815 3B

WATER TEMPERATURE
Quality of Surface Waters of the United States, 1970: Part 1. North Atlantic Slope Basins.
W75-11479 7C

Quality of Surface Waters of the United States, 1970: Part 2. South Atlantic Slope and Eastern Gulf of Mexico Basins.
W75-11480 7C

Quality of Surface Waters of the United States, 1968: Part 3. Ohio River Basin.
W75-11481 7C

Quality of Surface Waters of the United States, 1969: Part 6. Missouri River Basin.
W75-11482 7C

Quality of Surface Waters of the United States, 1970: Part 7. Lower Mississippi River Basin.
W75-11483 7C

Quality of Surface Waters of the United States, 1968: Part 8. Western Gulf of Mexico Basins.
W75-11484 7C

Quality of Surface Waters of the United States, 1970: Part II. Pacific Slope Basins in California.
W75-11485 7C

The Influence of Temperature on the Biological Oxidation of Urban Waste Waters by Means of an Activated Sludge (Influenza Della Temperature Nella Ossidazion Biologica dei Liquami Urbani Mediante Fanghi Attivi),
W75-11745 5D

Elimination of Hydrocarbons by Mussels,
W75-11760 5C

WATER TREATMENT
Green Systems for Wastewater Treatment.
W75-11401 5D

Water Processing Plant to Controlled Acidity Level,
W75-11421 5F

Flotation Aerator for Aerating and Moving Water,
W75-11439 5D

Biological and Chemical Purification Plant.
W75-11660 5D

Means for and Method of Purifying Contaminated Water,
W75-11672 5D

Iron and Manganese Removal with Ozone, Part I,
W75-11693 5F

Innovative Water Plant Slated for New Jersey,
W75-11696 5F

Uprating and Redesign of Water Treatment Plants, Part II,
W75-11849 5F

WATER USERS
Forecasting Urban Water Use: Commercial Establishments,
W75-11795 6D

WATER UTILIZATION
Utilization of Water in a Semi-Arid Region,
W75-11356 3F

Water Quality Relationships in the Great Lakes: Analysis of a Survey Questionnaire,
W75-11549 5B

Optimizing Water Utilization Through Multiple Crops Scheduling,
W75-11587 3F

An Integrated Power Process Model of Water Use and Waste Water Treatment in Chlor-Alkali Production,
W75-11765 5D

WATER WELLS
Ground-Water Levels in Louisiana--For Wells Measured Through 1974.
W75-11499 7C

WATER YIELD
Ground-Water Data in the Harrisburg - Halsey Area, Central Willamette Valley, Oregon,
W75-11498 7C

Water Harvesting for Livestock in Western Australia,
W75-11801 3B

Design and Construction of Roaded Catchments,
W75-11810 3B

Desert Strip Farming--Computer Simulation of an Ancient Water Harvesting Technique,
W75-11812 3B

WATER YIELD IMPROVEMENT
Proceedings of the Water Harvesting Symposium, Phoenix, Arizona, March 26-28, 1974.
W75-11800 3B

Water Harvesting for Livestock in Western Australia,
W75-11801 3B

Bitumen, Oil, and Clay Surfaces on a Deep Sand to Increase Runoff from Catchments for Excavated Tanks in Western Australia,
W75-11805 3B

Soil Treatment with Silicones for Water Harvesting,
W75-11806 3B

Chemical Water Harvesting,
W75-11807 3B

Performance and Durability of Sheet Metal, Butyl Rubber, Asphalt Roofing and Bentonite for Harvesting Precipitation,
W75-11808 3B

Water Harvesting Catchments on Indian Lands in the Southwest,
W75-11809 3B

Design and Construction of Roaded Catchments,
W75-11810 3B

The Design of Roaded Catchments for Maximum Runoff,
W75-11817 3B

Water Harvesting by Runoff Inducement for Irrigation of an Almond Orchard in a Semiarid Climate,
W75-11818 3B

Field Evaluation of Microwatershed and Vertical Mulch Systems,
W75-11819 3B

An Analysis of the Efficiency of Microwatershed Systems,
W75-11820 3B

Using Paraffin and Polythylene to Harvest Water for Growing Shrubs,
W75-11821 3B

Precipitation Entrapment for Evaporation Suppression,
W75-11822 3B

Crop Production by Water Harvesting,
W75-11823 3B

Runoff Utilization for Grain Production,
W75-11824 3B

Water Harvesting for Barley in a 30-CM Winter Rainfall Area,
W75-11825 3B

Opportunity for Harvesting Water from and Along Highways in Rangeland Areas of Wyoming,
W75-11826 3B

Establishing Windbreaks in Semiarid Areas by Altering the Microclimate or Supplying Additional Water,
W75-11827 3B

Multipurpose Salt Treated Water Harvesting System,
W75-11828 3B

Different Soil Treatments for Harvesting Water for Radish Production in the Mexico Valley,
W75-11829 3B

**WATER ZONING**
Revision of the Regulations 'Planning of Sanitary Protection Zones of a Central Water Supply System and Water Sources' (In Russian),
W75-11682 5G

**WATERPROOFING**
Chemical Water Harvesting,
W75-11807 3B

**WATERSHED MANAGEMENT**
Soil Moisture Accounting Component of the USDAHL-74 Model of Watershed Hydrology,
W75-11656 2G

An Economic and Environmental Reconnaissance of the Possibilities for Small Watershed Development in Chenango County,
W75-11796 4D

**WATERSHEDS (BASINS)**
Proceedings of the Water Harvesting Symposium, Phoenix, Arizona, March 26-28, 1974.
W75-11800 3B

Water Harvesting for Livestock, Wildlife, and Domestic Use,
W75-11803 3B

Hydrologic Aspects of Water Harvesting in the Northern Great Plains,
W75-11811 2A

**WATERWAYS**
Closure Conditions Mouth of the Russian River,
W75-11454 2L

**WAVE EQUATIONS**
Water Hammer in Coaxial Pipe Systems,
W75-11460 8B

**WAVE PROPAGATION**
Experimental Study of Wave Transimission,
W75-11773 8B

**WAVE RUNUP**
Experimental Study of Wave Transimission,
W75-11773 8B

**WAVES (WATER)**
Velocities Above Rough Bed in Oscillatory Flow,
W75-11763 8B

Experimental Study of Wave Transimission,
W75-11773 8B

Wave Energy Transfer Mechanisms in Wind-Wave Tunnels,
W75-11774 8B

**WAX**
Using Paraffin and Polythylene to Harvest Water for Growing Shrubs,
W75-11821 3B

**WEATHER FORECASTING**
A Federal Plan for Natural Disaster Warning and Preparedness, First Supplement FY 1976 - 1980.
W75-11553 2B

A Satellite Classification Technique for Subtropical Cyclones,
W75-11562 2B

Tropical Cyclone Intensity Analysis and Forecasting from Satellite Imagery,
W75-11577 2B

**WEATHER MODIFICATION**
A Federal Plan for Natural Disaster Warning and Preparedness, First Supplement FY 1976 - 1980.
W75-11553 2B

**WELL DATA**
Ground-Water Levels in Louisiana--For Wells Measured Through 1974.
W75-11499 7C

**WELL YIELD**
Determining Optimal Well Discharge,
W75-11768 4B

**WELLS**
Determining Optimal Well Discharge,
W75-11768 4B

**WEST INDIES**
Further Studies on the Origin of Hurricanes,
W75-11559 2B

**WESTERN GULF OF MEXICO BASINS**
Surface Water Supply of the United States, 1966-70: Part 8. Western Gulf of Mexico Basins--Volume 2. Basins from Lavaca River to Rio Grande.
W75-11487 7C

**WET AIR CATALYTIC OXIDATION**
A Design and Economic Evaluation of Wet-Air and Catalytic Oxidation of Sewage Sludge,
W75-11784 5D

**WET AIR OXIDATION**
Waste Water Purification.
W75-11663 5D

**WETLANDS**
Wetlands - Related Legislation in the United States,
W75-11550 6E

**WHATCOM COUNTY (WASH)**
A Geomorphic Shoreline Inventory with Management Considerations for Whatcom County, Washington,
W75-11455 2L

**WHEAT**
Salt Tolerance of Mexican Wheat: II. Relation to Variable Sodium Chloride and Length of Growing Season,
W75-11603 3C

**WHITE FIR TREES**
Diurnal Patterns of Water Potential in Abies Concolor and Pinus Ponderosa,
W75-11382 2I

**WILDLIFE HABITATS**
Habitat Heterogeneity and Avian Community Structure in North American Grasslands,
W75-11425 2I

**WIND TIDES**
Storm Tide Frequency Analysis for the Coast of North Carolina, South of Cape Lookout,
W75-11560 2B

Storm Tide Frequency Analysis for the Coast of Puerto Rico,
W75-11561 2A

**WIND-WAVE TUNNELS**
Wave Energy Transfer Mechanisms in Wind-Wave Tunnels,
W75-11774 8B

**WISCONSIN**
The Coasts of Wisconsin,
W75-11569 2H

**WYOMING**
Selenium in Waters in and Adjacent to the Kendrick Project, Natrona County, Wyoming,
W75-11492 5B

Opportunity for Harvesting Water from and Along Highways in Rangeland Areas of Wyoming,
W75-11826 3B

**X-RAY DIFFRACTION**
The Crystal and Molecular Structure of Selected Pesticidal Water Pollutants,
W75-11351 5A

Physicochemical Properties of Dredge Spoil,
W75-11465 5B

**XEROPHYTES**
Transpiration of Some Oreoxerophytes of the Central Caucasus, (In Georgian),
W75-11442 2D

**ZEOLITES**
Ammonia Removal from Municipal Wastewaters by Ion Exchange,
W75-11405 5D

**ZINC**
Barnacles: Possible Indicators of Zinc Pollution,
W75-11611 5B

Kinetics of the Fluorination of Zinc,
W75-11629 5A

Copper and Zinc in Cancer Irroratus: Comparative Metabolism of the Molt Cycle, le Cuivre et le Zinc Chez Cancer Irroratus (Crustace:Decapode): Metabolisme Compare au Cours du Cycle D'intermue,
W75-11752 5C

**ZINC FLUORIDE**
Kinetics of the Fluorination of Zinc,
W75-11629 5A

**ZONING**
Proceedings of Alabama Coastal Leaders Conference on Coastal Zone Management.
W75-11555 6E

# AUTHOR INDEX


**.REFJORD, F.**
Oligochaetes in the Bottom Fauna and Stomach Content of Trout, Salmo Trutta (L.),
W75-11385 2H

**BROL, I. P.**
Performance of Rice Varieties in a Highly Saline Sodic Soil as Influenced by Plant Population,
W75-11838 3C

**CHUTHAN, K.**
Man on the Hydrologic Cycle,
W75-11776 2A

**DAMS, J. M.**
Improved Application of Geophysics to Groundwater Resource Inventories in Glaciated Terrains,
W75-11355 2F

**DLER, M. S.**
Gypsum Solubility and Scaling Limits in Saline Waters,
W75-11473 3A

**ELSTROM, S. W.**
Transport Model, User's Manual,
W75-11468 5B

**FUJA, L. R.**
Unsaturated Hydraulic Conductivity from Cumulative Inflow Data,
W75-11593 2G

**GDON, E. F.**
Using Paraffin and Polythylene to Harvest Water for Growing Shrubs,
W75-11821 3B

**GLEN, B. L.**
Procedure for Selecting a Minimal Environmental Impact Routing for a Water Conveyance Canal,
W75-11764 6G

**GLEN, S. E.**
Rice Response to Nitrogen and Phosphorus in Flooded and Nonflooded Soils,
W75-11597 3F

**GVAREZ, R.**
Submicrogram Per Gram Concentrations of Mercury in Orchard Leaves Determined by Isotope Dilution and Spark-Source Mass Spectrometry,
W75-11581 5A

**HAR, A. C.**
Theory of Ground-Water Recharge for a Strip Basin,
W75-11646 2F

**HAYA, M. G.**
Different Soil Treatments for Harvesting Water for Radish Production in the Mexico Valley,
W75-11829 3B

**NDERSON, L. K.**
Advanced Wastewater Treatment Plant with Designed-In Reliability,
W75-11700 5D

**NDERSON, M. G.**
Demodulation of Stream-Flow Series,
W75-11449 2E

**NDREW, R. H.**
Variation in Effectiveness of Supplemental Irrigation on Sweet Corn Yield Components,
W75-11844 3F

**APPLEGATE, C. H.**
Land Spreading Effluent from a Secondary Facility,
W75-11365 5D

**ARMENTANO, T. V.**
Sedimentation Rates in a Long Island Marsh Determined by PB210 Dating,
W75-11643 2L

**ARNOT, N. D. JR.**
Domestic Sewage System,
W75-11509 5D

**ARTYKOV, M. S.**
Sanitary and Bacteriological Evaluation of the Raw Material, Air and Wastewaters of Some Bast Fiber Plants in the Uzbek SSR, (In Russian),
W75-11406 5B

Sanitary-Virological Study of the Effectiveness of Decontamination of Waste Waters on Irrigated Farm Yields, (In Russian),
W75-11674 5B

**ASADA, Y.**
Report of Analyses for Industrial Waste Water in Twenty-Eight Factories, (In Japanese),
W75-11671 5A

**ASMUS, D.**
Providing Suburban Sewerage Despite Environmental and Construction Problems,
W75-11657 5D

**ASSEL, R. A.**
Great Lakes Ice Cover, Winter 1973-74,
W75-11572 2C

**AUDSLEY, G. L.**
Cooperation in Water Resources Programs: Alaska's Example,
W75-11775 6B

**BABB, A. F.**
Hydraulic Model Studies of a Second Powerhouse at Rock Island Hydroelectric Project,
W75-11466 8B

Hydraulic Model Studies of a Second Powerhouse at Rock Island Hydroelectric Project, Cofferdam Tests,
W75-11467 8B

**BACA, R. G.**
Transport Model, User's Manual,
W75-11468 5B

**BALFE, M.**
Analysis of International Great Lakes Shipping and Hinterland,
W75-11576 6C

**BALL, J. W.**
Cavitation in Butterfly Valves,
W75-11777 8B

**BARKER, J. E.**
Diurnal Patterns of Water Potential in Abies Concolor and Pinus Ponderosa,
W75-11382 2I

**BARNETT, N. S.**
Application of a Generalisation of Wald's Identity to Solving Certain Multi-Stream Storage Problems,
W75-11649 4A

**BARNWELL, W. W.**
Hydrology for Land-Use Planning: The Hillside Area, Anchorage, Alaska,
W75-11504 4A

**BARRETT, B.**
An Inventory and Study of the Vermilion Bay-Atchafalaya Bay Complex; Area Description, Biology, Hydrology and Chemistry, and Sedimentology,
W75-11571 2L

**BARTH, E. F.**
EPA Experiences in Oxygen-Activated Sludge,
W75-11738 5D

**BARTHOLOMEW, W. V.**
Relation Between Nitrate Absorption and Water Transpiration by Corn,
W75-11602 3F

**BARTLEY, T. R.**
Environmental Aspects of Aquatic Plant Control,
W75-11843 5G

**BASSETT, R. L.**
Water Quality Changes Related to the Development of Anaerobic Conditions During Artificial Recharge,
W75-11497 5B

**BASTGEN, W.**
Incinerator Device and a Method of Processing Residuals in Waste Water, Liquefied Sewage and Sludge,
W75-11440 5D

**BECK, W. H.**
Water Harvesting Catchments on Indian Lands in the Southwest,
W75-11809 3B

**BEETON, A. M.**
Sources of Water Quality, Lake Level, Ice, Water Temperature and Meteorological Data for the St. Lawrence Great Lakes,
W75-11567 2H

**BELISLE, A. A.**
The Brown Pelican and Certain Environmental Pollutants in Louisiana,
W75-11757 5A

**BELZ, R. J.**
Use of Oxidized Cationic Starch in Flocculation and Dewatering of Municipal Sludge,
W75-11420 5D

**BENNET, R. S.**
Development of Salinity Control Technology in Grand Valley,
W75-11585 5G

**BERGE, W. F.**
Organochlorine Compounds in Several Marine Organisms from the North Sea and the Dutch Wadden Sea,
W75-11608 5B

**BERISFORD, C. W.**
The Ecology of the Cumberland Island National Seashore Camden County, Georgia,
W75-11546 2L

**BERKES, F.**
Mercury Levels in Fish in the La Grande River Area, Northern Quebec,
W75-11756 5A

**BERNAL, C. T.**
Salt Tolerance of Mexican Wheat: II. Relation to Variable Sodium Chloride and Length of Growing Season,
W75-11603 3C

**BERNSTEIN, L.**
Irrigation Management for Salt Control,
W75-11845 3C

**BESSEY, R. F.**
Planning for Resources-Environmental Conservation,
W75-11781 6B

**BEST, G. A.**
The Continuous Monitoring of Water Quality,
W75-11667 5A

**BETZ, J. V.**
Proposed Standards: Land Disposal of Effluents,
W75-11400 5D

**BETZER, S. B.**
Copper Uptake and Excretion by Busycon Canaliculatum L.,
W75-11755 5C

**BHUMBLA, D. R.**
Performance of Rice Varieties in a Highly Saline Sodic Soil as Influenced by Plant Population,
W75-11838 3C

**BIECHLER, F-J.**
Method for Combatting Pollution Using a Chromium Complex,
W75-11506 5G

**BIGGAR, J. W.**
Nitrification and Denitrification During Miscible Displacement in Unsaturated Soil,
W75-11596 3F

**BILBRO, J. D.**
Effect of Preplant-Only Irrigation on Cotton Yields,
W75-11842 3F

**BINGHAM, F. T.**
Salt Tolerance of Mexican Wheat: II. Relation to Variable Sodium Chloride and Length of Growing Season,
W75-11603 3C

**BISH, R. L.**
Coastal Resource Use: Decisions on Puget Sound,
W75-11573 6B

**BISHOP, P. L.**
Aerobic Digestion of Wastewater Sludge Under Low Temperature Conditions,
W75-11709 5D

**BLACK, S. A.**
Overview of Canadian Sludge Handling and Land Disposal Practices and Research,
W75-11716 5D

**BLAD, B. L.**
Evapotranspiration by Subirrigated Alfalfa and Pasture in the East Central Great Plains,
W75-11841 3F

**BLUM, U.**
Is the Malachite Green Broth According to Habs and Kirchner Suitable for Serving as an Isolation Medium for Pseudomonas Aeruginosa from Water, (In German),
W75-11435 5B

**BLUS, L. J.**
The Brown Pelican and Certain Environmental Pollutants in Louisiana,
W75-11757 5A

**BOEHM, P. D.**
The Solubility Behaviour of No. 2 Fuel Oil in Sea Water,
W75-11565 5B

**BOHNE, A. R.**
Cellular Snow Generation--A Doppler Radar Study,
W75-11634 2B

**BOLE, J. B.**
Wave Energy Transfer Mechanisms in Wind-Wave Tunnels,
W75-11774 8B

**BOLES, G.**
Land Use and Environmental Planning: An Application in the South Carolina Coastal Zone,
W75-11766 6G

**BOLLA, M.**
The Influence of Temperature on the Biological Oxidation of Urban Waste Waters by Means of an Activated Sludge (Influenza Della Temperature Nella Ossidazion Biologica dei Liquami Urbani Mediante Fanghi Attivi),
W75-11745 5D

**BOLTO, B. A.**
Sidrotherm Desalination,
W75-11707 5D

**BORDOVSKY, D. G.**
Choice of Irrigation Timing Indicator for Narrow Row Cotton,
W75-11840 3F

**BORGSTROM, R.**
Oligochaetes in the Bottom Fauna and Stomach Content of Trout, Salmo Trutta (L.),
W75-11385 2H

**BOSJE, J.**
Purifying Plant for Sewage,
W75-11673 5D

**BOTHAM, L. H.**
Urban Drainage and Flood Control Projects. Economic, Legal and Financial Aspects,
W75-11352 6B

**BOVEE, H. H.**
Lead and Arsenic Levels of Dairy Cattle in Proximity to a Copper Smelter,
W75-11544 5A

**BOYKO, B. I.**
Aerobic and Anaerobic Sludge Digestion,
W75-11719 5D

**BOZEMAN, J. R.**
The Ecology of the Cumberland Island National Seashore Camden County, Georgia,
W75-11 546 2L

**BRENT, A.**
Sewage Disposal Process,
W75-11522 5D

**BREZONIK, P. L.**
Continuous Monitoring, Automated Analysis and Sampling Procedures, (Literature Review),
W75-11711 5A

**BRIMBERG, J.**
Analysis of Plunging Phenomena in Water Reservoirs,
W75-11655 4A

**BROADBENT, F. E.**
A Comparison of 15N Depleted and 15N-Enriched Fertilizers as Tracers,
W75-11591 3F

**BROSZ, D. D.**
Comparing Trickle, Subsurface and Sprinkler Irrigation Systems,
W75-11589 3F

**BROWN, H. P.**
Lawrence County Surface Water Resources,
W75-11624 4A

**BROWN, L. A.**
Improved Application of Geophysics to Groundwater Resource Inventories in Glaciated Terrains,
W75-11355 2F

**BROWN, L. R.**
The Estimation of the Amount of Empire Mix Crude Oil in Mullet, Shrimp, and Oysters by Liquid Chromatography,
W75-11613 5A

**BRUCH, J. C. JR.**
Solution of a Free-Surface Boundary Value Problem Using an Inverse Formulation and the Finite Element Method,
W75-11447 2F

**BRUCKER, C.**
Novel Waste Treatment Variation Shows Great Promise,
W75-11702 5D

**BRUMMETT, K. L.**
Vermilion County Surface Water Resources,
W75-11623 4A

**BRUSH, L. M. JR.**
Turbulent Entrainment Across Stable Density Step Structures,
W75-11451 2J

**BRYANT, D. N.**
Disposal of Chemical Sewage Sludges on Land and Their Effects on Plants, Leachate and Soil Systems,
W75-11721 5E

**BUBEN, M.**
Influence of Lead on Calcium and Strontium Transfer Through the Duodenal Wall in Rats,
W75-11523 5C

**BUCKS, D. A.**
Quantity and Frequency of Trickle and Furrow Irrigation for Efficient Cabbage Production,
W75-11839 3F

**BUGLER, T. W. III**
Scale Effects on Cooling Tower Model Studies,
W75-11470 8B

**BUKOVSKAYA, S. N.**
Evaluation of the Quality of Surface Water for Developing Recommendations of Nonspecific Prophylaxis of Intestinal Infections, (In Russian),
W75-11512 5C

**BULKLEY, J. W.**
Water Quality Relationships in the Great Lakes: Analysis of a Survey Questionnaire,
W75-11549 5E

**BUNDGAARD-NIELSEN, M.**
On Taxation and Firms Choice of Waste Water Treatment Technology,
W75-11767 5C

NJES, J. H.
entrifugal Pump for Processing Liquids Containing Abrasive Constitutents, More Particularly, a Sand Pump of a Wastewater Pumper,
W75-11679 5D

RAU, R. G.
Kinetic and Equilibrium Studies of Boron Desorption from Soil,
W75-11600 2G

RDASS, W. J.
Water Harvesting for Livestock in Western Australia,
W75-11801 3B

RGI, P. H.
Hydraulic Design of Vertical Stilling Wells,
W75-11650 8B

RMANN, W.
Water Hammer in Coaxial Pipe Systems,
W75-11460 8B

RRIER, C. D.
ewer Branch Saddle Connector,
W75-11677 8C

RWELL, R. E.
utrient Transport in Surface Runoff as Influenced by Soil Cover and Seasonal Periods,
W75-11641 5B

RNE, A. R.
he Occurrence of Mercury in Amphibia,
W75-11534 5A

LLOWAY, J. A.
n Integrated Power Process Model of Water se and Waste Water Treatment in Chlor-Alali Production,
W75-11765 5D

MPBELL, H.
ffects of Control Variables and Sludge haracteristics on the Performance of Deatering and Thickening Devices,
W75-11723 5D

MPBELL, R. J.
eans for and Method of Purifying Conminated Water,
W75-11672 5D

NALE, R. P.
Food Web Model for Lake Michigan Part 2-odel Formulation and Preliminary Verification,
W75-11547 5C

RBONE, R. E.
ellular Snow Generation--A Doppler Radar udy,
W75-11634 2B

TER, C. E.
gricultural Drainage Research Needs and Priities, 1974,
W75-11632 4A

NETIC, J.
ie Behaviour of Metal tramethylenedithiocarbamates in the Graite-Tube Furnace for Atomic Absorption ectrometry,
W75-11797 5A

N, D. T. L.
bmerged Buoyant Jets in Quiescent Fluids,
W75-11461 8B

CHANCELLOR, W. J.
Simulation of Crop Resonse to Energy Inputs,
W75-11588 3F

CHANDRA, S.
Axisymmetric Seepage Flow Through Semi-Infinite Porous Media,
W75-11633 2F

CHANG, L. W.
Effects of Methylmercury Chloride on Rana Pipiens Tadpoles,
W75-11527 5C

CHATFIELD, J. E.
Liquid Treatment Plant and Process Particularly for Waste Water,
W75-11441 5D

CHAU, Y. K.
Determination of the Apparent Complexing Capacity of Lake Waters,
W75-11538 5B

CHAWLA, A. S.
Analysis of Canal Seepage to Interceptor Drain,
W75-11846 8A

CHAWLA, V. K.
Disposal of Chemical Sewage Sludges on Land and Their Effects on Plants, Leachate and Soil Systems,
W75-11721 5E

CHECKOVICH, A.
Sea Water Softening with the Lime-Magnesium Carbonate (LMC) Process,
W75-11699 5F

CHEER, C. J.
The Crystal and Molecular Structure of Selected Pesticidal Water Pollutants,
W75-11351 5A

CHERKINSKII, S. N.
Revision of the Regulations 'Planning of Sanitary Protection Zones of a Central Water Supply System and Water Sources' (In Russian),
W75-11682 5G

CHEW, K.
The Determination of Cadmium in Sea Water by Radioactivation,
W75-11798 5A

CHIANG, S. L.
Prediction of Flood Volume from Small Humid Region Watersheds,
W75-11462 4A

CHIARELLA, J. V.
Water Harvesting Catchments on Indian Lands in the Southwest,
W75-11809 3B

CHORITZ, E. L.
Package Plants: The Contractor's Point of View,
W75-11689 5D

CHOWDHRY, N. A.
Domestic Sewage Treatment by Underdrained Filter Systems,
W75-11751 5D

CHRISTENSEN, D. R.
Thickening of Unwanted Spent Lime Rejects,
W75-11848 5D

CHURCHILL, P. S.
Up-Rating Hydraulically Overloaded Sedimentation Tanks by Inclined Plates,
W75-11695 5D

CIKRT, M.
Biliary Excretion of Phenyl and Methyl Mercury Chlorides and Their Enterohepatic Circulation in Rats,
W75-11525 5C

CLAPP, C. E.
Use of Sewage Sludge in Agriculture with Adequate Environmental Safeguards,
W75-11718 5D

CLARK, J. H.
Sewer Branch Saddle Connector,
W75-11677 8C

CLUFF, C. B.
Engineering Aspects of Water Harvesting Research at the University of Arizona,
W75-11802 3B

COHEN, J. M.
Metal Removal by Physical and Chemical Treatment Processes,
W75-11542 5D

COIGN, M. J.
The Estimation of the Amount of Empire Mix Crude Oil in Mullet, Shrimp, and Oysters by Liquid Chromatography,
W75-11613 5A

COLBAUGH, J. E.
Thermophilic Digestion at the Hyperion Treatment Plant,
W75-11690 5D

COMMONER, B.
A Steady-State Model of Isotopic Fractionation Accompanying Nitrogen Transformations in Soil,
W75-11831 5B

CONDON, F. J.
Storm and Combined Sewer Abatement Technology in the United States--An Overview,
W75-11414 5D

CONLON, J. F.
The Casco Bay Oil Spill: Problems of Cleanup and Disposal,
W75-11615 5G

COOGAN, J. D.
Desalination,
W75-11675 3A

COOK, G.
Watch That Water,
W75-11368 5D

COOLEY, K. R.
Evaporation Suppression for Conserving Water Supplies,
W75-11816 3B

CRABBE, A. D.
Sediment Transport Theories: A Review,
W75-11453 2J

CRAMER, R. A. JR.
Flotation Aerator for Aerating and Moving Water,
W75-11439 5D

CRISP, D. J.
Barnacles: Possible Indicators of Zinc Pollution,
W75-11611 5B

CRIST, M. A.
Selenium in Waters in and Adjacent to the Kendrick Project, Natrona County, Wyoming,
W75-11492 5B

CRONAN, D. S.
Chemical Composition of Aegean Sea Sediments,
W75-11533 2J

CROWLEY, D. A.
Wetlands - Related Legislation in the United States,
W75-11550 6E

CUMMANS, J. E.
Low-Flow Characteristics of Streams in the Grays Harbor Drainages, Washington,
W75-11502 2E

DAGAN, G.
Well Pumping in Unconfined Aquifers: The Influence of the Unsaturated Zone,
W75-11631 4B

DAHM, D. B.
Separation of Emulsified Oil from Water,
W75-11360 5D

DALAL, R. C.
Comparative Efficiency of Soluble and Controlled-Release Sulfur-Coated Urea Nitrogen for Corn in Tropics,
W75-11601 3F

DALSIN, G. J.
Ground-Water Data for Bolivar County, Mississippi,
W75-11496 7C

DANIEL, DONNIE L.
Natural and Artificial Reefs in Mississippi Coastal Waters: Sport Fishing Pressure and Economic Considerations,
W75-11558 6B

DARGAN, K. S.
Performance of Rice Varieties in a Highly Saline Sodic Soil as Influenced by Plant Population,
W75-11838 3C

DAVIS, J. C.
Fish Toxicants in Kraft Effluents,
W75-11358 5C

DAY, R. O.
Iron and Manganese Removal with Ozone, Part I,
W75-11693 5F

DAYAN, N.
On the Collection Efficiency of Water Droplets Under the Influence of Electric Forces, I: Experimental, Charge-Multipole Effects,
W75-11639 2B

DEARBORN, L. L.
Hydrology for Land-Use Planning: The Hillside Area, Anchorage, Alaska,
W75-11504 4A

DEBO, T. N.
Role of Computer Simulation in Administering an Urban Drainage Ordinance,
W75-11669 6E

DEDRICK, A. R.
Storage Systems for Harvested Water,
W75-11815 3B

DEE, N.
Land Use and Environmental Planning: An Application in the South Carolina Coastal Zone,
W75-11766 6G

DEJONG, R. L. A.
Chemical Water Harvesting,
W75-11807 3B

DELLEUR, J. W.
Models of the Stochastic and Chronologic Structure, Prediction and Simulation of Runoff Sequences - Application to the Lower Ohio Basin,
W75-11783 2E

DEMIER, W. V.
Variable Thickness Transient Groundwater Flow Model User's Manual,
W75-11469 2F

DENISOV, M. A.
Acceleration of Biochemical Treatment of Wastewater in Petroleum Refineries,
W75-11371 5D

DEPALMA, L. M.
A Food Web Model for Lake Michigan Part 2-Model Formulation and Preliminary Verification,
W75-11547 5C

DICKERSON, J. D.
Establishing Windbreaks in Semiarid Areas by Altering the Microclimate or Supplying Additional Water,
W75-11827 3B

DINI, G.
The Influence of Temperature on the Biological Oxidation of Urban Waste Waters by Means of an Activated Sludge (Influenza Della Temperature Nella Ossidazion Biologica dei Liquami Urbani Mediante Fanghi Attivi),
W75-11745 5D

DIOSADY, L. L.
Recycling of Incinerator Ash,
W75-11714 5D

DIRKSEN, C.
Field Test of Soil Water Flux Meters,
W75-11586 2G

DISALVO, L. H.
Hydrocarbons Associated with Suspended Particulate Matter in San Francisco Bay Waters,
W75-11614 5A

DMITRIEVA, E. N.
Spawning Grounds of the European Walleye Lucioperca Lucioperca L. and Volga Walleye Lucioperca Volgensis (Gmelin) in the Ural River (In Russian),
W75-11668 2I

DOE, P. W.
Innovative Water Plant Slated for New Jersey,
W75-11696 5F

DOKIYA, Y.
Loss of Trace Elements from Natural Water During Storage. I. Behavior of 203 Hg and 65 Zn Added to Pond Water,
W75-11543 5A

DOLEZAL, J.
Atomic-Absorption Spectrometric Determination of Cadmium, Lead, and Zinc in Salts or Salt Solutions by Hanging Mercury Drop Electrodeposition and Atomization in a Graphite Furnace,
W75-11536 5A

DONALDSON, E. C.
Subsurface Waste Injection in the United States: Fifteen Case Histories,
W75-11627 5D

DONNAN, W. W.
Agricultural Drainage Research Needs and Priorities, 1974,
W75-11632 4A

DOSS, B. D.
Comparison of Fog Irrigation with Surface Irrigation in Corn Production,
W75-11837 3F

DOUGHERTY, J. P.
Evaporation Data in Texas,
W75-11630 7C

DOWDY, R. H.
Use of Sewage Sludge in Agriculture with Adequate Environmental Safeguards,
W75-11718 5D

DOWNEY, J. S.
Predictive Modeling of Effects of the Planned Kindred Lake on Ground-Water Levels and Discharge, Southeastern North Dakota,
W75-11503 4A

DREBES, H.
Vacuum System for Sewage Discharge in Krempel (District of Dithmarschen)-Experience with a New Kind of Sewerage (Vakuumentwaesserung Krempel/Dithmarschen- Erfahrungsbericht Ueber Eine Neuartige Kanalisation),
W75-11383 5D

DUDLEY, A. W. JR.
Effects of Methylmercury Chloride on Rana Pipiens Tadpoles,
W75-11527 5C

DUFFY, J.
A Steady-State Model of Isotopic Fractionation Accompanying Nitrogen Transformations in Soil,
W75-11831 5B

DUNKLE, C. G.
Coagulant Recovery Takes Planning,
W75-11665 5D

DUTT, G. R.
Multipurpose Salt Treated Water Harvesting System,
W75-11828 3B

DUXBURY, A.
Tracing Ocean Currents,
W75-11574 2E

DVORAK, V. F.
Tropical Cyclone Intensity Analysis and Forecasting from Satellite Imagery,
W75-11577 2B

EDWARDS, R. N. E.
Sewage Oxidation Treatment Apparatus,
W75-11395 5D

EIDAM, C. L.
The Casco Bay Oil Spill: Problems of Cleanup and Disposal,
W75-11615 5G

EKEDAHL, G.
Interlaboratory Study of Methods for Chemical Analysis of Water,
W75-11409 5A

-SWAIFY, S. A.
Predicting Exchangeable Sodium Ratios in Irrigated Tropical Vertisols,
W75-11595 3C

ORANTA, V.
Influence of Some Biocides Employed in the Wood-Processing Industry on Growth of Green Algae,
W75-11605 5C

SAWY, E. M.
Boundary Shear in Channel with Flood Plain,
W75-11463 8B

WELL, H. A.
Parameters for Estimating Annual Runoff and Soil Loss from Agricultural Lands in Rhodesia,
W75-11830 4A

FIELD, C. G.
Rate of Phosphorus Sorption by Five Oklahoma Soils,
W75-11836 3F

GLAND, C. B.
Soil Moisture Accounting Component of the USDAHL-74 Model of Watershed Hydrology,
W75-11656 2G

IE, L. J.
Quantity and Frequency of Trickle and Furrow Irrigation for Efficient Cabbage Production,
W75-11839 3F

ANS, C. E.
Opportunity for Harvesting Water from and Along Highways in Rangeland Areas of Wyoming,
W75-11826 3B

ART, C. J.
Floods in the Waiahole-Waikane Area, Oahu, Hawaii,
W75-11495 2E

RBOURN, M. L.
ield Evaluation of Microwatershed and Vertical Mulch Systems,
75-11819 3B

NG, S. C.
ptake, Distribution and Fate of 203 Hg-Ethylercuric Chloride in the Guppy and the Coonil,
75-11529 5C

GMEIER, D. D.
rop Production by Water Harvesting,
75-11823 3B

RELL, D. A.
etermining Effective Soil Water Diffusivities om One-Step Outflow Experiments,
75-11592 2G

RELL, J. B.
esign Information on Dewatering Properties Wastewater Sludges,
75-11722 5D

udges Generated in Phosphate Removal ocesses,
75-11737 5D

eatment and Disposal of Sludge from Mucipal Wastewater Plants in the United States,
75-11735 5D

FEKETE, S.
Instrumental Investigation of Biological Waste Water Treatment (A szennyvisek biologiai tisztitasanak muszeres vizsgalata),
W75-11407 5D

FERNANDEZ DEL RIEGO, ANTONIO
Distribution of Lignin in the Waters of Lourizan Inlet, as a Measurement of Contamination Due to Dumping of Ligninsulfonic Lyes, Resulting from Production of Cellulose Pulp, (In Spanish),
W75-11678 5B

FIELD, R.
Urban Runoff and Combined Sewer Overflow, (Literature Review),
W75-11710 5D

FINGER, R. E.
An Automated Spectrophotometric Suspended Solids Analysis for Activated Sludge,
W75-11408 5D

FISHBECK, A. G.
A Design and Economic Evaluation of Wet-Air and Catalytic Oxidation of Sewage Sludge,
W75-11784 5D

FISHER, R. E.
Lawrence County Surface Water Resources,
W75-11624 4A

FITZPATRICK, E. V.
The Casco Bay Oil Spill: Problems of Cleanup and Disposal,
W75-11615 5G

FLEGAL, A. R.
High Copper Concentrations in Squid Livers in Association with Elevated Levels of Silver, Cadmium and Zinc,
W75-11609 5C

FLEJSHER, L. F.
Spectrophotometric Determination of Fluorine in Water, (In Russian).
W75-11433 5A

FOSSATO, V. U.
Elimination of Hydrocarbons by Mussels,
W75-11760 5C

FOSTER, E. P.
Sewage Disposal System,
W75-11511 5D

FOSTER, P.
Barnacles: Possible Indicators of Zinc Pollution,
W75-11611 5B

Geochemistry of Surface Sediments in an Acid Stream Estuary,
W75-11531 2J

FOWLIE, P. J. A.
Aspects of Incinerating Chemical Sludges,
W75-11728 5D

FRANK, F. J.
Ground-Water Data in the Harrisburg - Halsey Area, Central Willamette Valley, Oregon,
W75-11498 7C

FRASIER, G.
Water Harvesting for Livestock, Wildlife, and Domestic Use,
W75-11803 3B

FREEMAN, T. G.
Cooperation in Water Resources Programs: Alaska's Example,
W75-11775 6B

FREEMAN, W. C.
City, Industry Face Pollution Abatement Together,
W75-11366 5D

FREESE, L. B.
Balancing Reservoir--A Key Element in Water Supply Plan,
W75-11687 4A

FRENCH, O. F.
Quantity and Frequency of Trickle and Furrow Irrigation for Efficient Cabbage Production,
W75-11839 3F

FRITH, J. L.
A Computer Model for Optimizing Design of Improved Catchment,
W75-11813 3B

Design and Construction of Roaded Catchments,
W75-11810 3B

FUEHRING, H. D.
Utilization of Water in a Semi-Arid Region,
W75-11356 3F

FUJII, H.
Combined Treatment of Municipal and Industrial Wastewater,
W75-11733 5D

FUJII, T.
Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant-Activated Sludge Treatment, Lime Treatment and Activated Carbon Treatment, (In Japanese),
W75-11362 5D

FUJINAGA, T.
Detector of Trace Substance in Water,
W75-11388 5A

FULTON, R. L.
Water Resources Planning in Urban Areas,
W75-11769 5D

FURGASON, R. R.
Iron and Manganese Removal with Ozone, Part I,
W75-11693 5F

FURUSE, M.
Waste Water Treatment System With An Ozone Generator,
W75-11426 5D

FUWA, K.
Loss of Trace Elements from Natural Water During Storage. I. Behavior of 203 Hg and 65 Zn Added to Pond Water,
W75-11543 5A

GACHTER, R.
Determination of the Apparent Complexing Capacity of Lake Waters,
W75-11538 5B

GALE, T. F.
Embryopathic Effects of Different Routes of Administration of Mercuric Acetate in the Hamster,
W75-11524 5C

**GALLILY, I.**
On the Collection Efficiency of Water Droplets Under the Influence of Electric Forces, I: Experimental, ChargeMultipole Effects,
W75-11639 2B

**GANGSTAD, E. O.**
Environmental Aspects of Aquatic Plant Control,
W75-11843 5G

**GARBER, W. F.**
Energy-Wastewater Treatment and Solids Disposal,
W75-11697 5D

Thermophilic Digestion at the Hyperion Treatment Plant,
W75-11690 5D

**GARBO, P. W.**
Oxygenation of Waste Water,
W75-11681 5D

**GARCIA DE EMILIANI, MARIA O.**
Phytoplankton in Lake Mascardi (Rio Negro, Argentina), (In Spanish),
W75-11532 5C

**GARDNER, H. R.**
An Analysis of the Efficiency of Microwatershed Systems,
W75-11820 3B

**GAUDY, A. F. JR.**
Response of Completely Mixed Activated Sludge Systems to Changes in the Environment,
W75-11478 5D

**GEDNEY, R. H.**
Development Planning of Laguna de Bay--Philippines,
W75-11770 4A

**GERMAIN, J. E.**
Plating and Cyanide Wastes, (Literature Review),
W75-11370 5D

Plating and Cyanide Wastes (Literature Review),
W75-11545 5D

**GERMAN, R. A.**
Radioactive - Tracer Displacement Method for the Determination of Small Quantities of Nickel,
W75-11526 5A

**GIDEON, J. A.**
Removal of Soluble Mercury from Waste Water by Complexing Techniques,
W75-11357 5D

**GLATER, J.**
Gypsum Solubility and Scaling Limits in Saline Waters,
W75-11473 3A

**GLICK, A. N.**
Procedure for Selecting a Minimal Environmental Impact Routing for a Water Conveyance Canal,
W75-11764 6G

**GODIN, K.**
Float-Wash Fractionator Saves Fibre and Water at Grand'Mere,
W75-11363 5D

**GOLDSTEIN, A. M.**
Optimum Design of Sour Water Strippers,
W75-11361 5D

**GOLTERMAN, H. L.**
Natural and Accelerated Phosphate Mobility, (In Dutch),
W75-11520 5C

**GOMISCEK, S.**
The Behaviour of Metal Tetramethylenedithiocarbamates in the Graphite-Tube Furnace for Atomic Absorption Spectrometry,
W75-11797 5A

**GOODRICK, R. L.**
Studies of Floodplain Vegetation and Water Level Fluctuation in the Kissimmee River Valley,
W75-11628 4A

**GOODYEAR, H. V.**
Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States,
W75-11556 2B

**GOVE, L. W. JR.**
Sewer Branch Saddle Connector,
W75-11677 8C

**GRAEF, S.**
Aeration Systems for Metro Chicago,
W75-11739 5D

**GRAF, W. H.**
Turbulent Drag Coefficients of Sharp-Edged Objects,
W75-11654 8B

Wall Shear Measurement in Sand-Water Mixture Flows,
W75-11653 8B

**GRAY, D. Y.**
Land Spreading Effluent from a Secondary Facility,
W75-11365 5D

**GRAY, G. C.**
Environmental Constraints Challenge Designers of Shoreline Community Near Kansas City, Missouri,
W75-11392 5D

**GRAY, T. W.**
Up-Rating Hydraulically Overloaded Sedimentation Tanks by Inclined Plates,
W75-11695 5D

**GREGG, B. C.**
A Method for Intermittent Chlorine Dosing in Continuous-Flow Toxicity Tests,
W75-11754 5A

**GRIFFIN, J.**
Land Use and Environmental Planning: An Application in the South Carolina Coastal Zone,
W75-11766 6G

**GRIFFIN, R. A.**
Kinetic and Equilibrium Studies of Boron Desorption from Soil,
W75-11600 2G

**GRIFFITH, G. P.**
Removal of Soluble Mercury from Waste Water by Complexing Techniques,
W75-11357 5D

**GRIGG, N. S.**
Urban Drainage and Flood Control Projects. Economic, Legal and Financial Aspects,
W75-11352 6B

**GRUDEN, N.**
Influence of Lead on Calcium and Strontium Transfer Through the Duodenal Wall in Rats,
W75-11523 5C

**GUARD, H. E.**
Hydrocarbons Associated with Suspended Particulate Matter in San Francisco Bay Waters,
W75-11614 5A

**GUNAJI, N. N.**
Turbulent Flow of Power-Law Fluids,
W75-11651 8B

**GUPTA, S. C.**
Determining Effective Soil Water Diffusivities from One-Step Outflow Experiments,
W75-11592 2G

**GUTHMAN, M.**
The Determination of Cadmium in Sea Water by Radioactivation,
W75-11798 5A

**GUYMON, G. L.**
Sediment Relations of Selected Alaskan Glacier-Fed Streams,
W75-11477 2J

**HACKBARTH, D. A.**
Hydrogeology of the Wainwright Area, Alberta,
W75-11475 4B

Regional Chemistry of Groundwater in the Wainwright Area, Alberta,
W75-11471 2F

**HAMILTON, D. L.**
Radioactive - Tracer Displacement Method for the Determination of Small Quantities of Nickel,
W75-11526 5A

**HAMON, W. R.**
Comparison of Precipitation Gage Catches with a Modified Alter and a Rigid Alter Type Windshield,
W75-11457 2B

**HANDA, B. K.**
Geochemistry and Gensis of Fluoride-Containing Ground Waters in India,
W75-11645 2K

**HANNAH, S. A.**
Metal Removal by Physical and Chemical Treatment Processes,
W75-11542 5D

**HANSON, C. L.**
Hydrologic Aspects of Water Harvesting in the Northern Great Plains,
W75-11811 2A

**HARGREAVES, G. H.**
Moisture Availability and Crop Production,
W75-11583 3F

**HARI, P.**
Effect of Water Stress, Temperature, and Light on Photosynthesis in Alder Seedlings,
W75-11691 2I

RR, R. D.
Soil and Hydrologic Factors Affecting the Stability of Natural Slopes in the Oregon Coast Range,
W75-11353 2G

STINGS, D.
Desalination,
W75-11675 3A

TFIELD, C.
tate Regulation of Coastal Water Area reserves,
/75-11568 6E

USER, V. L.
unoff Utilization for Grain Production,
/75-11824 3B

VILAND, J. M.
Iethod for Reclaiming Industrial Wastes and liminating Pollution,
/75-11367 5D

Y, K. G.
he Status of Oiled Wildlife: Research and anning,
/75-11617 5G

YASKI, J.
udies on Recovery of Chemicals and Manucture of Activated Substances from Pulping aste Liquor, Part 2, Use of Softwood KP-aste Liquor, (In Japanese),
75-11373 5D

ATH, A. G.
Method for Intermittent Chlorine Dosing in ontinuous-Flow Toxicity Tests,
75-11754 5A

ERT, P. H.
Satellite Classification Technique for Subpical Cyclones,
75-11562 2B

ERT, P. J.
arricane Experience Levels of Coastal Coun- Populations - Texas to Maine,
75-11570 2B

RMANN, D. F.
nter Pivot Design Capacities in Eastern lorado,
75-11835 8A

LMANN, R.
alysis of International Great Lakes Shipping d Hinterland,
75-11576 6C

WEG, O. J.
termining Optimal Well Discharge,
75-11768 4B

R, E. A.
oice of Irrigation Timing Indicator for Nar- v Row Cotton,
75-11840 3F

ain Sorghum Evapotranspiration and Water e Efficiency Under Trickle Irrigation,
5-11582 3F

ulation of Miscible Displacement in Soils,
5-11590 2F

, R. B.
Three-Dimensional Theory of Coastal Curts and Upwelling Over a Continental Shelf,
5-11450 2E

HILLEBRAND, M.
Organochlorine Compounds in Several Marine Organisms from the North Sea and the Dutch Wadden Sea,
W75-11608 5B

HILLEL, D.
Infiltration and Runoff for Small Field Plots Under Constant Intensity Rainfall,
W75-11458 3B

Water Harvesting by Runoff Inducement for Irrigation of an Almond Orchard in a Semiarid Climate,
W75-11818 3B

HILLESTAD, H. O.
The Ecology of the Cumberland Island National Seashore Camden County, Georgia,
W75-11546 2L

HILLIARD, B. C.
Agricultural Use of Sludge,
W75-11720 5C

HINES, M. S.
Progress Report to the Arkansas State Highway Commission for Year Ending June 30, 1975,
W75-11501 8B

HINZE, W. J.
Improved Application of Geophysics to Groundwater Resource Inventories in Glaciated Terrains,
W75-11355 2F

HISCOCK, K.
An Ecological Survey of the Rocky Coast Adjacent to a Bromine Extraction Works,
W75-11758 5C

HO, F. P.
Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States,
W75-11556 2B

Storm Tide Frequency Analysis for the Coast of North Carolina, South of Cape Lookout,
W75-11560 2B

Storm Tide Frequency Analysis for the Coast of Puerto Rico,
W75-11561 2A

HOARE, R.
An Ecological Survey of the Rocky Coast Adjacent to a Bromine Extraction Works,
W75-11758 5C

HOFFMAN, E. K.
County Combats Urban Storm Water Runoff Problems,
W75-11390 5G

HOLLICK, M.
The Design of Roaded Catchments for Maximum Runoff,
W75-11817 3B

HOLLIDAY, C. R.
Central North Pacific Tropical Cyclones, 1974,
W75-11579 2B

Western North Pacific Typhoons, 1974,
W75-11578 2B

HOLT, R. F.
Nutrient Transport in Surface Runoff as Influenced by Soil Cover and Seasonal Periods,
W75-11641 5B

HOLZBECHER, J.
The Determination of Traces of Lead (II) by Solid-State Luminescence,
W75-11541 5A

HOOVER, J. R.
Precipitation Entrapment for Evaporation Suppression,
W75-11822 3B

HORLINGS, H.
Removal of Phosphates and Metals from Sewage Sludges,
W75-11729 5D

HORNE, F. F.
Apparatus for Sewer Treatment to Kill Three Roots and Other Organic Growth Therewithin,
W75-11513 5G

HORNER, R. W.
Vermilion County Surface Water Resources,
W75-11623 4A

HOSOKAWA, J.
Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant-Activated Sludge Treatment, Lime Treatment and Activated Carbon Treatment, (In Japanese),
W75-11362 5D

HOST, A.
The Determination of Cadmium in Sea Water by Radioactivation,
W75-11798 5A

HOWELL, T. A.
Choice of Irrigation Timing Indicator for Narrow Row Cotton,
W75-11840 3F

Grain Sorghum Evapotranspiration and Water Use Efficiency Under Trickle Irrigation,
W75-11582 3F

HUANG, N. E.
Influence of Current on Statistical Properties of Waves,
W75-11772 2L

HUANG, W.
Optimizing Water Utilization Through Multiple Crops Scheduling,
W75-11587 3F

HUDNIK, V.
The Behaviour of Metal Tetramethylenedithiocarbamates in the Graphite-Tube Furnace for Atomic Absorption Spectrometry,
W75-11797 5A

HUNT, D. T. E.
Geochemistry of Surface Sediments in an Acid Stream Estuary,
W75-11531 2J

HUNT, W. G.
Use of Oxidized Cationic Starch in Flocculation and Dewatering of Municipal Sludge,
W75-11420 5D

HWANG, C. L.
On Taxation and Firms Choice of Waste Water Treatment Technology,
W75-11767 5G

HWANG, R. B.
Effect of Backfill on Drain Flow in Layered Soils,
W75-11834 8D

ILO, C. G.
Resistance to Flow in Alluvial Channels,
W75-11459 2E

IMAI, K.
Energy Losses at 90 Degrees Pipe Junctions,
W75-11778 8B

IMHOFF, R.
Experience of the Ruhrverband with the Treatment of Sewage Sludge (Erfahrungen des Ruhrverbandes bei der Klaerschlammbehandlung),
W75-11747 5D

INHOFFER, W. R.
Innovative Water Plant Slated for New Jersey,
W75-11696 5F

INMAN, D. L.
Current Measurements Using a Tilting Spar,
W75-11564 7B

ITO, H.
Energy Losses at 90 Degrees Pipe Junctions,
W75-11778 8B

IVANOV, O. I.
Hydrochemical and Hydrobiological Peculiarities of Limans in the Danube-Dniester Interfluve, (In Ukrainian),
W75-11847 2K

IVERS, H.
Vacuum System for Sewage Discharge in Krempel (District of Dithmarschen)-Experience with a New Kind of Sewerage (Vakuumentwaesserung Krempel/Dithmarschen- Erfahrungsbericht Ueber Eine Neuartige Kanalisation),
W75-11383 5D

JAMES, I. C. II.
Data Requirements for the Optimization of Reservoir Design and Operating Rule Determination,
W75-11500 4A

JENSEN, F. O.
Atomic-Absorption Spectrometric Determination of Cadmium, Lead, and Zinc in Salts or Salt Solutions by Hanging Mercury Drop Electrodeposition and Atomization in a Graphite Furnace,
W75-11536 5A

JOANEN, T.
The Brown Pelican and Certain Environmental Pollutants in Louisiana,
W75-11757 5A

JOHNSON, A. S.
The Ecology of the Cumberland Island National Seashore Camden County, Georgia,
W75-11546 2L

JOHNSON, C. J.
Lead and Arsenic Levels of Dairy Cattle in Proximity to a Copper Smelter,
W75-11544 5A

JOHNSON, J.
Analysis of International Great Lakes Shipping and Hinterland,
W75-11576 6C

JOHNSON, J. A.
A Three-Dimensional Theory of Coastal Currents and Upwelling Over a Continental Shelf,
W75-11450 2E

JOHNSON, N. A.
Ground-Water Data in the Harrisburg - Halsey Area, Central Willamette Valley, Oregon,
W75-11498 7C

JOHNSTON, K. N.
Subsurface Waste Injection in the United States: Fifteen Case Histories,
W75-11627 5D

JONES, B. G.
An Economic and Environmental Reconnaissance of the Possibilities for Small Watershed Development in Chenango County,
W75-11796 4D

JONES, M. B.
Synergistic Effects of Salinity, Temperature and Heavy Metals on Mortality and Osmoregulation in Marine and Estuarine Isopods (Crustacea),
W75-11610 5C

JONES, O. R.
Runoff Utilization for Grain Production,
W75-11824 3B

JORDAN, W. R.
Choice of Irrigation Timing Indicator for Narrow Row Cotton,
W75-11840 3F

JUNEAU, C. L. JR.
An Inventory and Study of the Vermilion Bay-Atchafalaya Bay Complex; Area Description, Biology, Hydrology and Chemistry, and Sedimentology,
W75-11571 2L

JUNKER, P.
Interlaboratory Study of Methods for Chemical Analysis of Water,
W75-11409 5A

KABEYA, H.
Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant-Activated Sludge Treatment, Lime Treatment and Activated Carbon Treatment, (In Japanese),
W75-11362 5D

KACE, J. S.
Reduced Cost Flocculation of a Textile Dyeing Wastewater,
W75-11375 5D

KAELIN, J. R.
Sewage Treatment Plant Equipped With an Aeration Impeller,
W75-11670 5D

Single Tank Sewage Treatment Plant,
W75-11399 5D

KAGAWA, S.
Studies on the Treatment of Wastewaters from the Towel Dyeing Industry,
W75-11376 5D

KAMISHIMA, H.
Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant-Activated Sludge Treatment, Lime Treatment and Activated Carbon Treatment, (In Japanese),
W75-11362 5D

KAMLER, E.
Further Observations on the Effect of Sodium Salt of 2,4-D on Early Developmental Stages of Carp (Cyprinus Carpio L.),
W75-11762 5C

KARELIN, YA. A.
Acceleration of Biochemical Treatment of Wastewater in Petroleum Refineries,
W75-11371 5D

KARMELI, D.
Basic Principles of Pulse Irrigation,
W75-11833 3F

KASHIWAYA, M.
Studies on Advanced Waste Treatment,
W75-11734 5D

KAUFMAN, W. J.
Ammonia Removal from Municipal Wastewaters by Ion Exchange,
W75-11405 5D

KEITH, F. W. JR.
Centrifuges - Types and Applications,
W75-11725 5D

KELLOGG, S. R.
Plating and Cyanide Wastes, (Literature Review),
W75-11370 5D

KELLY, R. J.
Sewage Disposal System,
W75-11511 5D

KELWAY, P. S.
The Rainfall Recorder Problem,
W75-11448 2B

KEMP, G. D.
Vacuum Dewatering of Sewage Sludge,
W75-11727 5D

KENNEDY, J. F.
Submerged Buoyant Jets in Quiescent Fluids,
W75-11461 8B

KENNEDY, S. R.
Method of Purifying Water,
W75-11379 5D

KESER, J.
The Value of the Peak Runoff Coefficient PSIS (Ueber den Aussagewert des Spitzenabflussbeiwertes PSIS),
W75-11713 2A

KHALIL, M. B.
River Regime with Special Reference to River Nile,
W75-11464 2J

KIENZLE, K. H.
Phosphate Precipitation in Activated Sludge Plants with Sludge Stabilization and Dentrification (Phospatfaellung in Belebungsanlagen mit Schlammstabilisation und Denitrifikationsstufe),
W75-11746 5D

KIM, J. R.
Forecasting Urban Water Use: Commercial Establishments,
W75-11795 6D

KING, I. G.
Agricultural Drainage Research Needs and Priorities, 1974,
W75-11632 4A

KIPP, K. L.
Variable Thickness Transient Groundwater Flow Model User's Manual,
W75-11469 2F

RDA, C.
Nitrification and Denitrification During Miscible Displacement in Unsaturated Soil,
W75-11596 3F

SHI, M.
Advanced Treatment of Waste Water from Machinery Works by Activated Carbon (Kasseitan ni yoru kikai kojo haisui no kodo shori),
W75-11372 5D

ELLSTROM, T.
A Comparative Study on Methods for Cadmium Analysis of Grain with an Application to Pollution Evaluation,
W75-11539 5A

OCHKOV, O. N.
Acceleration of Biochemical Treatment of Wastewater in Petroleum Refineries,
W75-11371 5D

OWLES, D.
Urban Runoff and Combined Sewer Overflow, (Literature Review),
W75-11710 5D

CIAN, L.
Effects of Fish-Ponds Near Jakubovo on the Ornithocenose There, (In Czech),
W75-11535 5C

HL, D. H.
A Steady-State Model of Isotopic Fractionation Accompanying Nitrogen Transformations in Soil,
W75-11831 5B

IGAWA, S.
Waste Water Treatment System With An Ozone Generator,
W75-11426 5D

IKE, I.
Outline of Tagawa Sewage Plant in Utsunomiya City, (In Japanese),
W75-11686 5D

ON, J. H.
Ammonia Removal from Municipal Wastewaters by Ion Exchange,
W75-11405 5D

STA, L.
The Occurrence of Mercury in Amphibia,
W75-11534 5A

STIAL, K.
Kinetics of Lead Retention and Distribution in Suckling and Adult Rats,
W75-11537 5B

VARIK, V. J.
Sewage Treatment System,
W75-11510 5D

ASOVSKIY, B. M.
The Use of Computers for Forecasting the Sanitary Systems of Water Bodies (Primeneniye EVM dlya prognozirovaniya sanitarnogo sostoyaniya vodoyemov),
W75-11410 5D

OSZYNSKI, U. I.
Well Pumping in Unconfined Aquifers: The Influence of the Unsaturated Zone,
W75-11631 4B

ZYNSKI, G. M.
Fish Toxicants in Kraft Effluents,
W75-11358 5C

KUBO, T.
Sequential Treatment of Kraft Pulp Washing Wastewater by Pilot Plant-Activated Sludge Treatment, Lime Treatment and Activated Carbon Treatment, (In Japanese),
W75-11362 5D

KUBOTA, M.
Effects of Soil Temperature and Soil Moisture in Podding Zone on Pod Development of Peanut Plants, (In Japanese),
W75-11456 3F

Report of Analyses for Industrial Waste Water in Twenty-Eight Factories, (In Japanese),
W75-11671 5A

KURNEY, W.
Composting Plant for Refuse-Sewage Sludge in the District of Gross-Gerau (Muell-Klaerschlamm-Kompostierungsanlage fuer den Kreis Gross-Gerau),
W75-11749 5D

KUROSAKA, S.
Studies on the Treatment of Wastewaters from the Towel Dyeing Industry,
W75-11376 5D

KUTAT, H. L.
Removal of Soluble Mercury from Waste Water by Complexing Techniques,
W75-11357 5D

LAAG, A. E.
Water Harvesting for Barley in a 30-CM Winter Rainfall Area,
W75-11825 3B

LAFONTAINE, E. O.
Uprating and Redesign of Water Treatment Plants, Part II,
W75-11849 5F

LAING, I. A. F.
Bitumen, Oil, and Clay Surfaces on a Deep Sand to Increase Runoff from Catchments for Excavated Tanks in Western Australia,
W75-11805 3B

Sealing Leaking Excavated Tanks on Farms in Western Australia,
W75-11814 3B

LANGEVELD, J. M.
Design Criteria for Single-Point Mooring Terminals,
W75-11771 8C

LANGMYHR, F. J.
Atomic-Absorption Spectrometric Determination of Cadmium, Lead, and Zinc in Salts or Salt Solutions by Hanging Mercury Drop Electrodeposition and Atomization in a Graphite Furnace,
W75-11536 5A

LARSON, R. E.
Use of Sewage Sludge in Agriculture with Adequate Environmental Safeguards,
W75-11718 5D

LARSON, W. E.
Determining Effective Soil Water Diffusivities from One-Step Outflow Experiments,
W75-11592 2G

Use of Sewage Sludge in Agriculture with Adequate Environmental Safeguards,
W75-11718 5D

LASTIHENOS, J.
A Plant Grows in Brooklyn,
W75-11701 5D

LECLAIR, B. P.
Effects of Control Variables and Sludge Characteristics on the Performance of Dewatering and Thickening Devices,
W75-11723 5D

The Use of Physicochemical Sludge Characteristics and Bench Dewatering Tests in Predicting the Efficiency of Thickening and Dewatering Processes,
W75-11724 5D

LEE, P.
Water Quality Report: The Columbia River Below Longview, Washington, December 1971 - November 1972,
W75-11472 5B

LEE, R.
Floods in the Waiahole-Waikane Area, Oahu, Hawaii,
W75-11495 2E

LEE, S. C.
Collision Efficiency of Water Drops in the Atmosphere,
W75-11638 2B

LENGAR, Z.
The Behaviour of Metal Tetramethylenedithiocarbamates in the Graphite-Tube Furnace for Atomic Absorption Spectrometry,
W75-11797 5A

LEPAGE, L. R.
Aerobic Digestion of Wastewater Sludge Under Low Temperature Conditions,
W75-11709 5D

The Effect of Temperature on the Aerobic Digestion of Wastewater Sludge,
W75-11708 5D

LEVIN, G. V.
Sewage Treatment Process,
W75-11685 5D

LEWANDOWSKI, R.
Process for Treating Waste Water,
W75-11387 5D

LEWANDOWSKI, S. O. R. L.
Process for Treating Waste Water,
W75-11387 5D

LI, R-M.
Solid Particle Settlement in Open-Channel Flow,
W75-11652 5B

LIANG, T.
Optimizing Water Utilization Through Multiple Crops Scheduling,
W75-11587 3F

LIAO, C. F-H.
Relation Between Nitrate Absorption and Water Transpiration by Corn,
W75-11602 3F

LIEN, L.
Oligochaetes in the Bottom Fauna and Stomach Content of Trout, Salmo Trutta (L.),
W75-11385 2H

LIN, C. L.
Collision Efficiency of Water Drops in the Atmosphere,
W75-11638 2B

LIND, B.
A Comparative Study on Methods for Cadmium Analysis of Grain with an Application to Pollution Evaluation,
W75-11539 5A

LINDELL, D. L.
Sulfur and Manganese Release from Soils Treated with Prilled Sulfur and Sulfur-Bentonite,
W75-11604 5B

LINFORD, H. B.
Reduced Cost Flocculation of a Textile Dyeing Wastewater,
W75-11375 5D

LINNMAN, L.
A Comparative Study on Methods for Cadmium Analysis of Grain with an Application to Pollution Evaluation,
W75-11539 5A

LIPPMAN, L.
Lead and Arsenic Levels of Dairy Cattle in Proximity to a Copper Smelter,
W75-11544 5A

LIST, R.
An Acceleration System for Water Drops,
W75-11636 2B

Collision and Breakup of Water Drops at Terminal Velocity,
W75-11637 2B

LIU, D.
Disposal of Chemical Sewage Sludges on Land and Their Effects on Plants, Leachate and Soil Systems,
W75-11721 5E

LOCKWOOD, J. G.
Evapotranspiration and Soil Moisture in Upland Grass Catchments in the Eastern Pennines,
W75-11648 2D

LOVE, L. S.
Liquid Treatment Apparatus Having Combined Reaction Basin and Clarifier,
W75-11521 5D

LOWE, R. L.
Current Measurements Using a Tilting Spar,
W75-11564 7B

LUE-HING, C.
Metro Chicago Studies on Nitrification,
W75-11742 5D

Suspended Solids Removal Processes Studied at Metro Chicago,
W75-11741 5D

LUEBS, R. E.
Water Harvesting for Barley in a 30-CM Winter Rainfall Area,
W75-11825 3B

LUM-SHUE-CHAN, K.
Determination of the Apparent Complexing Capacity of Lake Waters,
W75-11538 5B

LUMB, A. M.
Role of Computer Simulation in Administering an Urban Drainage Ordinance,
W75-11669 6E

LUOMA, S. N.
Mercury Cycling in a Small Hawaiian Estuary,
W75-11563 5C

LUTHIN, J. N.
Effect of Backfill on Drain Flow in Layered Soils,
W75-11834 8D

LUUKKANEN, O.
Effect of Water Stress, Temperature, and Light on Photosynthesis in Alder Seedlings,
W75-11691 2I

LUZIER, J. E.
Digital-Simulation and Projection of Water-Level Declines in Basalt Aquifers of the Odessa-Lind Area, East-Central Washington,
W75-11494 2F

LYNAM, B. T.
Aeration Systems for Metro Chicago,
W75-11739 5D

Metro Chicago Studies on Nitrification,
W75-11742 5D

Suspended Solids Removal Processes Studied at Metro Chicago,
W75-11741 5D

MACDONALD, J. G.
Wetlands - Related Legislation in the United States,
W75-11550 6E

MACKAY, D.
Large Diameter Submarine Steel Pipeline Crossings,
W75-11380 8A

MAGARA, Y.
Studies of the Biochemical Factors Controlling the Flocculation of Activated Sludge, (In Japanese),
W75-11402 5D

MAGGI, P.
The Growth of Posidonia and the Urban Pollution in the Gulf of Giens, (In French),
W75-11761 5C

MANHOOD, H. W.
Fish Toxicants in Kraft Effluents,
W75-11358 5C

MANSOUR, F. F.
Turbulent Drag Coefficients of Sharp-Edged Objects,
W75-11654 8B

MARINO, M. A.
Mathematical Models of Artificial Recharge Systems,
W75-11626 4B

Response of Unconfined Aquifer Systems to Deep Percolation,
W75-11474 2F

MARTIN, J. H.
High Copper Concentrations in Squid Livers in Association with Elevated Levels of Silver, Cadmium and Zinc,
W75-11609 5C

MARTIN, J-L. M.
Copper and Zinc in Cancer Irroratus Comparative Metabolism of the Molt Cycle. le Cuivre et le Zinc Chez Cancer Irroratus (Crustace Decapode) Metabolisme Compare au Cours du Cycle D'intermue
W75-11752 5C

MARTINEAU, J.
Method for Combatting Pollution Using a Chromium Complex.
W75-11506 5G

MARUYAMA, T.
Metal Removal by Physical and Chemical Treatment Processes,
W75-11542 5D

MASAKI, T.
Report of Analyses for Industrial Waste Water in Twenty-Eight Factories, (In Japanese).
W75-11671 5A

MASHARIPOV, N. P.
Sanitary and Bacteriological Evaluation of the Raw Material, Air and Wastewaters of Some Bast Fiber Plants in the Uzbek SSR, (In Russian),
W75-11406 5B

MATHEWS, A. P.
Water Quality Relationships in the Great Lakes: Analysis of a Survey Questionnaire,
W75-11549 5B

MATLAK, O.
Further Observations on the Effect of Sodium Salt of 2,4-D on Early Developmental Stages of Carp (Cyprinus Carpio L.),
W75-11762 5C

MATLOCK, W. G.
Desert Strip Farming--Computer Simulation of an Ancient Water Harvesting Technique,
W75-11812 3B

MATSKRLE, S.
Sewage Biological Processing,
W75-11658 5D

MATSKRLE, V.
Sewage Biological Processing,
W75-11658 5D

MATSUBARA, S.
Improvement of Combined Sewer System Storm Water Storage Pool (Goryu-shiki gesuido no kairyo, taisui ike hoshiki),
W75-11621 5D

MAVIS, J. D.
Sea Water Softening with the Lime-Magnesium Carbonate (LMC) Process,
W75-11699 5F

MCCARTHY, J. J.
The Influence of Particle Size on Oxidation of Total, Soluble, and Particulate Municipal Wastewater Components by Ozone,
W75-11850 5D

MCCORMICK, J. M.
Phytoplankton Diversity and Chlorophyll-a in a Polluted Estuary,
W75-11607 5C

MCCORQUODALE, J. A.
Experimental Study of Wave Transimission,
W75-11773 8B

ICCREARY, T. W.
Multipurpose Salt Treated Water Harvesting System,
W75-11828 3B

ICCUEN, R. H.
Forecasting Urban Water Use: Commercial Establishments,
W75-11795 6D

ICCUTCHAN, J. W.
Gypsum Solubility and Scaling Limits in Saline Waters,
W75-11473 3A

ICGLOTHLIN, C. D.
Catalytic-Coulometric Determination of Copper at Microgram and Nanogram Levels,
W75-11540 5A

ICKENDRICK, J.
The Physico-Chemical Treatment of Crude Sewage,
W75-11404 5D

ICMAHON, M. A.
Chloride and Tritiated Water Flow in Disturbed and Undisturbed Soil Cores,
W75-11594 2G

ICTAGGART-COWAN, J. D.
An Acceleration System for Water Drops,
W75-11636 2B

Collision and Breakup of Water Drops at Terminal Velocity,
W75-11637 2B

IELIN, G. A.
Optimum Design of Sour Water Strippers,
W75-11361 5D

IELTON, M. R.
Sewer Line Blow-Out Plug,
W75-11684 8C

IENON, M. P.
Radioactive - Tracer Displacement Method for the Determination of Small Quantities of Nickel,
W75-11526 5A

IERTES, J. D.
Procedure for Selecting a Minimal Environmental Impact Routing for a Water Conveyance Canal,
W75-11764 6G

ICHELSEN, D. L.
Removal of Soluble Mercury from Waste Water by Complexing Techniques,
W75-11357 5D

ICKELSON, R. H.
Center Pivot Design Capacities in Eastern Colorado,
W75-11835 8A

Performance and Durability of Sheet Metal, Butyl Rubber, Asphalt Roofing and Bentonite for Harvesting Precipitation,
W75-11808 3B

IKHAYLOV, A. V.
The Use of Computers for Forecasting the Sanitary Systems of Water Bodies (Primeneniye EVM dlya prognozirovaniya sanitarnogo sostoyaniya vodoyemov),
W75-11410 5D

MIKKELSEN, D. S.
Effects of Water Management and Soil Aggregation on the Growth and Nutrient Uptake of Rice,
W75-11832 3F

MILBRINK, G.
Oligochaetes in the Bottom Fauna and Stomach Content of Trout, Salmo Trutta (L.),
W75-11385 2H

MILES, D. H.
The Estimation of the Amount of Empire Mix Crude Oil in Mullet, Shrimp, and Oysters by Liquid Chromatography,
W75-11613 5A

MILLESON, J. F.
Studies of Floodplain Vegetation and Water Level Fluctuation in the Kissimmee River Valley,
W75-11628 4A

MILLI, H.
Sediment Transport Theories: A Review,
W75-11453 2J

MINTURN, R. E.
Calicum Sulfate Scaling in Reverse Osmosis (Hyper-filtration) of Brackish Waters by Hollow-Fiber and Spiral-Wound Modules,
W75-11505 3A

MISRA, C.
Nitrification and Denitrification During Miscible Displacement in Unsaturated Soil,
W75-11596 3F

MISRA, H. C.
Axisymmetric Seepage Flow Through Semi-Infinite Porous Media,
W75-11633 2F

MITAMURA, O.
Decomposition of Urea Associated with Photosynthesis of Phytoplankton in Coastal Waters,
W75-11612 5C

MIURA, K.
Detector of Trace Substance in Water,
W75-11388 5A

MIYAGACHO, S.
A Case of Subterranean Water Pollution Caused by the Public Refuse Disposal Ground, (In Japanese),
W75-11432 5B

MOHAMMED, A. I. Y.
Turbulent Flow of Power-Law Fluids,
W75-11651 8B

MOMCILOVIC, B.
Kinetics of Lead Retention and Distribution in Suckling and Adult Rats,
W75-11537 5B

MORIN, G. C. A.
Desert Strip Farming--Computer Simulation of an Ancient Water Harvesting Technique,
W75-11812 3B

MOSER, F.
Horizontal Reactor for Polymsn. Sewage Oxidation Etc.,
W75-11518 5D

MUDROCH, A.
Physicochemical Properties of Dredge Spoil,
W75-11465 5B

MUELLER-HAECKEL, A.
A Method of Investigating Populations of Diatoms in Flowing Waters, (In German),
W75-11445 2I

MYERS, R. C.
Boundary Shear in Channel with Flood Plain,
W75-11463 8B

NAGAHAMA, T.
A Survey of the Tokyo Metropolitan Shin-Kashi Treatment Plant, (Tokyo-to Shinkashi shorijo no gaiyo),
W75-11743 5D

NAKAYAMA, K.
Effects of Soil Temperature and Soil Moisture in Podding Zone on Pod Development of Peanut Plants, (In Japanese),
W75-11456 3F

NANBU, S.
Studies on Advanced Waste Treatment,
W75-11734 5D

NANBU, Y.
Studies of the Biochemical Factors Controlling the Flocculation of Activated Sludge, (In Japanese),
W75-11402 5D

NAPOLI, J.
The Coasts of Wisconsin,
W75-11569 2H

NASSAR, E. G.
Low-Flow Characteristics of Streams in the Grays Harbor Drainages, Washington,
W75-11502 2E

NASSER, M. S.
Experimental Study of Wave Transimission,
W75-11773 8B

NEFF, E. L.
Hydrologic Aspects of Water Harvesting in the Northern Great Plains,
W75-11811 2A

NEHMAN, G.
Land Use and Environmental Planning: An Application in the South Carolina Coastal Zone,
W75-11766 6G

NEMCHINOV, V. D.
Field Experience in Disinfecting Water Mains (In Russian),
W75-11411 5F

NICOL, H. I.
A Computer Model for Optimizing Design of Improved Catchment,
W75-11813 3B

NICOLLE, N. P.
Package Plant Owner Responsibility and Operation of Small Sewage Units,
W75-11688 5D

NIEDZWIECKI, J. L.
Optimum Design of Sour Water Strippers,
W75-11361 5D

NIELSEN, D. R.
Nitrification and Denitrification During Miscible Displacement in Unsaturated Soil,
W75-11596 3F

NIKLOWITZ, W. J.
Ultrastructural Effects of Acute Tetraethyllead Poisoning on Nerve Cells of the Rabbit Brain,
W75-11530 5C

NISHI, T.
A Case of Subterranean Water Pollution Caused by the Public Refuse Disposal Ground, (In Japanese),
W75-11432 5B

NORDBERG, G.
A Comparative Study on Methods for Cadmium Analysis of Grain with an Application to Pollution Evaluation,
W75-11539 5A

NULSEN, R. A.
A Computer Model for Optimizing Design of Improved Catchment,
W75-11813 3B

NUTBROWN, D. A.
Identification of Parameters in a Linear Equation of Groundwater Flow,
W75-11799 2F

O'DONNELL, P. M.
Kinetics of the Fluorination of Zinc,
W75-11629 5A

OBERMUELLER, A. J.
Effects of Water Management and Soil Aggregation on the Growth and Nutrient Uptake of Rice,
W75-11832 3F

OERTLI, J.
Salt Tolerance of Mexican Wheat: II. Relation to Variable Sodium Chloride and Length of Growing Season,
W75-11603 3C

OGLE, H. M.
Apparatus for Providing a Statistical Count of Particulate Material in a Fluid,
W75-11434 5A

OHARA, G. T.
Energy-Wastewater Treatment and Solids Disposal,
W75-11697 5D

Thermophilic Digestion at the Hyperion Treatment Plant,
W75-11690 5D

ONIANI, E. S.
Transpiration of Some Oreoxerophytes of the Central Caucasus, (In Georgian),
W75-11442 2D

ONO, Y.
Effects of Soil Temperature and Soil Moisture in Podding Zone on Pod Development of Peanut Plants, (In Japanese),
W75-11456 3F

ORHEIM, R. M.
Lead and Arsenic Levels of Dairy Cattle in Proximity to a Copper Smelter,
W75-11544 5A

ORR, J.
Providing Suburban Sewerage Despite Environmental and Construction Problems,
W75-11657 5D

OSTREICHER, F.
Activated Sludge Sewage Treatment for Seasonally Variable Throughput,
W75-11396 5D

PACE, J. E.
Removal of Soluble Mercury from Waste Water by Complexing Techniques,
W75-11357 5D

PALMQUIST, R. C.
A Topographic-Hydrogeologic Model for Solid Waste Landfill Siting,
W75-11644 5B

PARLANGE, J-Y.
Two-Dimensional Similarity Solution: Theory and Application to the Determination of Soil-Water Diffusivity,
W75-11640 2G

PATTERSON, K. E.
Plating and Cyanide Wastes (Literature Review),
W75-11545 5D

PAULSON, Q. F.
Predictive Modeling of Effects of the Planned Kindred Lake on Ground-Water Levels and Discharge, Southeastern North Dakota,
W75-11503 4A

PEARCE, J. B.
Shell Disease in Crabs and Lobsters from New York Bight,
W75-11606 5C

PEIRISH, A. J. JR.
Sewage Treatment Device,
W75-11508 5D

PERI, G.
Basic Principles of Pulse Irrigation,
W75-11833 3F

PFEIFF, S.
Meteorological, Topographical, and Construction Influence on the Rain Runoff in Sewer Systems (Meteorologische, Topographische und Bautechnische Einfluesse auf den Regenabfluss in Kanal-Isationsnetzen),
W75-11712 5D

PHILLABAUM, S. D.
A Geomorphic Shoreline Inventory with Management Considerations for Whatcom County, Washington,
W75-11455 2L

PILSON, M. E. Q.
Copper Uptake and Excretion by Busycon Canaliculatum L.,
W75-11755 5C

PINLESS, S. J.
The Reduction of Artificial Boundary Reflexions in Numerically Modelled Estuaries,
W75-11452 2L

PIRA, E. S.
'Chamber Method' for Drip Irrigation System Design and Installation Procedures,
W75-11584 3F

PLUEDDEMANN, E. P.
Soil Treatment with Silicones for Water Harvesting,
W75-11806 3B

PLUMMER, D.
Aspects of Incinerating Chemical Sludges,
W75-11728 5D

PODOLICK, P. A.
An Equitable Sewer Use Charge System,
W75-11391 5G

POLDER, J. V. D.
Friction--Frequency Dependence for Oscillatory Flows in Circular Pipe,
W75-11780 8B

POLISHCHUK, V. V.
Hydrochemical and Hydrobiological Peculiarities of Limans in the Danube-Dniester Interfluve, (In Ukrainian),
W75-11847 2K

POPE, P. E.
Sampling Tool for Taking Undisturbed Soil Cores,
W75-11599 2G

POPELKOVSKAYA, M. V.
Methods of Detecting the Fluorine Ion in Air and Water, (In Russian),
W75-11794 5A

POTEAT, K. O.
A Satellite Classification Technique for Subtropical Cyclones,
W75-11562 2B

PRETTYMAN, R. W.
Thickening of Unwanted Spent Lime Rejects,
W75-11848 5D

PROSSER, D. G.
Air Driven Rotating Biological Contactor Apparatus,
W75-11680 5D

PROUT, A. L.
Bitumen, Oil, and Clay Surfaces on a Deep Sand to Increase Runoff from Catchments for Excavated Tanks in Western Australia,
W75-11805 3B

PROUTY, R. M.
The Brown Pelican and Certain Environmental Pollutants in Louisiana,
W75-11757 5A

PULLEY, A. D.
Mercer County Surface Water Resources,
W75-11622 4A

PURDY, W. C.
Catalytic-Coulometric Determination of Copper at Microgram and Nanogram Levels,
W75-11540 5A

PYLES, M. R.
Disposal of Sandy Pipeline Dredge Spoils by End Dumping,
W75-11566 5G

QUINN, J. G.
The Solubility Behaviour of No. 2 Fuel Oil in Sea Water,
W75-11565 5B

QUINN, P. T.
Phytoplankton Diversity and Chlorophyll-a in a Polluted Estuary,
W75-11607 5C

RABYSHKO, E. V.
Some Problems of the Circulation of Enteroviruses in Environmental Objects, (In Russian),
W75-11438 5B

RAFAEL, J.
Open Water Purification System,
W75-11419 5D

RAINBOW, P. S.
Barnacles: Possible Indicators of Zinc Pollution,
W75-11611 5B

**ISIT, S. K.**
nergy-Wastewater Treatment and Solids sposal,
75-11697 5D

ermophilic Digestion at the Hyperion Treatent Plant,
75-11690 5D

**, A. R.**
mparative Analysis of Estimation Methods Nonlinear Functional Models of the Rainfall-noff Process,
75-11354 2A

**, R. G. S.**
mparative Analysis of Estimation Methods Nonlinear Functional Models of the Rainfall-noff Process,
75-11354 2A

**ZI, F.**
portunity for Harvesting Water from and ong Highways in Rangeland Areas of Wyom-,
75-11826 3B

**ITZ, E.**
ater Harvesting by Runoff Inducement for Iration of an Almond Orchard in a Semiarid mate,
75-11818 3B

**LINS, S. L.**
igation Management for Salt Control,
75-11845 3C

**LS, W. J.**
mparison of Precipitation Gage Catches with Modified Alter and a Rigid Alter Type ndshield,
75-11457 2B

**KIN, YU. R.**
udies of the Aromatic Compounds Content in a Water by Low-Temperature Luminescent ectroscopy, (In Russian),
75-11786 5A

**DELL, D. L.**
nulation of Miscible Displacement in Soils,
75-11590 2F

**ENAUER, A. E.**
riable Thickness Transient Groundwater ow Model User's Manual,
75-11469 2F

**HL, K. R.**
fects of Methylmercury Chloride on Rana iens Tadpoles,
75-11527 5C

**ADES, J. D.**
igation Management for Salt Control,
75-11845 3C

**, L.**
oan Drainage and Flood Control Projects. onomic, Legal and Financial Aspects,
75-11352 6B

**, M. P.**
osure Conditions Mouth of the Russian er,
75-11454 2L

**IARDSON, G. R.**
tro Chicago Studies on Nitrification,
75-11742 5D

Suspended Solids Removal Processes Studied at Metro Chicago,
W75-11741 5D

**RIEHL, H.**
Further Studies on the Origin of Hurricanes,
W75-11559 2B

**RINGER, W. H.**
City, Industry Face Pollution Abatement Together,
W75-11366 5D

**ROBERTSON, D. C.**
Comparison of Precipitation Gage Catches with a Modified Alter and a Rigid Alter Type Windshield,
W75-11457 2B

**ROBERTSON, W. K.**
Sampling Tool for Taking Undisturbed Soil Cores,
W75-11599 2G

**RODRIGUEZ-VAZQUEZ, J. A.**
Quantitative Inorganic Analysis by Gas Chromatrography, a Review,
W75-11528 5A

**ROE, L. P.**
Sludge Dewatering Using the Kruger Centrifuge,
W75-11726 5D

**ROGERS, I. H.**
Fish Toxicants in Kraft Effluents,
W75-11358 5C

**ROLLIER, H.**
The Determination of Traces of Lead (II) by Solid-State Luminescence,
W75-11541 5A

**RONDELL, B.**
Interlaboratory Study of Methods for Chemical Analysis of Water,
W75-11409 5A

**ROSENBERG, N. J.**
Evapotranspiration by Subirrigated Alfalfa and Pasture in the East Central Great Plains,
W75-11841 3F

**ROSENDAHL, P. C.**
A Bibliography of Biscayne Bay, Florida Monitoring and Research Programs,
W75-11557 10C

**RUEB, F.**
Methods and Equipment for the Treatment of Spent Oil Emulsions (Verfahren und Anlagen zur Behandlung Verbrauchter Oel-Emulsionen),
W75-11359 5D

**RYAN, D. E.**
The Determination of Traces of Lead (II) by Solid-State Luminescence,
W75-11541 5A

**SAFWAT, H. H.**
Friction--Frequency Dependence for Oscillatory Flows in Circular Pipe,
W75-11780 8B

**SAGE, W. L.**
Sewage Disposal System,
W75-11511 5D

**SAHAI, R.**
Contribution to the Ecology of Indian Aquatics: IV. Rate of Dry Matter Production of the Leaves of Several Common Aquatic Plants of Gorakhpur (India),
W75-11386 2I

**SAIDAMINOV, I. A.**
Acceleration of Biochemical Treatment of Wastewater in Petroleum Refineries,
W75-11371 5D

**SAIJO, Y.**
Decomposition of Urea Associated with Photosynthesis of Phytoplankton in Coastal Waters,
W75-11612 5C

**SAITO, K.**
Heat Treatment of Sewage Sludge,
W75-11732 5D

**SAITO, N.**
Outline of Tagawa Sewage Plant in Utsunomiya City, (In Japanese),
W75-11686 5D

**SALIB, W. A.**
Sludge Handling and Disposal Practices in Metropolitan Toronto,
W75-11731 5D

**SALYAMON, G. S.**
Methods of Detecting the Fluorine Ion in Air and Water, (In Russian),
W75-11794 5A

**SAMAR, P.**
An Evaluation of the Effectiveness and Applicability of Physical-Chemical Treatment of Urban Land Runoff,
W75-11389 5D

**SAMMON, D. C.**
The Application of Membrane Processes in the Treatment of Sewage,
W75-11666 5D

**SATEE, R.**
Treatment and Disposal of Anodizing Effluents, Part I,
W75-11377 5D

Treatment and Disposal of Anodizing Effluents, Part II,
W75-11378 5D

**SATO, M.**
Combined Treatment of Municipal and Industrial Wastewater,
W75-11733 5D

**SAVAGE, S. B.**
Analysis of Plunging Phenomena in Water Reservoirs,
W75-11655 4A

**SAWAJIRI, S.**
A Case of Subterranean Water Pollution Caused by the Public Refuse Disposal Ground, (In Japanese),
W75-11432 5B

**SCHIAFFINO, MARTA**
Phytoplankton in Lake Mascardi (Rio Negro, Argentina), (In Spanish),
W75-11532 5C

**SCHMIDT, K. D.**
Regional Sewering and Groundwater Quality in the Southern San Joaquin Valley,
W75-11446 5D

**SCHMIDTKE, N. W.**
Overview of Canadian Sludge Handling and Land Disposal Practices and Research,
W75-11716 5D

**SCHOENBAUM, T. J.**
The Management of Land and Water Use in the Coastal Zone: A New Law is Enacted in North Carolina,
W75-11575 6E

**SCHREIBER, A.**
Filtration and Purification of Contaminated Water,
W75-11418 5D

**SCHREIBER, B.**
Filtration and Purification of Contaminated Water,
W75-11418 5D

**SCHREIBER, E.**
Filtration and Purification of Contaminated Water,
W75-11418 5D

**SCHREIBER, P.**
Cost Benefit Analysis as Dimensioning Basis of Flood Control Measures: An Empirical Report (Nutzen-Kosten-Analyse als Grundlage der Dimensionierung von HW-Schutzmassnahmen-ein Erfahrungsbericht),
W75-11415 6B

**SCHROEDER, W. L.**
Disposal of Sandy Pipeline Dredge Spoils by End Dumping,
W75-11566 5G

**SCHUBERT, R.**
Is the Malachite Green Broth According to Habs and Kirchner Suitable for Serving as an Isolation Medium for Pseudomonas Aeruginosa from Water, (In German),
W75-11435 5B

**SCHULZ, H.**
The Space/Time Coeefficient Method for Calculation of Rainwater Runoff (Das Raumzeit-beiwertverfahren fuer die Berechnung von Regenwasserabfluessen),
W75-11384 5D

**SCHWAB, G. O.**
Agricultural Drainage Research Needs and Priorities, 1974,
W75-11632 4A

**SCHWARTZ, M. L.**
A Geomorphic Shoreline Inventory with Management Considerations for Whatcom County, Washington,
W75-11455 2L

**SCHWERDT, R. W.**
Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States,
W75-11556 2B

**SCOTT, D. S.**
Removal of Phosphates and Metals from Sewage Sludges,
W75-11729 5D

**SENBA, K.**
Studies on the Treatment of Wastewaters from the Towel Dyeing Industry,
W75-11376 5D

**SENDLEIN, L. V. A.**
A Topographic-Hydrogeologic Model for Solid Waste Landfill Siting,
W75-11644 5B

**SERHYEYEV, O. I.**
Hydrochemical and Hydrobiological Peculiarities of Limans in the Danube-Dniester Interfluve, (In Ukrainian),
W75-11847 2K

**SERVIZI, J. A.**
Fish Toxicants in Kraft Effluents,
W75-11358 5C

**SETTLES, G. P.**
Wetlands - Related Legislation in the United States,
W75-11550 6E

**SEWARD, JOE E. JR.**
Natural and Artificial Reefs in Mississippi Coastal Waters: Sport Fishing Pressure and Economic Considerations,
W75-11558 6B

**SHANNON, E. E.**
Aspects of Incinerating Chemical Sludges,
W75-11728 5D

**SHAPIRO, Y. E.**
Hygienic Evaluation of Spring Cappings Used on the Southern Shore of Crimea, (In Russian),
W75-11793 5G

**SHARMA, H. D.**
Analysis of Canal Seepage to Interceptor Drain,
W75-11846 8A

**SHAUG, J. C.**
Solution of a Free-Surface Boundary Value Problem Using an Inverse Formulation and the Finite Element Method,
W75-11447 2F

**SHCHERBININA, N. K.**
Spectrophotometric Determination of Sugars in Natural Waters, (In Russian),
W75-11437 5A

**SHEARER, G.**
A Steady-State Model of Isotopic Fractionation Accompanying Nitrogen Transformations in Soil,
W75-11831 5B

**SHEN, H. W.**
Solid Particle Settlement in Open-Channel Flow,
W75-11652 5B

**SHIBAMORI, K.**
A Case of Subterranean Water Pollution Caused by the Public Refuse Disposal Ground, (In Japanese),
W75-11432 5B

**SHIRASAKA, S.**
Report of Analyses for Industrial Waste Water in Twenty-Eight Factories, (In Japanese),
W75-11671 5A

**SHOEMAKER, W. J.**
Urban Drainage and Flood Control Projects. Economic, Legal and Financial Aspects,
W75-11352 6B

**SHULL, H. H.**
Center Pivot Design Capacities in Eastern Colorado,
W75-11835 8A

**SIEFERT, F.**
Dimensioning and Design of Small Waste Water Pumping Stations (Bemessung und Gestaltung von Klein-Abwasserpumpwerken),
W75-11744 8C

**SIMONEN, E. R.**
Sludge Handling and Disposal Practices in the Regional Municipality of Niagara,
W75-11730 5D

**SINANUWONG, S.**
Predicting Exchangeable Sodium Ratios in Irrigated Tropical Vertisols,
W75-11595 3C

**SINGLETON, F. D. JR.**
An Integrated Power Process Model of Water Use and Waste Water Treatment in Chlor-Alkali Production,
W75-11765 5D

**SINHA, A. B.**
Contribution to the Ecology of Indian Aquatics: IV. Rate of Dry Matter Production of the Leaves of Several Common Aquatic Plants of Gorakhpur (India),
W75-11386 2

**SIROTKINA, I. S.**
Spectrophotometric Determination of Sugars in Natural Waters, (In Russian),
W75-11437 5A

**SKOGERBOE, G. V.**
Development of Salinity Control Technology in Grand Valley,
W75-11585 5C

**SKRIVAN, J. A.**
Digital-Simulation and Projection of Water Level Declines in Basalt Aquifers of the Odessa-Lind Area, East-Central Washington,
W75-11494 2F

**SLAUGHTER, C. W.**
Cooperation in Water Resources Programs Alaska's Example,
W75-11775 6E

**SLEATH, J. F. A.**
Velocities Above Rough Bed in Oscillatory Flow,
W75-11763 8B

**SMAJSTRLA, A. G.**
Simulation of Miscible Displacement in Soils,
W75-11590 2G

**SMITH, D. C.**
Rehabilitating Oiled Aquatic Birds,
W75-11616 5C

**SMITH, E. C.**
Mercury Levels in Fish in the La Grande River Area, Northern Quebec,
W75-11756 5A

**SMITH, P. A.**
Chemical Composition of Aegean Sea Sediments,
W75-11533 2L

**SMITH, P. R.**
Turbulent Flow of Power-Law Fluids,
W75-11651 8B

**SMITS, C.**
Sufficient Water Supply and Sewer System and Equitable Distribution of the Cost (Tillstrekkelige vann- og Kolakkanlegg-samrettferdig fordeling av kostnadene),
W75-11393 5G

ENSEN, C. K.
eurization of Sapropel (Pasteurisierung von lschlamm),
-11750 5D

EN, R. C.
ur and Manganese Release from Soils ted with Prilled Sulfur and Sulfur-tonite,
-11604 5B

CE, J. A.
cury Levels in Fish in the La Grande River a, Northern Quebec,
-11756 5A

GFIELD, H. W.
g Paraffin and Polythylene to Harvest er for Growing Shrubs,
-11821 3B

OSZ, K.
her Observations on the Effect of Sodium of 2,4-D on Early Developmental Stages of (Cyprinus Carpio L.),
-11762 5C

IC, M.
ence of Lead on Calcium and Strontium sfer Through the Duodenal Wall in Rats,
-11523 5C

E, W. J.
ified Penman Equation to Provide the er Boundary Condition in Computing oration from Soil,
-11598 2D

, J. L.
omparison of 15N-Depleted and 15N-En-d Fertilizers as Tracers,
-11591 3F

fication and Denitrification During Misci-Displacement in Unsaturated Soil,
11596 3F

AR, P.
Occurrence of Mercury in Amphibia,
11534 5A

NEY, R.
Use of Physicochemical Sludge Charac-ics and Bench Dewatering Tests in Pre-g the Efficiency of Thickening and De-ring Processes,
11724 5D

ING, M. A.
neters for Estimating Annual Runoff and Loss from Agricultural Lands in Rhodesia,
11830 4A

, P. R.
omparison of 15N-Depleted and 15N-En-d Fertilizers as Tracers,
11591 3F

D, J. W.
es of Water Quality, Lake Level, Ice, r Temperature and Meteorological Data e St. Lawrence Great Lakes,
11567 2H

GER, B.
Application of Membrane Processes in the ment of Sewage,
11666 5D

YNSKI, B. J.
utomated Spectrophotometric Suspended s Analysis for Activated Sludge,
11408 5D

SUGIURA, Y.
A Case of Subterranean Water Pollution Caused by the Public Refuse Disposal Ground, (In Japanese),
W75-11432 5B

SUMER, B. M.
Simulation of Dispersion of Suspended Particles,
W75-11782 8B

SUSAG, R. H.
Use of Sewage Sludge in Agriculture with Adequate Environmental Safeguards,
W75-11718 5D

SUTHERLAND, R. C.
Forecasting Urban Water Use: Commercial Establishments,
W75-11795 6D

SVANTESON, S. E. A.
Device and Method for Conducting Waste Liquid from a Receptacle to a Pneumatic Liquid Disposal System,
W75-11519 5D

SWART, E. R.
The Physico-Chemical Treatment of Crude Sewage,
W75-11404 5D

SWARTZENDRUBER, D.
Infiltration and Runoff for Small Field Plots Under Constant Intensity Rainfall,
W75-11458 3B

SYLVESTER, J. R.
Biological Considerations on the Use of Thermal Effluents for Finfish Aquaculture,
W75-11759 5C

TAKAHASHI, T.
Tropical Showers in an Axisymmetric Cloud Model,
W75-11635 2B

TAKAMURA, Y.
Report of Analyses for Industrial Waste Water in Twenty-Eight Factories, (In Japanese),
W75-11671 5A

TAKECHI, H.
Studies on the Treatment of Wastewaters from the Towel Dyeing Industry,
W75-11376 5D

TAO, P. C.
Models of the Stochastic and Chronologic Structure, Prediction and Simulation of Runoff Sequences - Application to the Lower Ohio Basin,
W75-11783 2E

TATINCLAUX, J. C.
Scale Effects on Cooling Tower Model Studies,
W75-11470 8B

TAYLOR, G.
Hurricane Experience Levels of Coastal County Populations - Texas to Maine,
W75-11570 2B

TAYLOR, G. S.
Effect of Backfill on Drain Flow in Layered Soils,
W75-11834 8D

TAYLOR, J. H.
Development of Salinity Control Technology in Grand Valley,
W75-11585 5G

TEICHMANN, C. F.
Sewage Disposal Process,
W75-11522 5D

TEN,
Organochlorine Compounds in Several Marine Organisms from the North Sea and the Dutch Wadden Sea,
W75-11608 5B

TEPLYAKOV, P. A.
Studies of the Aromatic Compounds Content in Sea Water by Low-Temperature Luminescent Spectroscopy, (In Russian),
W75-11786 5A

TERMAN, G. L.
Rice Response to Nitrogen and Phosphorus in Flooded and Nonflooded Soils,
W75-11597 3F

THOMAS, G. W.
Chloride and Tritiated Water Flow in Disturbed and Undisturbed Soil Cores,
W75-11594 2G

THOMAS, R. D.
Subsurface Waste Injection in the United States: Fifteen Case Histories,
W75-11627 5D

THOMPSON, R. G.
An Integrated Power Process Model of Water Use and Waste Water Treatment in Chlor-Alkali Production,
W75-11765 5D

TICHACEK, G. J.
De Kalb County Surface Water Resources,
W75-11625 4A

TICHY, M.
Biliary Excretion of Phenyl and Methyl Mercury Chlorides and Their Enterohepatic Circulation in Rats,
W75-11525 5C

TIMMONS, D. R.
Nutrient Transport in Surface Runoff as Influenced by Soil Cover and Seasonal Periods,
W75-11641 5B

TISCHLER, T. B.
Oxygen Activated Sludge Systems in Texas,
W75-11740 5D

TOMLINSON, R. T.
Sampling Tool for Taking Undisturbed Soil Cores,
W75-11599 2G

TOOHEY, C. K.
Desalination,
W75-11675 3A

TOPOL, G. J.
Sewage Treatment Process,
W75-11685 5D

TOSAKA, K.
Studies on Recovery of Chemicals and Manufacture of Activated Substances from Pulping Waste Liquor, Part 2, Use of Softwood KP-Waste Liquor, (In Japanese),
W75-11373 5D

TOVAR, J. S.
Different Soil Treatments for Harvesting Water for Radish Production in the Mexico Valley,
W75-11829 3B

TRACEY, R. J.
Storm Tide Frequency Analysis for the Coast of North Carolina, South of Cape Lookout,
W75-11560 2B

TRAINER, F. W.
Geohydrologic Reconnaissance of the Upper Potomac River Basin,
W75-11493 2F

TRAKHTMAN, N. N.
Revision of the Regulations 'Planning of Sanitary Protection Zones of a Central Water Supply System and Water Sources' (In Russian),
W75-11682 5G

TSUKABAYASHI, K.
Treatment of Waste Water from Textile Dyeing Process (Senshoku haisui shori),
W75-11374 5D

TUCKER, L. S.
Urban Drainage and Flood Control Projects. Economic, Legal and Financial Aspects,
W75-11352 6B

TUDOR, W. J.
Ocean Engineering--Selected References,
W75-11779 8B

TULLANDER, V.
Final Disposal of Municipal Sludge in Sweden,
W75-11403 5E

TULLIS, J. P.
Cavitation in Butterfly Valves,
W75-11777 8B

TUNG, C. C.
Influence of Current on Statistical Properties of Waves,
W75-11772 2L

TURNER, N. C.
Two-Dimensional Similarity Solution: Theory and Application to the Determination of Soil-Water Diffusivity,
W75-11640 2G

UFIMTSEVA, V. P.
Spectrophotometric Determination of Fluorine in Water, (In Russian).
W75-11433 5A

ULMGREN, L.
Swedish Experiences in Chemical Treatment of Wastewater,
W75-11694 5D

UYEDA, T. M.
Sewage Treatment Device,
W75-11508 5D

VAN SCHILFGAARDE, J.
Irrigation Management for Salt Control,
W75-11845 3C

VARSHAL, G. M.
Spectrophotometric Determination of Sugars in Natural Waters, (In Russian),
W75-11437 5A

VATER, W.
Planning and Construction of Sludge Treatment Plants (Planung und bau von Schlammbehandlungsanlagen),
W75-11748 5D

VAYSMAN, YA. I.
The Use of Computers for Forecasting the Sanitary Systems of Water Bodies (Primeneniye EVM dlya prognozirovaniya sanitarnogo sostoyaniya vodoyemov),
W75-11410 5D

VENEMA, G. J.
In-Line Filtration May Be Just for You,
W75-11698 5D

VENKATASAWMY, K.
Evapotranspiration and Soil Moisture in Upland Grass Catchments in the Eastern Pennines,
W75-11648 2D

VOGEL, A. H.
A Food Web Model for Lake Michigan Part 2-Model Formulation and Preliminary Verification,
W75-11547 5C

VOITENKO, A. M.
Studies of the Aromatic Compounds Content in Sea Water by Low-Temperature Luminescent Spectroscopy, (In Russian),
W75-11786 5A

VOLOKH, B. F.
Apparatus for Cleaning Loose Filtering Material in Slow Water Filled Water Supply Filters,
W75-11436 5F

WALKER, G.
Barnacles: Possible Indicators of Zinc Pollution,
W75-11611 5B

WALKER, W. R.
Development of Salinity Control Technology in Grand Valley,
W75-11585 5G

WALLACE, T. J.
Chemical Water Harvesting,
W75-11807 3B

WALTER, C. R.
A Plant Grows in Brooklyn,
W75-11701 5D

WANG, L. K.
Separation of Emulsified Oil from Water,
W75-11360 5D

WASHINGTON, B. T.
Metro Chicago Studies on Nitrification,
W75-11742 5D

WASSON, B. E.
Ground-Water Data for Bolivar County, Mississippi,
W75-11496 7C

WATKINS, F. A. JR.
Geohydrologic Reconnaissance of the Upper Potomac River Basin,
W75-11493 2F

WEBBER, J.
Sludge Handling and Disposal Practices in England,
W75-11717 5D

WEBBER, L. R.
Agricultural Use of Sludge,
W75-11720 5C

WEIS, G. G.
Variation in Effectiveness of Supplemental Irrigation on Sweet Corn Yield Components,
W75-11844 3F

WEISS, H. V.
The Determination of Cadmium in Sea Water by Radioactivation,
W75-11798 5A

WELLS, D. M.
Procedure for Selecting a Minimal Environmental Impact Routing for a Water Conveyance Canal,
W75-11764 6G

WENDLING, W.
Analysis of International Great Lakes Shipping and Hinterland,
W75-11576 6C

WHEELER, J. R.
Formation and Collapse of Surface Films,
W75-11642 2K

WHITE, W. R.
Sediment Transport Theories: A Review,
W75-11453 2J

WHITTINGTON, D.
Experiences with sludge Handling in Texas,
W75-11736 5D

Oxygen Activated Sludge Systems in Texas,
W75-11740 5D

WIENS, J. A.
Habitat Heterogeneity and Avian Community Structure in North American Grasslands,
W75-11425 2I

WIERSMA, J. L.
Comparing Trickle, Subsurface and Sprinkler Irrigation Systems,
W75-11589 3F

WIGHT, H. L.
De Kalb County Surface Water Resources,
W75-11625 4A

WILLIAMS, D. W.
Simulation of Crop Resonse to Energy Inputs,
W75-11588 3F

WILLIAMS, G. C.
Water Development in Management of Livestock and Wildlife on Mountain Wildlands,
W75-11804 3B

WILLIAMS, J. R.
Hymo Flood Routing,
W75-11647 4A

WINANT, C. D.
Current Measurements Using a Tilting Spar,
W75-11564 7B

WOLANSKI, E. J.
Turbulent Entrainment Across Stable Density Step Structures,
W75-11451 2J

WOOD, W. W.
Water Quality Changes Related to the Development of Anaerobic Conditions During Artificial Recharge,
W75-11497 5B

WOODRUFF, N. P.
Establishing Windbreaks in Semiarid Areas by Altering the Microclimate or Supplying Additional Water,
W75-11827 3F

WOODWARD, G. M.
Pollution Detection and River Quality Management,
W75-11753 5A

**OODWELL, G. M.**
Sedimentation Rates in a Long Island Marsh Determined by PB210 Dating,
W75-11643 2L

**OOLHISER, D. A.**
Hydrologic Aspects of Water Harvesting in the Northern Great Plains,
W75-11811 2A

Opportunity for Harvesting Water from and Along Highways in Rangeland Areas of Wyoming,
W75-11826 3B

**, I.**
Optimizing Water Utilization Through Multiple Crops Scheduling,
W75-11587 3F

**NDERLICH, D.**
eration Systems for Metro Chicago,
W75-11739 5D

**MAZAKI, S.**
oss of Trace Elements from Natural Water uring Storage. I. Behavior of 203 Hg and 65 n Added to Pond Water,
W75-11543 5A

**NG, J. Y.**
eparation of Emulsified Oil from Water,
W75-11360 5D

**UDA, S.**
ombined Treatment of Municipal and Industrial Wastewater,
W75-11733 5D

**, C. S.**
il and Hydrologic Factors Affecting the Stability of Natural Slopes in the Oregon Coast nge,
W75-11353 2G

**AKI, I. H.**
ydrochemical and Hydrobiological Peculiarities of Limans in the Danube-Dniester Interve, (In Ukrainian),
W75-11847 2K

**JEVICH, V.**
neration of Hydrologic Samples: Case Study the Great Lakes,
W75-11476 2H

**T, K. J.**
robic Sewage Treatment System,
W75-11507 5D

**NG, J. S.**
ell Disease in Crabs and Lobsters from New rk Bight,
W75-11606 5C

**EL, O.**
ll Shear Measurement in Sand-Water Mix- Flows,
W75-11653 8B

**SOVA, T. S.**
itary and Hygienic Evaluation of Seepage ers of Structures Protecting Reservoirs (In sian),
W75-11412 5B

**DAL, T. J.**
Water Potential Threshold for the Increase bscisic Acid in Leaves,
W75-11394 2I

**ZAYTSEVA, N. V.**
The Use of Computers for Forecasting the Sanitary Systems of Water Bodies (Primeneniye EVM dlya prognozirovaniya sanitarnogo sostoyaniya vodoyemov),
W75-11410 5D

**ZAZNOBOVA, N. A.**
Field Experience in Disinfecting Water Mains (In Russian),
W75-11411 5F

**ZEFF, J. D.**
Domestic Water Purification Method and System,
W75-11427 5D

**ZEIDEL, K. G.**
Water Processing Plant to Controlled Acidity Level,
W75-11421 5F

**ZEMAN, A. J.**
Physicochemical Properties of Dredge Spoil,
W75-11465 5B

**ZENX, D. R.**
Metro Chicago Studies on Nitrification,
W75-11742 5D

**ZENZ, D. R.**
Suspended Solids Removal Processes Studied at Metro Chicago,
W75-11741 5D

**ZHUKOV, D. D.**
Acceleration of Biochemical Treatment of Wastewater in Petroleum Refineries,
W75-11371 5D

**ZUZEL, J. F.**
Comparison of Precipitation Gage Catches with a Modified Alter and a Rigid Alter Type Windshield,
W75-11457 2B

# ORGANIZATIONAL INDEX


**ICULTURAL DEVELOPMENT ADVISORY VICE, LEEDS (ENGLAND).**
idge Handling and Disposal Practices in En-nd,
75-11717 5D

**ICULTURAL ENGINEERING CENTRE, SBURY (RHODESIA).**
rameters for Estimating Annual Runoff and l Loss from Agricultural Lands in Rhodesia,
5-11830 4A

**ICULTURAL RESEARCH SERVICE, ON, COLO. CENTRAL GREAT PLAINS D STATION.**
formance and Durability of Sheet Metal, yl Rubber, Asphalt Roofing and Bentonite Harvesting Precipitation,
5-11808 3B

**CULTURAL RESEARCH SERVICE, RN, ALA.**
nparison of Fog Irrigation with Surface Ir-tion in Corn Production,
5-11837 3F

**CULTURAL RESEARCH SERVICE, N ROUGE, LA.**
cultural Drainage Research Needs and Pri-es, 1974,
-11632 4A

**CULTURAL RESEARCH SERVICE, SVILLE, MD. HYDROGRAPH LAB.**
Moisture Accounting Component of the DAHL-74 Model of Watershed Hydrology,
-11656 2G

**CULTURAL RESEARCH SERVICE, , IDAHO. NORTHWEST WATERSHED RCH CENTER.**
parison of Precipitation Gage Catches with odified Alter and a Rigid Alter Type lshield,
11457 2B

ologic Aspects of Water Harvesting in the nern Great Plains,
11811 2A

**ULTURAL RESEARCH SERVICE, AND, TEX. SOUTHWESTERN GREAT S RESEARCH CENTER.**
ff Utilization for Grain Production,
11824 3B

**ULTURAL RESEARCH SERVICE, FORT NS, COLO.**
Evaluation of Microwatershed and Verti-ulch Systems,
1819 3B

nalysis of the Efficiency of Micro-shed Systems,
1820 3B

tunity for Harvesting Water from and Highways in Rangeland Areas of Wyom-
1826 3B

Pivot Design Capacities in Eastern do,
1835 8A

**LTURAL RESEARCH SERVICE, TTAN, KANS.**
shing Windbreaks in Semiarid Areas by g the Microclimate or Supplying Addi-Water,
827 3B

**AGRICULTURAL RESEARCH SERVICE, MORRIS, MINN. NORTH CENTRAL SOIL CONSERVATION RESEARCH CENTER.**
Nutrient Transport in Surface Runoff as Influenced by Soil Cover and Seasonal Periods,
W75-11641 5B

**AGRICULTURAL RESEARCH SERVICE, ORONO, MAINE. SOIL, WATER AND AIR SCIENCES.**
Precipitation Entrapment for Evaporation Suppression,
W75-11822 3B

**AGRICULTURAL RESEARCH SERVICE, PHOENIX, ARIZ. WATER CONSERVATION LAB.**
Water Harvesting for Livestock, Wildlife, and Domestic Use,
W75-11803 3B

Storage Systems for Harvested Water,
W75-11815 3B

Evaporation Suppression for Conserving Water Supplies,
W75-11816 3B

**AGRICULTURAL RESEARCH SERVICE, RIVERSIDE CALIF. SALINITY LAB.**
Field Test of Soil Water Flux Meters,
W75-11586 2G

Irrigation Management for Salt Control,
W75-11845 3C

**AGRICULTURAL RESEARCH SERVICE, ST. PAUL, MINN.**
Use of Sewage Sludge in Agriculture with Adequate Environmental Safeguards,
W75-11718 5D

**AGRICULTURAL RESEARCH SERVICE, TEMPLE, TEX.**
Hymo Flood Routing,
W75-11647 4A

**AGRICULTURAL RESEARCH SERVICES, PHOENIX, ARIZ. WATER CONSERVATION LAB.**
Quantity and Frequency of Trickle and Furrow Irrigation for Efficient Cabbage Production,
W75-11839 3F

**AIRRIGATION ENGINEERING CO., INC. CARMEL VALLEY, CALIF. (ASSIGNEE).**
Apparatus for Sewer Treatment to Kill Three Roots and Other Organic Growth Therewithin,
W75-11513 5G

**AKADEMIYA NAUK SSSR, MOSCOW. INST. OF EVOLUTIONARY MORPHOLOGY AND ANIMAL ECOLOGY.**
Spawning Grounds of the European Walleye Lucioperca Lucioperca L. and Volga Walleye Lucioperca Volgensis (Gmelin) in the Ural River (In Russian),
W75-11668 2I

**AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT GEOKHIMII I ANALITITICHESKOI KHIMII.**
Spectrophotometric Determination of Sugars in Natural Waters, (In Russian),
W75-11437 5A

**AKADEMIYA NAUK URSR, KIEV. INSTYTUT HIDROBIOLOGII.**
Hydrochemical and Hydrobiological Peculiarities of Limans in the Danube-Dniester Interfluve, (In Ukrainian),
W75-11847 2K

**ALABAMA DEVELOPMENT OFFICE, MONTGOMERY. STATE PLANNING DIV.**
Proceedings of Alabama Coastal Leaders Conference on Coastal Zone Management.
W75-11555 6E

**ALASKA UNIV., COLLEGE. INST. OF WATER RESOURCES.**
Sediment Relations of Selected Alaskan Glacier-Fed Streams,
W75-11477 2J

**AMERICAN PETROLEUM INST., WASHINGTON, D.C.**
The Status of Oiled Wildlife: Research and Planning,
W75-11617 5G

**AMERICAN SOCIETY OF CIVIL ENGINEERS, NEW YORK. TASK COMMITTEE ON SELECTED REFERENCES OF THE TECHNICAL COUNCIL ON OCEAN ENGINEERING.**
Ocean Engineering--Selected References,
W75-11779 8B

**AMOCO PRODUCTION CO., TULSA, OKLA.**
Wave Energy Transfer Mechanisms in Wind-Wave Tunnels,
W75-11774 8B

**ANHEUSER-BUSCH, INC., ST. LOUIS, MO. (ASSIGNEE)**
Use of Oxidized Cationic Starch in Flocculation and Dewatering of Municipal Sludge,
W75-11420 5D

**ANNAMALAI UNIV., ANNAMALAINAGAR (INDIA).**
Man on the Hydrologic Cycle,
W75-11776 2A

**ARIZONA UNIV., TUCSON. DEPT. OF SOILS, WATER AND ENGINEERING.**
Desert Strip Farming--Computer Simulation of an Ancient Water Harvesting Technique,
W75-11812 3B

Crop Production by Water Harvesting,
W75-11823 3B

Multipurpose Salt Treated Water Harvesting System,
W75-11828 3B

**ARIZONA WATER RESOURCES RESEARCH CENTER, TUCSON.**
Engineering Aspects of Water Harvesting Research at the University of Arizona,
W75-11802 3B

**ARMY ENGINEER DISTRICT, BUFFALO, N.Y.**
Flood Plain Information: Ley Creek, Salina and Dewitt Townships, Onondaga County, New York.
W75-11785 4A

Flood Plain Information: Flood Hazard Report of 4-7 July 1969 Flood, Huron River, Norwalk Creek, Ohio.
W75-11787 4A

Flood Plain Information: Plum Creek, Brunswick Hills and Medina Townships, Medina County, Ohio.
W75-11788 4A

Flood Plain Information: Chittenango Creek, Bridgeport, Onondaga and Madison Counties, New York.
W75-11792 4A

**ARMY ENGINEER DISTRICT, JACKSONVILLE, FLA.**


**ARMY ENGINEER DISTRICT, JACKSONVILLE, FLA.**
Closure Conditions Mouth of the Russian River,
W75-11454 2L

**ARMY ENGINEER DISTRICT, KANSAS CITY, MO.**
Flood Plain Information: Contrary Creek, St. Joseph, Missouri.
W75-11791 4A

**ARMY ENGINEER DISTRICT, LOS ANGELES, CALIF.**
Flood Plain Information: Ventura River, Ventura County, California.
W75-11790 4A

**ARMY ENGINEER DISTRICT, SACRAMENTO, CALIF.**
Flood Plain Information: Northeast Stream Group, Stockton, California.
W75-11789 4A

**ASSIUT UNIV. (EGYPT). DEPT. OF HYDRAULICS.**
River Regime with Special Reference to River Nile,
W75-11464 2J

**ASSOCIATED WATER AND AIR RESOURCES ENGINEERS, INC., NASHVILLE, TENN.**
Ammonia Removal from Municipal Wastewaters by Ion Exchange,
W75-11405 5D

**ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL (ENGLAND).**
The Application of Membrane Processes in the Treatment of Sewage,
W75-11666 5D

**AUTOTROL CORP., MILWAUKEE, WIS. (ASSIGNEE).**
Air Driven Rotating Biological Contactor Apparatus,
W75-11680 5D

**BABCOCK AND WILCOX CO., NEW YORK. (ASSIGNEE).**
Sewage Disposal System,
W75-11511 5D

**BATTELLE-COLUMBUS LABS., OHIO.**
Land Use and Environmental Planning: An Application in the South Carolina Coastal Zone,
W75-11766 6G

**BATTELLE-PACIFIC NORTHWEST LABS., RICHLAND, WASH. SYSTEMS DEPT.**
Variable Thickness Transient Groundwater Flow Model User's Manual,
W75-11469 2F

**BATTELLE-PACIFIC NORTHWEST LABS., RICHLAND, WASH. WATER AND LAND RESOURCES DEPT.**
Transport Model, User's Manual,
W75-11468 5B

**BIRMINGHAM UNIV. (ENGLAND). DEPT. OF CHEMISTRY.**
Quantitative Inorganic Analysis by Gas Chromatography, a Review,
W75-11528 5A

**BIRMINGHAM UNIV. (ENGLAND). DEPT. OF CIVIL ENGINEERING.**
The Rainfall Recorder Problem,
W75-11448 2B

**BRISTOL UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.**
Demodulation of Stream-Flow Series,
W75-11449 2E

**BRITISH COLUMBIA UNIV., VANCOURVER. DEPT. OF ZOOLOGY.**
Fish Toxicants in Kraft Effluents.
W75-11358 5C

**BROOKHAVEN NATIONAL LAB., UPTON, N.Y.**
Sedimentation Rates in a Long Island Marsh Determined by PB210 Dating,
W75-11643 2L

**BUREAU OF INDIAN AFFAIRS, PHOENIX, ARIZ.**
Water Harvesting Catchments on Indian Lands in the Southwest,
W75-11809 3B

**BUREAU OF MINES, BARTLESVILLE, OKLA. BARTLESVILLE ENERGY RESEARCH CENTER.**
Subsurface Waste Injection in the United States: Fifteen Case Histories,
W75-11627 5D

**BUREAU OF RECLAMATION, DENVER, COLO. DIV. OF RESEARCH.**
Hydraulic Design of Vertical Stilling Wells,
W75-11650 8B

Environmental Aspects of Aquatic Plant Control,
W75-11843 5G

**BUREAU OF SPORT FISHERIES AND WILDLIFE, LAUREL, MD. PATUXENT WILDLIFE RESEARCH CENTER.**
The Brown Pelican and Certain Environmental Pollutants in Louisiana,
W75-11757 5A

**BURNS AND ROE CONSTRUCTION CORP., FOUNTAIN VALLEY, CALIF.**
Sea Water Softening with the Lime-Magnesium Carbonate (LMC) Process,
W75-11699 5F

**CALIFORNIA UNIV., DAVIS.**
Nitrification and Denitrification During Miscible Displacement in Unsaturated Soil,
W75-11596 3F

Effect of Backfill on Drain Flow in Layered Soils,
W75-11834 8D

**CALIFORNIA UNIV., DAVIS. DEPT. OF AGRONOMY AND RANGE SCIENCE.**
Effects of Water Management and Soil Aggregation on the Growth and Nutrient Uptake of Rice,
W75-11832 3F

**CALIFORNIA UNIV., DAVIS. DEPT. OF SOILS AND PLANT NUTRITION.**
A Comparison of 15N-Depleted and 15N-Enriched Fertilizers as Tracers,
W75-11591 3F

Kinetic and Equilibrium Studies of Boron Desorption from Soil,
W75-11600 2G

**CALIFORNIA UNIV., DAVIS. DEPT. OF WATER SCIENCE AND ENGINEERING.**
Response of Unconfined Aquifer Systems to Deep Percolation,
W75-11474 2F

Mathematical Models of Artificial Recharge Systems.
W75-11626 4B

**CALIFORNIA UNIV., DAVIS. WATER RESOURCES CENTER.**
Directory of Water Resources Expertise. Water Research Faculty and Staff Scientists
W75-11580 10C

**CALIFORNIA UNIV., LOS ANGELES. SCHOOL OF ENGINEERING AND APPLIED SCIENCE.**
Gypsum Solubility and Scaling Limits in Saline Waters.
W75-11473 3A

**CALIFORNIA UNIV., RIVERSIDE.**
Water Harvesting for Barley in a 30-CM Winter Rainfall Area,
W75-11825 3F

**CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL SCIENCE AND AGRICULTURAL ENGINEERING.**
Salt Tolerance of Mexican Wheat: II. Relatio to Variable Sodium Chloride and Length o Growing Season,
W75-11603 3

**CALIFORNIA UNIV., SANTA BARBARA. DEPT OF MECHANICAL AND ENVIRONMENTAL ENGINEERING.**
Solution of a Free-Surface Boundary Valu Problem Using an Inverse Formulation and th Finite Element Method,
W75-11447 2

**CAMBRIDGE UNIV. (ENGLAND). DEPT. OF ENGINEERING.**
Velocities Above Rough Bed in Oscillato Flow,
W75-11763 8

**CAMP, DRESSER AND MCKEE, INC., BOSTON, MASS.**
City, Industry Face Pollution Abateme Together,
W75-11366

**CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).**
Physicochemical Properties of Dredge Spoil,
W75-11465

Determination of the Apparent Complex Capacity of Lake Waters,
W75-11538

**CANTERBURY UNIV., CHRISTCHURCH (NE ZEALAND). SCHOOL OF FORESTRY.**
Diurnal Patterns of Water Potential in Al Concolor and Pinus Ponderosa,
W75-11382

**CEA CENTRE DE LA HAGUE, CHERBOURG (FRANCE). LABORATOIRE DE RADIOECOLOGIE MARINE.**
Copper and Zinc in Cancer Irroratus: Comp tive Metabolism of the Molt Cycle, le Cuiv le Zinc Chez Cancer Irror (Crustace:Decapode): Metabolisme Com au Cours du Cycle D'intermue,
W75-11752

**CENTRAL AND SOUTHERN FLORIDA FLO CONTROL DISTRICT, WEST PALM BEACH RESOURCES PLANNING DEPT.**
Studies of Floodplain Vegetation and W Level Fluctuation in the Kissimmee River ley,
W75-11628

**TRAL SOIL SALINITY RESEARCH INST., NAL (INDIA). DIV. OF SOILS AND ONOMY.**
rformance of Rice Varieties in a Highly line Sodic Soil as Influenced by Plant Popu-ion,
75-11838 3C

**AGO UNIV., ILL. LAB. FOR OSPHERIC PROBING.**
llular Snow Generation--A Doppler Radar dy,
5-11634 2B

**INNATI UNIV., OHIO. DEPT. OF RONMENTAL HEALTH.**
rastructural Effects of Acute Tetraethyllead soning on Nerve Cells of the Rabbit Brain,
5-11530 5C

**DE RIVER PURIFICATION BOARD, GOW (SCOTLAND).**
Continuous Monitoring of Water Quality,
5-11667 5A

**TE BURIAL VAULT, INC., WEST ON, OHIO. (ASSIGNEE).**
obic Sewage Treatment System,
5-11507 5D

**REGIONS RESEARCH AND NEERING LAB., FAIRBANKS, ALASKA.**
peration in Water Resources Programs: ska's Example,
5-11775 6B

**RADO STATE UNIV., FORT COLLINS.**
ermining Optimal Well Discharge,
5-11768 4B

itation in Butterfly Valves,
-11777 8B

**RADO STATE UNIV., FORT COLLINS. OF AGRICULTURAL ENGINEERING.**
elopment of Salinity Control Technology in d Valley,
-11585 5G

**RADO STATE UNIV., FORT COLLINS. OF ATMOSPHERIC SCIENCE.**
her Studies on the Origin of Hurricanes,
-11559 2B

**RADO STATE UNIV., FORT COLLINS. OF CIVIL ENGINEERING.**
n Drainage and Flood Control Projects. omic, Legal and Financial Aspects,
11352 6B

ration of Hydrologic Samples: Case Study e Great Lakes,
11476 2H

Particle Settlement in Open-Channel ,
11652 5B

**ONWEALTH SCIENTIFIC AND TRIAL RESEARCH ORGANIZATION, URNE (AUSTRALIA). DIV. OF CAL TECHNOLOGY.**
therm Desalination,
11707 5D

**CTICUT AGRICULTURAL MENTAL STATION, NEW HAVEN. OF ECOLOGY AND CLIMATOLOGY.**
Dimensional Similarity Solution: Theory pplication to the Determination of Soil-Diffusivity,
1640 2G

**CONSOLIDATED-BATHURST LTD., GRAND'MERE (QUEBEC).**
Float-Wash Fractionator Saves Fibre and Water at Grand'Mere,
W75-11363 5D

**DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA). INST. OF OCEANOGRAPHY.**
Formation and Collapse of Surface Films,
W75-11642 2K

**DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA). TRACE ANALYSIS RESEARCH CENTRE.**
The Determination of Traces of Lead (II) by Solid-State Luminescence,
W75-11541 5A

**DARMOUTH MEDICAL SCHOOL, HANOVER, N.H. DEPT. OF ANATOMY.**
Embryopathic Effects of Different Routes of Administration of Mercuric Acetate in the Hamster,
W75-11524 5C

**DEJONG AND ASSOCIATES, TUCSON, ARIZ.**
Chemical Water Harvesting,
W75-11807 3B

**DELAWARE UNIV., NEWARK. DEPT. OF CHEMICAL ENGINEERING.**
A Design and Economic Evaluation of Wet-Air and Catalytic Oxidation of Sewage Sludge,
W75-11784 5D

**DEPARTMENT OF AGRICULTURE, OTTAWA (ONTARIO). SOIL RESEARCH INST.**
Modified Penman Equation to Provide the Upper Boundary Condition in Computing Evaporation from Soil,
W75-11598 2D

**DEPARTMENT OF THE ENVIRONMENT, READING (ENGLAND). CENTRAL WATER PLANNING UNIT.**
Identification of Parameters in a Linear Equation of Groundwater Flow,
W75-11799 2F

**DOW CORNING CORP., MIDLAND, MICH.**
Soil Treatment with Silicones for Water Harvesting,
W75-11806 3B

**EAST-CENTRAL STATE SOIL AND WATER RESOURCES (NIGERIA).**
Resistance to Flow in Alluvial Channels,
W75-11459 2E

**ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE (SWITZERLAND). LABORATOIRE D'HYDRAULIQUE.**
Turbulent Drag Coefficients of Sharp-Edged Objects,
W75-11654 8B

**ENVIRONMENTAL PROTECTION AGENCY, BOSTON, MASS. DIV. OF SURVEILLANCE AND ANALYSIS.**
The Casco Bay Oil Spill: Problems of Cleanup and Disposal,
W75-11615 5G

**ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. MUNICIPAL POLLUTION CONTROL DIV.**
Storm and Combined Sewer Abatement Technology in the United States--An Overview,
W75-11414 5D

**ENVIRONMENTAL PROTECTION SERVICE, BURLINGTON (ONTARIO). WASTE WATER TECHNOLOGY CENTER.**
Disposal of Chemical Sewage Sludges on Land and Their Effects on Plants, Leachate and Soil Systems,
W75-11721 5E

Effects of Control Variables and Sludge Characteristics on the Performance of Dewatering and Thickening Devices,
W75-11723 5D

The Use of Physicochemical Sludge Characteristics and Bench Dewatering Tests in Predicting the Efficiency of Thickening and Dewatering Processes,
W75-11724 5D

Aspects of Incinerating Chemical Sludges,
W75-11728 5D

**ESCUELA NACIONAL DE AGRICULTURA, CHAPINGO (MEXICO). DEPT. OF SOILS.**
Different Soil Treatments for Harvesting Water for Radish Production in the Mexico Valley,
W75-11829 3B

**ETUDES ET PROCEDES D'ASSAINISSEMENT PURATOR, RENNES (FRANCE). (ASSIGNEE).**
Process for Treating Waste Water,
W75-11387 5D

**EXXON RESEARCH AND ENGINEERING CO., FLORHAM PARK, N.J. FRACTIONATION/THERMODYNAMICS SECTION.**
Optimum Design of Sour Water Strippers,
W75-11361 5D

**FLEET WEATHER CENTRAL FPO SAN FRANCISCO, 96630.**
Western North Pacific Typhoons, 1974,
W75-11578 2B

Central North Pacific Tropical Cyclones, 1974,
W75-11579 2B

**FLORIDA UNIV., GAINESVILLE.**
Sampling Tool for Taking Undisturbed Soil Cores,
W75-11599 2G

Continuous Monitoring, Automated Analysis and Sampling Procedures, (Literature Review),
W75-11711 5A

**FOREST SERVICE (USDA), ALBUQUERQUE, N. MEX. ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION.**
Using Paraffin and Polythylene to Harvest Water for Growing Shrubs,
W75-11821 3B

**FRANKFURT UNIV. (WEST GERMANY). HYGIENE-INSTITUT.**
Is the Malachite Green Broth According to Habs and Kirchner Suitable for Serving as an Isolation Medium for Pseudomonas Aeruginosa from Water, (In German),
W75-11435 5B

**FREESE AND NICHOLS, FORT WORTH, TEX.**
Balancing Reservoir--A Key Element in Water Supply Plan,
W75-11687 4A

**GENERAL ELECTRIC CO., ST. PETERSBURG, FLA. ENVIRONMENTAL HEALTH DIV.**
Land Spreading Effluent from a Secondary Facility,
W75-11365 5D

**GEOLOGICAL SURVEY, ANCHORAGE, ALASKA.**
Hydrology for Land-Use Planning: The Hillside Area, Anchorage, Alaska,
W75-11504 4A

**GEOLOGICAL SURVEY, BATON ROUGE, LA.**
Ground-Water Levels in Louisiana--For Wells Measured Through 1974.
W75-11499 7C

**GEOLOGICAL SURVEY, BISMARCK, N.DAK.**
Predictive Modeling of Effects of the Planned Kindred Lake on Ground-Water Levels and Discharge, Southeastern North Dakota,
W75-11503 4A

**GEOLOGICAL SURVEY, HONOLULU, HAWAII.**
Floods in the Waiahole-Waikane Area, Oahu, Hawaii,
W75-11495 2E

**GEOLOGICAL SURVEY, HONOLULU, HAWAII. WATER RESOURCES DIV.**
Mercury Cycling in a Small Hawaiian Estuary,
W75-11563 5C

**GEOLOGICAL SURVEY, JACKSON, MISS.**
Ground-Water Data for Bolivar County, Mississippi,
W75-11496 7C

**GEOLOGICAL SURVEY, LITTLE ROCK, ARK.**
Progress Report to the Arkansas State Highway Commission for Year Ending June 30, 1975,
W75-11501 8B

**GEOLOGICAL SURVEY, LUBBOCK, TEX.**
Water Quality Changes Related to the Development of Anaerobic Conditions During Artificial Recharge,
W75-11497 5B

**GEOLOGICAL SURVEY, PORTLAND, OREG.**
Ground-Water Data in the Harrisburg - Halsey Area, Central Willamette Valley, Oregon,
W75-11498 7C

**GEOLOGICAL SURVEY, RESTON, VA.**
Quality of Surface Waters of the United States, 1970: Part 1. North Atlantic Slope Basins.
W75-11479 7C

Quality of Surface Waters of the United States, 1970: Part 2. South Atlantic Slope and Eastern Gulf of Mexico Basins.
W75-11480 7C

Quality of Surface Waters of the United States, 1968: Part 3. Ohio River Basin.
W75-11481 7C

Quality of Surface Waters of the United States, 1969: Part 6. Missouri River Basin.
W75-11482 7C

Quality of Surface Waters of the United States, 1970: Part 7. Lower Mississippi River Basin.
W75-11483 7C

Quality of Surface Waters of the United States, 1968: Part 8. Western Gulf of Mexico Basins.
W75-11484 7C

Quality of Surface Waters of the United States, 1970: Part II. Pacific Slope Basins in California.
W75-11485 7C

Surface Water Supply of the United States, 1966-70: Part 6. Missouri River Basin--Volume 3, Missouri River Basin from Sioux City, Iowa, to Nebraska City, Nebraska.
W75-11486 7C

Surface Water Supply of the United States, 1966-70: Part 8. Western Gulf of Mexico Basins--Volume 2. Basins from Lavaca River to Rio Grande.
W75-11487 7C

Surface Water Supply of the United States, 1966-70: Part 9. Colorado River Basin--Volume 3. Lower Colorado River Basin
W75-11488 7C

Surface Water Supply of the United States, 1966-70: Part 10. The Great Basin.
W75-11489 7C

Surface Water Supply of the United States, 1966-70: Part 12. Pacific Slope Basins in Washington--Volume 1. Pacific slope Basins in Washington Except Columbia River Basin.
W75-11490 7C

Surface Water Supply of the United States, 1966-70: Part 13. Snake River Basin.
W75-11491 7C

Selenium in Waters in and Adjacent to the Kendrick Project, Natrona County, Wyoming,
W75-11492 5B

Geohydrologic Reconnaissance of the Upper Potomac River Basin,
W75-11493 2F

Digital-Simulation and Projection of Water-Level Declines in Basalt Aquifers of the Odessa-Lind Area, East-Central Washington,
W75-11494 2F

Data Requirements for the Optimization of Reservoir Design and Operating Rule Determination,
W75-11500 4A

**GEOLOGICAL SURVEY, TACOMA, WASH.**
Low-Flow Characteristics of Streams in the Grays Harbor Drainages, Washington,
W75-11502 2E

**GEORGIA UNIV., SAVANNAH. MARINE EXTENSION CENTER.**
The Ecology of the Cumberland Island National Seashore Camden County, Georgia,
W75-11546 2L

**GILBERT ASSOCIATES, INC., READING, PA.**
An Equitable Sewer Use Charge System,
W75-11391 5G

**GORKOVSKII MEDITSINSKII INSTITUT (USSR).**
Sanitary and Hygienic Evaluation of Seepage Waters of Structures Protecting Reservoirs (In Russian),
W75-11412 5B

**GRAND SHEET METAL PRODUCTS CO., MELROSE PARK, ILL. CRONAME DIV.**
Treatment and Disposal of Anodizing Effluents, Part I,
W75-11377 5D

**GRAND SHEET METAL PRODUCTS CO., MELROSE PARK, ILL. CRONOME DIV.**
Treatment and Disposal of Anodizing Effluents, Part II,
W75-11378 5D

**GREATER VANCOUVER SEWAGE AND DRAINAGE DISTRICT. (BRITISH COLUMBI**
Large Diameter Submarine Steel Pipe Crossings.
W75-11380

**GUELPH UNIV. (ONTARIO). DEPT. OF LAN RESOURCE SCIENCE.**
Agricultural Use of Sludge.
W75-11720

**HALCROW (WILLIAM) AND PATNERS, LONDON (ENGLAND).**
Boundary Shear in Channel with Flood Plai
W75-11463

**HAVENS AND EMERSON LTD., EAST PATERSON, N.J.**
Innovative Water Plant Slated for New Jers
W75-11696

**HAWAII INST. OF GEOPHYSICS, HONOLU**
Predicting Exchangeable Sodium Ratios i rigated Tropical Vertisols,
W75-11595

**HAWAII UNIV., HILO. CLOUD PHYSICS OBSERVATORY.**
Tropical Showers in an Axisymmetric C Model,
W75-11635

**HAWAII UNIV., HONOLULU. DEPT. OF AGRICULTURAL ENGINEERING.**
Optimizing Water Utilization Through Mu Crops Scheduling,
W75-11587

**HAWAII UNIV., HONOLULU. DEPT. OF AGRONOMY AND SOIL SCIENCE.**
Unsaturated Hydraulic Conductivity fro mulative Inflow Data,
W75-11593

**HAZEN AND SAWYER, NEW YORK.**
A Plant Grows in Brooklyn,
W75-11701

**HEBREW UNIV., JERUSALEM (ISRAEL). DEPT. OF ATMOSPHERIC SCIENCES.**
On the Collection Efficiency of Water D Under the Influence of Electric Forces, perimental, Charge-Multipole Effects,
W75-11639

**HEBREW UNIV., REHOVOTH (ISRAEL). OF SOIL AND WATER SCIENCE.**
Infiltration and Runoff for Small Fiel Under Constant Intensity Rainfall,
W75-11458

**HELSINKI UNIV. (FINLAND). DEPT. OF SILVICULTURE.**
Effect of Water Stress, Temperature, ar on Photosynthesis in Alder Seedlings,
W75-11691

**HOKKAIDO UNIV., SAPPORO (JAPAN). OF APPLIED CHEMISTRY.**
Studies on Recovery of Chemicals and facture of Activated Substances from Waste Liquor, Part 2, Use of Softwo Waste Liquor, (In Japanese),
W75-11373

**HOUSTON UNIV., TEX. DEPT. OF QUANTITATIVE MANAGEMENT SCIE**
An Integrated Power Process Model Use and Waste Water Treatment in C kali Production,
W75-11765

**HYDRAULICS RESEARCH STATION, WALLINGFORD (ENGLAND).**
Sediment Transport Theories: A Review,
W75-11453 2J

**HYDROCOMP, INC., PALO ALTO, CALIF.**
Role of Computer Simulation in Administering an Urban Drainage Ordinance,
W75-11669 6E

**IBARAKI UNIV., MITO (JAPAN). FACULTY OF AGRICULTURE.**
Report of Analyses for Industrial Waste Water in Twenty-Eight Factories, (In Japanese),
W75-11671 5A

**ILLINOIS DEPT. OF CONSERVATION, SPRINGFIELD. DIV. OF FISHERIES.**
Mercer County Surface Water Resources,
W75-11622 4A

Vermilion County Surface Water Resources,
W75-11623 4A

Lawrence County Surface Water Resources,
W75-11624 4A

De Kalb County Surface Water Resources,
W75-11625 4A

**IMPERIAL COLL. OF SCIENCE AND TECHNOLOGY, LONDON (ENGLAND). APPLIED GEOCHEMISTRY RESEARCH GROUP.**
Chemical Composition of Aegean Sea Sediments,
W75-11533 2J

**INCA-ONE CORP., LOS ANGELES, CALIF. (ASSIGNEE)**
Domestic Water Purification Method and System,
W75-11427 5D

**INSTITUT HYGIENY A EPIDEMIOLOGIE, PRAGUE (CZECHOSLOVAKIA).**
Biliary Excretion of Phenyl and Methyl Mercury Chlorides and Their Enterohepatic Circulation in Rats,
W75-11525 5C

**INSTITUT SCIENTIFIQUE ET TECHNIQUE DES PECHES MARITIMES, NANTES (FRANCE). SERVICE DE POLLUTION.**
The Growth of Posidonia and the Urban Pollution in the Gulf of Giens, (In French),
W75-11761 5C

**INSTITUTE NATIONAL DE LIMNOLOGIE, SANTO TOME (ARGENTINA).**
Phytoplankton in Lake Mascardi (Rio Negro, Argentina), (In Spanish),
W75-11532 5C

**INSTITUTE OF OCEANOGRAPHIC SCIENCES, BIRKENHEAD (ENGLAND).**
The Reduction of Artificial Boundary Reflexions in Numerically Modelled Estuaries,
W75-11452 2L

**INSTITUTO DI BIOLOGIA DEL MARE, VENICE (ITALY).**
Elimination of Hydrocarbons by Mussels,
W75-11760 5C

**INSTITUTO ESPANOL DE OCEANOGRAFIA, MADRID (SPAIN).**
Distribution of Lignin in the Waters of Lourizan Inlet, as a Measurement of Contamination Due to Dumping of Ligninsulfonic Lyes, Resulting from Production of Cellulose Pulp, (In Spanish),
W75-11678 5B

**INTERNATIONAL BIRD RESCUE RESEARCH CENTER, BERKELEY, CALIF.**
Rehabilitating Oiled Aquatic Birds,
W75-11616 5G

**INTERNATIONAL TELEPHONE AND TELEGRAPH CORP., NEW YORK. (ASSIGNEE).**
Sewage Treatment Device,
W75-11508 5D

**IOWA INST. OF HYDRAULIC RESEARCH, IOWA CITY.**
Scale Effects on Cooling Tower Model Studies,
W75-11470 8B

**IOWA STATE UNIV., AMES. DEPT. OF EARTH SCIENCES.**
A Topographic-Hydrogeologic Model for Solid Waste Landfill Siting,
W75-11644 5B

**JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF GEOGRAPHY.**
Turbulent Entrainment Across Stable Density Step Structures,
W75-11451 2J

**JONES (BARCLAY) AND ASSOCIATES, ITHACA, N.Y.**
An Economic and Environmental Reconnaissance of the Possibilities for Small Watershed Development in Chenango County,
W75-11796 4D

**JYVASKYLA UNIV. (FINLAND). DEPT. OF BIOLOGY.**
Influence of Some Biocides Employed in the Wood-Processing Industry on Growth of Green Algae,
W75-11605 5C

**KANSAS STATE UNIV., COLBY. COLBY BRANCH EXPERIMENT STATION.**
Choice of Irrigation Timing Indicator for Narrow Row Cotton,
W75-11840 3F

**KARLSRUHE UNIV. (WEST GERMANY). INSTITUT FUER HYDRO-MECHANIK, STAUNANLAGEN UND WASSERVERSORGUNG.**
Water Hammer in Coaxial Pipe Systems,
W75-11460 8B

**KAROLINSKA INSTITUTET, STOCKHOLM (SWEDEN). DEPT. OF ENVIRONMENTAL HYGIENE.**
A Comparative Study on Methods for Cadmium Analysis of Grain with an Application to Pollution Evaluation,
W75-11539 5A

**KENTUCKY UNIV., LEXINGTON. DEPT. OF AGRONOMY.**
Chloride and Tritiated Water Flow in Disturbed and Undisturbed Soil Cores,
W75-11594 2G

**KLEIN (ALBERT) KG, NIEDERFISCHBACH (WEST GERMANY). (ASSIGNEE).**
Incinerator Device and a Method of Processing Residuals in Waste Water, Liquefied Sewage and Sludge,
W75-11440 5D

**KOMENSKEHO UNIVERSITA, BRATISLAVA (CZECHOSLOVAKIA). KATEDRA SYST. EKOL. ZOOL.**
Effects of Fish-Ponds Near Jakubovo on the Ornithocenose There, (In Czech),
W75-11535 5C

**KUYBYSHEVSKII NAUCHNO-ISSLEDOVATELSKII INSTITUT EPIDEMIOLOGII, MIKROBIOLOGII I GIGIENY (USSR).**
Some Problems of the Circulation of Enteroviruses in Environmental Objects, (In Russian),
W75-11438 5B

Evaluation of the Quality of Surface Water for Developing Recommendations of Nonspecific Prophylaxis of Intestinal Infections, (In Russian),
W75-11512 5C

**LAGUNA LAKE DEVELOPMENT AUTHORITY, MANILA (PHILIPPINES).**
Development Planning of Laguna de Bay--Philippines,
W75-11770 4A

**LARKIN AND ASSOCIATES, KANSAS CITY, MO.**
Environmental Constraints Challenge Designers of Shoreline Community Near Kansas City, Missouri,
W75-11392 5D

**LEEDS UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.**
Evapotranspiration and Soil Moisture in Upland Grass Catchments in the Eastern Pennines,
W75-11648 2D

**LIVERPOOL UNIV., PORT ERIN (ENGLAND). DEPT. OF MARINE BIOLOGY.**
Synergistic Effects of Salinity, Temperature and Heavy Metals on Mortality and Osmoregulation in Marine and Estuarine Isopods (Crustacea),
W75-11610 5C

**LJUBLJANA UNIV. (YUGOSLAVIA). INST. OF CHEMISTRY.**
The Behaviour of Metal Tetramethylenedithiocarbamates in the Graphite-Tube Furnace for Atomic Absorption Spectrometry,
W75-11797 5A

**LJUBLJANA UNIV. (YUGOSLAVIA). J. STEFFAN INST.**
The Occurrence of Mercury in Amphibia,
W75-11534 5A

**LOS ANGELES SANITATION BUREAU, PLAYA DEL REY, CALIF. HYPERION TREATMENT PLANT.**
Thermophilic Digestion at the Hyperion Treatment Plant,
W75-11690 5D

**LOUISIANA WILDLIFE AND FISHERIES COMMISSION, NEW ORLEANS. DIV. OF OYSTERS, WATER BOTTOMS AND SEAFOODS.**
An Inventory and Study of the Vermilion Bay-Atchafalaya Bay Complex; Area Description, Biology, Hydrology and Chemistry, and Sedimentology,
W75-11571 2L

**M.M.S., INC., MEMPHIS, TENN. (ASSIGNEE).**
Sewer Line Blow-Out Plug,
W75-11684 8C

**MARYLAND UNIV., COLLEGE PARK. DEPT. OF CHEMISTRY.**
Catalytic-Coulometric Determination of Copper at Microgram and Nanogram Levels,
W75-11540 5A

**MARYLAND UNIV., COLLEGE PARK. DEPT. OF CIVIL ENGINEERING.**
Forecasting Urban Water Use: Commercial Establishments,
W75-11795 6D

**MASSACHUSETTS UNIV., AMHERST. DEPT. OF FOOD AND AGRICULTURAL ENGINEERING.**
'Chamber Method' for Drip Irrigation System Design and Installation Procedures,
W75-11584 3F

**MCGILL UNIV., MONTREAL (QUEBEC).**
Mercury Levels in Fish in the La Grande River Area, Northern Quebec,
W75-11756 5A

**MCGILL UNIV., MONTREAL (QUEBEC). DEPT. OF CIVIL ENGINEERING AND APPLIED MECHANICS.**
Analysis of Plunging Phenomena in Water Reservoirs,
W75-11655 4A

**MECKLENGURG COUNTY, ENGINEER'S OFFICE, CHARLOTTE, N.C.**
County Combats Urban Storm Water Runoff Problems,
W75-11390 5G

**METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, ILL.**
Aeration Systems for Metro Chicago,
W75-11739 5D

Suspended Solids Removal Processes Studied at Metro Chicago,
W75-11741 5D

Metro Chicago Studies on Nitrification,
W75-11742 5D

**MIAMI UNIV., FLA. SCHOOL OF LAW.**
Wetlands - Related Legislation in the United States,
W75-11550 6E

State Regulation of Coastal Water Area Preserves,
W75-11568 6E

**MIAMI UNIV., FLA. SEA GRANT INSTITUTIONAL PROGRAM.**
A Bibliography of Biscayne Bay, Florida Monitoring and Research Programs,
W75-11557 10C

**MICHIGAN UNIV., ANN ARBOR. DEPT. OF CIVIL ENGINEERING.**
A Food Web Model for Lake Michigan Part 2-Model Formulation and Preliminary Verification,
W75-11547 5C

Water Quality Relationships in the Great Lakes: Analysis of a Survey Questionnaire,
W75-11549 5B

**MIDDLE EAST TECHNICAL UNIV., ANKARA (TURKEY). DEPT. OF CIVIL ENGINEERING.**
Wall Shear Measurement in Sand-Water Mixture Flows,
W75-11653 8B

**MINISTRY OF AGRICULTURE AND FORESTRY, KONOSU (JAPAN). CENTRAL AGRICULTURAL EXPERIMENT STATION.**
Effects of Soil Temperature and Soil Moisture in Podding Zone on Pod Development of Peanut Plants, (In Japanese),
W75-11456 3F

**MINNESOTA UNIV., ST. PAUL.**
Determining Effective Soil Water Diffusivities from One-Step Outflow Experiments,
W75-11592 2G

**MINNETONKA PUBLIC WORKS, MINN.**
Providing Suburban Sewerage Despite Environmental and Construction Problems,
W75-11657 5D

**MISSISSIPPI STATE UNIV., MISSISSIPPI STATE. DEPT. OF CHEMISTRY.**
The Estimation of the Amount of Empire Mix Crude Oil in Mullet, Shrimp, and Oysters by Liquid Chromatography,
W75-11613 5A

**MISSOURI UNIV., CLINTON. DEPT. OF AGRONOMY.**
Sulfur and Manganese Release from Soils Treated with Prilled Sulfur and Sulfur-Bentonite,
W75-11604 5B

**MISSOURI UNIV., ROLLA. DEPT. OF MECHANICAL AND AEROSPACE ENGINEERING.**
Collision Efficiency of Water Drops in the Atmosphere,
W75-11638 2B

**MONASH UNIV., CLAYTON (AUSTRALIA). DEPT. OF MATHEMATICS.**
Application of a Generalisation of Wald's Identity to Solving Certain Multi-Stream Storage Problems,
W75-11649 4A

**MONTCLAIR STATE COLL., UPPER MONTCLAIR, N.J. DEPT. OF BIOLOGY.**
Phytoplankton Diversity and Chlorophyll-a in a Polluted Estuary,
W75-11607 5C

**MOSKOVSKII GOSUDARSTVENNYI MEDITSINSKII INSTITUT (I) (USSR).**
Revision of the Regulations 'Planning of Sanitary Protection Zones of a Central Water Supply System and Water Sources' (In Russian),
W75-11682 5G

**MOSS LANDING MARINE LABS., CALIF.**
High Copper Concentrations in Squid Livers in Association with Elevated Levels of Silver, Cadmium and Zinc,
W75-11609 5C

**MUNICIPALITY OF METROPOLITAN SEATTLE, RENTON, WASH. RENTON TREATMENT PLANT.**
An Automated Spectrophotometric Suspended Solids Analysis for Activated Sludge,
W75-11408 5D

**NAGOYA UNIV. (JAPAN). WATER RESEARCH LAB.**
Decomposition of Urea Associated with Photosynthesis of Phytoplankton in Coastal Waters,
W75-11612 5C

**NALCO CHEMICAL CO., CHICAGO, ILL.**
In-Line Filtration May Be Just for You,
W75-11698 5D

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, CLEVELAND, OHIO. LEWIS RESEARCH CENTER.**
Kinetics of the Fluorination of Zinc,
W75-11629 5A

**NATIONAL BUREAU OF STANDARDS, WASHINGTON, D.C. INST. FOR MATERIALS RESEARCH.**
Submicrogram Per Gram Concentrations of Mercury in Orchard Leaves Determined by Isotope Dilution and Spark-Source Mass Spectrometry,
W75-11581 5A

**NATIONAL ENVIRONMENTAL RESEARCH CENTER, CINCINNATI, OHIO. ADVANCED WASTE TREATMENT RESEARCH LAB.**
Metal Removal by Physical and Chemical Treatment Processes,
W75-11542 5D

Urban Runoff and Combined Sewer Overflow, (Literature Review),
W75-11710 5D

Design Information on Dewatering Properties of Wastewater Sludges,
W75-11722 5D

Treatment and Disposal of Sludge from Municipal Wastewater Plants in the United States,
W75-11735 5D

Sludges Generated in Phosphate Removal Processes,
W75-11737 5D

EPA Experiences in Oxygen-Activated Sludge,
W75-11738 5D

**NATIONAL ENVIRONMENTAL SATELLITE SERVICE, WASHINGTON, D.C.**
Tropical Cyclone Intensity Analysis and Forecasting from Satellite Imagery,
W75-11577 2B

**NATIONAL FERTILIZER DEVELOPMENT CENTER, MUSCLE SHOALS, ALA.**
Rice Response to Nitrogen and Phosphorus in Flooded and Nonflooded Soils,
W75-11597 3

**NATIONAL MARINE FISHERIES SERVICE, HIGHLANDS, N.J. SANDY HOOK LAB.**
Shell Disease in Crabs and Lobsters from New York Bight,
W75-11606 5

**NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BOULDER, COLO. ENVIRONMENTAL RESEARCH LAB.**
Great Lakes Ice Cover, Winter 1973-74,
W75-11572 2

**NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BOULDER, COLO. ENVIRONMENTAL RESEARCH LABS.**
Atmospheric Physics and Chemistry Laboratory: Collected Reprints 1973.
W75-11552

**NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, WASHINGTON, D.C.**
A Federal Plan for Natural Disaster Warning and Preparedness, First Supplement FY 1980.
W75-11553

**NATIONAL SWEDISH ENVIRONMENT PROTECTION BOARD, STOCKHOLM. RESEARCH LAB.**
Final Disposal of Municipal Sludge in Sweden
W75-11403

Interlaboratory Study of Methods for Chemical Analysis of Water,
W75-11409

**ATIONAL WEATHER SERVICE, FORT ORTH, TEX.**
Hurricane Experience Levels of Coastal County Populations - Texas to Maine,
W75-11570 2B

**ATIONAL WEATHER SERVICE, FORT ORTH, TEX. SOUTHERN REGION.**
A Satellite Classification Technique for Subtropical Cyclones,
W75-11562 2B

**ATIONAL WEATHER SERVICE, SILVER PRING, MD.**
Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States,
W75-11556 2B

**ATIONAL WEATHER SERVICE, SILVER PRING, MD. OFFICE OF HYDROLOGY.**
Storm Tide Frequency Analysis for the Coast of North Carolina, South of Cape Lookout,
W75-11560 2B

Storm Tide Frequency Analysis for the Coast of Puerto Rico,
W75-11561 2A

**ATURAL ENVIRONMENT RESEARCH OUNCIL, ANGLESEY (WALES). UNIT OF IARINE INVERTEBRATE BIOLOGY; AND NIVERSITY COLL. OF NORTH WALES, ENAI BRIDGE. MARINE SCIENCE LABS.**
An Ecological Survey of the Rocky Coast Adjacent to a Bromine Extraction Works,
W75-11758 5C

**ATURAL ENVIRONMENTAL RESEARCH OUNCIL, ANGLESEY (WALES). UNIT OF IARINE INVERTEBRATE BIOLOGY.**
Barnacles: Possible Indicators of Zinc Pollution,
W75-11611 5B

**AVAL BIOMEDICAL RESEARCH LAB., AKLAND, CALIF.**
Hydrocarbons Associated with Suspended Particulate Matter in San Francisco Bay Waters,
W75-11614 5A

**AVAL UNDERSEA CENTER, SAN DIEGO, ALIF.**
The Determination of Cadmium in Sea Water by Radioactivation,
W75-11798 5A

**EBRASKA UNIV., LINCOLN. DEPT. OF IORTICULTURE AND FORESTRY.**
Evapotranspiration by Subirrigated Alfalfa and Pasture in the East Central Great Plains,
W75-11841 3F

**EDERLANDS INSTITUUT VOOR ONDERZOEK DER ZEE, TEXEL.**
Organochlorine Compounds in Several Marine Organisms from the North Sea and the Dutch Wadden Sea,
W75-11608 5B

**ERATOOM N.V., THE HAGUE NETHERLANDS). (ASSIGNEE).**
Centrifugal Pump for Processing Liquids Containing Abrasive Constitutents, More Particularly, a Sand Pump of a Wastewater Pumper,
W75-11679 5D

**EW HAMPSHIRE UNIV., DURHAM. DEPT. F CIVIL ENGINEERING.**
The Effect of Temperature on the Aerobic Digestion of Wastewater Sludge,
W75-11708 5D

Aerobic Digestion of Wastewater Sludge Under Low Temperature Conditions,
W75-11709 5D

**NEW MEXICO STATE UNIV., CLOVIS. PLAINS BRANCH AGRICULTURAL EXPERIMENT STATION.**
Utilization of Water in a Semi-Arid Region,
W75-11356 3F

**NEW MEXICO STATE UNIV., UNIVERSITY PARK. DEPT. OF CIVIL ENGINEERING.**
Turbulent Flow of Power-Law Fluids,
W75-11651 8B

**NEW SOUTH WALES UNIV., KENSINGTON (AUSTRALIA). FACULTY OF MILITARY STUDIES.**
Theory of Ground-Water Recharge for a Strip Basin,
W75-11646 2F

**NEW YORK STATE COOPERATIVE EXTENSION SERVICE, PENN YAN.**
A Water Potential Threshold for the Increase of Abscisic Acid in Leaves,
W75-11394 2I

**NOAA NATIONAL OCEAN SURVEY, WASHINGTON, D.C.**
Great Lakes Water Levels, 1974, Daily and Monthly Average Water Surface Elevations.
W75-11554 2H

**NORTH CAROLINA STATE UNIV., RALEIGH.**
An Evaluation of the Effectiveness and Applicability of Physical-Chemical Treatment of Urban Land Runoff,
W75-11389 5D

**NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF CIVIL ENGINEERING.**
Influence of Current on Statistical Properties of Waves,
W75-11772 2L

**NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF SOIL SCIENCE.**
Relation Between Nitrate Absorption and Water Transpiration by Corn,
W75-11602 3F

**NORTH CAROLINA UNIV., CHAPEL HILL. SCHOOL OF LAW.**
Legal Measures Concerning Marine Pollution.
W75-11551 5G

The Management of Land and Water Use in the Coastal Zone: A New Law is Enacted in North Carolina,
W75-11575 6E

**OAK RIDGE NATIONAL LAB., TENN.**
Calicum Sulfate Scaling in Reverse Osmosis (Hyper-filtration) of Brackish Waters by Hollow-Fiber and Spiral-Wound Modules,
W75-11505 3A

**OBIHIRO ZOOTECHNICAL UNIV. (JAPAN). DEPT. OF VETERINARY AND PUBLIC HEALTH.**
A Case of Subterranean Water Pollution Caused by the Public Refuse Disposal Ground, (In Japanese),
W75-11432 5B

**OCEANIC INST., WAIMANALO, HAWAII.**
Biological Considerations on the Use of Thermal Effluents for Finfish Aquaculture,
W75-11759 5C

**OFFICE OF THE CHIEF OF ENGINEERS (ARMY), WASHINGTON, D.C. URBAN STUDIES BRANCH.**
Water Resources Planning in Urban Areas,
W75-11769 5D

**OKLAHOMA STATE UNIV., STILLWATER. CENTER FOR WATER RESEARCH IN ENGINEERING.**
Response of Completely Mixed Activated Sludge Systems to Changes in the Environment,
W75-11478 5D

**ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO.**
Overview of Canadian Sludge Handling and Land Disposal Practices and Research,
W75-11716 5D

**ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO. POLLUTION CONTROL BRANCH.**
Sludge Handling and Disposal Seminar, Conference Proceedings No. 2.
W75-11715 5D

Aerobic and Anaerobic Sludge Digestion,
W75-11719 5D

Domestic Sewage Treatment by Underdrained Filter Systems,
W75-11751 5D

**OREGON STATE UNIV., CORVALLIS. DEPT. OF AGRICULTURAL CHEMISTRY.**
Uptake, Distribution and Fate of 203 Hg-Ethylmercuric Chloride in the Guppy and the Coontail,
W75-11529 5C

**OREGON STATE UNIV., CORVALLIS. DEPT. OF CIVIL ENGINEERING.**
Disposal of Sandy Pipeline Dredge Spoils by End Dumping,
W75-11566 5G

**OREGON STATE UNIV., CORVALLIS. DEPT. OF FOREST ENGINEERING.**
Soil and Hydrologic Factors Affecting the Stability of Natural Slopes in the Oregon Coast Range,
W75-11353 2G

**OREGON STATE UNIV., CORVALLIS. DEPT. OF ZOOLOGY.**
Habitat Heterogeneity and Avian Community Structure in North American Grasslands,
W75-11425 2I

**OSLO UNIV. (NORWAY). DEPT. OF CHEMISTRY.**
Atomic-Absorption Spectrometric Determination of Cadmium, Lead, and Zinc in Salts or Salt Solutions by Hanging Mercury Drop Electrodeposition and Atomization in a Graphite Furnace,
W75-11536 5A

**PENNSYLVANIA DEPT. OF ENVIRONMENTAL RESOURCES, HARRISBURG. DIV. OF COMPREHENSIVE RESOURCES PROGRAMMING.**
Prediction of Flood Volume from Small Humid Region Watersheds,
W75-11462 4A

**PENWALT CORP., WARMINSTER, PA. SHARPLES-STOKES DIV.**
Centrifuges - Types and Applications,
W75-11725 5D

**PLAYA DEL REY, CALIF. HYPERION TREATMENT PLANT.**
Energy-Wastewater Treatment and Solids Disposal,
W75-11697 5D

**POLISH ACADEMY OF SCIENCES, WARSAW. INST. OF EXPERIMENTAL BIOLOGY.**
Further Observations on the Effect of Sodium Salt of 2,4-D on Early Developmental Stages of Carp (Cyprinus Carpio L.),
W75-11762 5C

**PROTRON ASSOCIATES, PALO ALTO, CALIF. (ASSIGNEE).**
Apparatus for Providing a Statistical Count of Particulate Material in a Fluid,
W75-11434 5A

**PUBLIC WORKS RESEARCH INST., TOKYO (JAPAN).**
Heat Treatment of Sewage Sludge,
W75-11732 5D

Studies on Advanced Waste Treatment,
W75-11734 5D

**PURDUE UNIV., LAFAYETTE, IND. SCHOOL OF CIVIL ENGINEERING.**
Models of the Stochastic and Chronologic Structure, Prediction and Simulation of Runoff Sequences - Application to the Lower Ohio Basin,
W75-11783 2E

**PURDUE UNIV., LAFAYETTE, IND. WATER RESOURCES RESEARCH CENTER.**
Comparative Analysis of Estimation Methods in Nonlinear Functional Models of the Rainfall-Runoff Process,
W75-11354 2A

Improved Application of Geophysics to Groundwater Resource Inventories in Glaciated Terrains,
W75-11355 2F

**REGIONAL MUNICIPALITY OF NIAGARA, NIAGARA FALLS (ONTARIO). PUBLIC WORKS DEPT.**
Sludge Handling and Disposal Practices in the Regional Municipality of Niagara,
W75-11730 5D

**RENSSELAER POLYTECHNIC INST., TROY, N.Y. DEPT. OF CHEMICAL ENGINEERING; AND RENSSELAER POLYTECHNIC INST., TROY, N.Y. DEPT. OF ENVIRONMENTAL ENGINEERING.**
Separation of Emulsified Oil from Water,
W75-11360 5D

**RESEARCH COUNCIL OF ALBERTA, EDMONTON.**
Regional Chemistry of Groundwater in the Wainwright Area, Alberta,
W75-11471 2F

Hydrogeology of the Wainwright Area, Alberta,
W75-11475 4B

**RHODE ISLAND UNIV., KINGSTON. DEPT. OF CHEMISTRY.**
The Crystal and Molecular Structure of Selected Pesticidal Water Pollutants,
W75-11351 5A

**RHODE ISLAND UNIV., KINGSTON. GRADUATE SCHOOL OF OCEANOGRAPHY.**
The Solubility Behaviour of No. 2 Fuel Oil in Sea Water
W75-11565 5B

Copper Uptake and Excretion by Busycon Canaliculatum L.,
W75-11755 5C

**ROBERT S. KERR ENVIRONMENTAL RESEARCH LAB., ADA, OKLA. NATIONAL WATER QUALITY CONTROL RESEARCH PROGRAM.**
Rate of Phosphorus Sorption by Five Oklahoma Soils,
W75-11836 3F

**ROORKEE UNIV. (INDIA). DEPT. OF HYDROLOGY.**
Axisymmetric Seepage Flow Through Semi-Infinite Porous Media,
W75-11633 2F

**SAINT ANDREWS COLL., GORAKHPUR (INDIA). DEPT. OF BOTANY.**
Contribution to the Ecology of Indian Aquatics: IV. Rate of Dry Matter Production of the Leaves of Several Common Aquatic Plants of Gorakhpur (India),
W75-11386 2I

**SAINT REGIS PAPER CO., WEST NYACK, N.Y.**
Reduced Cost Flocculation of a Textile Dyeing Wastewater,
W75-11375 5D

**SAVANNAH STATE COLL., GA. DEPT. OF CHEMISTRY.**
Radioactive - Tracer Displacement Method for the Determination of Small Quantities of Nickel,
W75-11526 5A

**SCANDIACONSULT INTERNATIONAL A.B., STOCKHOLM (SWEDEN).**
Swedish Experiences in Chemical Treatment of Wastewater,
W75-11694 5D

**SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF.**
Current Measurements Using a Tilting Spar,
W75-11564 7B

**SEPPIC, PARIS(FRANCE). (ASSIGNEE).**
Method for Combatting Pollution Using a Chromium Complex,
W75-11506 5G

**SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ N.V., THE HAGUE (NETHERLANDS).**
Design Criteria for Single-Point Mooring Terminals,
W75-11771 8C

**SHIBATA KAGAKU KIKAI KOGYO KABUSHIKI, TOKOYO (JAPAN). (ASSIGNEE).**
Detector of Trace Substance in Water,
W75-11388 5A

**SIR GEORGE WILLIAMS UNIV., MONTREAL (QUEBEC). DEPT. OF CIVIL ENGINEERING.**
Experimental Study of Wave Transimission,
W75-11773 8B

**SOIL RESEARCH LAB., CHANDIGARH (INDIA).**
Geochemistry and Gensis of Fluoride-Containing Ground Waters in India,
W75-11645 2K

**SOUTH DAKOTA STATE UNIV., BROOKINGS. WATER RESOURCES INST.**
Comparing Trickle, Subsurface and Sprinkler Irrigation Systems,
W75-11589 3F

**SOUTHERN METHODIST UNIV., DALLAS, TEX.**
The Influence of Particle Size on Oxidation of Total, Soluble, and Particulate Municipal Wastewater Components by Ozone
W75-11850 5D

**STATE UNIV. OF NEW YORK, BUFFALO. FACULTY OF LAW AND JURISPRUDENCE.**
Coastal Zone Legal References (Selected) 1975
W75-11548 2L

**STEVENS, THOMPSON AND RUNYAN, INC., PORTLAND, OREG.**
Advanced Wastewater Treatment Plant with Designed-In Reliability,
W75-11700 5D

**STONE AND WEBSTER ENGINEERING CORP., BOSTON, MASS. ENVIRONMENTAL ENGINEERING DIV.**
Submerged Buoyant Jets in Quiescent Fluids.
W75-11461 8B

**TECHNICAL UNIV. OF DENMARK, LYNGBY.**
On Taxation and Firms Choice of Waste Water Treatment Technology,
W75-11767 5G

**TECHNICAL UNIV. OF ISTANBUL (TURKEY). DEPT. OF CIVIL ENGINEERING.**
Simulation of Dispersion of Suspended Particles,
W75-11782 8B

**TECHNION-ISRAEL INST. OF TECH., HAIFA. DEPT. OF AGRICULTURAL ENGINEERING.**
Basic Principles of Pulse Irrigation,
W75-11833 3F

**TECHNION-ISRAEL INST. OF TECH., HAIFA. FACULTY OF CIVIL ENGINEERING.**
Well Pumping in Unconfined Aquifers: The Influence of the Unsaturated Zone,
W75-11631 4B

**TECHNISCHE HOGESCHOOL, DELFT (NETHERLANDS). LAB. OF THERMAL AND NUCLEAR ENGINEERING.**
Friction--Frequency Dependence for Oscillatory Flows in Circular Pipe,
W75-11780 8B

**TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF AGRICULTURAL ENGINEERING.**
Grain Sorghum Evapotranspiration and Water Use Efficiency Under Trickle Irrigation,
W75-11582 3F

Simulation of Miscible Displacement in Soils,
W75-11590 2F

**TEXAS A AND M UNIV., LUBBOCK. AGRICULTURAL RESEARCH AND EXTENSION CENTER.**
Effect of Preplant-Only Irrigation on Cotton Yields,
W75-11842 3F

**TEXAS TECH UNIV., LUBBOCK. DEPT. OF CIVIL ENGINEERING.**
Procedure for Selecting a Minimal Environmental Impact Routing for a Water Conveyance Canal,
W75-11764 6C

**TEXAS WATER DEVELOPMENT BOARD, AUSTIN.**
Evaporation Data in Texas,
W75-11630 7C

**TEXAS WATER QUALITY BOARD, AUSTIN.**
Experiences with sludge Handling in Texas,
W75-11736 5D

Oxygen Activated Sludge Systems in Texas,
W75-11740 5D

**TOHOKU UNIV., SENDAI (JAPAN). INST. OF HIGH SPEED MECHANICS.**
Energy Losses at 90 Degrees Pipe Junctions,
W75-11778 8B

**TOKYO UNIV. (JAPAN). DEPT. OF AGRICULTURAL CHEMISTRY.**
Loss of Trace Elements from Natural Water During Storage. I. Behavior of 203 Hg and 65 Zn Added to Pond Water,
W75-11543 5A

**TORONTO UNIV. (ONTARIO). DEPT. OF PHYSICS.**
An Acceleration System for Water Drops,
W75-11636 2B

Collision and Breakup of Water Drops at Terminal Velocity,
W75-11637 2B

**UNITED NATIONS DEVELOPMENT PROGRAM, NEW DELHI (INDIA).**
Water Harvesting by Runoff Inducement for Irrigation of an Almond Orchard in a Semiarid Climate,
W75-11818 3B

**UNIVERSITY COLL. OF NORTH WALES, MENAI BRIDGE. MARINE SCIENCE LABS.**
Geochemistry of Surface Sediments in an Acid Stream Estuary,
W75-11531 2J

**UNIVERSITY OF EAST ANGLIA, NORWICH (ENGLAND). SCHOOL OF MATHEMATICS AND PHYSICS.**
A Three-Dimensional Theory of Coastal Currents and Upwelling Over a Continental Shelf,
W75-11450 2E

**UNIVERSITY OF SOUTH FLORIDA, TAMPA. DEPT. OF BIOLOGY.**
Proposed Standards: Land Disposal of Effluents,
W75-11400 5D

**UNIVERSITY OF SOUTHERN MISSISSIPPI, HATTIESBURG. BUREAU OF BUSINESS RESEARCH.**
Natural and Artificial Reefs in Mississippi Coastal Waters: Sport Fishing Pressure and Economic Considerations,
W75-11558 6B

**UNIVERSITY OF THE WEST INDIES, ST. AUGUSTINE (TRINIDAD).**
Comparative Efficiency of Soluble and Controlled-Release Sulfur-Coated Urea Nitrogen for Corn in Tropics,
W75-11601 3F

**UTAH STATE UNIV., LOGAN. DEPT. OF AGRICULTURAL AND IRRIGATION ENGINEERING.**
Moisture Availability and Crop Production,
W75-11583 3F

**UTTAR PRADESH IRRIGATION RESEARCH INST., ROORKEE (INDIA).**
Analysis of Canal Seepage to Interceptor Drain,
W75-11846 8A

**UZBEKSKII NAUCHNO-ISSLEDOVATELSKII INSTITUT SANITARII, GIGIENY I PROFZABOLEVANII, TASHKENT (USSR).**
Sanitary and Bacteriological Evaluation of the Raw Material, Air and Wastewaters of Some Bast Fiber Plants in the Uzbek SSR, (In Russian),
W75-11406 5B

Sanitary-Virological Study of the Effectiveness of Decontamination of Waste Waters on Irrigated Farm Yields, (In Russian),
W75-11674 5B

**VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF AGRICULTURAL ENGINEERING.**
Simulation of Crop Resonse to Energy Inputs,
W75-11588 3F

**VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF BIOLOGY; AND VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. CENTER FOR ENVIRONMENTAL STUDIES.**
A Method for Intermittent Chlorine Dosing in Continuous-Flow Toxicity Tests,
W75-11754 5A

**VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF CHEMISTRY.**
Removal of Soluble Mercury from Waste Water by Complexing Techniques,
W75-11357 5D

**VSESOYUZNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT VODOSNABZHENIYA, KANALIZATSII, GIDROTEKHNICHESKIKH SOORUZHENII I INZHENERNOI GIDROGEOLOGII, CHELYABINSK (USSR).**
Spectrophotometric Determination of Fluorine in Water, (In Russian).
W75-11433 5A

**VYSSHEE INZHENEROE MORSKOE UCHILISHCHE, ODESSA (USSR).**
Studies of the Aromatic Compounds Content in Sea Water by Low-Temperature Luminescent Spectroscopy, (In Russian),
W75-11786 5A

**WASATCH NATIONAL FOREST, SALT LAKE CITY, UTAH. RANGE, WILDLIFE AND WATERSHED MANAGEMENT.**
Water Development in Management of Livestock and Wildlife on Mountain Wildlands,
W75-11804 3B

**WASHINGTON STATE DEPT. OF ECOLOGY, OLYMPIA.**
Water Quality Report: The Columbia River Below Longview, Washington, December 1971 - November 1972,
W75-11472 5B

**WASHINGTON STATE UNIV., PULLMAN. COLL. OF ENGINEERING RESEARCH DIV.**
Hydraulic Model Studies of a Second Powerhouse at Rock Island Hydroelectric Project,
W75-11466 8B

Hydraulic Model Studies of a Second Powerhouse at Rock Island Hydroelectric Project, Cofferdam Tests,
W75-11467 8B

**WASHINGTON UNIV., SEATTLE.**
Coastal Resource Use: Decisions on Puget Sound,
W75-11573 6B

**WASHINGTON UNIV., SEATTLE. DEPT. OF ENVIRONMENTAL HEALTH.**
Lead and Arsenic Levels of Dairy Cattle in Proximity to a Copper Smelter,
W75-11544 5A

**WASHINGTON UNIV., SEATTLE. SEA GRANT ADVISORY SERVICE.**
Tracing Ocean Currents,
W75-11574 2E

**WASHINGTON UNIV., ST. LOUIS, MO. CENTER FOR THE BIOLOGY OF NATURAL SYSTEMS.**
A Steady-State Model of Isotopic Fractionation Accompanying Nitrogen Transformations in Soil,
W75-11831 5B

**WATERLOO UNIV., (ONTARIO). DEPT. OF CHEMICAL ENGINEERING.**
Removal of Phosphates and Metals from Sewage Sludges,
W75-11729 5D

**WESTERN AUSTRALIA DEPT. OF AGRICULTURE, KATANNING. SOIL CONSERVATION SERVICE.**
Water Harvesting for Livestock in Western Australia,
W75-11801 3B

**WESTERN AUSTRALIA DEPT. OF AGRICULTURE, MOORA. SOIL CONSERVATION SERVICE.**
Design and Construction of Roaded Catchments,
W75-11810 3B

A Computer Model for Optimizing Design of Improved Catchment,
W75-11813 3B

**WESTERN AUSTRALIA DEPT. OF AGRICULTURE, SOUTH PERTH. SOILS DIV.**
Bitumen, Oil, and Clay Surfaces on a Deep Sand to Increase Runoff from Catchments for Excavated Tanks in Western Australia,
W75-11805 3B

Sealing Leaking Excavated Tanks on Farms in Western Australia,
W75-11814 3B

**WESTERN AUSTRALIA UNIV., NEDLANDS. DEPT. OF CIVIL ENGINEERING.**
The Design of Roaded Catchments for Maximum Runoff,
W75-11817 3B

**WESTERN REGIONAL RESEARCH LAB., BERKLEY, CALIF.**
Proceedings of the Water Harvesting Symposium, Phoenix, Arizona, March 26-28, 1974.
W75-11800 3B

**WESTERN WASHINGTON STATE COLL, BELLINGHAM. COASTAL STUDIES GROUP.**
A Geomorphic Shoreline Inventory with Management Considerations for Whatcom County, Washington,
W75-11455 2L

**WESTON (ROY F.), INC., WEST CHESTER, PA.**
Plating and Cyanide Wastes, (Literature Review),
W75-11370 5D

Plating and Cyanide Wastes (Literature Review),
W75-11545 5D

**WISCONSIN UNIV., MADISON. DEPT. OF AGRONOMY.**
Variation in Effectiveness of Supplemental Irrigation on Sweet Corn Yield Components,
W75-11844 3F

**WISCONSIN UNIV., MADISON. DEPT. OF PATHOLOGY.**
Effects of Methylmercury Chloride on Rana Pipiens Tadpoles,
W75-11527 5C

**WISCONSIN UNIV., MADISON. SEA GRANT PROGRAM.**
The Coasts of Wisconsin,
W75-11569 2H

**WISCONSIN UNIV., MILWAUKEE. CENTER FOR GREAT LAKES STUDIES.**
Sources of Water Quality, Lake Level, Ice, Water Temperature and Meteorological Data for the St. Lawrence Great Lakes,
W75-11567 2H

Analysis of International Great Lakes Shipping and Hinterland,
W75-11576 6C

**YALTA SANITARY-EPIDEMIOLOGY STATION (USSR).**
Hygienic Evaluation of Spring Cappings Used on the Southern Shore of Crimea, (In Russian),
W75-11793 5G

**YOKOHAMA SEWERAGE BUREAU, KANAGAWA (JAPAN).**
Combined Treatment of Municipal and Industrial Wastewater,
W75-11733 5D

**YUGOSLAV ACADEMY OF SCIENCES AND ARTS, ZAGREB. INST. FOR MEDICAL RESEARCH AND OCCUPATIONAL HEALTH.**
Influence of Lead on Calcium and Strontium Transfer Through the Duodenal Wall in Rats,
W75-11523 5C

Kinetics of Lead Retention and Distribution in Suckling and Adult Rats,
W75-11537 5B

**ZOOLOGISK MUSEUM, OSLO (NORWAY).**
Oligochaetes in the Bottom Fauna and Stomach Content of Trout, Salmo Trutta (L.),
W75-11385 2H

# ACCESSION NUMBER INDEX


W75-11351 5A
W75-11352 6B
W75-11353 2G
W75-11354 2A
W75-11355 2F
W75-11356 3F
W75-11357 5D
W75-11358 5C
W75-11359 5D
W75-11360 5D
W75-11361 5D
W75-11362 5D
W75-11363 5D
W75-11364 5D
W75-11365 5D
W75-11366 5D
W75-11367 5D
W75-11368 5D
W75-11369 5D
W75-11370 5D
W75-11371 5D
W75-11372 5D
W75-11373 5D
W75-11374 5D
W75-11375 5D
W75-11376 5D
W75-11377 5D
W75-11378 5D
W75-11379 5D
W75-11380 8A
W75-11381 5D
W75-11382 2I
W75-11383 5D
W75-11384 5D
W75-11385 2H
W75-11386 2I
W75-11387 5D
W75-11388 5A
W75-11389 5D
W75-11390 5G
W75-11391 5G
W75-11392 5D
W75-11393 5D
W75-11394 2I
W75-11395 5D
W75-11396 5D
W75-11397 5D
W75-11398 5D
W75-11399 5D
W75-11400 5D
W75-11401 5D
W75-11402 5D
W75-11403 5E
W75-11404 5D
W75-11405 5D
W75-11406 5B
W75-11407 5D
W75-11408 5D
W75-11409 5A
W75-11410 5D
W75-11411 5F
W75-11412 5B
W75-11413 5D
W75-11414 5D
W75-11415 6B
W75-11416 5D
W75-11417 8C
W75-11418 5D
W75-11419 5D
W75-11420 5D
W75-11421 5F
W75-11422 5D
W75-11423 5D
W75-11424 5D
W75-11425 2I
W75-11426 5D
W75-11427 5D
W75-11428 5D
W75-11429 5D
W75-11430 5D
W75-11431 5A
W75-11432 5B
W75-11433 5A
W75-11434 5A
W75-11435 5B
W75-11436 5F
W75-11437 5A
W75-11438 5B
W75-11439 5D
W75-11440 5D
W75-11441 5D
W75-11442 2D
W75-11443 5D
W75-11444 5D
W75-11445 2I
W75-11446 5D
W75-11447 2F
W75-11448 2B
W75-11449 2E
W75-11450 2E
W75-11451 2J
W75-11452 2L
W75-11453 2J
W75-11454 2L
W75-11455 2L
W75-11456 3F
W75-11457 2B
W75-11458 3B
W75-11459 2E
W75-11460 8B
W75-11461 8B
W75-11462 4A
W75-11463 8B
W75-11464 2J
W75-11465 5B
W75-11466 8B
W75-11467 8B
W75-11468 5B
W75-11469 2F
W75-11470 8B
W75-11471 2F
W75-11472 5B
W75-11473 3A
W75-11474 2F
W75-11475 4B
W75-11476 2H
W75-11477 2J
W75-11478 5D
W75-11479 7C
W75-11480 7C
W75-11481 7C
W75-11482 7C
W75-11483 7C
W75-11484 7C
W75-11485 7C
W75-11486 7C
W75-11487 7C
W75-11488 7C
W75-11489 7C
W75-11490 7C
W75-11491 7C
W75-11492 5B
W75-11493 2F
W75-11494 2F
W75-11495 2E
W75-11496 7C
W75-11497 5B
W75-11498 7C
W75-11499 7C
W75-11500 4A
W75-11501 8B
W75-11502 2E
W75-11503 4A
W75-11504 4A
W75-11505 3A
W75-11506 5G
W75-11507 5D
W75-11508 5D
W75-11509 5D
W75-11510 5D
W75-11511 5D
W75-11512 5C
W75-11513 5G
W75-11514 5D
W75-11515 3A
W75-11516 5D
W75-11517 5D
W75-11518 5D
W75-11519 5D
W75-11520 5C
W75-11521 5D
W75-11522 5D
W75-11523 5C
W75-11524 5C
W75-11525 5C
W75-11526 5A
W75-11527 5C
W75-11528 5A
W75-11529 5C
W75-11530 5C
W75-11531 2J
W75-11532 5C
W75-11533 2J
W75-11534 5A
W75-11535 5C
W75-11536 5A
W75-11537 5B
W75-11538 5B
W75-11539 5A
W75-11540 5A
W75-11541 5A
W75-11542 5D
W75-11543 5A
W75-11544 5A
W75-11545 5D
W75-11546 2L
W75-11547 5C
W75-11548 2L
W75-11549 5B
W75-11550 6E
W75-11551 5G
W75-11552 2B
W75-11553 2B
W75-11554 2H
W75-11555 6E
W75-11556 2B
W75-11557 10C
W75-11558 6B
W75-11559 2B
W75-11560 2B
W75-11561 2A
W75-11562 2B
W75-11563 5C
W75-11564 7B
W75-11565 5B
W75-11566 5G
W75-11567 2H
W75-11568 6E
W75-11569 2H
W75-11570 2B
W75-11571 2L
W75-11572 2C
W75-11573 6B
W75-11574 2E
W75-11575 6E
W75-11576 6C
W75-11577 2B
W75-11578 2B
W75-11579 2B
W75-11580 10C
W75-11581 5A
W75-11582 3F
W75-11583 3F
W75-11584 3F
W75-11585 5G
W75-11586 2G
W75-11587 3F
W75-11588 3F
W75-11589 3F
W75-11590 2F
W75-11591 3F
W75-11592 2G
W75-11593 2G
W75-11594 2G
W75-11595 3C
W75-11596 3F
W75-11597 3F
W75-11598 2D
W75-11599 2G
W75-11600 2G
W75-11601 3F
W75-11602 3F
W75-11603 3C
W75-11604 5B
W75-11605 5C
W75-11606 5C
W75-11607 5C
W75-11608 5B
W75-11609 5C
W75-11610 5C
W75-11611 5B
W75-11612 5C
W75-11613 5A
W75-11614 5A
W75-11615 5G
W75-11616 5G
W75-11617 5G
W75-11618 5D
W75-11619 5D
W75-11620 5D
W75-11621 5D
W75-11622 4A
W75-11623 4A
W75-11624 4A
W75-11625 4A
W75-11626 4B
W75-11627 5D
W75-11628 4A
W75-11629 5A
W75-11630 7C
W75-11631 4B
W75-11632 4A
W75-11633 2F
W75-11634 2B
W75-11635 2B
W75-11636 2B
W75-11637 2B
W75-11638 2B
W75-11639 2B
W75-11640 2G
W75-11641 5B
W75-11642 2K
W75-11643 2L
W75-11644 5B
W75-11645 2K
W75-11646 2F
W75-11647 4A
W75-11648 2D
W75-11649 4A
W75-11650 8B
W75-11651 8B
W75-11652 5B
W75-11653 8B
W75-11654 8B
W75-11655 4A
W75-11656 2G
W75-11657 5D
W75-11658 5D
W75-11659 5D
W75-11660 5D
W75-11661 5D
W75-11662 5D

| SOURCE | ACCESSION NUMBER | TOTAL |
|---|---|---|
| B. STATE WATER RESOURCES RESEARCH INSTITUTES | W75-11351--11357<br>11477--11478<br>11580, 11783 | 11 |
| C. OTHER | | |
| BioSciences Information Service | W75-11382<br>11385--11386<br>11394, 11406<br>11411--11412<br>11425<br>11432--11433<br>11435<br>11437--11438<br>11442, 11445<br>11512, 11520<br>11668, 11671<br>11674, 11678<br>11682, 11691<br>11761, 11786<br>11793--11794<br>11847 | 28 |
| Effects of Pollutants on Aquatic Life (Katz) | W75-11605--11617<br>11752--11760<br>11762 | 23 |
| National Oceanic and Atmospheric Administration | W75-11546--11579 | 34 |
| Office of Water Research and Technology | W75-11505 | 1 |
| U. S. Geological Survey | W75-11479--11504 | 26 |
| Vanderbilt University, Metals Pollution | W75-11523--11531<br>11533--11534<br>11536--11545<br>11581<br>11797--11798 | 21 |



☆ U. S. GOVERNMENT PRINTING OFFICE : 1975 O - 210-951 (9)

# CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey and the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

**Supported by the Environmental Protection Agency in cooperation with WRSIC**

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

## Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

0 SCIENTIFIC AND TECHNICAL INFORMATION

## INDEXES

S SUBJECT INDEX

A AUTHOR INDEX

O ORGANIZATIONAL INDEX

N ACCESSION NUMBER INDEX

R ABSTRACT SOURCES

U.S. MAIL

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE
COM-211

AN EQUAL OPPORTUNITY EMPLOYER

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

OFFICIAL BUSINESS

PRINTED MATTER

John Littlewood
Documents Division
220 D Library
Champaign, IL 61820

16.33391
c48

# SELECTED WATER RESOURCES ABSTRACTS

THE LIBRARY OF THE
JAN 9 1976
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

VOLUME 8, NUMBER 24
DECEMBER 15, 1975

W75-11851 -- W75-12400
CODEN: SWRABW

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

SELECTED WATER RESOURCES ABSTRACTS is available to Federal agencies, contractors, or grantees in water resources upon request to: Manager, Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior, Washington, D. C. 20240.

SELECTED WATER RESOURCES ABSTRACTS is also available on subscription from the National Technical Information Service. Annual subscription rates are: To the SWRA Journal, $75 ($95 foreign); to the Journal & Annual Index, $100 ($125 foreign); to the Annual Index only, $50 ($65 foreign). Certain documents announced in this journal may be purchased from the NTIS at prices indicated in the entry. Prepayment is required.

# SELECTED
# WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior

**VOLUME 8, NUMBER 24**
DECEMBER 15, 1975

W75-11851 -- W75-12400

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

# FOREWORD

**Selected Water Resources Abstracts,** a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

**Selected Water Resources Abstracts** is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

## CONTENTS

FOREWORD_____iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

**01** NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

**02** WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

**03** WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

**04** WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

**05** WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

**06** WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

**07** RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

**08** ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

**09** MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

**10** SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

# SELECTED WATER RESOURCES ABSTRACTS

## 2. WATER CYCLE

### 2A. General

**THE GRAPHICAL HYDROGRAPHS METHOD WITH THE INTERMEDIARY OF STORM OVERFLOWS AND FLOOD RETENTION TANKS (DAS GRAFISCHE AFLUSS-GANGLINIENVERFAHREN MIT ZWISCHENSCHALTUNG VON RUE UND RB),**
For primary bibliographic entry see Field 5D.
W75-11861

**COMBINED WASTEWATER OVERFLOWS,**
Blume (John A.) and Associates, Engineers, San Francisco, Calif.
For primary bibliographic entry see Field 5D.
W75-11912

**SYSTEMS APPROACH TO HYDROLOGY.**
Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, 1971. 464 p.

Descriptors: *Conferences, *Hydrology, *Systems analysis, *Hydrologic systems, *Statistical models, *Hawaii, Input-output analysis, Simulation analysis, Stochastic processes, Streamflow, Mathematical models, Synthetic hydrology, Runoff, Floods, Flood flow, Rainfall-runoff relationships, Precipitation(Atmospheric), Evapotranspiration, Groundwater, Network design, Regional analysis, Water yield, Water quality control, Watersheds(Basins), Streams erosion, Scour.
Identifiers: *Japan, Kinematic wave.

The seminar theme was 'The Systems Approach to Analysis of Hydrologic Processes and Environments.' Twenty papers, nine from Japan and eleven from the United States, were presented. At the end of each paper are summaries of discussion remarks and authors' responses. Titles of papers are: Stochastic Hydrologic Systems; Transformation System in Flood Runoff Phenomena; The Structure of Inputs and Outputs of Hydrologic Systems; A Study of Long Range Runoff System Response Based on Information Theory; Nonlinear Runoff Kernels of Hydrologic System; Linear Systems Analysis in Hydrology--The Transform Approach, The Kernel Oscillations and the Effect of Noise; Effect of an Error in Discharge Measurements on the Detection Process in Runoff Systems Analysis; Kernels of Stochastic Linear Hydrologic Systems; Hydrologic Systems in Hawaii; The Stochastic Kinematic Wave; Systems Simulation of Streamflows; Efficiency of Parameter and Sate Estimation Methods in Relation to Models of Lumped and Distributed Hydrologic Systems; Effects of Movement of Precipitation Area upon Runoff Phenomena; Numerical Simulation of Watershed Hydrology; An Application of Simulated Rainfall Models to Forecasting of the Long Term Variation of River Bed; Simulation of the Short-Time Scour-Fill Process in Erodible Streams with Stochastic Sediment Transfer at the Stream Bed; Meteoro-Hydrological Aspects of Rainfall in Japan; The Role of Network Design in the Management and Control of Streamflow Water Quality; A Three-Component, Nonlinear Water-Yield Model; and Hydrological Studies of Evapotranspiration and Groundwater Flow in Sandy Land. (See also W75-12015 thru W75-12032) (Humphreys - ISWS)
W75-12014

**STOCHASTIC HYDROLOGIC SYSTEMS,**
Illinois Univ., Urbana, Dept. of Hydraulic Engineering.
V. T. Chow.
In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 1-23, 1971. 4 fig, 3 tab, 10 ref. OWRT A-029-ILL(6) 14-01-0001-1632.

Descriptors: *Hydrologic systems, *Stochastic processes, *Annual flood, *Time series analysis, *Water yield, Mathematical models, Evapotranspiration, Runoff, Rainfall, Analytical techniques, Model studies, Watersheds(Basins), Markov processes, Rainfall-runoff relationships, Precipitation(Atmospheric), Water storage.
Identifiers: *French Broad River(NC), *Sangamon River(Ill), Basin storage, Power spectrum analysis.

Hydrologic phenomena were simulated as stochastic hydrologic systems in terms of mathematical models whose components are represented by stochastic processes. The proposed stochastic hydrologic model was based on a mathematical formulation of the principle of system continuity composed of component stochastic processes of precipitation, runoff, and evapotranspiration, plus losses and basin storage. Based on various assumptions two stochastic watershed system models were formulated and analyzed to illustrate the application of the proposed stochastic hydrologic model. One watershed system model was the annual storm-flood model in which the input hourly rainfall of the annual storm was represented by a first-order nonhomogeneous Markov chain and the annual storm-flood by multiple linear regression. The rainfall and runoff relationship of the watershed was represented by a bivariate Markov process. The other watershed model was the watershed yield model in which the component hydrologic processes of precipitation, runoff, evapotranspiration, and basin storage were simulated as stochastic processes by time series to be determined by correlogram and power spectrum analysis. As numerical examples for analysis, the French Broad River basin above Bent Creek, North Carolina, was used as the watershed for the annual storm-flood model, and the upper Sangamon River basin above Monticello in east central Illinois was used as the watershed for the watershed yield model. (See also W75-12014) (Singh - ISWS)
W75-12015

**TRANSFORMATION SYSTEM IN FLOOD RUNOFF PHENOMENA,**
Kyoto Univ. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-12016

**THE STRUCTURE OF INPUTS AND OUTPUTS OF HYDROLOGIC SYSTEMS,**
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich.
In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 51-79, 1971. 12 fig, 3 ref. NSF GK-11444.

Descriptors: *Hydrologic systems, *Mathematical models, *Input-output analysis, *Model studies, *Systems analysis, Mathematical studies, Hydrology, Analytical techniques, Theoretical analysis, Equations, Stochastic processes, Correlation analysis, Time series analysis, Statistical methods, Rainfall, Streamflow, Probability, Hydrologic aspects.

A brief analysis leads to the conclusion that all water inputs and outputs of hydrologic environments are periodic-stochastic processes. To make a basic structural analysis of hydrologic processes possible, ten hypotheses were given. Complex hydrologic processes of inputs and outputs, such as river flow and precipitation time series, are composed of periodic components in several parameters and an independent stochastic component. Periodicities in the mean and standard deviation may or may not be proportional. Techniques for making inferences about significant harmonics were outlined for both cases. Nonparametric and parametric methods of removing these periodicities from a series were given and the autocorrelation coefficients of standardized series were shown to be periodic also. To obtain the independent stochastic components of the second-order stationarity, periodicities in the mean, standard deviation, and autocorrelation coefficients can be removed. Complex hydrologic series are not third-order stationary either. The shapes of distributions of stochastic independent components for discrete series of small time units (say one day) require the fitting of probability density functions of an unfamiliar type to hydrology. (See also W75-12014) (Humphreys - ISWS)
W75-12017

**A STUDY OF LONG RANGE RUNOFF SYSTEM RESPONSE BASED ON INFORMATION THEORY,**
Kyoto Univ., (Japan). Dept. of Civil Engineering.
T. Ishihara, and S. Ikebuchi.
In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 80-101, 1971. 12 fig, 4 tab, 15 ref.

Descriptors: *Rainfall-runoff relationships, *Stochastic processes, *Hydrologic systems, *Statistical methods, Correlation analysis, Hydrology, Mathematical studies, Systems analysis, Analytical techniques, Runoff, Unit hydrographs, Synthesis, Precipitation(Atmospheric), Rainfall, Snowmelt, Dishcharge(Water), River flow, Base flow.
Identifiers: *Information theory.

Long-range runoff phenomena are essentially stochastic processes. To understand them, their deterministic characteristics and the statistical laws involved in the system of transition between precipitation and river discharge must be known. Methods were proposed for the analysis and synthesis of a long-range runoff response based on the ideas and techniques of information theory. First, statistical properties of daily precipitation and river discharge series were discussed through their correlation analysis; then, after time-invariant linearization of the runoff system according to the physical mechanisms in the runoff phenomena, the unit-impulse response function designated as the 'statistical unit hydrograph' was derived from the Wiener-Hoph equation. Statistical unit hydrographs that take into account both the variations of the water content in the subsurface stratum during the rainy season and the daily snow melt water input to the system in the snow melt season were proposed. Results of these procedures applied to the Yura River basin were in good agreement with the natural stream records. (See also W75-12014) (Humphreys - ISWS)
W75-12018

**NONLINEAR RUNOFF KERNELS OF HYDROLOGIC SYSTEM,**
Tokyo Inst. of Tech. (Japan). Dept. of Civil Engineering.
M. Hino, T. Sukigara, and H. Kikkawa.
In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 102-115, 1971. 6 fig, 17 ref, 1 append.

Descriptors: *Hydrologic systems, *Stochastic processes, *Inputioutput analysis, *Runoff, Runoff forecasting, Floods, Theoretical analysis, Mathematical studies, Statistical methods, Hydrograph analysis, Precipitation excess, Correlation analysis, Hydrology, Rainfall.
Identifiers: Nonlinear stochastic processes, Nonlinear runoff kernels.

In recent years, great strides have been made in the area of stochastic hydrology. A lot of quantitative information on hydrologic phenomena has been derived reasonably from statistical hydrologic data. However, studies from a point of view of non-linear stochastic process are rather few and not necessarily successful. A method was described of deriving the nonliner 'runoff kernels' based on the Wiener theory of nonlinear random process, together with comments on the results obtained from applying method to a daily rainfall-runoff process for a real basin. It was shown that the short-period runoff component shows strong nonlinearity at a short lag-time, while a weak nonlinearity was also found for the long term runoff component. The predictability for heavy daily rainfall was shown to be increased considerably. In an appendix, the importance of the probability distribution of rainfall and runoff data was discussed, stressing that the preliminary processing to transform these data into random variables with Gaussian probability distribution will further improve the efficiency of linear or nonlinear stochastic hydrologic theories. (See also W75-12014) (Humphreys - ISWS)
W75-12019

**EFFECT OF AN ERROR IN DISCHARGE MEASUREMENTS ON THE DETECTION PROCESS IN RUNOFF SYSTEMS ANALYSIS,**
Hokkaido Univ., Sapporo (Japan). Dept. of Civil Engineering.
T. Kishi.
In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 143-162, 1971. 9 fig, 3 ref.

Descriptors: *Runoff, *Systems analysis, *Mathematical studies, *Theoretical analysis, Discharge(Water), Velocity, Measurement, Reliability, Flow measurement, Methodology, Reservoirs, Turbulence, Flow characteristics, Rainfall.
Identifiers: *Error, Observation error, Truncation error.

A river basin acts as a low pass filter in the prediction process and becomes an amplifier for high frequency bands in the detection process. Theoretical considerations were made about the detection process for a basin of cascade-connected linear reservoirs. Theoretically, the possibility of obtaining the time function of input depends on the functional form of the output and on the order of the system or the number of linear reservoirs. An approximate method of calculation by which the Fourier inverse transform of the detected input function is always integrable was presented. Results of calculations using field data were described as illustrative examples. It was pointed out that the precision of the detected values of the input decreases markedly if even a small error is contained in the measurements of the output. Also investigated was the relation of turbulence characteristics of natural streams to the error in velocity measurements which must be a significant factor affecting the total error in discharge measurements. The error in velocity measurements can be decreased appreciably if the observational period at a point is prolonged by a small fraction of time. (See also W75-12014) (Humphreys - ISWS)
W75-12020

**KERNELS OF STOCHASTIC LINEAR HYDROLOGIC SYSTEMS,**
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
R. G. Quimpo.
In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 163-185, 1971. 4 fig, 20 ref. NSF GK-20388.

Descriptors: *Hydrologic systems, *Stochastic processes, *Runoff, *Mathematical models, Mathematical studies, Analytical techniques, Model studies, Input-output analysis, Systems analysis, Hydrology, Synthetic hydrology, Simulation analysis, Markov processes.
Identifiers: Linear stochastic processes, Autoregression model.

Using operational methods of analyzing linear systems, kernels corresponding to current stochastic models of hydrologic time series were obtained. It was shown that these models essentially assume the form of the kernel of the linear system in terms of undetermined parameters as contrasted with the approach which requires the solution of the Wiener-Hopf equations. Markov second and third order autoregressive models equivalent to two types of self-similar models for a typical river were obtained using a least-square criterion on the kernel. To compare the re-scale range properties of synthetic data using different generating techniques, 2400 years of record were synthesized for each of five models. Visual inspection of respective re-scaled-range vs. length-of-record plots suggested essentially the same result for the range regardless of which model was used to generate data. (See also W75-12014) (Humphreys - ISWS)
W75-12021

**HYDROLOGIC SYSTEMS IN HAWAII,**
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
P. C. Ekern, L. S. Lau, F. L. Peterson, S. Price, and R. Pulfrey.
In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 186-201, 1971. 6 fig.

Descriptors: *Hydrologic systems, *Rainfall, *Groundwater, *Hawaii, Geologic history, Geology, Climates, Evaporation, Solar radiation, Floods, Hydrology, Islands, Volcanoes, Transpiration.

Geologic history, rainfall climate, evaporation and transpiration, flood hydrology, and geology and groundwater under Hawaiian conditions were each briefly presented. The Hawaiian islands are a chain of shield-shaped basaltic domes built over a 1600 mile fissure of the ocean floor which has existed probably since at least Middle Tertiary (about 30 million years). The major climatic controls in Hawaii are exercised by the tropical locale, the surrounding ocean, and the Pacific anticyclone and topography. Each of the major islands has its distinctive terrain, but their mean rainfall distributions have certain features in common. Great variations of rainfall occur within small distances and with elevation. In some areas, mean annual rainfall increases by 75 inches for each 1000 feet of elevation and 2 or 3 miles of distance. On all the major islands, localities with over 300 inches of rain a year and others with less than 20 inches a year may be 20 miles or less apart. Hawaii's most serious hydrologic problem, other than long-range water resources management and planning, is flash flooding. Two general modes of groundwater occurrence are present in the Hawaiian islands: high-level groundwater and basal groundwater. Dikes in and near the rift zones of the volcanoes impound large volumes of fresh water. The principal source of fresh groundwater in the Hawaiian islands is the lens-shaped basal water body, commonly called the Ghyben-Herzberg lens, floating on denser salt water. (See also W75-12014) (Humphreys - ISWS)
W75-12022

**THE STOCHASTIC KINEMATIC WAVE,**
Massachusetts Inst of Tech., Cambridge. Dept of Civil Engineering.
P. S. Eagleson.
In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 202-225, 1971. 7 fig, 1 tab, 14 ref.

Descriptors: *Hydrologic systems, *Stochastic processes, *Hydrographs, Streamflow forecasting, Mathematical models, Rainfall-runoff relationships, Streamflow, Runoff, Overland flow, Watersheds(Basin), Storm runoff, Runoff forecasting, Peak discharge, Annual, Flood frequency, Rainfall, Precipitation excess.
Identifiers: *Kinematic wave.

The kinematic wave method of hydrograph forecasting was generalized through the incorporation of random variations in the temporal and areal distribution of storm rainfall excess. Expressions were derived for the peak direct runoff and streamflow in terms of the statistics of these random variables. Generalized probability density functions of storm duration and storm rainfall depth (given duration, an assumed loss function, and an assumed probability density function) for a runoff-producing area were used with the stochastic equations for maximum direct storm runoff to derive the probability density function of peak streamflow. The latter was used to obtain the classical flood-frequency curve as an explicit function of parameters defining the rainfall distributions and the catchment-stream phsiography. The flood-frequency relation was used to derive the mean annual flood as a function of catchment area and this compared well with observations from 44 Connecticut rivers. Agreement of the predicted flood-frequency curve with observation on particular catchments was also good but was apparently sensitive to the particular value of the direct runoff fraction and to the fraction of the catchment area contributing direct runoff. (See also W75-12014) (Humphreys - ISWS)
W75-12023

**SYSTEMS SIMULATION OF STREAMFLOWS,**
Kyoto Univ., (Japan), Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-12024

**EFFICIENCY OF PARAMETER AND STATE ESTIMATION METHODS IN RELATION TO MODELS OF LUMPED AND DISTRIBUTED HYDROLOGIC SYSTEMS,**
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
C. C. Kisiel.
In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 246-278, 1971. 67 ref. OWRT B-007-ARIZ(14)

Descriptors: *Hydrologic systems, *Systems analysis, *Model studies, *Decision making, *Reviews, Hydrology, Optimization, Theoretical analysis, Efficiences, Stochastic processes, Statistical methods, Input-output analysis, Risks, Calibrations, Time series analysis.
Identifiers: Bayesian decision theory, Model validation.

A review of the important philosophical and practical issues inherent in modeling and parameter estimation errors was given. Included was a discussion of the identification problem and its relation to optimization theory and statistical estimation theory. System determinacy and indeter

ninacy was defined in terms of the number of variables, data points, and equations and then urther elaborated in terms of design, identification, and parameter estimation problems. In view f the proliferation of hydrologic models and an pparent polarization of viewpoints on modeling, ome issues involved in choosing among models vere presented. These include model validation, pparent and inherent randomness, and lumped nd distributed parameter models. The latter nodels were interpreted by a frequency domain nethod; a heat flow problem was modeled by both nethods and interpreted in terms of autocorrelaion and spectrum functions for the lumped model. Objective and subjective criteria were presented or validation of hydrologic models. An outline of Bayesian decision theory was presented and then pplied to evaluating the cost of uncertainty in the esign of bridge piers. The uncertainty exists in he mean and variance of the log-normal distribuion used to describe the annual peak flows on Rilto Creek in Tucson, Arizona. A model for valuating the worth of additional hydrologic data vas also presented. (See also W75-12014) (Humphreys - ISWS)
W75-12025

**EFFECTS OF MOVEMENT OF PRECIPITATION AREA UPON RUNOFF PHENOMENA,**
Tokyo Univ., (Japan). Dept. of Civil Engineering.
Y. Takahasi, K. Mushiake, and T. Hashimoto.
In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 279-294, 1971. 12 fig, 5 ref.

Descriptors: *Hydrographs, *Hydrologic systems, *Model studies, *Runoff, Mathematical models, Watersheds(Basins), Storm runoff, Storms, Movement, Velocity, Rainfall, Spatial distribution, Precipitation(Atmospheric).
Identifiers: *Japan, *Kanna River.

Model simulation of streamflow hydrographs usually assumes that rainfall is distributed uniformly over the watershed. But, in reality, rainfall may vary considerably in time and in space. For floods in small river basins (less than several hundred square kilometers) in Japan, effects of the spatial distribution and movement of precipitation storm cells especially cannot be ignored. The effects of the distribution of precipitation and its movement upon storm hydrographs were reported. The use of a hydraulic runoff model was applied as the method of runoff analysis. The model was solved numerically. Studies about effects of the various characteristics of storm area upon flood hydrographs were carried out by means of numerical experiments on two kinds of simplified catchment model. At the same time, several properties of the model catchment were studied. Characteristics of rain storms, such as scale, distribution, direction, and velocity, were investigated through analyses of hydrological data in the Kanna River Basin. Comparisons between computed and observed hydrographs caused by a storm passing over the basin showed good agreement for the peak flow and the rising limb of the hydrograph, but agreement was not good for recession limb. (See also W75-12014) (Humphreys - ISWS)
W75-12026

**NUMERICAL SIMULATION OF WATERSHED HYDROLOGY,**
Texas Univ., at Austin. Dept. of Civil Engineering.
W. L. Moore, and B. J. Claborn.
In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 295-325, 1971. 12 fig, 5 tab, 11 ref.

Descriptors: *Rainfall-runoff relationships, *Simulation analysis, *Synthetic hydrology, Stochastic processes, Watersheds(Basins), Water storage, Soil moisture, Mathematical models, Streamflow, Soil water movement, Rainfall, Infiltration, Runoff, Computer programs.
Identifiers: *Stanford Watershed Model, Fortran IV.

In translating the Stanford Watershed Model into Fortran IV, several modifications were made in the manner of treating depression storage, infiltration, soil moisture storage, and soil moisture movement. The result was a program variation for simulating the physical processes occuring in a watershed. The rainfall input was stored and transferred to various elements using mathematical relations based on physical processes. Most parameters have physical interpretation and with experience can be estimated with at least some degree of precision. The simulation emphasized surface storage, infiltration, and soil moisture phases as significant in determining the amount of streamflow. The time distribution of runoff was treated by means of a distribution graph. Limited results were included for application to two watersheds. (See also W75-12014) (Jess - ISWS)
W75-12027

**AN APPLICATION OF SIMULATED RAINFALL MODELS TO FORECASTING OF THE LONG TERM VARIATION OF RIVER BED,**
Osaka Univ. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-12028

**SIMULATION OF THE SHORT-TIME SCOUR-FILL PROCESS IN ERODIBLE STREAMS WITH STOCHASTIC SEDIMENT TRANSFER AT THE STREAM BED,**
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2J.
W75-12029

**METEORO-HYDROLOGICAL ASPECTS OF RAINFALL IN JAPAN.**
Meteorological Research Inst., Tokyo (Japan). Typhoon Research Lab.
For primary bibliographic entry see Field 2B.
W75-12030

**A THREE-COMPONENT, NONLINEAR WATER-YIELD MODEL,**
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
W. M. Snyder, W. C. Mills, and J. C. Stephens.
In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 428-443, 1971. 8 fig, 2 tab, 8 ref.

Descriptors: *Rainfall-runoff relationships, *Simulation analysis, *Synthetic hydrology, Stochastic processes, Mathematical models, Streamflow, Water yield, Runoff, Rainfall, Watersheds(Basins), Discharge(Water).
Identifiers: *Rainfall-runoff models.

A three-component, nonlinear model was developed and tested on three experimental watersheds. Input data were rainfall in 5-day periods. The first component expressed physical characteristics of the watershed in terms of a potential for water yield. The second varied with watershed wetness and related transmission of potential yield to the watershed outlet. The final component was a seasonal-loss function. Input rainfall was diminished by this function to produce 5-day amounts of rainfall. Output was volume of streamflow for synchronous 5-day periods. (See also W75-12014) (Jess-ISWS)
W75-12031

**HYDROLOGICAL STUDIES OF EVAPOTRANSPIRATION AND GROUNDWATER FLOW IN SANDY LAND,**
National Research Inst. of Agricultural Engineering, Hiratsuka (Japan).
For primary bibliographic entry see Field 2D.
W75-12032

**PREDICTIVE MODELS FOR GREAT LAKES HYDROLOGY,**
State Univ. of New York, Buffalo. Dept. of Civil Engineering.
D. D. Meredith.
Water Resources Bulletin, Vol 11, No 3, p 526-535, June 1975. 5 tab, 6 ref, append. OWRT B-062-ILL(4). 14-31-0001-3580.

Descriptors: *Great Lakes, *Simulation analysis, *Hydrology, *Model studies, Hydrologic data, Precipitation(Atmospheric), Evaporation, Runoff, Water balance, Regression analysis, Water temperature, Statistical models, Lakes, Statistics.
Identifiers: Theisson polygon method.

A study was undertaken to develop predictive models for Great Lakes hydrology which could be used in simulation studies to investigate alternative operating rules. The individual hydrologic components were assumed to be normally distributed for each month, and linear regression equations were estimated for predicting the value of the individual monthly hydrologic components. It was shown that some of the hydrologic components for downwind (in this case, downstream) lakes were dependent on hydrologic events for the upwind lakes. This was particularly so for precipitation in the downwind lake basins which appeared to be dependent on evaporation values for upwind lakes. Therefore, any change in the hydrology of an upwind lake would cause a change in the hydrology of the downwind lakes. (Roberts-ISWS)
W75-12049

## 2B. Precipitation

**THE STOCHASTIC AND CHRONOLOGIC STRUCTURE OF RAINFALL SEQUENCES - APPLICATION TO INDIANA,**
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
M. L. Kavvas, and J. W. Delleur.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 257, $7.25 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center Technical Report No. 57, 1975. 199 p, 62 fig, 32 tab, 83 ref, 3 append. OWRT B-036-IND (10).

Descriptors: *Rainfall, Stochastic Processes, *Indiana, Precipitation, Central U.S., Statistical Methods.
Identifiers: *Rainfall, *Sequences, *Rainfall Occurrences, Rainfall Counts, Neyman-Scott Cluster Process, Autoregressive Moving Average Model.

The report is in two parts: the first is concerned with the point stochastic analysis of the daily rainfall occurrence in Indiana, and the second with the time series analysis of the monthly and the annual rainfall sequences at various stations in Central United States. The point statistical analysis utilized some statistical functions and tests of hypotheses. There are cyclicities both in the first and second moments of the point stochastic process. Physically meaningful annual and 15-day cycles were found to be significant. There is a slight downward trend in the rate of daily occurrence in Indiana. The Neyman-Scott cluster process was constructed in the time dimension to model this physical persistence. The model fit the data well. In the time series analysis, a theoretical and empirical analysis of the removal of cyclicities was performed; however differencing could not be used for the generation purposes although it did

remove the cyclicities in the data. Standardization, although it introduces some spurious nonstationarities into the data, is an acceptable method for generation purposes. A spectral and a variance-time analysis of the ARIMA family of the hydrologic time series models was done to study their long range dependence characteristics. For the annual rainfall series a white noise model with normally distributed residuals is adequate and can be used for hydrologic simulation purposes in the Central United States.
W75-11854

**ERRORS AND FLUCTUATIONS OF RAIN-GAUGE ESTIMATES OF AREAL RAINFALL,**
McGill Univ., Montreal (Quebec).
For primary bibliographic entry see Field 7A.
W75-11933

**DISTRIBUTION OF AQUATIC MACROPHYTES RELATED TO PAPER MILL EFFLUENTS IN A SOUTHERN MICHIGAN STREAM,**
Southeast Missouri State Univ., Cape Girardeau. Dept. of Biology.
R. G. Kullberg.
American Midland Naturalist, Vol 91, No 2, p 271-281, 1974. 3 fig, 3 tab, 18 ref.

Descriptors: *Aquatic plants, *Distribution, *Streams, *Michigan, Volume, Standing crops, Turbidity, Chemical properties, Pollution abatement, Pulp wastes, Ammonia, Sulfates, Lignins, Speciation, Peat.
Identifiers: *Portage Creek(Michigan), Tannins, Nasturtium officinale, Potamogeton pectinatus, Potamogeton crispus, Sparganium americanum, Elodea canadensis, Plant cover.

Distribution of macrophyte cover, volume, and standing crop along Portage Creek near Kalamazoo, Michigan, were estimated. The stream begins in an unpopulated, uncultivated area and flows into an urban area where it received paper mill wastes, after which aquatic macrophytes were absent. Another study made one year after cessation of paper mill effluents showed a ten-fold reduction in turbidity in the polluted portion of the stream, suggesting that turbidity was the most probable cause for the earlier absence of macrophytes. Concentration of dissolved substances was low and relatively stable in the upper reaches. Ammonia, sulfate, and tannin-lignin concentrations increased in the lower reaches. Down-stream the only cover was by Nasturtium officinale. The substrate cover by macrophytes was 41% in the upstream unpolluted portion. The two dominant species were Potamogeton pectinatus and Sparganium americanum. Aquatic macrophytes occupied 0.043% of the water volume. Of the ten species found, Nasturtium officinale, Potamogeton crispus, P. pectinatus, and Elodea canadensis occupied 82.8% of total plant volume and comprised 83.3% of dry weight. Length of growing season, mean annual temperature, concentration of dissolved substances, and shallow water were responsible for the low standing crop and number of species. (Buchanan-Davidson--Wisconsin)
W75-11991

**HYDROLOGIC SYSTEMS IN HAWAII,**
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 2A.
W75-12022

**METEORO-HYDROLOGICAL ASPECTS OF RAINFALL IN JAPAN.**
Meteorological Research Inst., Tokyo (Japan). Typhoon Research Lab.
In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 379-394, 1971. 18 fig, 4 ref.

Descriptors: *Climatic zones, *Rainfall intensity, *Foreign countries, *Frequency curves, Rainfall, Geographical regions, Rainfall disposition, Distribution patterns, Diurnal, Precipitation excess, Topography, Climatology, Climatic data, Orography, Cloud bursts, Duration curves, Frequency, Rates, Depth, Areal, Monsoons, Typhoons.
Identifiers: *Japan.

The distribution of the regional division of heavy rainfalls in Japan and its meteorological causes were briefly described. Those distributions coincided very well with that of the climatic provinces. Based on the results of climatological studies in Japan, it was suggested that the climatic province is available for estimation of the various hydrological values as follows: (1)the characteristics of depth-duration and intensity-duration curve, (2)regional change of rainfall amount and its intensity, and (3)recurrence interval of rainfall amount. Study results were presented in graphical form. (See also W75-12014) (Humphreys - ISWS)
W75-12030

**ENVIRONMENTAL RESEARCH LABORATORIES, 1973 ANNUAL REPORT.**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W75-12033

**LIDAR VS. PHOTOMETER, A ONE MONTH COMPARISON,**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W75-12036

**THE SIMPLE ATDL URBAN AIR POLLUTION MODEL,**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W75-12038

**DIFFUSION ESTIMATION FOR SMALL EMISSIONS,**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W75-12039

**1974 WATER RESOURCES DATA FOR OREGON, SURFACE WATER RECORDS, PRECIPITATION RECORDS,**
Oregon State Engineers Office, Salem. Water Resources Dept.
For primary bibliographic entry see Field 7C.
W75-12087

**WEATHER MODIFICATION: WHERE ARE WE NOW AND WHERE SHOULD WE BE GOING, AN EDITORIAL OVERVIEW,**
National Hurricane and Experimental Meteorology Lab., Coral Gables, Fla.
For primary bibliographic entry see Field 3B.
W75-12088

**ON THE VARIABILITY OF 'DYNAMIC SEEDABILITY' AS A FUNCTION OF TIME AND LOCATION OVER SOUTH FLORIDA: PART I. SPATIAL VARIABILITY,**
National Hurricane and Experimental Meteorology Lab., Coral Gables, Fla.
For primary bibliographic entry see Field 3B.
W75-12089

**A DETAILED MICROPHYSICAL SIMULATION OF HYGROSCOPIC SEEDING ON THE WARM RAIN PROCESS,**
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-12090

**FLORIDA AREA CUMULUS EXPERIMENTS 1970-1973 RAINFALL RESULTS,**
Virginia Univ., Charlottesville. Dept. of Environmental Sciences; and Virginia Univ., Charlottesville. Center for Advanced Studies.
For primary bibliographic entry see Field 3B.
W75-12091

**SMALL-SCALE VARIABILITY OF HAIL AND ITS SIGNIFICANCE FOR HAIL PREVENTION EXPERIMENTS,**
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 3B.
W75-12092

**FORMATION OF GRAUPEL,**
Naval Weapons Center, China Lake, Calif.
For primary bibliographic entry see Field 3B.
W75-12093

**HAIL SUPPRESSION DATA FROM WESTERN NORTH DAKOTA, 1969-1972,**
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-12094

**DESIGN OF A HAIL SUPPRESSION PROJECT FOR ILLINOIS,**
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 3B.
W75-12095

**THE NATURE OF WINTER CLOUDS AND PRECIPITATION IN THE CASCADE MOUNTAINS AND THEIR MODIFICATION BY ARTIFICIAL SEEDING. PART I: NATURAL CONDITIONS,**
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-12096

**A NUMERICAL MODEL OF PRECIPITATION FROM SEEDED AND UNSEEDED COLD OROGRAPHIC CLOUDS,**
Denver Research Inst., Colo.
For primary bibliographic entry see Field 3B.
W75-12098

**TESTING OF CLOUD SEEDING MATERIALS AT THE CLOUD SIMULATION AND AEROSOL LABORATORY, 1971-1973,**
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W75-12099

**AN EXPLANATION FOR THE UNUSUAL NUCLEATING ABILITY OF AEROSOLS PRODUCED FROM THE AGI-NH4I-ACETONE SYSTEM,**
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-12100

NALYSIS OF RADAR OBSERVATIONS OF A ANDOMIZED CLOUD SEEDING EXPERI-IENT,
outh Dakota School of Mines and Technology, apid City. Inst. of Atmospheric Sciences.
or primary bibliographic entry see Field 3B.
/75-12101

OMPARISON OF GAGE AND RADAR ETHODS OF CONVECTIVE RAIN MEASURE-IENT,
ational Oceanic and Atmospheric Administra-on, Coral Gables, Fla. Experimental Meteorolo-Lab.
. L. Woodley, A. R. Olsen, A. Herndon, and V. iggert.
ournal of Applied Meteorology, Vol 14, No 5, p 9-928, August 1975. 18 fig, 6 tab, 26 ref.

escriptors: *Rainfall, *Rain gages, *Radar, Florida, Measurement, Remote sensing, Net-orks, Analytical techniques, Depth-areas curves, recipitation(Atmospheric), Rain, Rainfall sposition, Areal, Isohyets, Reliability, eteorology.
entifiers: *Radar rainfall measurements.

age and radar methods of convective rain mea-rement were compared in the context of the con-uing multiple cloud seeding experiment of the xperimental Meteorology Laboratory (EML). An ptimal system, combining the best features of th, was recommended. The nature of the Florida nvective rainfall measured was documented ing measurements from a dense raingage esonet (about 3 sq km per gage over 570 sq km) at was operated for a total of 93 days in 1971 and 73. The gaging requirements for detection and easurement of 24 hour rainfalls in the mesonet ere determined using the full complement of ges as the standard. For the measurement of eal convective rainfall greater than 0.25 mm ithin a factor of 2 on 90, 70 and 50% of the days, ge densities of 31, 91 and 208 sq km per gage, spectively, were required. The daily representa-n of rainfall by the radar improves if one adjusts using gages. In the mean, adjustment produced a atistically significant 15% improvement in radar ccuracy. The adjusted radar measurements than ld an approximate gage density equivalence of 25 km per gage. For the measurement of the rain-ll from individual showers anywhere, the gage-djusted radar is far superior to gages alone. For easurement in a fixed area the size of the esonet, gages are superior to radar. To measure infall over the EML target either gages alone, or radar adjusted by gages, can accomplish the sk. (Sims-ISWS)
/75-12102

N THE EFFECT OF NATURAL RAINFALL ARIABILITY AND MEASUREMENT ERRORS N THE DETECTION OF SEEDING EFFECT,
attelle-Northwest, Richland, Wash.
or primary bibliographic entry see Field 3B.
/75-12103

HE EFFECT OF PERSISTENCE OF AGI ON ANDOMIZED WEATHER MODIFICATION XPERIMENTS,
ureau of Reclamation, Denver, Colo.
or primary bibliographic entry see Field 3B.
/75-12104

N THE DESIGN AND EVALUATION OF CU-ULUS MODIFICATION EXPERIMENTS,
irginia Univ., Charlottesville. Dept. of Environ-ental Sciences; and Virginia Univ., Charlot-sville. Center for Advanced Studies.
or primary bibliographic entry see Field 3B.
/75-12105

**EVALUATION BY MONTE CARLO TESTS OF EFFECTS OF CLOUD SEEDING ON GROWING SEASON RAINFALL IN NORTH DAKOTA,**
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-12106

**BAYESIAN AND CLASSICAL STATISTICAL METHODS APPLIED TO RANDOMIZED WEATHER MODIFICATION EXPERIMENTS,**
Battelle-Northwest, Richland, Wash.
For primary bibliographic entry see Field 3B.
W75-12107

**THE NATURE OF WINTER CLOUDS AND PRECIPITATION IN THE CASCADE MOUNTAINS AND THEIR MODIFICATION BY ARTIFICIAL SEEDING. PART II: TECHNIQUES FOR THE PHYSICAL EVALUATION OF SEEDING,**
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-12108

**THE NATURE OF WINTER CLOUDS AND PRECIPITATION IN THE CASCADE MOUNTAINS AND THEIR MODIFICATION BY ARTIFICIAL SEEDING. PART III: CASE STUDIES OF THE EFFECTS OF SEEDING,**
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-12109

**POTENTIAL OF PRECIPITATION MODIFICATION IN MODERATE TO SEVERE DROUGHTS,**
Illinois State Water Survey, Urbana.
F. A. Huff, and R. G. Semonin.
Journal of Applied Meteorology, Vol 14, No 5, p 974-979, August 1975. 2 fig, 5 tab, 9 ref. Bureau of Reclamation 14-06-D-7197.

Descriptors: *Weather modification, *Droughts, *Artificial precipitation, *Illinois, Feasibility, Cloud seeding, Precipitation(Atmospheric), Rainfall, Rainfall disposition, Climatology, Water supply, Mathematical models, Water shortage, Agriculture, Meteorology.
Identifiers: Potential of weather modification.

Assuming that successful precipitation modification could be achieved under atmospheric conditions favorable for the development of natural precipitation, a three-phase study was made to acquire information on the potential for alleviation of moderate to severe droughts in Illinois. The first phase involved time-space analyses of monthly precipitation characteristics in previous major droughts of 12- to 24-month duration. In the second phase, detailed analyses were made of various storm properties during the 1953-54 drought, one of the worst on record in Illinois. The third phase involved use of a one-dimensional cloud model to investigate cloud seeding potential in the 1953-54 drought. Overall, results indicated that atmospheric conditions are favorable for natural precipitation development frequently enough in most droughts that successful cloud seeding operations could contribute occasionally to temporary alleviation of water shortages over portions of an extensive drought region, particularly with respect to agricultural needs. (Sims-ISWS)
W75-12110

**THE USE OF A MULTIZONE HYDROLOGIC MODEL WITH DISTRIBUTED RAINFALL AND DISTRIBUTED PARAMETERS IN THE NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM,**
National Weather Service, Slidell, La. Lower Mississippi River Forecast Center.
D. G. Morris.
August 1975. 15 p, 4 fig, 3 tab, 6 ref.

Descriptors: *River forecasting, *Stream flow, *Rain gages, Floods, Rainfall, Hydrology, Rainfall intensity, Precipitation(atmospheric), Hydrography, Forecasting, Weather, Weather data, Precipitation intensity, Rainfall disposition, Parametric hydrology.
Identifiers: *Hydrological models, *Flood forecasting, *Rainfall distribution, *River forecast system, Streamflow simulation, Streamflow hydrologic models, Zonal precipitation, Convective rainfall, Distributed parameters, Parameters, Hydrologic surveys, Meteorological instruments.

Tests were conducted on a basin with a less-than-optimum rain gage network to evaluate the possibility of improving streamflow simulation through the use of zonal precipitation input and zonally varied parameters. Preliminary results for the 959-mi2, 4-zone watershed indicate that improved hydrograph reconstitution is obtained for rises caused by convective rains where the model parameters are adjusted to reflect hydrologic differences between upstream and downstream zones. The multizone approach used is model independent and should be valid for any conceptual hydrologic model employing a unit hydrograph to define the temporal distribution of runoff volumes. (NOAA)
W75-12159

**ESTIMATION OF HURRICANE STORM SURGE IN APALACHICOLA BAY, FLORIDA,**
National Weather Service, Silver Spring, Md.
J. E. Overland.
NOAA Technical Report NWS 17, June 1975. 66p, 23 fig, 1 tab, 25 ref.

Descriptors: *Hurricanes, *Storms, *Storm surge, *Model studies, Tropical cyclones, Climatology, Meteorology, Meteorological data, Storm structure, Weather, Weather patterns, Climatic data, Hydrologic data, Wind velocity, Bays, *Florida.
Identifiers: *Hurrican storm surges, Hurricane storms, *Apalachicola Bay (Fla), Hurricane surges, Hydrodynamic model, Amplitude effects, Space variable wind velocities, Storm parameters, SPLAH computation, Hurricane parameters, Bay models.

A vertically integrated two-dimensional numerical hydrodynamic model is developed for simulation of hurricane surge in Apalachicola Bay. Standard explicit time differencing is used in conjunction with a single Richardson lattice. Model features include finite amplitude effects, space variable wind velocities, and parameterization of flooding of terrain, overtopping of barrier islands and flow through narrow passes. The model utilizes the results of C.P. Jelesnianski's SPLASH model computation for open coast surge as input seaward of the Bay and continues the same storm tract and wind field as used in the SPLASH computation across the Bay. The Bay model was calibrated for the astronomical tides and verified against hurricane Agnes. The response of Apalachicola Bay has been determined from numerical computations for a variety of hypothetical hurricanes as specified by various storm parameters. Surge heights in the Bay increase with hurricane central pressure depression in a nearly linear fashion as does the open coast surge. An important parameter is the duration that the open coast surge remains high, a function of the forward speed of the storm and, to a lesser extent, the radius of the maximum winds. (NOAA)
W75-12164

**INTERIM REPORT, PROBABLE MAXIMUM PRECIPITATION IN CALIFORNIA.**
Weather Bureau, Washington, D.C. Hydrometeorological Section.
Hydrometeorological Report No. 36, October 1961, 231 p.

Descriptors: *Precipitation(Atmospheric), *Probable maximum precipitation, *Rain, *Rainfall, Rainfall intensity, Snowfall, Climatology, Hydrology, Meteorology, Precipitation Intensity, Snowpacks, Storms, Weather, Weather data, Floods, Runoff forecasting, Flood forecasting, Flood control, Meteorological data, Climatic data, Basins, *California.
Identifiers: Maximum precipitation, Precipitation levels, Precipitation forecasts, Precipitation probability, Rainfall forecasting, Rainfall probability, Precipitation storms, Orographic precipitation, Snowmelts, Snowmelt conditions.

The purpose of this report is to present criteria for estimating probable maximum precipitation over basins above prospective flood-control structures in the Pacific drainage of California. It includes sections on types and characteristics of major California precipitation storms; convergence probable maximum precipitation criteria; criteria for probable maximum orographic precipitation on windward slopes; criteria for probablle maximum spillover precipitation; combination of convergence and orographic probable maximum precipitation; checks on probable maximum precipitation; summary of steps in obtaining probable maximum precipitation for a basin; and temperature and wind criteria for snowmelt. (ETJA)
W75-12165

**A STATISTICAL STUDY OF TROPICAL CYCLONE POSITIONING ERRORS WITH ECONOMIC APPLICATIONS,**
National Hurricane Center, Coral Gables, Fla.
C. J. Neumann.
NOAA Technical Memorandum NWS SR-82, March 1975. 21 p, 7 fig, 6 tab, 24 ref.

Descriptors: *Tropical cyclones, *Hurricanes, *Warning systems, *Monte Carlo method, Storms, Weather data, Weather, Climatology, Meteorology, Meteorological data, Forecasting, Weather forecasting, Coasts, Probability.
Identifiers: *Cyclones, Cyclone studies, Cyclone positioning errors, Hurricane forecasts, Hurricane studies, Hurricane landfall forecasts, Storm landfall, Landfall forecasting, Hurricane warning zone, Coastal regions, Coastal hurricanes, Hurricane warning systems, Hurricane vectors, Control storms, Statistical studies.

Hurricane landfall forecasts are based heavily on the latest available motion vector and position of a storm. Inaccuracies in these data are closely related to errors in the time and place of storm landfall. This study uses a Monte Carlo simulation of hurricane positioning errors to determine a statistical relationship between positioning errors and landfall errors. It is shown that for a typical 18-hour landfall forecast, approximately 22% of the landfall position error can be attributed to initial data uncertainties. It is further shown that a 20% increase in the size of a hurricane warning zone can be expected if the currently observed posion ing errors are increased an average of 10 nmi. However, a 10 nmi decrease in positioning error yields only an 11% decrease in the size of the warning area. An economic analysis of potential changes in the size of hurricane warning areas is also shown. It is estimated that protection costs for a typical 300 nmi Gulf of Mexico coastal hurricane warning zone total $25.1 million. A 10 nmi increase in positioning error will thus increase this loss by about $5 million per storm. A 10 nmi decrease in positioning error will decrease protection costs by about $2.75 million per storm. (NOAA)
W75-12166

**THE FLOOD OF APRIL 1974 IN SOUTHERN MISSISSIPPI AND SOUTHEASTERN LOUISIANA,**
National Weather Service, Washington, D.C.
For primary bibliographic entry see Field 2E.
W75-12170

## 2C. Snow, Ice, and Frost

**FORMATION OF GRAUPEL,**
Naval Weapons Center, China Lake, Calif.
For primary bibliographic entry see Field 3B.
W75-12093

**THE NATURE OF WINTER CLOUDS AND PRECIPITATION IN THE CASCADE MOUNTAINS AND THEIR MODIFICATION BY ARTIFICIAL SEEDING. PART I: NATURAL CONDITIONS,**
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-12096

**A PRELIMINARY STUDY OF THE FORMATION OF LANDFAST ICE AT BARROW, ALASKA, WINTER 1973-74,**
Alaska Univ., College. Geophysical Inst.
L. H. Shapiro.
June 1975, Report No. UAG R-235 and No. 75-7, 44 p, 14 fig, 2 ref. NOAA Grant No. 04-3-158-41.

Descriptors: *Ice, *Ice cover, *Frozen ground, *Permafrost, *Ice-water interfaces, Mapping, Topographic mapping, Environment, Oceanography, Climatology, Hydrologic data, On-site investigations, On-site data collections, *Alaska.
Identifiers: *Landfast ice, Ice formations, Barrow(Alaska), Pack ice, Ice maps, Ice dynamics, Hummock fields, Ice drift, Pressure ridges, Shear ridges, Ice studies, Topographic features, Artic ice.

During late December 1973, the landfast ice sheet at Barrow broke loose and drifted offshore, following which an intense storm drove the pack ice into the nearshore zone. As a result, a new landfast ice mass was formed, which included a complex array of pressure ridges, shear ridges and hummock fields. The entire process was monitored by radar, and this report provides information on the velocity vector of the pack ice during this time, and on the sequence of events which lead to the formation of the landfast ice. This data, in conjunction with field observations, gives some insight into the mechanisms by which some of the structural features of the landfast ice mass were formed. An important feature of the landfast ice was a linear hummock field about 4 km long, 135 m wide, and with an average elevation of about 3 m. On its offshore side, this 'ice pile' was bounded by a shear ridge which built shortly after the pile under the same conditions of ice drift. The formation of both these features took less than 1.5 hours, and the transition between them is hypothesized to have resulted from the change in water depth along the outer boundary of the shoal. (NOAA)
W75-12162

**INTERIM REPORT, PROBABLE MAXIMUM PRECIPITATION IN CALIFORNIA.**
Weather Bureau, Washington, D.C. Hydrometeorological Section.
For primary bibliographic entry see Field 2B.
W75-12165

**MAJOR LATE-WINTER FEATURES OF ICE IN NORTHERN BERING AND CHUKCHI SEAS AS DETERMINED FROM SATELLITE IMAGERY,**
Alaska Univ., College. Geophysical Inst.
L. H. Shapiro, and J. J. Burns.
Sea Grant Report No. 75-8, June 1975. 16 p, 9 fig, NOAA Grant No. 02-3-158-41.

Descriptors: *Ice, *Sea ice, Hydrographic analysis, Iced lakes, Oceanography, Marine geology, Satellites(artificial), Alaska, Artic Ocean, Remote reusing.
Identifiers: *Bering Sea, *Chukchi Sea, *Ice formation, Meteorological satellites, Sea ice movements, Sea ice formation, Satellite imagery, Geophysical data, Ice drift, Coastal ice, Shear zones, Pack ice, Spaceborne photography, Geophysical surveys

Imagery from the ERTS-1, DAPP AND NOAA 2/3 VHRR satellite systems were used for identification of recurring features of the movement and distribution of sea ice in the Bering and Chukchi seas during late winter. Data acquired during March and April of 1973 and 1974 show several such features including: (1) a shear zone of variable width along the west coast of Alaska which separates landfast ice from drifting sea ice; (2) an area of generally broken pack ice between Bering Strait and Point Hope; (3) persistent polynya off south-facing coasts, such as that east of Point Hope, south of the Seward and Chukchi Peninsula and south of the larger islands; (4) convergence zones on the north sides of St. Lawrence and Nunivak Islands, and (5) narrow shear zones extending generally southward from the boundaries of Bering Strait and from the east and west ends of St. Lawrence Island. The pattern observed is consistent with a general southward drift of sea ice under the influence of the prevailing northerly winds. Closure of ice against south-facing coasts, reflecting northward ice drift, occurred about 10% of the time. These episodes probably correlate either with short periods of dominately south winds or drift under the influence of north setting currents when prevailing north winds were light. (NOAA)
W75-12168

## 2D. Evaporation and Transpiration

**HYDROLOGICAL STUDIES OF EVAPOTRANSPIRATION AND GROUNDWATER FLOW IN SANDY LAND,**
National Research Inst. of Agricultural Engineering, Hiratsuka (Japan).
R. Kaneko.
In: Systems Approach to Hydrology: Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 444-452, 1971. 5 fig.

Descriptors: *Evapotranspiration, *Groundwater, Dunes, Sand aquifers, Sands, Hydrologic cycle, Infiltration, Lysimeters, Transpiration, Sea water, Impervious soils, Percolation, Water balance, Hydrology, Equations.
Identifiers: *Japan, *Hiratsuka City, Sandy soil.

Groundwater flow from 1953 through 1965 in an almost flat coastal sand dune located 60 km southwest of Tokyo and 3.5 km inland was discussed. Because of the sandy soil, all precipitation infiltrated into the ground and there was no surface runoff. Soil moisture, groundwater level and evapotranspiration were measured and meteorological observations were made. During the 13 years of record, the population increase and development of industry caused a rapid increase of pumpage. Water levels declined and the unconfined groundwater table lowered because of percolation into deeper strata. Transpiration was estimated using precipitation, groundwater flow, groundwater stage, and the relationship between groundwater level and its drawdown corresponding to change in environments. Evapotranspiration indirectly obtained by water balance calculation was more reliable than direct measurements with lysimeters. The rater of groundwater lowering increased with time, rising after rains but generally

ining 400 cm by 1965. (See also W75-12014)
berts-ISWS)
5-12032

RIATIONS OF THE TURBULENT FLUXES
MOMENTUM, HEAT AND MOISTURE
ER LAKE ONTARIO,
ospheric Environment Service, Toronto
tario).
primary bibliographic entry see Field 2H.
5-12078

E SPATIAL AND TEMPORAL VARIATIONS
THE TURBULENT FLUXES OF HEAT, MO-
NTUM AND WATER VAPOR OVER LAKE
TARIO,
ional Oceanic and Atmospheric Administra-
, Boulder, Colo. Environmental Research
s.
. Bean, C. B. Emmanuel, R. O. Gilmer, and R.
IcGavin.
nal of Physical Oceanography, Vol 5, No 3, p
540, July 1975. 11 fig, 2 tab, 9 ref.

criptors: *Evaporation, *Lake Ontario,
rbulent flow, *Variability, Heat, Momentum
sfer, Water vapor, Winds, Temperature, Time
es analysis, Aircraft, Spectroscopy, Fetch,
velling.
ntifiers: Polar continental outbreaks, Instru-
ted aircraft, Gust probe, Turbulent flux, Eddy
elation, Sensors, Convergence zone.

ing the 1972 International Field Year for the
at Lakes 'alert' periods, the NOAA/RFF/DC-6
probe instrumented aircraft was used to
rd time series of wind, temperature, and water
or at heights ranging from 18 to 300 m above
surface of Lake Ontario. The time series
rds showed great variability. This was espe-
y the case of evaporation when, in the fall,
r continental outbreaks moved across the lake.
n an outbreak of cold dry air moved across the
at 12-15 m/s on October 9, 1972. This resulted
drop of the air temperature at 30 m above the
from 12 to 6 degrees C, while the evaporation
increased to more than 1 cm/day. This may be
pared to the 0.5 cm/day typical evaporation
observed in the tropics during BOMEX.
hermore, infrared lake surface temperatures
wed cold regions (5C) along the north shore,
umably due to strong upwelling, while the
er and south shore regions of the lake were of
order of 12-15 degrees C. The turbulent flux
ntities of momentum, heat, and water vapor
e obtained by the eddy correlation technique
their spectra were determined at several loca-
s over the lake surface for 3-minute sampling
ths. At the aircraft speed of 92 m/s this
esented a flight path of about 17 km. The spec-
demonstrated the tendency for the peak value
narch to longer wavelengths with increasing
ht. (Roberts-ISWS)
3-12079

RNAL AND SEASONAL SOIL WATER UP-
KE AND FLUX WITHIN A BERMUDAGRASS
OT ZONE,
cultural Research Service, Phoenix, Ariz.
er Conservation Lab.
. Rice.
Science Society of America Proceedings, Vol
No 3, p 394-398, May-June 1975. 9 fig, 2 tab, 9

criptors: *Evapotranspiration, *Soil water,
saturated flow, *Hydraulic conductivity,
nudagrass, Lawns, Water utilization, Root
e, Consumptive use, Irrigation, On-site in-
igations, Soil water movement, Soil moisture,
surface flow, Vegetation, Diurnal, Seasonal,
sure head, Tensiometers.
ntifiers: *Water uptake.

Diurnal water movement within a bermudagrass root zone and the uptake of water by the roots was studied in a field plot. A fast response tensiometer-pressure-transducer system was used to measure the hydraulic head. The relations of pressure head to water content and to hydraulic conductivity were determined in situ. Diurnal water content and soil water flux profiles were derived by using the established hydraulic properties. The fast response tensiometer system enabled calculation of flux and water content changes over 2-hour intervals. Diurnal water extraction rates calculated for different depths and times during the growing season yielded evapotranspiration rates that agreed well with rates measured on similar days in previous years using a lysimeter. The water uptake pattern changes rapidly near the surface during the first few days after irrigation. Rewetting within the soil profile occurred in late afternoon at depths where upward gradients were present. The seasonal consumptive-use curve can be estimated from several daily evapotranspiration rates calculated during the growing season. (Sims-ISWS)
W75-12082

## 2E. Streamflow and Runoff

**A PARTICULAR COMPARISON OF ANNUAL MAXIMA AND PARTIAL DURATION SERIES METHODS OF FLOOD FREQUENCY PREDICTION,**
Institute of Hydrology, Wallingford (England).
C. Cunnane.
Journal of Hydrology, Vol. 18, No. 3/4, p 257-271, March, 1973. 1 fig, 9 ref.

Descriptors: *Hydrologic aspects, *Flood forecasting, Flood frequency, Mathematical studies.

A method for comparing the statistical efficiency of the estimate of the T year flood, Q(T), by two different methods has been developed. On the basis of commonly used assumptions it is shown that for return periods greater than about T = 10 years, the annual exceedance series estimate of Q(T) has larger sampling variance than the annual maxima series estimates. For the same range of return periods, the partial duration series estimate of Q(T) has smaller sampling variance than the annual maxima series estimate only if the partial duration series contains at least 1.65 N items, where N is the number of years of record. (Sandoski-FIRL)
W75-11929

**FLOOD EVENT DATA COLLATION,**
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 7C.
W75-11943

**FLOOD PROFILES IN THE UMPQUA RIVER BASIN, OREGON: PART 3, UMPQUA RIVER BELOW SCOTTBURG, SCHOLFIELD, COW CREEK ABOVE GLENDALE,**
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 4A.
W75-11959

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS - VOLUME 3. BASINS FROM APALACHICOLA RIVER TO PEARL RIVER.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11967

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 6. MISSOURI RIVER BASIN--VOLUME 1. MISSOURI RIVER BASIN ABOVE WILLISTON, NORTH DAKOTA.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11968

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 7. LOWER MISSISSIPPI RIVER--VOLUME 2. ARKANSAS RIVER BASIN.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11969

**STOCHASTIC HYDROLOGIC SYSTEMS,**
Illinois Univ., Urbana, Dept. of Hydraulic Engineering.
For primary bibliographic entry see Field 2A.
W75-12015

**TRANSFORMATION SYSTEM IN FLOOD RUNOFF PHENOMENA,**
Kyoto Univ. (Japan). Dept. of Civil Engineering.
T. Ishihara, and T. Takasao.
In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 24-50, 1971. 7 fig, 3 tab, 15 ref.

Descriptors: *Flood flow, *Rainfall, *Soil horizons, *Hydraulic systems, *Hydrologic aspects, *Runoff, Soil moisture, Mathematical models, Infiltration, Roughness coefficient, Overland flow, Dynamics, Watersheds(Basins), Peak discharge, Discharge(Water).
Identifiers: *Runoff dynamics, Nonlinearity of runoff, Transformation system.

The storm runoff during a flood was described as a transformation system from rainfall to discharge. Three fundamental patterns exist in runoff process and their characteristics are mainly determined by the nonlinearity and the variation properties of the area where runoff occurs. The characteristics of each pattern were analyzed, the transformation operator from rainfall to runoff was presented, and the significance of the nonlinearity of runoff was discussed in terms of system dynamics. Overland and subsurface flows were considered as affected by the properties of the A-layer or the surface substratum. The results presented are applicable to basin sizes of a few hundred square miles. For larger basins, the problems of flood routing and dispersion of the flood wave still await solution. (See also W75-12014) (Singh - ISWS)
W75-12016

**NONLINEAR RUNOFF KERNELS OF HYDROLOGIC SYSTEM,**
Tokyo Inst. of Tech. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12019

**KERNELS OF STOCHASTIC LINEAR HYDROLOGIC SYSTEMS,**
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12021

**THE STOCHASTIC KINEMATIC WAVE,**
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12023

**SYSTEMS SIMULATION OF STREAMFLOWS,**
Kyoto Univ., (Japan), Dept. of Civil Engineering.
Y. Iwasa, K. Inoue, and Y. Tsunematsu.
In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January

11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 226-245, 1971. 5 fig, 1 tab, 8 ref.

Descriptors: *Mathematical models, *Flood routing, *Simulation analysis, Hydrology, Open channel flow, Storage, Hydraulics, Streamflow.
Identifiers: *Lax-Wendroff scheme, *One-dimensional analysis, *Kinematic wave theory, Method of characteristics.

Basin runoff hydrology was modeled by mathematical simulation of overland and streamflows. Mathematical formulation of streamflow behavior by one-dimensional methods of hydraulic analysis and its use in streamflow simulation was dealt with. The simulation technique consisted of a mathematical model of channel reaches and applying flood routing procedures. A classification of model approximations in the system and their hydraulic role in mathematical expressions was described. The models were evaluated under idealized conditions to give physical significance to the channel storage in terms of channel geometry. (See also W75-12014) (Lardner - ISWS)
W75-12024

**EFFECTS OF MOVEMENT OF PRECIPITATION AREA UPON RUNOFF PHENOMENA,**
Tokyo Univ., (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12026

**A BAYESIAN FRAMEWORK FOR THE USE OF REGIONAL INFORMATION IN HYDROLOGY,**
Resource Analysis, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 6A.
W75-12048

**1974 WATER RESOURCES DATA FOR OREGON, SURFACE WATER RECORDS, PRECIPITATION RECORDS,**
Oregon State Engineers Office, Salem. Water Resources Dept.
For primary bibliographic entry see Field 7C.
W75-12087

**THE USE OF A MULTIZONE HYDROLOGIC MODEL WITH DISTRIBUTED RAINFALL AND DISTRIBUTED PARAMETERS IN THE NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM,**
National Weather Service, Slidell, La. Lower Mississippi River Forecast Center.
For primary bibliographic entry see Field 2B.
W75-12159

**COOK INLET TIDAL STREAM ATLAS,**
Inst. of Marine Science. Alaska Univ., College.
For primary bibliographic entry see Field 2L.
W75-12163

**A STUDY OF FLASH-FLOOD SUSCEPTIBILITY -- A BASIN IN SOUTHERN ARIZONA,**
National Weather Service, Salt Lake City, Utah. Western Region.
For primary bibliographic entry see Field 4A.
W75-12167

**THE FLOOD OF APRIL 1974 IN SOUTHERN MISSISSIPPI AND SOUTHEASTERN LOUISIANA,**
National Weather Service, Washington, D.C.
J. H. Chin
Technical Memorandum NWS HYDRO-24, August 1975. 45 p, 16 fig, 4 tab, 13 ref.

Descriptors: *Floods, *Flooding, *Flood data, *Flood damage, *Precipitation excess, Flash floods, Historic floods, Flood discharge, Precipitation(Atmospheric), Weather patterns, Rainfall intensity, Climatology, Storms, Squalls, *Mississippi, *Louisiana.
Identifiers: *Pascagoula River basin, *Pearl River basin, Storm precipitation, Precipitation, Precipitation distribution.

The flood of April 1974 over the Pascagoula and Pearl River Basins in southern Mississippi and southeastern Louisiana ranks among the most severe in terms of crest stages and maximum flood discharge reached. The objectives of this report are to present the meteorological events associated with the flood, in particular the precipitation distribution, and to give a concise account of the flood itself. Emphasis will be placed on events in southern Mississippi, where heaviest storm precipitation fell and where flooding was most severe. This flood was mainly the result of a storm that covered Louisiana, Mississippi, and western Alabama on April 11-15, 1974. Significant incursion of tropical maritime air mass into the region occurred prior to and during the storm. The broad synoptic-scale situation associated with the precipitation was an occluded Low centered over the Midwest together with its frontal system. The major portion of the storm precipitation, however, was due to mesoscale squall line severe storms that developed in the moist environment of the warm sector ahead of the front. Amounts exceeding the 100-yr rainfall were observed at some places in southern Mississippi and at least one site in Louisiana. (NOAA)
W75-12170

**A STUDY OF FLASH-FLOOD OCCURRENCES AT A SITE VERSUS OVER A FORECAST ZONE,**
National Weather Service, Salt Lake City, Utah. Western Region.
Gerald Williams.
NOAA Technical Memorandum NWS WR-100, August 1975, 16 p.

Descriptors: *Flood forecasting, *Flash floods, *Floods, *Flooding, *Flood data, *Maximum probable flood, Flood control, Hydrology, River forecasting, Warning systems, Flood plains, Flood recurrence interval, Weather forecasting, Meteorological data, Rainfall, Forecasting, Rainfall intensity.
Identifiers: Flash flooding, Flash flood studies, Flood studies, Flood predictions, Forecast zones, Flash flood occurrences, Flood occurrences, Meteorological forecasting.

Some relations are described between probability of point rainfall amounts and probability of the same amounts falling some place within an area; i.e., point probability vs. areal probability. Analogously, the relationship between probability of flash-flood occurrences at sites and the probability of flash-flood occurrences somewhere within a forecast zone are also developed. The paper considers and examines unusually heavy rainfall of short duration from convective activity and its closely related partner, flash-floods. Some of the conclusions drawn from the study are that the 100-year 1/2-hour amount of point rainfall probably may occur once every several years somewhere on a 60-square-mile basin. Flash-flood occurrences appear to exhibit similar relationships but over larger areas. Errors in verification of flash-flood watches and warnings may occur when only known flash-flood occurrences are used. Forecast verification may improve if all events are made known and enhancement of accuracy in forecast procedures is probable. (NOAA)
W75-12174

**FLOOD PLAIN INFORMATION: FOUNTAIN CREEK, COLORADO SPRINGS, MANITOU SPRINGS, COLORADO.**
Army Engineer District, Albuquerque, N. Mex.
Prepared for the Pikes Peak Area Council of Governments, August, 1974. 44 p, 9 fig, 16 plates, 5 tab.

Descriptors: *Flood plains, *Flood damage, *Flood plain zoning, *Flood profiles, *Flood data, Land use, Planning, Historic floods, Obstruction to flow, *Colorado, Flood forecasting, Flood proofing.
Identifiers: Fountain Creek(Colo), Colorado Springs(Colo), Manitou Springs(Colo), Flood plain management, Intermediate Regional Flood, Standard project flood, Pikes Peak(Colo), Subdivision regulations.

Fountain Creek, a perennial stream with headwaters fed by glacial snowpacks and springs, rises in the mountains near Pikes Peak, flows through a narrow steep walled canyon. In the upper part of the study area of 120 sq mi, stream slope averages about 90 ft/mi and the valley width averages 400 ft; in the lower part about 63 ft/mi with average valley width of 600 ft. Flood plain is narrow with extensive residential commercial, and tourist development. Flood producing storms occur from May to August when maximum contrast in temperature causes heaviest precipitation. Even more intense rainfall from cloudbursts occurs during July and August. Historical documents and newspaper files give information on past floods which have caused extensive damage. Obstruction to flow is created by 31 bridges, including numerous footbridges and other planked crossings which can be expected to wash downstream. Highest peak discharge in the study reach produced by an Intermediate Regional Flood (IRF) would be 20,500 cfs and by a Standard Project Flood(SPF) 34,000 cfs. At the same location, main channel velocity of an IRF would be 13.1 feet per second and of a SPF, 15.4 feet per second. Both an IRF and a SPF would cause severe damage to Colorado Springs and Manitou Springs, neighboring communities on Fountain Creek. Both cities have enacted subdivision regulations that could be the foundation of effective flood plain management. (Diefendorf-North Carolina)
W75-12372

**FLOOD PLAIN INFORMATION: TONAWANDA CREEK AND ITS AFFECTED TRIBUTARIES, ERIE AND NIAGARA COUNTIES, NEW YORK.**
Army Engineer District, Buffalo, N. Y.
Prepared for Erie-Niagara Basin Regional Water Resources Planning and Development Board, August, 1967. 86 p, 46 fig, 14 plates, 18 tab.

Descriptors: Floods, *Flooding, *Flood control, *Flood plains, Water management(Applied), *New York State Barge Canal, *New York, Flood protection.
Identifiers: *Tonawanda Creek(New York), Erie County(New York), Niagara County(New York), Intermediate Regional Flood, Standard Project Flood.

Flooding along Tonawanda Creek and its tributaries from its confluence with the Niagara River to the easterly limit of Erie and Niagara Counties in western New York state, a distance of 41.5 creek miles, is examined. The lower reach is navigable with very flat channel gradients. Most of the flood plain is agricultural, with scattered residences. Overflow from the narrow winding obstructed channel can occur at all times of year, although major floods occur in the late winter and early spring from snow melt and moderate rainfall. Flood flows in lower reaches are modified by abundant overbank storage. In the upper reaches flooding is of long duration. There are no existing or authorized flood control projects within the study area, and, with the exception of the town of Royalton, none of the communities have flood plain regulations. The largest flood at Alabama, New York, occured January 23, 1959, cresting at 16.0 feet due to ice jams, with peak discharge of 6550 cfs. The March 1960 flood crested at 14.3 feet with peak discharge of 7980 cfs, its impact lessened by removal of an old dam and improvement of the Erie Barge Canal. An Intermediate Regional Flood (IRF) and Standard Project Flood (SPF) would have peak discharges of 11,500 cfs and

5,200 cfs, respectively. In the Tonawanda Creek Reach between Rapids, New York and the Erie-Niagara and Genessee County line which sustained the most damage and widespread flooding along the creek in 1960, an IRF would cause flooding to be over 1 foot deeper and the SPF 2 feet deeper than 1960 in this area. (Salzman-North Carolina)
W75-12373

## 2F. Groundwater

**DISPLACEMENT STABILITY OF WATER DRIVES IN WATER-WET CONNATE-WATER-BEARING RESERVOIRS,**
Koninklijke-Shell Exploratie en. Produktie Laboratorium, Rijswijk (Netherlands).
For primary bibliographic entry see Field 4B.
W75-11870

**GEOHYDROLOGY OF COLLIER COUNTY, FLORIDA,**
Dames and Moore, Park Ridge, Ill.
For primary bibliographic entry see Field 4B.
W75-11874

**GEOCHEMISTRY OF OIL-FIELD WATER APPLIED TO EXPLORATION,**
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 4B.
W75-11879

**DECIPHERING OF GROUND WATER FROM AERIAL PHOTOGRAPHS,**
For primary bibliographic entry see Field 4B.
W75-11882

**INNOVATIVE WORKOVER FOR WASSON WATER WELLS,**
For primary bibliographic entry see Field 3B.
W75-11890

**LAND SUBSIDENCE IN THE SAN JOAQUIN VALLEY, CALIFORNIA, AS OF 1972,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W75-11956

**LAND SUBSIDENCE DUE TO GROUND-WATER WITHDRAWAL IN THE LOS BANOS-KETTLEMAN CITY AREA, CALIFORNIA, PART 2. SUBSIDENCE AND COMPACTION OF DEPOSITS,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W75-11957

**LAND SUBSIDENCE DUE TO GROUND-WATER WITHDRAWAL IN THE LOS BANOS-KETTLEMAN CITY AREA, CALIFORNIA, PART 3. INTERRELATIONS OF WATER-LEVEL CHANGE, CHANGE IN AQUIFER-SYSTEM THICKNESS, AND SUBSIDENCE,**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W75-11958

**GROUND-WATER BASIC DATA FOR EMMONS COUNTY, NORTH DAKOTA,**
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 4B.
W75-11963

**ARTIFICIAL GROUNDWATER RECHARGE, I. CIRCULAR RECHARGING AREA,**
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 4B.
W75-12040

**GEOCHEMISTRY OF STRONTIUM IN THE SCIOTO RIVER DRAINAGE BASIN, OHIO,**
Miami Univ., Oxford, Ohio. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W75-12052

**DIURNAL FLUCTUATIONS OF WATER TABLES INDUCED BY ATMOSPHERIC PRESSURE CHANGES,**
Texas Univ. at Austin. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2G.
W75-12077

**USE OF ENVIRONMENTAL ISOTOPE METHODS AS A RECONNAISSANCE TOOL IN GROUNDWATER EXPLORATION NEAR SAN ANTONIO DE PICHINCHA, ECUADOR,**
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Radiohydrometrie.
H. Moser, and W. Stichler.
Water Resources Research, Vol 11, No 3, p 501-505, June 1975. 3 fig, 5 ref.

Descriptors: *Groundwater recharge, *Isotope studies, *Deuterium, *Water sources, *Exploration, *Tritium, Groundwater, Springs, Areal hydrogeology, Surveys, Recharge, Subsurface waters, Semiarid climates, Meteorolotical data, Discharge(Water), Natural recharge, Hydrology, Basins, Spring waters, Radioisotopes, Stable isotopes.
Identifiers: *Ecuador, *Reconnaissance tool, *Oxygen 18.

In a semiarid area in the Sierra of Ecuador (about 20 km north of Quito), measurements of deuterium, oxygen 18, and tritium content in spring water, surface water, and precipitation were performed The results, together with some meteorological and hydrogeological data, furnished information on the recharge area and on the recharge rate of groundwater. On the basis of the results, a groundwater exploitation does not appear feasible. (Prickett-ISWS)
W75-12080

**ARTIFICAL GROUNDWATER RECHARGE, II. RECTANGULAR RECHARGING AREA,**
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 4B.
W75-12097

**METHOD OF CLEANING AND STIMULATING A WATER WELL,**
For primary bibliographic entry see Field 3B.
W75-12301

**FLUID FLOW IN CHANNELS, CAPILLARIES, AND POROUS MEDIA UNDER THE INFLUENCE OF AN ELECTRIC FIELD.**
Bureau of Mines, Morgantown, W. Va. Petroleum Research Lab.
L. C. Headley, C. I. Pierce, and W. K. Sawyer.
Report of Investigations 7342, January, 1970. 33 p, 15 fig, 1 tab, 24 ref.

Descriptors: Flow, *Electrochemistry, Physical properties, Porous media, Capillary, Conductivity, Aquifer characteristics, *Electric fields, Oil Industry, *Flooding(Oil Recovery).

A series of exploratory tests was conducted to determine the effects of steady electric fields on fluid flow and streaming potential in narrow passages and porous media, the effects of steady electric fields on fluid interfaces, and the influence of internal voltages on fluid flow in a porous porcelain sample. Voltages greater than about 5 kilovolts were found to influence liquip droplets emanating from a capillary tube. Solutions of polyethylene oxide and polyacrylamide in water exhibited widely different behavior than that of other liquids tested. Liquid-liquid displacement tests in porous samples to determine the influence of high voltage applied to the displacing liquid on flow rates and recovery gave no significant differences. No consistently measurable effects were noted, either on flow rate or streaming potential, when an electric field was applied transverse to the direction of flow in porous media and in narrow rectangular or cylindrical channels. Experimental values of formation factor and streaming potential for a porous porcelain sample agreed qualitatively with those calculated from electrokinetic theory for ultrafine capillaries. However, the agreement for the electroviscous effect was not good. (Campbell-NWWA)
W75-12381

**GROUND WATER AND GROUND-WATER CONTROL,**
For primary bibliographic entry see Field 4B.
W75-12386

**BACTERIAL PROCESSES FOR IMPROVED OIL RECOVERY.**
Tulsa Univ., Okla
J. R. Frick.
Journal of Petroleum Technology, Vol. 24, p 1469-1470, December, 1972. 12 ref.

Descriptors: *Bacteria, Oil, *Clostridium, *Oil spills, *Oil pollution, Oil industry, Oil reservoirs, Clogging, Permeability.
Identifiers: *Desulfovibria hydrocarbonoclasticus, Water-thickening agents, *Oil recovery.

Bacteriological oil recovery is reviewed from its first application in 1946. At that time, the bacteria, Desulfovibria hydrocarbonoclasticus, and aerobe, was injected into an oil producing formation to increase recovery. The four mechanisms of oil release are: (1) production of gaseous carbon dioxide, (2) production of organic acids and detergents, (3) dissolution of carbonates in the rock, and (4) physical dislodgement of the oil. Bacteria of the Clostridium type have been isolated. They reduce heavy hydrocarbons in place to form lighter fractions and gases. Bacteria might also be used for selective plugging in wells. Another possible application is in the underground production of water-thickening agents. (Bradbeer-NWWA)
W75-12391

**STUDIES IN THE SYSTEM CACO3-FECO3: 1. PHASE RELATIONS; 2. A METHOD FOR MAJOR-ELEMENT SPECTROCHEMICAL ANALYSIS; 3. COMPOSITIONS OF SOME FERROAN DOLOMITES,**
Chicago Univ., Dept. of Geophysical Sciences.
J. R. Goldsmith, D. C. Graf, J. Witters, and D. A. Northrop.
Journal of Geology, Vol 70, No 6, p 659-687, November, 1962. 11 fig, 10 tab, 15 ref.

Descriptors: *Dolomite, *Calcite, *Diagenesis, *Phase diagrams, Geochemistry, Thermal properties, Melting, Pressure, Liquids, Gases, Geology, Sedimentology, Ground water.
Identifiers: *Magnesite, *Siderite.

Isothermal sections at 600, 650, 700, 750 and 800C, run for the most part at 15 kilobars total pressure, were obtained using a squeezer-type apparatus. Above approximately 675C the system contains two two-phase and two single-phase areas. A three-phase area in the Mg-poor portion of the system is first detected at 675C and becomes progressively larger at 650C and 600C. Ferroan dolomite, ferroan- magnesian calcite, and calcian-

magnesian siderite coexist in this three phase triangle. The hypothetical compound CaFe (CO3)2, not known in nature, lies in a two-phase field even at 800C. The maximum FeCO3 substitution observed in twenty naturally occurring ferroan dolomites examined is 31% mol, essentially the same as the maximum equilibrium substitution achieved experimentally. Natural ferroan dolomites may be metastable compositionally, therefore the FeCO3 content cannot be used for geological thermometry. A spectrochemical method is described which determines mol% with small root mean square relative errors. (Bradbeer-NWWA)
W75-12400

**HYDROGEOLOGIC DATA FOR THE LOWER CONNECTICUT RIVER BASIN, CONNECTICUT,**
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-19954

## 2G. Water In Soils

**FUNGUS DISEASES OF WHEAT ON IRRIGATED LANDS. (IN RUSSIAN),**
Volgograd Agricultural Inst. (USSR).
For primary bibliographic entry see Field 2I.
W75-11904

**EVALUATING THE PRODUCTIVITY OF PINE FORESTS IN THE HINTON-EDSON AREA, ALBERTA, FROM SOIL SURVEY MAPS,**
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 4A.
W75-12003

**NUMERICAL SIMULATION OF WATERSHED HYDROLOGY,**
Texas Univ., at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12027

**EFFECT OF HYSTERESIS ON THE PREDICTION OF INFILTRATION, REDISTRIBUTION AND DRAINAGE OF WATER IN A LAYERED SOIL,**
New Mexico State Univ., University Park. Dept. of Agronomy.
J. H. Dane, and P. J. Weirenga.
Journal of Hydrology, Vol 25, No 3/4, p 229-242, May 1975. 18 fig, 2 tab, 18 ref.

Descriptors: *Soil water, *Hydraulic conductivity, *Hysteresis, *Computer models, Moisture tension, *Infiltration, Drainage, Tensiometers, Darcys law, Irrigation, Sands, Drying, Wetting, Moisture content, Soil water movement.
Identifiers: *Soil columns, Drying curves, Wetting curves.

In order to study the effect of hysteresis on soil water movement, a large soil column filled with Glendale clay loam over a river sand was flood-irrigated with 10 cm water. The infiltration rate, wetting front advance, water content redistribution, and amount of drainage water were measured. A computer model was developed to simulate the flow behavior. The main drying and main wetting curves in the relationship between soil water tension and water content and in the relationship between hydraulic conductivity and water content were provided in the computer model. From these relationships, scanning curves were developed to simulate hysteretic flow behavior under both wetting and drying conditions. Experimental data were compared with data computed from either the main drying, the main wetting, or the scanning curves. Infiltration was accurately predicted using the main wetting curves. However, redistribution and drainage were better predicted when hysteresis was taken into account. (Schicht-ISWS)
W75-12041

**MATHEMATICAL ANALYSIS OF STEADY SATURATED FLOW THROUGH A MULTILAYERED SOIL WITH A SLOPING SURFACE,**
Florida Univ., Gainesville. Dept. of Soil Science.
H. M. Selim, M. S. Selim, and D. Kirkham.
Soil Science Society of America Proceedings, Vol 39, No 3, p 445-453, May-June 1975. 12 fig, 3 tab, 16 ref. NSF Grant GK-31137.

Descriptors: *Saturated flow, *Seepage, *Slopes, *Infiltration, Potential flow, Saturated soils, Soil water movement, Mathematical studies, Mathematical models, Model studies, Hydraulic conductivity, Permeability, Soil water, Groundwater movement, Groundwater potential, Flow, Soils.
Identifiers: Multi-layered soils.

An analytical solution was presented for a two-dimensional multilayered hillside seepage problem. The soil was horizontally stratified with each layer having a different permeability. The flow medium was assumed to be water-saturated to the soil surface, bounded below by an impermeable barrier at a finite depth, and bounded laterally by vertical streamlines. Seepage occurred into the flow medium along the upper part and out along the lower part of the sloping soil surface. Two situations were analyzed, one with a constant slope soil surface and another with an abritrarily shaped soil surface. The potential and stream functions for the problem were developed by starting with a general series solution to Laplace's equation and using a modified Gram-Schmidt method to determine the series coefficients. Solutions were derived for two-layered and three-layered soils. From these derivations, solutions for soils with more than three layers could be readily deduced. The results presented include flow nets, seepage velocities, and infiltration rates for two-layered and three-layered soils. (Sims-ISWS)
W75-12044

**A THERMODYNAMIC INTEGRAL EQUATION FOR THE EQUILIBRIUM MOISTURE PROFILE IN SWELLING SOIL,**
Arizona Water Resources Research Center, Tucson.
G. Sposito.
Water Resources Research, Vol 11, No 3, p 499-500, June 1975. 10 ref. OWRT A-055-ARIZ(3).

Descriptors: *Soil moisture, *Thermodynamics, *Equilibrium, *Equations, Solutes, Profiles, Water table, Entropy, Temperature, Bulk density, Porous media.
Identifiers: *Swelling soil, *Gravichemical potential, Soil-water-air system, Moisture profile.

The methods of thermodynamics were employed to develop a nonlinear integral equation for the equilibrium moisture profile in a swelling soil which was assumed to be uniform in the distribution of dissolved substances. The equation was shown to be identical with an expression suggested (but not derived) by Philip in response to criticism of his discussion of the hydrostatics of swelling porous media. (Visocky-ISWS)
W75-12050

**INFLUENCE OF SOIL WATER MATRIC POTENTIAL AND RESISTANCE TO PENETRATION ON CORN ROOT ELONGATION,**
For primary bibliographic entry see Field 3F.
W75-12055

**DIURNAL FLUCTUATIONS OF WATER TABLES INDUCED BY ATMOSPHERIC PRESSURE CHANGES,**
Texas Univ. at Austin. Dept. of Geological Sciences.
L. J. Turk
Journal of Hydrology, Vol 26, No 1/2, p 1-16, July 1975. 8 fig, 37 ref.

Descriptors: *Water table, *Water level fluctuations, *Atmospheric pressure, *Diurnal, *Great Salt Lake, *Utah, Seasonal, Water table aquifers, Capillary fringe, Zone of aeration, Particle size, Model studies, On-site investigations, Pores, Air, Monitoring, Observation wells
Identifiers: *Bonneville Salt Flats, Entrapped air.

The shallow water table at the Bonneville Salt Flats, Utah, fluctuates 1.5 to 6.0 cm per day during the summer and 0.5 to 1.0 cm per day during the winter. Highest water levels occur in late afternoon and lowest levels occur in mid-morning. Similar fluctuations occur in many other localities having shallow, fine-grained aquifers. The fluctuations are attributed to temperature-related atmospheric pressure changes acting on the capillary zone. This proposed mechanism involves the transfer of water from below the water table to the capillary fringe in response to lower pressure, and transfer of water from the capillary fringe to the water table in response to higher pressure. Rapid volume changes of air entrapped in the capillary pores account for the expulsion of infusion of capillary water. Laboratory experiments with an artificial aquifer confirmed that such fluctuations can occur rapidly when the only variable is pressure. In this case no intervening confining layer existed, so the mechanism was distinctly different from the mechanism which causes blowing wells. The correct interpretation of fluctuations of several centimeters can be of considerable importance in monitoring small changes of water levels in manometers emplaced to monitor seepage through dams or levees, or in measuring small drawdowns in observation wells during pumping tests of fine-grained aquifers. (Visocky-ISWS)
W75-12077

**SOIL WATER MEASUREMENT WITH AN INEXPENSIVE SPECTROPHOTOMETER,**
Agricultural Research Service, Durant, Okla. Water Quality Management.
S. A. Bowers, S. J. Smith, H. D. Fisher, and G. E. Miller.
Soil Science Society of America Proceedings, Vol 39, No 3, p 391-393, May-June 1975. 4 fig, 1 tab, 3 ref.

Descriptors: *Soil water, *Water measurement, *Instrumentation, *Soil moisture meters, *Spectrometers, On-site tests, Analytical techniques, Electronic equipment, Moisture, Moisture content, Evaluation, Available water, Soil moisture, Soil properties, Moisture availability, Spectrophotometry, Clay loan, Silts, Clays, Sands, Absorption.
Identifiers: *Soil water content, Soil water extraction, Surface soils, Sandy loam, Silt loam, Soil-methanol extract.

A small, portable, battery-powered, spectrophotometer was developed to measure soil water content rapidly. Soil water contents of 16 soils were related to the absorbance at 1.94 micrometers by a soil-methanol extract by the curvilinear equation: Absorbance = K(% soil water/100 + 1.025(% soil water)) + a. With the exception of Houston Black Clay, one equation could be used for all soils. Determination time for individual samples was approximately 15 min. (Henley-ISWS)
W75-12081

RNAL AND SEASONAL SOIL WATER UP-
E AND FLUX WITHIN A BERMUDAGRASS
T ZONE,
ultural Research Service, Phoenix, Ariz.
r Conservation Lab.
rimary bibliographic entry see Field 2D.
12082

OLVING THE FLOW EQUATION IN UN-
RATED SOILS BY OPTIMIZATION:
IZONTAL INFILTRATION,
ecticut Agricultural Experiment Station,
Haven. Dept. of Ecology and Climatology.
Parlange.
Science Society of America Proceedings, Vol
o 3, p 415-418, May-June 1975. 1 tab, 11 ref, 1
ıd.

iptors: *Unsaturated flow, *Absorption,
ısivity, Soils, Soil water, Soil physics, Soil
anics, Infiltration, Mathematics, Mathemati-
udies, Optimization, Subsurface waters, Soil
ure, Flow, Diffusion, Soil water movement,
ulture, Agronomy, Clays, Labor.
fiers: Yolo light clay.

tly, integral methods have been developed
rovide accurate approximations to the diffu-
quation with rapidly varying diffusivity, but
e in general some numerical iteration. A new
ical approach was developed which yields
al approximation without any numerical
on. The method was applied to the problem
-dimensional horizontal infiltration of water
s. It was shown that the sorptivity is an in-
t, which can be expressed in terms of the
f two integrals involving the diffusivity. The
ical results were in excellent agreement with
ical calculations for Yolo light clay. Since
ivity for most soils varies even more rapidly
or Yolo light clay, the approach should
even more accurate for most soils. The
que is quite general and can be adapted to
other problems of water movement in un-
ted soils. (Sims-ISWS)
2083

E-STEP WETTING PROCEDURE FOR
RMINING BOTH WATER CHARAC-
TIC AND HYDRAULIC CONDUCTIVITY
SOIL CORE,
i Univ., Honolulu. Dept. of Agronomy and
ience.
huja.
ience Society of America Proceedings, Vol
3, p 418-423, May-June 1975. 9 fig, 8 ref.

ptors: *Hydraulic conductivity, *Soil water
nent, *Unsaturated flow, Soil mechanics,
ysics, Soil physical properties, Numerical
s, Laboratory tests, Diffusivity, Soils, Soil
Soil properties, Soil moisture, Agriculture,
omy, Wetting.
iers: *Soil water characteristic, Suction.

able simplifications were used to obtain
ne suction-water content and unsaturated
lic conductivity relationships from data
ed during wetting of a relatively dry soil
rough a high-hydraulic-resistance porous
For soil-water contents below the bubbling-
e value, the two functions were assumed to
reviously known power forms. The result-
ilarity was then utilized to obtain these
ns from cumulative inflow and wetting-
osition data, using an iterative numerical
n of the ordinary differential equations. Ac-
of the solution was tested on a set of
ed data. Tests of the technique as a whole
erated data for one soil and experimental
r another showed it to be promising. For
ontents above the bubbling-pressure value,
od was suggested to obtain the two hydrau-
perties from cumulative inflow and soil-
uction at the other end of the core. (Sims-

2084

**CATION DISTRIBUTION IN SOILS AS RELATED TO SEWAGE SLUDGE DISPOSAL ON LAND,**
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 5B.
W75-12139

**CHEMICAL TESTS FOR PLANT AVAILABLE METALS IN SOILS.**
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 5A.
W75-12142

**A SIMULTANEOUS CALCULATION OF THE CAPILLARY-SORPTION POTENTIALS, MOISTURE AND FLOW OF WATER IN SOILS USING A COMPUTER AND EQUATIONS OF SOIL MOISTURE MOVEMENT, (IN RUSSIAN),**
V. Ya Kulik, and N. V. Piomugina.
Dokl Vses Ord Lenina Akad S-Kh Nauk Im V I Lenina., No 3, p 41-43. 1973.

Descriptors: *Soil moisture, Soil water movement, *Sorption, *Capillary action, Flow, Equations.

An algorithm which allows simultaneous reception of four values necessary for a determination of a number of applied problems, is described. A calculation of the flow of moisture allows incidental determination of the moisture-exchange problem between layers of soils without substantial increase in the loss of the time of the computer. Copyright (c) 1974, Biological Abstracts, Inc.
W75-12208

**ACTIVITY OF ENZYMES (PROTEASE AND UREASE) AND FORMS OF MOBILE NITROGEN IN THIN PEAT SOIL OF THE SECOND YEAR OF USE, (IN RUSSIAN),**
Akademiya Navuk BSSR, Minsk. Inst. of Experimental Botany.
For primary bibliographic entry see Field 5B.
W75-12216

**RAPID SOIL MOISTURE DETERMINATION BY IMMERSION METHOD, (IN KOREAN),**
Institute of Plant Environment, Suwon (Republic of Korea).
K. N. Im, I. S. Cho, and Y. H. Shin.
Res Rep Off Rural Dev (Plant Environ) (Suwon), No 15, p 37-41, 1973.

Descriptors: *Soil moisture, Measurement, Methodology, Analytical techniques.
Identifiers: *Immersion method, Oven-dry method.

A rapid method of soil moisture determination based on the Archimedes principle was compared with the oven-dry method. The methods showed a high correlation and low standard deviation. The rapid method gives an accurate determination in 4-5 min. and may be used in the field.--Copyright 1974, Biological Abstracts, Inc.
W75-12240

**STATISTICAL INVESTIGATION OF THE RELATION BETWEEN ABSORBABILITY AND CONTENT OF GRAINSIZE FRACTIONS AND HUMUS, (IN RUSSIAN),**
L. N. Kuleshov.
Izv Akad Nauk Az SSR Ser Biol Nauk. No 1, p 26-31. 1973.

Descriptors: Humus, *Absorption, Clays, *Grain, *Statistical studies, *Soils.
Identifiers: *USSR, Chernozems, Azerbaidzhan.

The advantage of statistical analysis for revealing the relation between interrelated properties of soils is demonstrated. Particles larger than 0.005 mm have absorbability. In chernozems of the USSR absorbability is due mainly to humus, the effect of the clay fraction being secondary, whereas in the compact soils of Azerbaidzhan absorbability is governed by the content of clay while the effect of humus is negligible.--Copyright 1974, Biological Abstracts, Inc.
W75-12344

## 2H. Lakes

**LIFE HISTORY, ECOLOGY, AND MANAGEMENT OF THE CARP, CYPRINUS CARPIO LINNAEUS, IN ELEPHANT BUTTE LAKE.**
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 6B.
W75-11972

**N AND P DISTRIBUTION IN LAKE KINNERET (ISRAEL) WITH EMPHASIS ON DISSOLVED ORGANIC NITROGEN,**
Israel Oceanographic and Limnological Research Ltd., Haifa.
For primary bibliographic entry see Field 5C.
W75-11975

**RESPONSE OF LAKE SUPERIOR ALGAE TO NUTRIENTS AND TACONITE TAILINGS,**
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5C.
W75-11976

**PRIMARY PRODUCTION IN THE PLANKTON COMMUNITY OF A TROPICAL LAKE,**
Savannah River Ecology Lab., Aiken, S.C.
For primary bibliographic entry see Field 5C.
W75-11978

**CLASSIFICATION OF WISCONSIN LAKES BY TROPHIC CONDITION.**
Wisconsin Dept. of Natural Resources, Madison. Bureau of Water Quality.
For primary bibliographic entry see Field 5C.
W75-11979

**LIMNOLOGY OF LAKES OF THE SYLVANIA RECREATION AREA, OTTAWA NATIONAL FOREST,**
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
J. P. Crumbrine, and A. M. Beeton.
Special Report No 24, March 1975. 88 p, 33 fig, 20 tab, 29 ref.

Descriptors: *Limnology, *Michigan, *Baseline studies, Geology, Soils, Vegetation, Climatic data, Hydrology, Physical properties, Regional analysis, Chemical properties, Dimensions, Water temperature, Hydrogen ion concentration, Conductivity, Heavy metals, Nutrients, Gases, Coliforms, Benthos, Phytoplankton, Zooplankton, Primary productivity, Precipitation(Atmospheric), Radiation, Winds, Ions, Diatoms, Color, Light penetration, Recreation.
Identifiers: *Sylvania Recreation Area(Mich), *Ottawa National Forest(Mich).

As a base for sound management of the Sylvania Area 14 lakes were studied. Differences resulted from varying groundwater inflow. Drainage lakes had the lowest sulfate, highest calcium, magnesium, sodium, silica, potassium, chloride, iron, phosphorus, and nitrate; larger watersheds and groundwater inflow; and were mesotrophic-oligotrophic and eutrophic. Seepage lakes had the highest sulfate, lowest concentrations of all other chemicals, and were mesotrophic-oligotrophic. There was an inverse relationship between color and transparency. Iron concentrations were re-

lated to transparency. Seston concentrations caused seasonal transparency fluctuations. In productive lakes, summer dissolved oxygen concentrations decreased uniformly from surface to bottom. Nutrient-poor lakes had oxygen maxima in the epilimnion which decreased with depth in summer. Anaerobic conditions in the hypolimnia caused low benthic populations as indicated by the predominance of Chaoborus populations. Fragilaria pinnata and F. crontonensis were associated with drainage lakes. Melosira, Cyclotella, and non-diatoms were abundant in seepage lakes. Seven species of copepods and cladocerans were present, but Leptodiaptomus minutus was absent in drainage lakes, some copepods were absent and phytoplankton low in bog lakes. Studies on responses of the Experimental Lakes Area of Canada to fertilization should be considered in management decisions concerning Sylvania lakes. (Buchanan-Davidson-Wisconsin)
W75-11981

**DISTRIBUTION AND BIOMASS OF MACROPHYTES IN LAKE DGAL MALY,**
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland).
For primary bibliographic entry see Field 8I.
W75-11993

**EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. XIV. THE RELATIONS BETWEEN THE FISH AND OTHER BIOCENOTIC COMPONENTS (SUMMING UP THE STUDIES),**
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
For primary bibliographic entry see Field 8I.
W75-11998

**THE LAKE AS ECOSYSTEM,**
G. H. Schwabe.
Universitas, Vol 16, No 3, p 213-226, 1974.

Descriptors: *Lakes, *Ecosystems, Limnology, Biological properties, Life cycles, Balance of nature.

Inland water bodies are equated with ecosystem models. Water availability is the indispensable basic material for all biotic processes. Geological age, relatively homogeneous salt concentration, low, fluctuating dissolved substance contents distinguish oceans from inland waters. Inland water bodies are sections of the earth's surface exposed to the sun's radiation and are components of the ecosphere, an indistinctly contoured boundary at the base of the atmosphere. Since light cannot penetrate the earth, organic substance formation is possible only on the surface. Light can penetrate water, and with dissolved inorganic ingredients and water's high density and viscosity, plants can develop along special pathways. Plankton are found in every stationary water body, are the most impressive community of organisms, and reflect a lake's ecological character. Photosynthesis of organic substance is the fundamental process of life, but cannot ensure permanent continuation of the total life process. Lakes have characteristic biocoenoses, are internally balanced systems of plant and animal populations, are subject to fluctuations of physical conditions, but may themselves modify these conditions, they can maintain a balance under wide ranging external conditions, are limited to a self-contained water mass, and cannot be extracted from the ecosphere. (Buchanan-Davidson-Wisconsin)
W75-11999

**DANGER SIGNS FOR TAHOE'S FUTURE,**
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5C.
W75-12002

**PREDICTIVE MODELS FOR GREAT LAKES HYDROLOGY,**
State Univ. of New York, Buffalo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12049

**DAILY FALL ACTIVITY AND DIRECTION OF MOVEMENTS OF FISH IN LAKE QUENOUILLE IN THE LAURENTIANS, (IN FRENCH),**
National Inst. of Scientific Research, Quebec.
A. Rousseau.
Rev Can Biol, Vol 32, No 4, p 233-239, 1973

Descriptors: *Canada, *Fish populations, *Fish management, Fish migration, Lakes, *Bullheads, *Yellow perch.
Identifiers: *Circadian rythms(Fish), Laurentians, Lepomis-Gibbosus, Perca-flavescens, Quebec, *Lake Quenouille(Quebec), *Pumpkinseed(Fish).

A knowledge of the circadian rhythms of fish and their displacement patterns is important for the pursuit of fish population studies and for the rational management of fishery resources. A study of lake Quenouille (a small warm shallow water lake in Quebec, Canada), involving gill net fishing during 4 consecutive weekends, had led to the following observations: the yellow perch (Perca flavescens) and the pumpkinseed (Lepomis gibbosus) are diurnal fishes exhibiting maximal activity from 8-9 h and 9-11 h respectively; the brown bullhead (Ictalurus nebulosus) is noctural, exhibiting maximal activity between 22 h and 2 h. A study of fish deplacement patterns revealed that the average angle of displacement with respect to the shoreline was 68-69 degrees for the yellow perch and pumpkinseed and 90 degrees for the brown bullhead.--Copyright 1974, Biological Abstracts, Inc.
W75-12064

**VARIATIONS OF THE TURBULENT FLUXES OF MOMENTUM, HEAT AND MOISTURE OVER LAKE ONTARIO,**
Atmospheric Environment Service, Toronto (Ontario).
G. A. McBean, and R. D. Paterson.
Journal of Physical Oceanography, Vol 5, No 3, p 523-531, July 1975. 7 fig, 2 tab, 10 ref.

Descriptors: *Lake Ontario, *Turbulence, *Variability, Moisture, Momentum transfer, Latent heat, Water vapor, Atmosphere, Instrumentation, Aircraft, Time series analysis, Thermometers, Winds, Temperature, Evaporation, Upwelling, Wind velocity, Radiosondes.
Identifiers: *Internation Field Year for the Great Lakes, Doppler radar, Momentum flux, Sensible heat, Time histories, Sensors, Radiation thermometer.

During the International Field Year for the Great Lakes, measurements of turbulence and turbulent fluxes were made with an instrumented jet aircraft. After removing effects of aircraft motion, the fluxes were computed by the eddy correlation method. Flights were made along the north shore, along the center of the lake, and across the shoreline on four days in October 1972 at a flight level of 150 m. Flights were made at levels 30, 60, 150, and 300 m over another location on the lake. The horizontal variations in the fluxes at 150 m above the surface were illustrated and their relationship to the surface pattern discussed. It was found that the 150 m pattern was displaced downstream about 15 km. The heat flux pattern showed considerable horizontal variation. These variations, coupled with a downwind displacement at higher levels, added to the difficulties in estimating the fluxes from a few measurements. The fluxes did show an approximately linear decrease with height. Further work is indicated before the fluxes of momentum, heat, and moisture from a large lake can be completely understood. (Roberts-ISWS)
W75-12078

**THE SPATIAL AND TEMPORAL VARIATIO OF THE TURBULENT FLUXES OF HEAT, M MENTUM AND WATER VAPOR OVER LA ONTARIO,**
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Resea Labs.
For primary bibliographic entry see Field 2D.
W75-12079

**PRAIRIE POTHOLE ECOLOGY AND FEASIBILITY OF GROWING RAINB TROUT (SALMO GAIRDNERI RICHARDS IN PRAIRIE POTHOLES,**
North Dakota State Univ., Fargo. Dept. of Zo gy.
For primary bibliographic entry see Field 8I.
W75-12157

**COASTWISE CURRENTS IN THE VICINITY CHICAGO, AND CURRENTS ELSEWHER SOUTHERN LAKE MICHIGAN,**
Michigan Univ., Ann Arbor. Dept. of Atmosp and Oceanic Science.
E. C. Monahan, and P. C. Pilgrim.
(1975), 152 p. NOAA Grant No.04-5-158-16.

Descriptors: *Currents(Water), *Coasts, *C currents, *Rip currents, Current meters, ing(Aquatic), Flow, Water circulation, Michigan, Great Lakes, Wind velocity, Drif tles, Hydrologic data, Aquatic drift.
Identifiers: *Coastal currents, *Lake cur *Coastwise currents, Current patterns, Cu measurement, Current direction, Chicago w *Lake circulation, Vertical current, Dro Wind direction, Surface drifters, Water tem ture, Lake data, Current data.

The study was undertaken to obtain backg information about the coastwise currents immediate vicinity of the city of Chicago, Il and to a lesser degree to characterize the ci tion in the southern basin of Lake Michigan motivation for conducting this research from the city of Chicago's active considerat the construction of recreational islands offsh that city. Some of the conclusions drawn fr study are 1) the currents encountered in this are typically weak (less than 0.6 knots); 2) a of correlation between current and wind dire is often evidenced; 3) some observations s marked change in current at the depth of mocline; 4) offshore currents near Chicago ( surface mooring locations) during summe primarily to NW or N, in accord with FWPCA (1967) findings; 5) a clockwise circ in the southern basin of Lake Michigan exis ing the summer months; 6) this general circ pattern in the southern basin of Lake Mich not compatible with the FWPCA (1967) res the findings of Harrington's (1895) classica are also not in accord with the present fi (NOAA)
W75-12161

**DIVERSION AND WITHDRAWAL OF TIONAL WATER FROM LAKE MIC INTO THE ILLINOIS WATERWAY.**
For primary bibliographic entry see Field 4A.
W75-12197

**TOXIC WATERS (DISCUSSION OF R FEDERAL ACTION AGAINST WATER P TION).**
Resources for the Future, Inc., Washington
For primary bibliographic entry see Field 5G.
W75-12230

## Water In Plants

**ATIVE THROUGHFALL ENRICHMENT BIOLOGIC AND BY AEROSOL-DERIVED TERIALS IN LOBLOLLY PINES,**
issippi Univ., University. Dept. of Geology Geological Engineering.
primary bibliographic entry see Field 5B.
-11853

**VEY OF THE MATRIC WATER OF VARI- PLANT GROUPS,**
ah Univ., Al Basrah (Iraq).
l-Saadi, and H. H. Wiebe.
Soil, Vol 39, No 2, p 253-261, 1973.

riptors: Plant management, Plant physiology, phytes, Halophytes, Salt tolerance, Drought nce, Aquatic plants.
ifiers: *Chenopodiaceae, *Matric water.

ic water (matric-bound water) was measured e water retained by plant material after bration on a pressure membrane or ultra At increasing pressures, lower amounts of are held by matric or colloidal surface s. Matric water was expressed as a percent of the dry weight or the original water content. material was oven dried, ground, and then ited with water prior to the matric determina- which occurred in the pressure membrane as either 1 bar or 20 bars, supplied by ler N for 72 h. Matric water was measured in s or in photosynthetic stem tissues from 60 es, including hydrophytes, xerophytes and hytes. The correlations between matric tials and drought and salt tolerance ratings determined. High matricbound water values ll as high tissue water contents were found in es of Chenopodiaceae, which are considered salt and drought tolerant than species of plant groups. Low matric water values were in the coniferous tree leaves and in grasses, ntermediate values were found in Com- e, miscellaneous herbaceous species, and ious trees. No correlation could be found en either salt or drought tolerance ratings ie matric percent when the latter was ex- d on a dry weight basis. When matric water xpressed as a percent of the original water t, there was a positive correlation with nt tolerance ratings in all families studied ex- ucculent Chenopodiaceae.--Copyright 1974, ical Abstracts, Inc.
1883

**WATER RELATIONS OF HEMLOCK A CANADENSIS): I. SOME EQUILIBRI- VATER RELATIONS AS MEASURED BY RESSURE-BOMB TECHNIQUE,**
o Univ. (Ontario). Dept. of Botany.
Tyree, J. Dainty, and M. Benis.
Bot, Vol 51, No 8, p 1471-1480, 1973. Illus.

ptors: *Hemlock trees, *Water balance, rement, Turgidity analysis.
iers: Tsuga-canadensis, Measuring ques, *Pressure-bomb measurement.

tical and experimental aspects of the rium water relations of excised hemlock (T. nsis) shoots are examined. The equilibrium relations of hemlock were determined by ne pressure-gomb technique on shoots 15-40 sh weight. At or near full turgor the osmotic e of the cells averages 16.5 plus or minus s. The fraction of the total water content of k shoots residing in the living cells is 0.77 minus 0.04. When hemlock shoots are near rgor the balancing pressure will change with the volume expressed provided the changes represent less the 1/2% of the hoot water. (See W75-11901 and W75- -Copyright 1974, Biological Abstracts, Inc.
900

**THE WATER RELATIONS OF HEMLOCK (TSUGA CANADENSIS): II. THE KINETICS OF WATER EXCHANGE BETWEEN THE SYM- PLAST AND APOLAST,**
Toronto Univ. (Ontario). Dept. of Botany.
M. T. Tyree, and J. Dainty.
Can J Bot, Vol 51, No 8, p 1481-1489, 1973. Illus.

Descriptors: *Hemlock trees, *Water balance, Physical properties, *Mode of action, Plant growth, Analysis.
Identifiers: Apoplast, Symplast, Tsuga-canadensis, *Pressure-bomb measuring technique, Water exchange.

A theoretical analysis of the events that occur while a plant enclosed in a pressure bomb evolves from 1 equilibrium balancing pressure to another is presented. The initial rate of efflux from any 1 cell in response to a pressure increment of delta P equals (ALp)1 delta P, where (ALp)i is the surface area times hydraulic conductivity of the cell's semipermeable membrane(s). If the volume changes and pressure increment are small, the cell will approach equilibrium exponentially. The 1/2 time of the exponential process is governed by (ALp)iki, where ki is the cell constant ( = the combined rate of change of osmotic and turgor pressure with the volume expressed from the cell). Experimental studies of the kinetics of water exhange between the symplast and apoplast of hemlock (T. canadensis) shoots in a pressure bomb reveal that the cells collectively behave as though they fall into 3 distinct populations which approach equilibrium with different 1/2 times. (See also W75-11900)--Copyright 1974, Biological Abstracts, Inc.
W75-11901

**THE WATER RELATIONS OF HEMLOCK (TSUGA CANADENSIS): III. THE TEMPERA- TURE DEPENDENCE OF WATER EXCHANGE IN A PRESSURE BOMB,**
Toronto Univ. (Ontario). Dept. of Botany.
M. T. Tyree, M. Benis, and J. Dainty.

Descriptors: *Hemlock trees, *Water balance, *Temperature, Physical properties, Equations, *Mathematical studies, *Water utilization.
Identifiers: Apoplast, Symplast, Tsuga-canadensis, Arrhenius rate theory, *Pressure-bomb technique.

The pressure-bomb technique was used to measure the temperature dependence of water exchange between the apoplast and symplast of hemlock (T. canadensis) shoots. By applying the Arrhenius rate theory, the activation energy for water exchange in the whole shoot equals 25.9 plus or minus 0.6 x 10 to the 3rd power J/mole. A theory is proposed on the basis of the Arrhenius rate equations which allows prediction of the relative magnitudes of the membrane resistance, Rm, and the extracellular resistance, Rx, to water permeation. On this basis Rm may be at least one-quarter of Rx and may even exceed Rx. (See also W75-11900)--Copyright 1974, Biological Abstracts, Inc.
W75-11902

**FUNGUS DISEASES OF WHEAT ON IR- RIGATED LANDS. (IN RUSSIAN),**
Volgograd Agricultural Inst. (USSR).
A. V. Malikova.
Mikol Fitopathol, Vol 8, No 1, p 63-64, 1974.

Descriptors: *Wheat, Plant diseases, USSR, *Soil fungi, *Irrigation effects, *Rusts, *Powdery mildew.

Wheat is affected by the same diseases on irrigated and unirrigated lands, but under irrigation conditions fungus development is slightly different. Under irrigation conditions the development of leaf rust and powdery mildew is intensified, whereas the development of root rot of spring wheat decreases considerably. Wheat plants cultivated under optimum moisture conditions were less infected with loose smut. With an increase of the irrigation rate and N application, the infection of plants with leaf rust and powdery mildew increased.--Copyright 1974, Biological Abstracts, Inc.
W75-11904

**PHENOLIC COMPOUNDS OF WHEAT LEAVES UNDER DROUGHT STRESS,**
Oklahoma State Univ., Stillwater. Dept. of Botany and Plant Pathology.
S.-D. Tsai, and G. W. Tood.
Phyton Rev Int Bot Exp, Vol 30, No 1/2, p 67-75, 1972.

Descriptors: *Leaves, *Chemical analysis, Chromatography, *Phenols, *Moisture stress, Drought tolerance, Plant physiology, *Wheat, *Crop response.
Identifiers: Wheat.

Leaf samples were extracted and analyzed for their content of phenolic compounds by 2-dimensional paper chromatography. They were subdivided into 3 fractions: (I) Free phenolics soluble in 40% and 95% ethanol; (II) Soluble in 40% ethanol but insoluble in 95% ethanol hydrolyzable with NaOH; and (III) Insoluble in 40% hydrolyzable with NaOH ethanol. UV-Absorbance of 40% ethanol-soluble materials at wave length of 275 nm was increased as a result of severe drought in the drought-susceptible cultivar 'Ponca' but did not change in drought-resistant 'KanKing.' Analysis by the Folin-Denis test showed a 25-27% decline in phenolic compounds as a result of water stress in both cultivars, mostly due to a decline in fraction (II). Twenty compounds were tentatively identified of a total of about 37 spots that were located. Of these, 3 disappeared following drought in both cultivars and 5 others showed substantial declines. Two unknown compounds appeared as a result of drought in both cultivars. If phenolic compounds are involved in cellular injury following drought stress this might be due to release of these substances into the cytoplasm rather than to increased synthesis.--Copyright 1973, Biological Abstracts, Inc.
W75-11905

**THE EFFECT OF HYDROGEN IN CONCEN- TRATIONS IN SIMULATED RAIN ON THE MOSS TORTULA RURALIS (HEDW.)SM,**
Montana Univ., Missoula. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W75-11987

**DISTRIBUTION OF AQUATIC MACROPHYTES RELATED TO PAPER MILL EFFLUENTS IN A SOUTHERN MICHIGAN STREAM,**
Southeast Missouri State Univ., Cape Girardeau. Dept. of Biology.
For primary bibliographic entry see Field 2B.
W75-11991

**DISTRIBUTION OF SOLAR RADIATION WITHIN A DECIDUOUS FOREST,**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
B. A. Hutchison, and D. R. Matt.
In: 1973 Annual Report; Report ATDL-106, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 1-30, December 1974. 15 fig, 1 tab, 7 ref.

Descriptors: *Solar radiation, *Deciduous forests, *Frequency curves, Forests, Radiation, Light intensity, Canopy, Light penetration, Vegetation, Cloud cover, Distribution patterns, On-site investigations, Microenvironment, Atmosphere, Photometry.
Identifiers: Radiation flux densities, Tulip poplar.

It has long been recognized that the time distribution of radiative flux densities within vegetative stands depart from Gaussian. As early as 1911, it had been noted that time averages of radiation in a spruce forest were meaningless owing to the non-normality of the distribution of radiation values. In general, time distributions reported in the literature are unimodal and skewed to higher flux densities. Most of these studied deal only with radiation reaching the forest floor. As part of the U.S. International Biological Program Eastern Deciduous Forest Biome effort at Oak Ridge, the distribution of solar radiation is being studied in a tulip poplar (Liriodendron tulipifera) forest in vertical and horizontal space and the temporal changes in this distributions . Results indicated that time distributions of flux densities in this forest are non-normal. Further, the amount of skewness increases with elevation in this forest. Time distributions of flux densities were compared for days having complete overcast, for clear days, and for days of varying cloud cover and type. It was found, within the forest, the distributions of flux densities are similar on all days and that increasing cloudiness only narrows the distribution curve and decreases the amount of skewness. (See also W75-12033) (Sims-ISWS)
W75-12034

**DIURNAL AND SEASONAL SOIL WATER UPTAKE AND FLUX WITHIN A BERMUDAGRASS ROOT ZONE,**
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2D.
W75-12082

**THE ICHTHYOFAUNA OF THE ROKYTNA RIVER: I. SPECIES COMPOSITION, ABUNDANCE AND BIOMASS,**
Ceskoslovenska Akademie Ved, Brno. Ustav pro Vyzkum Obratlovcu.
S. Lusk.
Zool Listy, Vol 22, No 2, p 165-180, 1973.

Descriptors: *Biomass, Fish reproduction, *Trout.
Identifiers: Alburnoides-Bipunctatus, Barbus-Barbus, Chondrostoma-Nasus, Cobitis-Taenia, *Czechoslovakia(Rokytna River), Gobio-Gobio, Leuciscus-Cephalus, *Barbel zone(Streams).

A total of 28 spp. of fishes and 2 interspecific hybrids were ascertained in the Rokytna River (Czechoslovakia). Of that number, 10 spp. occur in the stream due to stocking by anglers, or invasion from ponds. In all, 18 spp. are indigenous in the stream, reproducing naturally. In the past, the species composition of the fish fauna of the stream has changed little, except for Cobitis taenia whose habitat was destroyed by amelioration measures. Most of the stream can be characterized as the barbel zone; the upper part of the stream is unsettled and the spring region is a trout zone. In the lower and middle reaches of the stream abundance fluctuated around 10,000 fish/ha, and twice that number in the upper reaches of the Rokytna River and its tributary, the Rouchovanka Stream. Chondrostoma nasus, Leuciscus cephalus and Barbus barbus, are of fishery importance. Gobio gobio and (Alburnoides) bipunctatus were also numerically important. In sections outside the trout zone, the biomass varied between 500 and 600 kg/ha; within the trout zone it did not exceed 300 kg/ha.--Copyright (c) 1974, Biological Abstracts, Inc.
W75-12129

**AN INFRA-RED PSYCHROMETER FOR DETECING CHANGES IN THE HUMIDITY OF LEAF BOUNDARY LAYERS,**
Adelaide Univ. (Australia). Dept. of Botany.
D. W. Sheriff
J. Exp Bot, Vol 24, No 81, p 641-647, 1973.

Descriptors: Absorption, Infrared radiation, *Water vapor, Measurement, *Leaves, *Boundary layers, *Humidity, Hygrometry.
Identifiers: *Nicotiana-glauca, *Psychrometers(Infrared).

An apparatus is described which uses the principle of the absorption of IR light by water vapor for the measurement of water vapor concentrations in the atmosphere or in the boundary layers of leaves (of Nicotiana glauca). -Copyright 1974, Biological Abstracts, Inc.
W75-12131

**LIFE HISTORY NOTES AND MERISTIC VARIATION IN THE FRESHWATER FOURSPINE STICKLEBACK, APELTES QUADRACUS (MITCHILL), NEAR SEPT-ILES: QUEBEC,**
Ottawa Univ. (Ontario). Dept. of Biology.
G. Power, and B. W. Coad.
Nat Can (Que)., Vol 100, No 3, p 247-251, 1973.

Descriptors: *Sticklebackes, *Life history studies, *Canada, Fish food organisms, Diptera, Ecology, Crustaceans, Mayflies, Freshwater fish, Fish population.
Identifiers: Apeltes-Quadracus, *Meristic variation, Quebec, Sept-Iles

An isolated freshwater population of the fourspine stickleback was examined for aspects of its ecology and meristic variation. Three age groups were found but only females survived into a 3rd yr of life. Egg numbers and diameters were determined during the breeding season, June-July. Older fish had more and larger eggs. The diet consisted of Chironomidae larvae, Cladocera and Ephemeroptera larvae. Vertebral and gill raker number were lower in the freshwater population compared to a marine population but fin ray counts were similar. The significance of these similarities and differences is discussed. The freshwater population was probably isolated from a marine counterpart by formation of a waterfall several thousand years ago.--Copyright (c) 1974, Biological Abstracts, Inc.
W75-12176

**ROLE OF EPIDERMAL CELL TURGOR ON STOMATAL REGULATION IN ISOLATED EPIDERMAL PEELINGS OF CITRULLUS COLOCYNTHIS LINN. (SCHRAD.),**
Jodhpur Univ. (India). Dept. of Botany.
M. C. Bhandari, and D. N. Sen.
Biochem Physiol Pflanz (BPP), Vol 164, No 2, P 180-187. 1973.

Descriptors: *Stomata, Systematics, Epidermis, Osmatic pressure, Plant growth.
Identifiers: *Citrullus-Colocynthis, *Epidermal, Cell turgor, Plasmolysis, Starch, Turgor.

Epidermal cell turgor appeared to play a definite role in the regulation of stomatal pores in isolated epidermal peelings of C. colocynthis. Guard cells and their surrounding epidermal cells had different osmotic potentials and absorbing capacities. Plasmolysis in epidermal cells caused by incubating peelings in suitable sucrose solutions, led to the lowering of their turgor potentials, which resulted in opening of the stomata. Any increase in turgor potential of epidermal cells caused by incubation of such peelings in water resulted in closure of stomata. Water from plasmolysed epidermal cells was taken up by guard cells due to greater difference of osmotic potentials between epidermal cells and guard cells than between epidermal cells and the incubation medium. When peelings with plasmolysed epidermal and guard cells were incubated in water, water moved into the guard cells from the medium because of its non-availability in plasmolysed epidermal cells. As the pore opened, the starch in guard cells disappeared, but the cause of this could not be ascertained.--Copyright 1974, Biological Abstracts, Inc.
W75-12323

**PHOSPHORUS METABOLISM A RESPIRATION IN WHEAT LEAVES A ROOTS IN THE CASE OF WATER DEFIENC (IN RUSSIAN),**
Vsesoyuznyi Institut Rastenievodstva, Lening (USSR).
For primary bibliographic entry see Field 5I.
W75-12362

## 2J. Erosion and Sedimentation

**A MOBILE SPRINKLER IRRIGATION FAC TY FOR MEASUREMENT OF SURFACE NOFF AND SOIL EROSION (EINE TRA PORTABLE BEREGNUNGSANLAGE FUER MESSUNG VON OBERFLAECHENABFL UND BODENABTRAG).**
For primary bibliographic entry see Field 7B.
W75-11948

**WATER RESOURCES DATA FOR CALIF NIA, 1973: PART 2. WATER QUAL RECORDS.**
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-11962

**QUALITY OF SURFACE WATERS OF UNITED STATES, 1970: PART 8. WEST GULF OF MEXICO BASINS.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11965

**QUALITY OF SURFACE WATERS OF UNITED STATES, 1969: PART 8. WEST GULF OF MEXICO BASIN.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11966

**AN APPLICATION OF SIMULATED RAINF MODELS TO FORECASTING OF THE L TERM VARIATION OF RIVER BED,**
Osaka Univ. (Japan). Dept. of Civil Engineeri
A. Murota, and M. Hashino
In: Systems Approach to Hydrology: Proce of the First Bilateral U.S.-Japan Semin Hydrology, Hawaii University, Honolulu, Ja 11-17, 1971. Water Resources Publications, Collins, Colorado, p 325-350, 1971. 12 fig, 4 ta

Descriptors: *Sediment transport, *Rai *Simulation analysis, *River beds, Model st Sediment load, Stochastic processes, Sed yield, Sediment discharge, Dunes, Sedim Watersheds(Basin), Landslides, avalanches, Water storage, Stream Geomorphology.
Identifiers: *Japan, *Debris yields

The long-term variations of river bed being a panied with the transversal supply of sed transported from the watershed to the river nel was studied by numerical experiments. mous amounts of debris production due to slides in the mountainous area have been by heavy rainfalls. Part of the debris may t down directly into the river channel and hur debris in large scale are occasionally form the river bed. These dunes move down slo the channel, and our morphological ques whether the long-term variation of the bed will show any trend of convergence to the bed under natural environments. From sto cal evaluations of debris yields, it was disc that the major factor affecting landslide gen and resulting debris is not directly precip but water storage in the drainage basin in th of subsurface storage. The functional relati between the watershed storage and debris was empirically established. If the

nce has been properly simulated and the shed storage has been calculated by run-off ses, the probable occurrences of landslide sulting quantities of debris may be forecast e watershed storage versus debris yields on. Synthesis of rainfall simulations was re-. After calculations of supplemental inflow iment from the watershed to channels and ation of simulated river flow, the river bed ons at the 26 km reach of our objective river orecast extending over 10 years future. The es showed some negative interpretations for ility of stable bed profile under actual en-ents. (See also W75-12014) (Lee - ISWS) 2028

LATION OF THE SHORT-TIME SCOUR-PROCESS IN ERODIBLE STREAMS STOCHASTIC SEDIMENT TRANSFER IE STREAM BED,
Water Research Lab., Logan.
ley, K. Sakhan, and K. G. Renard.
stems Approach to Hydrology; Proceedings First Bilateral U.S.-Japan Seminar in logy, Hawaii University, Honolulu, January 1971. Water Resources Publications, Fort , Colorado, p 351-378, 1971. 9 fig, 4 ref.

ptors: *Stream erosion, *Mathematical , *Stochastic processes, *Boundary ses, Sediment transport, Suspended load, id, Scour, Streambeds, Ephemeral streams, waves, Sediments, Entrainment, Analytical ques, Model studies, Markov processes, Al-hannels.

emeral streams, the occurrence of translato-es causes the shortening of the time of rise ydrograph which in turn results in channel ity. A simulation model was developed to e the dynamics of the channel in terms of: one-dimensional stream flow equations, e-dimensional sediment transport equation, tion for the stream bed, and (3)a stochastic nt transfer at the stream bed which also in-the bed load. The main advantage of the ap-adopted is that the problem of separating id from suspended load was avoided by with states of occurrence rather than l zones. Stochastic processes were used to e sediment transfer between states. It was hat the computational schemes used are The term associated with the friction factor quation of momentum controls the stability solution. To demonstrate the operation of del, real-time simulation was done using tical data for a stream reach 24,000 feet in The suspended load tends to change instan-ly with the water hydrograph, while there lag in the response function associated bed load. Study results were presented in al form. (See also W75-12014) (Humphreys 029

ENT BASIN DESIGN,
County Drain Commissioner's Office, Mich.
naineu.
nd Sewage Works, Vol 122, No 7, p 82-84, 5, 1 fig.

tors: *Settling basins, *Sedimentation, ll-runoff relationships, *Urbanization, orks, Construction, Maintenance, Flood cy, Settling velocity, Rational formula, Overflow, Erosion control, Design

ers: Emergency overflow.

and sedimentation have increased greatly ncreased urbanization, which exaggerates blem by upsetting the balance nature has ed between rainfall and runoff. Settling an be utilized in an analysis of a sediment basin. Settling depends upon the rate of inflow, basin area, flow velocity through the basin, and the settling velocity of the particles. Because a construction project is usually completed within a year, it is reasonable to design a sediment basin to remove the peak silt load that would be generated by a one-year frequency storm. The one-year frequency flood can be calculated using suitable values of one-year rainfall intensity, time of concentrations, and runoff factor. The facility needs to be kept in good working order to perform satisfactorily. (Singh-ISWS)
W75-12042

**A MINI-PROJECT FOR AVON HARBOR, NORTH CAROLINA,**
North Carolina State Univ., Raleigh. Center for Marine Coastal Studies.
For primary bibliographic entry see Field 8A.
W75-12045

**SMALL GROINS ON THE SHORES OF LONG ISLAND SOUND,**
New York Ocean Science Lab., Montauk.
For primary bibliographic entry see Field 8A.
W75-12046

**RUNOFF AND EROSION LOSSES,**
For primary bibliographic entry see Field 5B.
W75-12137

**INTRODUCTION OF SHORE EROSION CONTROL LEGISLATION.**
For primary bibliographic entry see Field 6E.
W75-12279

## 2K. Chemical Processes

**GEOCHEMISTRY OF OIL-FIELD WATER APPLIED TO EXPLORATION,**
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 4B.
W75-11879

**PHENOLIC COMPOUNDS OF WHEAT LEAVES UNDER DROUGHT STRESS,**
Oklahoma State Univ., Stillwater. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 2I.
W75-11905

**MERCURY CONCENTRATIONS IN OPEN OCEAN WATERS: SAMPLING PROCEDURE,**
Connecticut Univ., Groton. Marine Sciences Inst.; and Connecticut Univ., Groton. Dept. of Geology.
For primary bibliographic entry see Field 5A.
W75-11953

**WATER RESOURCES DATA FOR CALIFORNIA, 1973: PART 2. WATER QUALITY RECORDS.**
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-11962

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 6. MISSOURI RIVER BASIN.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11964

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 8. WESTERN GULF OF MEXICO BASINS.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11965

**A THERMODYNAMIC INTEGRAL EQUATION FOR THE EQUILIBRIUM MOISTURE PROFILE IN SWELLING SOIL,**
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 2G.
W75-12050

**GEOCHEMISTRY OF STRONTIUM IN THE SCIOTO RIVER DRAINAGE BASIN, OHIO,**
Miami Univ., Oxford, Ohio. Dept. of Geology.
A. M. Stueber, A. D. Baldwin, J. B. Curtis, Jr., P. Pushkar, and J. D. Steele.
Geological Society of America Bulletin, Vol 86, No 7, p 892-896, July 1975. 4 fig, 2 tab, 19 ref. OWRT A-030-OHIO(2).

Descriptors: *Geochemistry, *Strontium, *Ohio, *Groundwater, *Carbonate rocks, Calcium, Shales, Glacial drift, Bedrock, Radioisotopes, Geologic control, Water chemistry, Spectrophotometry, Leaching, Sampling, Surface-groundwater relationships, River basins, Water types.
Identifiers: *Scioto River Basin(Ohio), Celestite.

Groundwater that emanates from carbonate bedrock in the Scioto River drainage basin is characterized by Sr87/Sr86 ratios in the range of 0.708 to 0.709; usually high Sr/Ca ratios in this water identify celestite lenses within the carbonate bedrock as the dominant source of strontium. Groundwater from clastic bedrock, principally shale, has Sr87/Sr86 ratios that vary from about 0.710 to about 0.713 and shows low Sr/Ca ratios. Thus, there are two basic groundwater types that emanate from bedrock within the basin. They can be identified by these two parameters. Most groundwater that has been in contact only with glacial till, which covers the northern two-thirds of the basin, has carbonate-type Sr87/Sr86 ratios as well as high Sr/Ca ratios. Celestite is apparently present in the till throughout much of the Scioto Basin. Groundwater that contains celestite-derived strontium, whether from the carbonate bedrock or the till, has so great a strontium content as to control completely the Sr87/Sr86 ratios of surface water northwest of the glacial boundary. This fact limits the usefullness of the Sr87/Sr86 parameter as a tracer in water studies within the basin. (Visocky-ISWS)
W75-12052

**INORGANICS, (LITERATURE REVIEW),**
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W75-12072

**WATER CHARACTERISTICS, (LITERATURE REVIEW),**
Maine Univ. Orono.
For primary bibliographic entry see Field 5A.
W75-12073

**APPLICATION OF THE METHYLTHYMOL BLUE SULFATE METHOD TO WATER AND WASTEWATER ANALYSIS,**
Ontario Ministry of the Environment, Rexdale, Water Quality Branch.
For primary bibliographic entry see Field 5A.
W75-12324

**STUDIES IN THE SYSTEM CACO:-FECO3: 1. PHASE RELATIONS; 2. A METHOD FOR MAJOR-ELEMENT SPECTROCHEMICAL ANALYSIS; 3. COMPOSITIONS OF SOME FERROAN DOLOMITES,**
Chicago Univ., Dept. of Geophysical Sciences.
For primary bibliographic entry see Field 2F.
W75-12400

## 2L. Estuaries

**THE EFFECT OF WIND ON THE SPREAD OF CONTAMINATION IN THE YEISK ESTUARY, (IN RUSSIAN),**
For primary bibliographic entry see Field 5B.
W75-11983

**SEASONAL PREVALENCE OF CHONDROCOCCUS COLUMNARIS INFECTION IN BLACK BULLHEADS FROM CLEAR LAKE, IOWA,**
Iowa State Univ., Ames. Dept. of Zoology and Entomology.
For primary bibliographic entry see Field 5C.
W75-11995

**HYDROLOGICAL STUDIES OF EVAPOTRANSPIRATION AND GROUNDWATER FLOW IN SANDY LAND,**
National Research Inst. of Agricultural Engineering, Hiratsuka (Japan).
For primary bibliographic entry see Field 2D.
W75-12032

**DISPERSION AND SETTLING AROUND A WASTE DISPOSAL POINT IN A SHALLOW SEA,**
Liege Univ. (Belgium). Institut de Mathematique.
For primary bibliographic entry see Field 5B.
W75-12043

**A MINI-PROJECT FOR AVON HARBOR, NORTH CAROLINA,**
North Carolina State Univ., Raleigh. Center for Marine Coastal Studies.
For primary bibliographic entry see Field 8A.
W75-12045

**SMALL GROINS ON THE SHORES OF LONG ISLAND SOUND,**
New York Ocean Science Lab., Montauk.
For primary bibliographic entry see Field 8A.
W75-12046

**GROWTH OF THE GREEN ALGA CODIUM FRAGILE IN A CONNECTICUT ESTUARY,**
Yale Univ., New Haven, Conn. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-12051

**EMIGRATION OF THE PEAMOUTH CHUB, MYLOCHEILUS CAURINUS, ACROSS A DILUTE SEAWATER BRIDGE: AN EXPERIMENTAL ZOOGEOGRAPHIC STUDY,**
Victoria Univ. (British Columbia). Dept. of Biology.
D. W. Clark, and J. F. McInerney.
Can J Zool., Vol 52, No. 4, p 457-469. 1974.

Descriptors: *Canada, Sea water, *Saline water-freshwater interfaces, Islands, *Barrier islands, *Fish migration, Glaciology, Salinity.
Identifiers: British Columbia, *Chub (Peamouth), Mylocheilus-Caurnius, Vancouver Island (B.C.), Zoo geographic studies, Fraser River (B.C.), Straits of Georgia (B.C.).

In British Columbia, the postglacial distribution of the peamouth chub, M. caurinus, is limited to certain mainland drainages except for several problematical island occurrences, including Vancouver Island (British Columbia, Canada). The saline waters of the 30-mi wide Strait of Georgia evidently act as a barrier to island dispersal. However, during periods of very high runoff from the Fraser River, a corridor of low-salinity water is established between the mouth of the Fraser River and Vancouver Island. For primary-division freshwater fish, the probably constitutes a sweepstakes emigration route consisting of a shallow surface gradient with terminal salinities occasionally falling to levels which peamouth chub can tolerate. In a simulated crossing of Georgia Strait, peamouth chub demonstrated superior survival capabilities in comparison to 3 other freshwater species. The study lends support to the idea that the presence of chub in the Nanaimo River system on Vancouver Island represents a natural postglacial range extension.--Copyright (c) 1974, Biological Abstracts, Inc.
W75-12151

**STORM TIDE FREQUENCIES ON THE SOUTH CAROLINA COAST,**
National Weather Service, Silver Spring, Md.
V. A. Myers.
Superintendent of Documents, U.S. Printing Office, Washington, D.C. 20402, for $1.45. NOAA Technical Report NWS-16 June 1975. 79 p, 33 fig, 8 tab, 43 ref.

Descriptors: *Storm surge, *Tides, *Flood forecasting, Hurricanes, Storms, Climatology, Floods, Disasters, Rainfall, Precipitation(Atmospheric), Ocean waves, Tsunamis, Weather forecasting, Weather, Hydrology, *South Carolina.
Identifiers: Tidal currents, Storm tide frequencies, *Storm tides, Flood Insurance Program, Coastal tides, Tide predictions, Hurricane predictions, Hurricane occurrences, Hurricane tides, Flood hazards, Tide frequencies.

Methods are described for estimating hurricane tide frequencies on a coast by applying the National Weather Service hydrodynamic storm surge model to a full set of climatologically representative hurricanes. The first purpose is to provide technical documentation of the coastal tide frequency determination for an area of South Carolina that includes the five maritime counties; Beaufort, Colleton, Charleston, Georgetown, and Horry; the cities of Charleston, Beaufort, Georgetown, and Myrtle Beach; and a number of townships and towns. The second purpose is to describe and illustrate by example the methods used by NOAA for tide frequency determination along any hurricane-prone coastal reach. It provides and explains the basis for hurricane tide frequencies for all of the open coast of South Carolina from an annual probability of occurrence of 0.10 to an annual probability of 0.002 (mean recurrence interval 10 yr. to 500 yr.). The motivation for this report is the Flood Insurance Program which uses the results to define flood risk zones. (NOAA)
W75-12160

**COOK INLET TIDAL STREAM ATLAS,**
Inst. of Marine Science. Alaska Univ., College.
J.C.H. Mungall.
IMS Report R73-6, Sea Grant Report 73-17, (1973). 24 p, 17 fig. N00014-67-A-0317-0002 and Grant No. 04-3-158-41.

Descriptors: *Tides, *Tidal streams, *Tidal waters, *Currents(Water), *Inlets(Waterways), Ocean currents, Sea level, Water levels, Oceanographic data, Tidal effects, Maps, *Alaske, Hydrologic data, Water level fluctuation.
Identifiers: *Cook Inlet(Alaska), Tidal stream atlas, Current Atlas, Tide calculations, Current estimations, Current predictions, Current levels, Tidal model, M2 tide, Neap tides, Spring tides, Anchorage currents, Low tides, High tides, Tidal levels.

The purpose of this tidal stream atlas is to provide oceanographers and engineers with a convenient means of estimating currents in Cook Inlet. The currents were computed using a numerical tidal model whose original purpose was that of calculating the distribution of the amplitude and phase of the M2 tide Cook Inlet. The numerical model used as input was for the M2 tide across the seaward entrance of Cook Inlet, and was adjusted so as to give the best possible agreement between the computed and actual amplitude and phase Anchorage. As the differences between the computed and observed values throughout the re the inlet were small (in all cases less than 8% ference in amplitude and in phase) it was dec that the associated current amplitudes and ph would also be reasonably accurate and would vide information suitable for oceanographic o gineering use. The assumption was made tha ratios between Neap tides and Spring tides f M2 tide amplitude (0.8 and 1.6 throughout mu Cook Inlet) would hold good also for the curr Having computed the Neap and Spring curren was decided that the most convenient reference point would be the effective daily range at Anchorage taken from the tide ta (NOAA)
W75-12163

**ESTIMATION OF HURRICANE STORM SU IN APALACHICOLA BAY, FLORIDA,**
National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 2B.
W75-12164

**OCEANOGRAPHIC OBSERVATIONS IN GEORGIA BIGHT: DATA REPORT FOR EASTWARD CRUISES E-13-73 (4-11 TEMBER) AND E-19-73 (8-9 DECEMBER 19**
Skidaway Inst. of Oceanography, Savannah,
L. P. Atkinson.
Tech. Rpt. Series No. 75-6 (1975). 156 p, 1 f tab. GA-27725; NSF-GX-33615 and NSF 39141; R-800-372.

Descriptors: *Bays, *Topographic ma Topography, Hydrology, Hydrography, O Weather, Temperature, Water temper Water, Silicates, Nitrates, Salinity, Chloro Sampling, Carbon, Zooplankton, Water sam Georgia.
Identifiers: *Oceanographic observa *Georgia Bight, Water depth, Dissolved o carbon, Biological data, Carbon-14, Parti carbon, Particulate nitrogen, Benthic micro tebrates, Mercury analysis, Sediment size sis.

Data from Cruise E-13-73 (4-11 September and Cruise E-19-73 (8-9 December 1973) R.V. EASTWARD in the Georgia Bigh presented. Included are the NODC statio touts with the following data: depth, tempe salinity, oxygen, phosphate, nitrate, silicat solved organic carbon, weather, ships' po station time and depth. Biological data i chlorophyll, carbon-14 primary productivit ticulate carbon and nitrogen, principal zoo ton species and main benthic macroinverte Sediment size analysis and mercury analy also included. (NOAA)
W75-12169

**STD, CURRENT METER, AND DROGU SERVATIONS IN ROSARIO STRAIT, JAN - MARCH 1974,**
National Oceanic and Atmospheric Adm tion, Boulder, Colo. Environmental R Labs.
J. D. Schumacher, and R. M. Reynolds
Available from Superintendent of Doc U.S. Government Printing Office, Wash D.C. 20402. NOAA Technical Report E PMEL 24; June 1975. 226 p.

Descriptors: *Current meters, *Currents, measurement, *Water measurements, Ocean currents, Temperature, Salinity waters, Winds, Water circulation, Washing
Identifiers: *STD observations, Current m servations, *Drogue observations, Straits, STD measurements, Sigma-t dat data, Wind data.

aries of STD measurements, current meter rogue data from Rosario Strait and adjacent during January to March 1974 are ted as computer-generated plots and as con- of temperature, salinity, and sigma-t. Some nd wind data has been included to aid in data retation. (NOAA)
2175

RAL OCEAN PROGRAMS REVIEW.
mary bibliographic entry see Field 6E.
2200

CAL CHOICES SAVE SHORELINE,
mary bibliographic entry see Field 6G.
2231

GEN, PHOSPHORUS, AND EUTROPHI- N IN THE COASTAL MARINE EN- MENT,
Hole Oceanographic Institution, Mass.
mary bibliographic entry see Field 5C.
236

RINE SANCTUARY GRANTS--APPLICA- AND SELECTION CRITERIA CDURES.
l Oceanic and Atmospheric Administra- ckville, Md.
nary bibliographic entry see Field 6E.
262

R QUALITY AND SALT WATER INTRU- N THE LOWER NECHES RIVER,
Univ. Beaumont, Tex. Dept. of Biology.
nary bibliographic entry see Field 5C.
327

## ATER SUPPLY GMENTATION D CONSERVATION

## aline Water Conversion

SS FOR DEMINERALIZING WATER,
o Nazionale delle Ricerche, Rome (Italy).
e).
, and R. Passino.
atent No 3,901,781, 3 p, 3 ref; Official of the United States Patent Office, Vol 4, p 1416, August 26, 1975.

ors: *Patents, *Water treatment, *Water control, *Water purification, *Water ontrol, *Demineralization, *Pre-treatment Electrodialysis, Ion exchange, Resins, xchange.

ss for demineralizing water is disclosed mprises of a combination of a pre-treat- the water and an electrodialysis process neralization. The invention provides a ment system for the feed water to an elec- is demineralization plant where the water able alkalinity content. The pre-treatment he composition of the materials dissolved to reduce concentration and ohmic on resistances; to avoid scale formed by sits from the feed water; to remove from water colloidal substances which would precipitate on the membranes; to raise ity of actual current, increasing the f product and decreasing the specific d chemical reactant requirements; and to uric acid also at high concentration, in- ydrochloric acid, thus enabling an addi- nomy. The pre-treatment consists in an nge treatment carried out by using ion resins of a cation type to replace in the be fed to an electrodialysis process, the hard cations with H+ and Na+ ions, separately or together, using H+ to neutralize the HCO3- ions. The pre-treatment also regenerates the exhausted ion exchange resins. (Sinha-OEIS)
W75-12311

ANALYSIS OF REVERSE OSMOSIS FACILITIES, GREENFIELD, IOWA,
For primary bibliographic entry see Field 5F.
W75-12320

ON THE COMPARISON OF REVERSE OSMOSIS MEMBRANE PERFORMANCE,
Zagreb Univ. (Yugoslavia). Inst. of Physical Chemistry.
B. Kunst, G. Arneri, and Z. Vainaht.
Desalination, Vol 16, No 2, p 169-177, April, 1975. 4 fig, 3 tab, 10 ref.

Descriptors: *Reverse osmosis, *Membrane processes, Analytical techniques, Pressure, Porosity,Physical properties, Performance.
Identifiers: Pressure sensitivity.

Methods of comparing the operational performance of different reverse osmosis membranes are analyzed. The inherent porosity of a membrane was shown to affect systematically the extent of concentration polarization at the high pressure side of the film. The development of a proposed method for determining the value of membrane flux needed to compare various membranes is documented. It was shown that the inherently more porous Batch 316- and 400-type reverse osmosis membranes do not show improved performances at the highest operating pressures (102atm). This is due to the tendency of high pressure to close the small-size pores that are initially generated in these types of membranes. The pressure sensitivity of such membranes, caused by the increased concentration polarization above the more porous membranes, should be considered when comparing the performances of different reverse osmosis membranes. (Kramer-FIRI.)
W75-12347

## 3B. Water Yield Improvement

GEOHYDROLOGY OF COLLIER COUNTY, FLORIDA,
Dames and Moore, Park Ridge, Ill.
For primary bibliographic entry see Field 4B.
W75-11874

GRAPHIC SOLUTION TO FRACTURE TREATMENT DESIGN,
Amoco Production Co., Tulsa, Okla.
For primary bibliographic entry see Field 8B.
W75-11876

A NEW LOOK AT SANDSTONE ACIDIZING,
Exxon Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 4B.
W75-11878

INNOVATIVE WORKOVER FOR WASSON WATER WELLS,
F. Holasek.
Water Well Journal, Vol 29, No 5, p 76-77, May, 1975. 1 fig.

Descriptors: *Water wells, *Wells, *Water supply, *Specific capacity, *Water yield, Dependable supply, Groundwater, Reservoir supply, Water supply development, Flow rate, Sand aquifer, *Texas.
Identifiers: Production rate, Gaines County(Tex), Ogallala aquifer.

The Wasson water field, Gaines County, Texas, supplies several major petroleum companies with water for secondary oil recovery processes. The wells produce from the Ogallala and Cretaceous formations at about 200 feet. A recent increase in the production rates of the existing wells was made by removing the gravel packs and washing the formation with a high velocity water-jet containing abrasives. Wells treated in this way increased in production considerably. For example, the first well treated increased in production rate from 190 gpm to 650 gpm after treatment. (Bradbeer-NWWA)
W75-11890

SOUTHERN NEVADA WATER PROJECT.
Water and Sewage Works, Vol. 120, No. 4, p 68-70, May, 1973. 6 fig.

Descriptors: *Water supply, *Water sources, Water table, Reservoirs, Tunnels, Pumps, Population, Construction, *Nevada.
Identifiers: Las Vegas(Nev.), Lake Mead(Nev.).

Between 1960 and 1970 the permanent population of Las Vegas, Nevada increased from 127,000 to 270,000. Under this pressure, the water table was dropping at a rate of 10 feet per year. In some places the ground actually sank. To solve the problem, the Bureau of Reclamation worked with city, state, and federal governments to find a new source of water for Las Vegas and the surrounding area. A 200-foot deep reservoir was blasted from the rock about 1.5 miles from Lake Mead and a lateral tunnel was drilled to connect the new reservoir to the lake. The motors for ten turbine pumps were installed in a building constructed on top of the reservoir. The pumps were lowered 120 feet to lift the water for transportation to the city. The pumps are capable of pumping as much as 200 mgd to the Las Vegas area. The water flows four miles through a 12-foot diameter tunnel through an adjacent mountain range. (Sandoski-FIRI.)
W75-11913

A THREE-COMPONENT, NONLINEAR WATER-YIELD MODEL,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
For primary bibliographic entry see Field 2A.
W75-12031

WEATHER MODIFICATION: WHERE ARE WE NOW AND WHERE SHOULD WE BE GOING. AN EDITORIAL OVERVIEW,
National Hurricane and Experimental Meteorology Lab., Coral Gables, Fla.
R. I. Sax, S. A. Changnon, L. O. Grant, W. F. Hitschfield, and P. V. Hobbs.
Journal of Applied Meteorology, Vol 14, No 5, p 652-672, August 1975. 71 ref.

Descriptors: *Weather modification, *Reviews, *Meteorology, Cloud seeding, Artificial precipitation, Hail, Fog, Clouds, Cloud physics, Hurricanes, Orography, Water resources, Water supply, Droughts, Water management(Applied), Precipitation(Atmospheric), Political aspects, Agroclimatology, Artificial storms, Research priorities.
Identifiers: Inadvertent weather modification, Hail suppression, Orographic precipitation, Convective clouds, Fod modification, Hurricane modification.

Attention was focused on where we are now and where we should be going with respect to several important areas of weather modification. These areas were: (1) inadvertent mesoscale weather and climate modification, (2) hail suppression, (3) weather modification for augmenting orographic precipitation, (4) convective cloud modification, (5) hurricane modification, (6) weather modification for water management, and (7) fog modification. The discussion was mainly editorial in nature

and represented the opinions of the authors. It was concluded that considerable progress has been made in weather modification during the past quarter-century. Progress has been slower in some areas than in others, but the overall feeling is optimism--Optimism that the scientific problems of today can be solved by careful research in the future. (Sims-ISWS)
W75-12088

**ON THE VARIABILITY OF 'DYNAMIC SEEDABILITY' AS A FUNCTION OF TIME AND LOCATION OVER SOUTH FLORIDA: PART I. SPATIAL VARIABILITY,**
National Hurricane and Experimental Meteorology Lab., Coral Gables, Fla.
W. R. Cotton, and A. Boulanger.
Journal of Applied Meteorology, Vol 14, No 5, p 710-717, August 1975. 12 fig, 11 ref.

Descriptors: *Weather modification, *Cloud seeding, *Florida, *Sounding, Atmosphere, Cloud physics, Atmospheric physics, Model studies, Mathematical models, Artificial precipitation, Nucleation, Air masses, Temperature, Humidity, Meteorology.
Identifiers: *Atmospheric soundings, Cumulus models.

Using a one-dimensional cumulus model, predictions of the effects of seeding cumulus clouds were performed during the month of July 1973 as a part of the Experimental Meteorology Laboratory FACE 1973 Experiment. The calculations were performed with the Miami 1200 GMT soundings and soundings taken in the interior of Florida at 1400 GMT at the so-called Central Site (CS) location. A comparison of 'seedability' predictions using the Miami 1200 GMT and CS 1400 GMT soundings have shown that substantial differences between the two seedability predictions occur on a number of days in spite of the fact that the soundings are separated in time by only 2 h and in space by only 110 km. The differences can be attributed to the frequent intrusion of dry air masses of varying height and thickness. The intensity of the dry layers are generally greatest over the higher-latitude CS location. The greatest differences between the two soundings, and hence the greatest difference between the predicted seeding effects, occurred during periods of transition from a disturbed, westerly flow regime to a well-defined, deep, easterly flow regime. (Sims-ISWS)
W75-12089

**A DETAILED MICROPHYSICAL SIMULATION OF HYGROSCOPIC SEEDING ON THE WARM RAIN PROCESS,**
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
R. D. Farley, and C. S. Chen.
Journal of Applied Meteorology, Vol 14, No 5, p 718-733, August 1975. 15 fig, 2 tab, 41 ref, 2 append. Bureau of Reclamation 14-06-D-6796, NSF GA-36910X.

Descriptors: *Weather modification, *Model studies, *Cloud seeding, Cloud physics, Salts, Mathamatical models, Nucleation, Advection, Condensation, Coalescence, Raindrops, Drops(Fluids), Artificial precipitation, Precipitation(Atmospheric), Meteorology
Identifiers: *Cloud models, Warm rain process, Drop breakup.

The Wisner one-dimensional time-dependent model has been modified to allow the condensed water forms to be represented by 52 logarithmically spaced size categories covering a range of just under 2 micrometers radius to slightly less than 5 mm radius. The size distribution of the water drops was allowed to evolve with time as a result of the physical processes of vertical advection, condensation/evaporation, stochastic coalescence, and drop breakup. Salt seeding was simulated by introduction of a distribution of raindrop embryos at cloud base for a specified period of time. The raindrop embryo distribution was derived from calculations on the diffusional growth of a distribution of salt particles in the unsaturated air below cloud base. This model was applied to the 23 July 1970 salt seeding case near Rapid City. This 'detailed microphysical' study has indicated that salt seeding can be effective in stimulating the warm rain process only if breakup-induced chain reactions result. In order for the chain reaction to develop, high vertical velocities (greater than 10 m/s) are required. Salt seeding acts mainly as a catalyst in initiating this Langmuir-type chain reaction. Without breakup, salt seeding has little effect other than to allow a few of the big drops to fall out of the model clouds. Breakup acting alone may cause the model clouds to precipitate but much longer periods are required than when seeding and breakup are combined. The effects of salt seeding and breakup induced chain reactions are also strongly dependent on the dynamics of the model cloud. (Sims-ISWS)
W75-12090

**FLORIDA AREA CUMULUS EXPERIMENTS 1970-1973 RAINFALL RESULTS,**
Virginia Univ., Charlottesville. Dept. of Environmental Sciences; and Virginia Univ., Charlottesville. Center for Advanced Studies.
J. Simpson, and W. L. Woodley.
Journal of Applied Meteorology, Vol 14, No 5, p 734-744, August 1975. 16 fig, 9 tab, 26 ref.

Descriptors: *Weather modification, *Cloud seeding, *Artificial precipitation, *Florida, Rainfall, Clouds, Cloud physics, Silver iodide, Mathematical models, Networks, Rain gages, Radar, On-site investigations, Sampling, Analytical techniques, Evaluation, Meteorology.
Identifiers: *Cumulus clouds, Cloud mergers.

After four summer periods of randomized experimentation with dynamic cumulus seeding in a 13,000 sq km target area in south Florida, 14 seed and 23 control cases are available, with increased documentation of radar measurement accuracy. Seed-control rainfall comparisons are made for 'floating' and total target for the 6 hour period following the first seeding. On days screened as suitable for the experiments, natural rain volume varied by a factor of 62 for floating target and by a factor of 25 for total target. Area seed-control rainfall differences are not significant with six classical tests, nor is the difference between random and non-random controls. Analysis of isolated experimental clouds obtained on days of multiple cloud seeding produced significant findings. Results were stratified depending on whether the single clouds dissipated in the target area without merger or whether they merged with a neighbor. With the former stratification, the mean seeded rainfall exceeded the mean control rainfall by a factor of 2, a result that is consistent with earlier single cloud studies. No meaningful rainfall comparison was possible with the latter stratification because, on the average, the seeded clouds merged (and were dropped) 13 min earlier than the controls. This disparity in mean lifetimes before merger suggests that seeding is promoting merger in Florida Area Cumulus Experiments as intended. (Sims-ISWS)
W75-12091

**SMALL-SCALE VARIABILITY OF HAIL AND ITS SIGNIFICANCE FOR HAIL PREVENTION EXPERIMENTS,**
Illinois State Water Survey, Urbana.
G. M. Morgan, Jr., and N. B. Towery.
Journal of Applied Meteorology, Vol 14, No 5, p 763-770, August 1975. 12 fig, 3 tab, 20 ref. NSF GI-37859.

Descriptors: *Hail, *Variability, *Weather modification, *Illinois, Areal, Size, Distribution patterns, Sampling, On-site investigations, Networks, Measurement, Crops, Damages, Statistics, Meteorology.
Identifiers: *Hail variability, Hail suppression, Hailswaths

Studies of small-scale variability of hailfa parameters are being pursued using fine-scale ne works of passive hail sensors of various design These studies have revealed the great variabili which exists in objective hail parameters over ve short distances. The objective of the fine-sca measurements is to eventually produce a statistic hailstreak model with which to assess the unce tainty produced by making areal hail estimat with coarse networks as part of hail prevention e periments. An example of such an assessment i a single hailstreak crop-loss pattern illustrated t problem and demonstrated that, for the particu damage pattern used, a square grid with 1 mi spa ing would estimate the areal damage within 2 accuracy 80% of the time. (Sims-ISWS)
W75-12092

**FORMATION OF GRAUPEL,**
Naval Weapons Center, China Lake, Calif.
R. E. Reinking
Journal of Applied Meteorology, Vol 14, No 5 745-754, August 1975. 7 fig, 4 tab, 23 ref. Bureau Reclamation 14-06-D-6592.

Descriptors: *Graupel, *Rime, *Cloud phys *Weather modification, Snow, Crystals, S Growth rates, Clouds, Sampling, Analyt techniques, Cloud seeding, Meteorolo *California.
Identifiers: *Sierra Nevada(Calif)

Measurements were made of the sizes and conc trations of graupel and snow crystals occurrin seeded and untreated winter storms of the Si Nevada. The amounts of rime on individual s crystals were also determined. The observat show that crystal riming, and formation precipitation of graupel, are common to all st of Sierran snowstorms. Graupel occurs simult ously with all types of snow crystals, but dividual crystal types do not consistently o with or serve as kernels for particles of gra Graupel particles do not develop predominanti kernel snow crystals that grow to relatively l sizes over relatively long periods by depos and accretion. Graupel often forms instead select few small crystals, when it forms util regular crystals as kernels. Graupel frequ develops without kernels, by alternate ri processes. One possible alternative mechanism that produces graupel from rime mulated at localized points on parent crystals. (Sims-ISWS)
W75-12093

**HAIL SUPPRESSION DATA FROM WEST NORTH DAKOTA, 1969-1972,**
South Dakota School of Mines and Techno Rapid City. Inst. of Atmospheric Sciences.
J. R. Miller, Jr, E. I. Boyd, R. A. Schleusener, A. S. Dennis.
Journal of Applied Meteorology, Vol 14, N 755-762, August 1975. 5 fig, 10 tab, 13 ref. B of Reclamation 14-06-D-6660.

Descriptors: *Weather modification, *Artificial precipitation, *North Dakota, seeding, Crops, Damages, Silver iodide, derstorms, Storms, Precipitation(Atmosph Analytical techniques, Meteorology.
Identifiers: *Hail suppression, Crop da Crop-hail losses

Four seasons of hail data were gathered on domized cloud seeding project aimed at re hail damage and increasing rainfall in w North Dakota. Hail on seed days was ge less severe than on no-seed days. Statistic of data from passive hail indicators do not rejection of the null hypothesis at the 90 fidence level, but application of rank tests t hail insurance loss data indicated that the

ced crop damage from hail. Post-analyses of
ed data indicated that: (1) the ratio of rainfall
unt to hail energy was greater for seed days
no-seed days, and (2) radar characteristics of
ed storms differ from those of unseeded
ns. In addition, case studies of 34 storms in-
ed that damaging hail was usually suppressed
their updraft areas were seeded continu-
. (Sims-ISWS)
-12094

**GN OF A HAIL SUPPRESSION PROJECT
ILLINOIS,**
is State Water Survey, Urbana.
Changnon, G. M. Morgan, Jr., G. L.
emeier, N. G. Towery, and R. C. Grosh.
al of Applied Meteorology, Vol 14, No 5, p
82, August 1975. 6 fig, 3 tab, 19 ref. NSF GI-
).

riptors: *Weather modification, *Hail,
ects, *Illinois, Social aspects, Silver iodide,
omics, Research facilities, Forecasting, Sam-
On-site investigations, Operations, Cloud
ng, Planning, Feasibility studies, Meteorolo-

ifiers: *Hail suppression, *Project design.

ad program to Design and Experiment to
ess Hail (DESH) in Illinois was described.
program draws on results acquired during 17
of extensive hail research in Illinois. The
pal task of DESH is to determine the desira-
and the feasibility of hail suppression experi-
tion in Illinois and the Midwest. Socio-
mic studies have led to an affirmative con-
n on the desirability issues. The feasibility
on appears affirmative and rests on certain
esults. Airborne cloud base seeding in the
midwestern environment is possible but will
re difficult and expensive than in less humid
Radar will be needed for short-term
sting, aircraft operations, identification of
ial hail-storms, and in the evaluation of
g effectiveness. Weather forecasting by ob-
techniques will be valuable in both opera-
and evaluation, and adequate objective
ques have been largely developed. The
l shape of the proposed experiment is now
It will consist of an impact monitoring ef-
which will make assessments of societal, en-
ental, and economic impacts and commu-
with the public; an operational effort to ex-
the experiment according to the final
d design; and an evaluation effort combin-
ariety of surface, synoptic, and radar data
ess the efficacy of the chosen seeding
ue. (Sims-ISWS)
2095

**NATURE OF WINTER CLOUDS AND
PITATION IN THE CASCADE MOUN-
AND THEIR MODIFICATION BY AR-
AL SEEDING. PART I: NATURAL CON-
NS,**
gton Univ., Seattle. Dept. of Atmospheric
es.
obbs.
of Applied Meteorology, Vol 14, No 5, p
, August 1975. 25 fig, 3 tab, 23 ref. Bureau
amation 14-06-D-6999, NSF GA-17831, GI-

tors: *Clouds,
itation(Atmospheric), *Snow,
ngton, Winter, Weather, Weather data,
ins, Data collections, On-site investiga-
Moisture content, Cloud physics, Sampling,
ng, Ice, Graupel, Crystals, Rime,
Atmospheric), Atmosphere, Winds,
ology.
ers: *Cascade Mountains.

the first of three papers describing and
ng field investigations, carried out from
1974, of winter clouds and precipitation in the Cascade Mountains of Washington State and their modification by artificial seeding. Airborne and ground observations of the natural clouds and precipitation were described here. It was observed that: (1) in pre-frontal conditions ice particles dominate over water droplets above the -10C level, but the ratio of ice to water is lower in post-frontal conditions; (2) the passage of an occluded or warm front causes a sharp lowering of the diffusional growth layers of the ice crystals, so that particles reaching the ground change from unrimed crystals which grow at low temperatures to rimed crystals which form a higher temperatures; (3) the maximum ice particle concentrations in the clouds are often several orders of magnitude greater than measurements of ice nuclei would suggest; (4) the growth of precipitation particles by riming and aggregation is particularly rapid in the last kilometer of fall; (5) snow particles reaching the ground originate 10 to 100 km upwind; and (6) on the western slopes of the Cascades the degree of riming and precipitation rates increase with increasing wind speed and water vapor content at 3 km, but this is not the case on the eastern slopes of the Cascades. (Sims-ISWS)
W75-12096

**A NUMERICAL MODEL OF PRECIPITATION FROM SEEDED AND UNSEEDED COLD OROGRAPHIC CLOUDS,**
Denver Research Inst., Colo.
M. N. Plooster, and N. Fukuta.
Journal of Applied Meteorology, Vol 14, No 5, p 859-867, August 1975. 4 fig, 3 tab, 17 ref. Bureau of Reclamation 14-06-D-7048, NSF GI-39849.

Descriptors: *Weather modification, *Cloud seeding, *Model studies, *Mathematical models, Artificial precipitation, Cloud physics, Air circulation, Silver iodide, Nucleation, Computer models, Simulation analysis, Meteorology.
Identifiers: *Orographic clouds, Flow models, Cloud physics models, Seeding rates.

A numerical model of ice-phase precipitation from orographic clouds which includes the effects of seeding the artificial ice nuclei was described. The model described the events which take place when a layer of moist air of near-neutral stability, overlain by a more stable dry layer, flows over a mountain ridge. A two-dimensional, steady-state model of the flow in the vertical plane normal to the ridge furnished a field of the flow streamlines along which microphysical processes are followed. The cloud physics model described the formation of the supercooled cloud, the formation of ice particles from both natural and artificial ice nuclei, and the growth and precipitation of ice particles. Growth by both vapor deposition and riming were included. Artificial ice nuclei were released from a localized source at ground level. A simple Fickian diffusion process was used to describe the vertical transport of nuclei to the cold upper region of the cloud. The model calculated the rate of precipitation at ground level as a function of horizontal position. The dependence of precipitation efficiency on cloud top temperature was in good agreement with field observations from the Climax experiment. Substantial precipitation increases were produced by seeding clouds whose natural precipitation efficiences are low. However, it was shown that the seeding rate required to produce a given increase in precipitation rate is a strong function of cloud temperature. The model also showed that precipitation rates depend upon the activity of the ice nuclei as a function of temperature. (Sims-ISWS)
W75-12098

**TESTING OF CLOUD SEEDING MATERIALS AT THE CLOUD SIMULATION AND AERSOL LABORATORY, 1971-1973,**
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
D. M. Garvey.
Journal of Applied Meteorology, Vol 14, No 5, p 883-890, August 1975. 9 fig, 2 tab, 3 ref. NSF GI-32894X2.

Descriptors: *Weather modification, *Cloud seeding, *Nucleation, *Testing, Evaluation, Testing procedures, Analytical techniques, Instrumentation, Research facilities, Crystals, Aerosols, Iodides, Silver iodide, Cloud physics, Meteorology.
Identifiers: *Cloud chambers, Ammonium iodide.

Developments in instrumentation at the Cloud Simulation and Aerosol Laboratory at Colorado State University since the Second International Workshop on Condensation and Ice Nuclei were outlined. Emphasis was given to improvements in the isothermal cloud chamber and the current status of a second-generation, controlled slow-expansion cloud chamber in which ascent of an air parcel may be simulated. Work with the aerosol dilution system (wind tunnel) was also described. Tests conducted during the three years 1971 through 1973 to determine the ice nucleus production of many currently used cloud-seeding devices were summarized. Effectiveness curves for nine ground-based steady-state generators burning various solutions of AgI-NH4I and AgI-NaI in acetone were presented. Test results for three airborne generators were also given and contrasted with the results for the ground generators. Finally, effectiveness values were presented for a number of pyrotechnics manufactured by Olin, Colspan, Sierra Research, and Naval Weapons Center. The need for caution in the use of such effectiveness curves in the design of weather modification experiments was stressed. It is believed that optimal 'dosages' of artificial nuclei for natural clouds can be determined using cloud chamber measurements. But probable differences in cloud characteristics and aerosol residence times both in cloud and in transit to cloud must be taken into account. Such considerations, together with a more accurate simulation of operational conditions of ventilation for different cloud-seeding devices, constitute a major thrust of current research effort at the Simulation Laboratory. (Sims-ISWS)
W75-12099

**AN EXPLANATION FOR THE UNUSUAL NUCLEATING ABILITY OF AEROSOLS PRODUCED FROM THE AGI-NH4I-ACETONE SYSTEM,**
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
B. L. Davis, L. R. Johnson, and F. J. Moeng.
Journal of Applied Meteorology, Vol 14, No 5, p 891-896, August 1975. 4 fig, 4 tab, 18 ref. NSF GI-34806.

Descriptors: *Nucleation, *Cloud seeding, *Weather modification, Silver iodide, Aerosols, Chemistry, Cystallography, Ice, Crystals, Ammonium compounds, Iodides, Laboratory tests, Meteorology.
Identifiers: *Ammonium iodide, Acetone.

The exceptional ice nucleating ability of aerosols obtained from combustion of AgI-NH4I-acetone solution is now well known. The high nucleating ability has been determined to come from the existence of a complex compound having a better epitaxial fit with respect to ice than has silver iodide. The compound has a stability region which includes the temperature interval of -20 to +9C at water saturation and has been observed to be present on AgI aersol particles produced from standard aircraft seeding generators in a wind tunnel dilution system. Its presence is presumed to occur as a result of incomplete destruction of the NH4(+) of the original solution. Although the unit cell of the phase is monoclinic, c-centered, it has a close packed structure nearly identical to silver iodide in the ao-bo crystallographic plane. In this plane the phase has a misfit with respect to the basal plane of ice of 1.3% at -7C as compared to 1.5% for silver iodide. The composition of the

phase is 3AgI-NH4I-6H2O but with 25% of the silver positions being vacant on the average. Compositions of 2:1 mole ratio AgI:NH4I can also exist in an apparent metastable state. The threshold of ice nucleation for the pure B sub n phase was found to be -1C as contrasted to the recognized -4C threshold for silver iodide. (Sims-ISWS)
W75-12100

**ANALYSIS OF RADAR OBSERVATIONS OF A RANDOMIZED CLOUD SEEDING EXPERIMENT,**
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
A. S. Dennis, A. Koscielski, D. E. Cain, J. H. Hirsch, and P. L. Smith, Jr.
Journal of Applied Meteorology, Vol 14, No 5, p 897-908, August 1975. 7 fig, 9 tab, 11 ref. Bureau of Reclamation 14-06-D-6796.

Descriptors: *Weather modification, *Cloud seeding, *Artificial precipitation, Analytical techniques, Rainfall, Storms, Radar, Aircraft, Remote sensing, Silver iodide, Sodium chloride, Mathematical models, Correlation analysis, Regression analysis, Projects, Project planning, Meteorology.

Magnetic tape records for radar observations of 80 moving one-hour test cases in a three-way randomized (no-seed, salt, silver iodide) cloud seeding experiment have been analyzed in terms of echoing areas and radar-estimated rainfall amounts. Individual test cases ranged from nonprecipitating cumulus up to moderate thunderstorms with echoing areas exceeding 100 sq km and rainfall estimated at 3000 kT in 1 hour. Out of numerous predictor variables, cloud depth was found to be the best single predictor for both echoing area and radar-estimated rainfall. The echoing area and radar-estimated rainfall were very closely correlated. A cube-root transformation of the radar-estimated rainfall improved the correlation between cloud depth between cloud depth and the radar-estimated rainfall for the no-seed (control) sample to 0.91. For clouds of a given depth, both the echoing area and radar-estimated rainfall were larger in seeded than in unseeded cases. The differences between no-seed and salt cases were of marginal statistical significance, but the differences in echoing area and rainfall between no-seed and silver iodide cases were significant at the 1% level. The indicated effects, expressed as a percentage of the echoing area or radar-estimated rainfall in the no-seed cases, decreased with cloud depth. A comparison of no-seed and AgI cases with the aid of a one-dimensional steady-state cloud model showed that AgI seeding may have led to increases in maximum cloud height averaging 600 m. It was concluded that seeding affected the precipitation in the Cloud Catcher test cases through both the microphysical processes and the cloud dynamics. (Sims-ISWS)
W75-12101

**ON THE EFFECT OF NATURAL RAINFALL VARIABILITY AND MEASUREMENT ERRORS IN THE DETECTION OF SEEDING EFFECT,**
Battelle-Northwest, Richland, Wash.
A. R. Olsen, and W. L. Woodley.
Journal of Applied Meteorology, Vol 14, No 5, p 929-938, August 1975. 3 fig, 4 tab, 11 ref.

Descriptors: *Rinfall, *Variability, *Measurement, *Florida, Radar, Remote sensing, Rain gages, Cloud seeding, Weather modification, Precipitation(Atmospheric), Rain, Areal, Rain-fall disposition, Statistics, Meteorology.
Identifiers: *Measurement errors, Seeding effects.

Natural rain variability and measurment errors are obstacles to the determination of the seeding effect in convective cloud seeding experiments. The relative importance of these problems in Florida was evaluated. The major thrust of the work was embodied in a computer simulation of area cloud seeding experiments for two areas (570 sq km and 13,000 sq km) using field measurements as input. The effect of natural rain variability was studied as it related to the power functions of selected statistical tests for seeding effect. Measurement errors for gage and radar systems were introduced by modifying the underlying distribution of area mean rainfall. For the two Florida areas, natural rain variability is by far the major obstacle to the determination of a seeding effect. Errors are of lesser importance for the system of rain measurement used in Florida, which involves radar-rain estimates adjusted by gages. With a less accurate system of rain measurement, errors would assume greater relative importance. It was concluded that to detect a particular seeding effect with a minimum number of cases, the importance of natural rain variability must be decreased through either stratification of the experimental days or through meteorological predictors. The measurement system used by the Experimental Meteorology Laboratory is adequate for the evaluation of its seeding experiments and little will be gained through the expenditure of time and effort to improve it further. (Sims-ISWS)
W75-12103

**THE EFFECT OF PERSISTENCE OF AGI ON RANDOMIZED WEATHER MODIFICATION EXPERIMENTS,**
Bureau of Reclamation, Denver, Colo.
D. Rottner, S. R. Brown, and O. H. Foehner.
Journal of Applied Meteorology, Vol 14, No 5, p 939-945, August 1975. 5 fig, 2 tab, 17 ref.

Descriptors: *Weather modification, *Cloud seeding, *Silver iodide, *Persistence, *Colorado, *New Mexico, Rainfall, Precipitation(Atmospheric), Ice, Nucleation, Statistics, Statistical methods, Evaluation, Aircraft, Rain gages, Atmosphere, Sounding, Mountains, Meteorology.
Identifiers: *Ice nuclei, Seeding effects.

The hypothesis was tested that AgI may persist for long periods of time and contaminate control experimental days when these control days immediately follow a seeded day. When the first 6-hour periods of all such potentially contaminated days were placed in the seeded population for two randomized weather modification experiments, the Colorado River Basin Pilot Project in the San Juan Mountains and the Jemez Atmospheric Water Resources Research Project, a statistically significant seeding effect was detected. When the first 6-hour periods were not included in either population a significant seeding effect was also detected. However, when the possibly contaminated periods were included in the control population, an inconclusive seeding effect was noted. Support for the hypothesis was obtained by making aircraft measurements of ice nuclei on days following seeded days in the San Juan experiment. Ice nuclei counts of 2 to 3 orders of magnitude above background were found under certain conditions. (Sims-ISWS)
W75-12104

**ON THE DESIGN AND EVALUATION OF CUMULUS MODIFICATION EXPERIMENTS,**
Virginia Univ., Charlottesville. Dept. of Environmental Sciences; and Virginia Univ., Charlottesville. Center for Advanced Studies.
J. Simpson, J. C. Eden, and A. R. Olsen.
Journal of Applied Meteorology, Vol 14, No 5, p 946-958, August 1975. 20 fig, 9 tab, 24 ref.

Descriptors: *Weather modification, *Cloud seeding, *Evaluation, *Florida, Statistics, Project planning, Rainfall, Precipitation(Atmospheric), Measurement, Simulation analysis, Mathematical models, Probability, Frequency analysis, Histograms, Meteorology.
Identifiers: *Seeding effects, Cumulus clouds.

Combination of numerical simulation, many sim
taneous measurements, and a large assortmen
statistical tools employed at all stages have b
found useful in design and evaluation of modif
tion experiments on cumulus clouds. A
domized sample is essential although non rand
controls have supplemented it by providing ne
sary information on natural distributions. A 26
data set from a dynamic seeding experiment
isolated Florida cumuli was used here. Numer
simulation of seeded and unseeded cumu
towers defined the key screening vari
'seedability,' namely the predicted height
ference between seeded and unseeded tower
that only days on which the physical see
hypothesis would be expected to work
selected for experimentation. On those days,
domization was between clouds selected by
experimenters as suitable. Classical and Baye
statistics were used together in the evalua
with both univariate and multivariate analy
Various well-known probability density distr
tions fitted the seeded and unseeded rainf
Among the best were gamma, log-normal, be
and beta-P. Seed-control differences were
amined with nonparametric and parametric
(some of the latter after data transformation)
effects of random and systematic measuremen
rors were considered. In all tests, the seed-co
rainfall difference was significant at better
5%. A multiplicative seeding factor of 2.3 was
mated in several ways (allowing for or ge
around the bias problem with ratio estimator
lated to long-tailed distributions). (Sims-ISWS
W75-12105

**EVALUATION BY MONTE CARLO TESTS EFFECTS OF CLOUD SEEDING ON GROW SEASON RAINFALL IN NORTH DAKOTA,**
South Dakota School of Mines and Techno
Rapid City. Inst. of Atmospheric Sciences.
A. S. Dennis, J. R. Miller, Jr., D. E. Cain, and Schwaller.
Journal of Applied Meteorology, Vol 14, No 959-969, August 1975. 3 fig, 7 tab, 12 ref. Bure
Reclamation 14-06-D-6660.

Descriptors: *Weather modification, *Cloud
ing, *Evaluation, *North Dakota, Projects,
processing, Monte Carlo method, Stratific
Statistics, Statistical methods, Rainfall, Art
precipitation, Precipitation(Atmospheric),
iodide, Radar, Rain gages, Hail, Meteorology

Rainfall data collected at 67 gages in a 2750
target area during a 4-year randomized cloud
ing experiment in North Dakota have
stratified in a variety of ways and subject
statistical tests. Some stratifications relat
cloud model predictions were possible for on
last two years when a rawinsonde statio
operated as part of the project. Monte Car
periments simulating 500 reruns of the 4-ye
periment have been used to establish signifi
levels for the tests within each data stratific
The analysis provided significant evidenc
seeding convective clouds on a determinate
days leads to: (1) an increase in the frequen
rainfall events at the individual target gages,
increase in the average rainfall recorded pe
fall event, and (3) an increase in total rain
the target. This evidence applied to those
with dynamic seedability; that is, days for w
cloud model predicted an increase in clo
height under the influence of silver iodide se
Rainfall observations on days when the
model predicted no increase in cloud
showed no significant differences betwee
and no-seed days. There was no obvious
account for the significant differences be
seed and no-seed days with dynamic seedab
was tentatively concluded that dynamic e
including rainfall increases, were produc
light to moderate silver iodide seeding from
cloud base. The potential rainfall increase
ing from seeding below selected clouds o
with dynamic seedability was estimated
inch per growing season. (Sims-ISWS)

12106

ESIAN AND CLASSICAL STATISTICAL HODS APPLIED TO RANDOMIZED THER MODIFICATION EXPERIMENTS,
lle-Northwest, Richland, Wash.
Olsen.
al of Applied Meteorology, Vol 14, No 5, p 73, August 1975. 7 ref.

iptors: *Weather modification, *Cloud seed- Evaluation, *Statistics, Statistical methods, processing, Rainfall, Artificial precipitation, pitation(Atmospheric), Mathematics, Mathe- al models, Statistical models, Meteorology, astic processes.
fiers: *Randomized experiments, Bayesian ds.

ical procedures for analyzing the results of mized weather modification experiments presented in a format designed to emphasize nderlying assumptions. A parallel develop- of Bayesian and classical statistical ques was given to demonstrate that both dologies can be used under tye assumed ex- ental conditions and that the difficulties in ng either are comparable. (Sims-ISWS)
2107

NATURE OF WINTER CLOUDS AND IPITATION IN THE CASCADE MOUN- S AND THEIR MODIFICATION BY AR- IAL SEEDING. PART II: TECHNIQUES THE PHYSICAL EVALUATION OF SEED-

ngton Univ., Seattle. Dept. of Atmospheric es.
Hobbs, and L. F. Radke.
l of Applied Meteorology, Vol 14, No 5, p 8, August 1975. 12 fig, 1 tab, 28 ref. Bureau lamation 14-06-D-6999, NSF GA-17381, GI-

ptors: *Weather modification, *Cloud seed- *Evaluation, *Washington, Mountains, , Sampling, Aircraft, Radar, Instrumenta- Measurement, Equipment, Cloud physics, Crystals, Ice, Precipitation(Atmospheric), e data collections, Silver iodide, Nucleation, rology.
iers: *Cascade Mountains.

ne, ground, and radar techniques used for ing the effects of artificial seeding on clouds and precipitation over the Cascade ains were described. The clouds were for 1 or 2 hr with silver iodide and/or dry persed from an aircraft at locations which e trajectory analysis, based on field data, in- would affect precipitation in a small (90 sq redetermined target area straddling the e crest. The effects of seeding on the were determined from the aircraft through bservations, ice nuclei measurements, and rements of the type and concentrations of articles. A Doppler radar located near the e crest was used to measure the spectra of eds of the precipitation particles. At l stations within the target area on the , measurements and observations were before, during, and after seeding of tation rates; the types, concentrations, and s of riming of snow crystals; and the con- ions of freezing nuclei and silver in the ll. The effects of heavy seeding on the were generally pronounced and measura- od physical evidence for artificial modifica- f snowfall on the ground within the target as not as common, but was obtained in a of detailed case studies. (See also W75- (Sims-ISWS)
2108

**THE NATURE OF WINTER CLOUDS AND PRECIPITATION IN THE CASCADE MOUNTAINS AND THEIR MODIFICATION BY ARTIFICIAL SEEDING. PART III: CASE STUDIES OF THE EFFECTS OF SEEDING,**
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
P. V. Hobbs.
Journal of Applied Meteorology, Vol 14, No 5, p 819-858, August 1975. 50 fig, 10 tab, 11 ref. Bureau of the Reclamation 14-06-D-6999, NSF GI-17381, GI-31759.

Descriptors: *Weather modification, *Cloud seeding, *Washington, Sampling, Aircraft, Evaluation, Measurement, Mountains, Winter, Snow, Precipitation(Atmospheric), Artificial precipitation, Crystals, Rime, On-site data collections, Silver iodide, Nucleation, Cloud physics, Meteorology.
Identifiers: *Cascade Mountains, *Case studies.

Three case studies were described to evaluate the effects of artificial seeding from the air on cloud structure and snowfall on the ground in a small predetermined target area in the Cascade Mountains. On January 31, 1972, stratocumulus clouds just west of the Cascade crest were heavily seeded with silver iodide for 72 min. Airborne observations showed that the clouds were glaciated by the artificial seeding, new crystal types appeared, and there was an increase in convective activity. On the ground in the target area new snow crystal types appeared, riming decreased, freezing nuclei in the snowfall increased, and the snowfall rate decreased during the predicted period-of-effect (PPE) of seeding. Stratocumulus clouds over the Cascades were heavily seeded with silver iodide and dry ice for 77 min on January 19, 1973. Clouds, glaciated by the seeding, were tracked over the target area from the aircraft. A 2.5-fold and 10-fold increase in precipitation occurred in the target area at Snoqualmie Pass and Kachess Dam, respectively, during the PPE. At the same time the amounts of silver in the snowfall increased. Twenty-six cumulus clouds over the Cascades were seeded with silver iodide on March 27, 1973. There were sharp increases in the ice content of these clouds and snow fell from them over the target area during the PPE, causing snow showers at Snoqualmie Pass and Hyak. These detailed physical evaluations support preictions, based on observations of the natural clouds and precipitation and theoretical computations, that snowfall across the Cascade Mountains can be redistributed and increased by artificial seeding. (See also W75-12108) (Sims-ISWS)
W75-12109

**METHOD OF CLEANING AND STIMULATING A WATER WELL,**
J. D. Jenkins.
US Patent No 3,899,027, 3 p, 1 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 937, No 2, p 507, August 12, 1975.

Descriptors: *Patents, *Water wells, *Water supply, *Water yield improvement, Water reuse, Aquifers, Well casings, Impaired water use, Recirculated water, Chemicals, Water level, Recycling, *Cleaning.

A system is described for cleaning and benefitting of wells which relies on a recycling of the fluid from the well pump whereby the entire discharge from the pump is recycled through the well and surrounding aquifer along with selectively introduced solutions. The invention provides for precise amounts of chemical additives to be introduced with the concentrations being cycled through the well while being accurately controlled. This apparatus is mounted on the well without removing or in any way interfering with the pump apparatus or related equipment by extending a recycle line from the pump discharge to the well casing below the pump apparatus. The entire inner surface of the casing, as well as the inner and outer surfaces of the well column and the surrounding aquifer are subjected to the cleaning action. The free falling of the pump fluid back down the well casing impacts with the water standing in the lower portion of the casing and generates substantial shock wave energy which is transmitted to the surrounding aquifer, producing a cleaning action which stimulates the well and improves the yield. (Sinha-OEIS)
W75-12301

## 3C. Use Of Water Of Impaired Quality

**SPRAY IRRIGATION OF TREATED MUNICIPAL SEWAGE,**
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-11856

**RECYCLING ALLOWS ZERO WASTEWATER DISCHARGE,**
Black, Crow, and Eidsness, Inc., Clearwater, Fla.
For primary bibliographic entry see Field 5D.
W75-12364

## 3D. Conservation In Domestic and Municipal Use

**RECIRCULATING RESIN CLEANING CHEMICAL FEEDER SYSTEM FOR WATER SOFTENERS,**
J. L. Williams.
US Patent No 3,899,422, 4 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 937, No 2, p 632, August 12, 1975.

Descriptors: *Patents, *Water softening, *Water treatment, *Impaired water quality, *Water quality control, Filters, Ion exchange, Cleaning, Equipment, Recycling.
Identifiers: Backwash, Regeneration.

This invention provides an improved backwash system in water softeners which incorporates a scrubbing and cleaning action within a separate cleaning tube where the particles not only move along with the liquid flow which sets them in motion, but are specifically passed through the jet action flow of liquid so as to substantially enhance the cleaning action. In addition is the incorporation of a feeder for chemical additives also under the control of the flow inducing jet stream or liquid discharge. The apparatus includes an elongated cleaning tube fixed to the service tube along a substantial portion of its length within the filter bed. This cleaning tube is open at the top and bottom for a flow of the particulate filter material. The discharge end of a feed line connects with the cleaning tube below the upper intake end. A flap valve is so oriented as to, during the normal or water softening cycle, effectively seal the port and during the backwash operation arcuately flare open into the cleaning tube so as to provide a jet distribution of the liquid from the service tube diagonally across the cleaning tube covering the full cross-sectional area. The flow in the cleaning tube draws the filter material vertically downward in a circulating manner and actually passing directly through the jet flow of the cleaning liquid and being subjected to the action of the chemical additive. (Sinha-OEIS)
W75-12307

**WATER QUALITY MANAGEMENT IN A METROPOLITAN AREA,**
British Columbia Univ., Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 5G.
W75-12354

## 3E. Conservation In Industry

**WATER RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE NORTHERN GREAT PLAINS COAL REGION OF WYOMING, MONTANA, AND NORTH DAKOTA, 1975.**
Geological Survey, Denver, Colo. Water Resources Div.
For primary bibliographic entry see Field 5A.
W75-11961

**HYGIENIC EFFECTIVENESS OF MEASURES FOR TREATING THE INDUSTRIAL WASTE-WATERS OF THE KONAKOVO STATE REGIONAL ELECTRIC POWER PLANT, (IN RUSSIAN),**
Sanitary Epidemiology Station, Konakovo (USSR).
For primary bibliographic entry see Field 5D.
W75-11984

**APPLICATION OF A SIMPLE DISPERSION MODEL TO A RURAL INDUSTRIAL REGION,**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W75-12037

**RECOVERING PROTEINS FROM WASTE WATER,**
Secretary of Agriculture, Washington, D.C. (assignee).
For primary bibliographic entry see Field 5D.
W75-12057

**POWER CONVERSION APPARATUS FOR UTILIZING THE FORCE OF WAVES,**
D. K. Lockhart.
US Patent No 3,896,625, 3 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 936, No 5, p 1605, July 29, 1975.

Descriptors: *Patents, *Ocean waves, *Waves(Water), *Energy conversion, *Water level fluctuations, Water conveyance, Water storage, Pressure equipment.
Identifiers: Pressurized water.

An apparatus for utilizing the force of waves uses the tremendous inertia of falling water together with the constant rhythmic undulation effect of the surf to collect and pressurize water for subsequent release as a source of power. The collecting apparatus consists of a flexible pipe which includes funnels and check valves along its length. The funnels are held by flotation collars so that the faces of the funnel orifices are awash even in calm sea. The seaward end of the pipe is secured but with enough slack to provide movement with the undulation effect of the surf. The discharge end of the pipe empties into a reservoir where the water is pressurized and stored until it is used to drive a turbine, or the like. (Sinha-OEIS)
W75-12062

**THE EFFECT OF LEGISLATION OF THE FUTURE USE OF WATER IN THE LEATHER INDUSTRY,**
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5D.
W75-12112

**BIO-OXIDATION PROCESS SAVES H20,**
Sun Oil Co., Toledo, Ohio.
For primary bibliographic entry see Field 5D.
W75-12115

**STRONG IMPACT OF TEXTILES BY U.S. WATER CONTROL ACT,**
For primary bibliographic entry see Field 5G.
W75-12117

**EFFLUENT TREATMENT FOR A SMALL TANNERY,**
Research Advisory Service, Inc., Western Springs, Ill.
For primary bibliographic entry see Field 5D.
W75-12118

**NO-EFFLUENT TANNERY PROCESSES,**
Rhodes Univ., Grahamstown (South Africa). Leather Industries Research Inst.
For primary bibliographic entry see Field 5D.
W75-12124

**COMPLETE INDUSTRIAL WASTE-WATER REUSE GOAL OF REFINING STUDY,**
Bechtel Corp., San Francisco, Calif. Ecology and Water Quality Group.
For primary bibliographic entry see Field 5D.
W75-12125

**FISHERIES ECONOMICS. A BIBLIOGRAPHY,**
Manchester Univ. (England). Dept. of Agricultural Economics.
J. A. Butlin, and J. M. Tomkins.
Southampton University, Department of Economics, Environmental Economics Study Group Bibliography Series 3, July 1973. 7 p, 53 ref.

Descriptors: *Bibliographies, *Marine fisheries, *Commercial fishing, *Optimization, Model studies, Law of the Sea, Exploitation, Fish populations, Fish management, Salmon, Pacific Ocean, Regulation, Permits, International waters, Taxes, Welfare(Economics).
Identifiers: *Fishery economics, Common property resource, Halibut fisheries.

This bibliography contains 23 books and 30 articles published in the period from 1942 to 1972. The diverse topics in the broad area of fisheries economics include legal aspects of ocean fishing., management consideration, recent developments and research, specific considerations of Pacific salmon and halibut, the utilization of optimization techniques, and modeling commercial fishing. This bibliography contains 2 articles and 4 books by J.A. Crutchfield, and 4 articles by V.L. Smith. (Becker-Wisconsin)
W75-12181

**ECONOMIC GROWTH VS. THE ENVIRONMENT. A BIBLIOGRAPHY,**
Bristol Univ. (England). Dept. of Economics.
For primary bibliographic entry see Field 6G.
W75-12182

**ELECTRIC GENERATOR RESPONSIVE TO WAVES IN BODIES OF WATER,**
E. L. Schera, Jr.
U.S. Patent No 3,898,471, 3 p, 9 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 937, No 1, p 292, August 5, 1975.

Descriptors: *Patents, *Waves(Water), *Ocean waves, *Energy conversion, *Energy transfer, Electric generators, Electric power generation, Floats.
Identifiers: Surface waves, Oscillation.

A generator is described which is responsive to surface waves, particularly in large bodies of water. The apparatus solves the problem of producing electric energy for various purposes, particularly flashing signals as an aid to navigation. In operation, this device is adapted to respond to normal surface waves on a base of water and is not intended to function with the action of ocean tides or other surface levels of bodies of water. The a justment of the float with respect to the level the water where waves normally occur is made slots and screws. When the float responds to su face waves, the generator will be operated in posite direction, which if a permanent magnet ternator is used, will generate a voltage when float is moved upward and downward. The volta is regulated by a solid state regulator. From the the electric current is carried to the lamp for safe illumination. Even small oscillation will gener enough electric power to illuminate the lamp to visible within a reasonable range. (Sinha-OEIS)
W75-12186

**SOLAR SEA THERMAL ENERGY.**
Hearing--Subcomm. on Energy--Comm. Science and Astronautics, U. S. House Representatives, 93d Cong, 2d Sess, May 23, 19 134 p, multiple fig, photo, ref

Descriptors: *Hydroelectric power, *Ocea *Heated water, *Electric power producti *Thermal power, Thermal water, Water temp ture, Hydrothermal studies, Solar radiation, E gy, Electric power, Electric generators, Elec powerplants, Electricity, Hydroelectric pla Electric power costs, Costs, Economics, Trop regions, Research and development
Identifiers: *Congressional hearings, *Solar powerplants, Energy crisis, Solar energy.

The topic of this subcommittee hearing was potentiality of extracting solar energy from ocean waters. Witnesses reported that it is p ble to harness ocean solar energy and to pro electric power at a cost competitive with fossil plants. The process of extracting electric po from the ocean involves the use of a standard heat engine which receives heat from the w upper layers of the tropical ocean, and then, extracting power, rejects the residual heat int deep cold water. Suggestion was made that sea power plants offer the opportunity of ob ing an inexhaustible source of low-cost ele power, free of thermal and atmospheric pollu and without the unsolved problem of radioa waste disposal. Witnesses presented detail garding construction, cost, and over-all feasi of solar sea powerplants. (Fernandez-Florida)
W75-12196

**DEEPWATER PORT ACT OF 1974.**
For primary bibliographic entry see Field 5G.
W75-12198

**THE POTENTIAL FOR ENERGY PRO TION FROM GEOTHERMAL RESOURCES**
For primary bibliographic entry see Field 4B.
W75-12199

**THE RUSH FOR OFFSHORE OIL AND WHERE THINGS STAND ON THE O CONTINENTAL SHELF.**
For primary bibliographic entry see Field 5G.
W75-12222

**HISTORICAL GUIDE TO FEDERAL W POLLUTION CONTROL LAWS AFFEC FOOD PROCESSING,**
Economic Research Service, Washington, D
For primary bibliographic entry see Field 5G
W75-12226

**THE DEEPWATER PORTS ACT OF 1974; SPEED AHEAD,**
For primary bibliographic entry see Field 5G
W75-12229

**THE ECONOMICS OF CLEAN WATER.**
Environmental Protection Agency, Wash D. C.

imary bibliographic entry see Field 5G.
2233

## Conservation In Agriculture

OLIC COMPOUNDS OF WHEAT LEAVES
R DROUGHT STRESS,
oma State Univ., Stillwater. Dept. of Botany
ant Pathology.
mary bibliographic entry see Field 2I.
1905

ENCE OF SOIL WATER MATRIC
NTIAL AND RESISTANCE TO PENETRA-
ON CORN ROOT ELONGATION,
Mirreh, and J. W. Ketcheson.
Soil Sci, Vol 53, No 4, p 383-388, 1973.

ptors: *Corn(Field), *Soil water, *Root
opment, Clays, Loams, Soil density, Crop
tion.
iers: Soil water matric, Turgor.

y of the Interacting effects of soil bulk den-
d soil water matric potential on resistance to
ation and on corn (Zea mays) root elonga-
owed that for any level of resistance, elon-
was further restricted as potential
sed (suction increased). This was explained
n the effect of matric potential on plant tur-
hich in turn affects the ability of the root to
me resistance. At neglibible resistance,
ion was greater in a clay loam soil than over
equivalent osmotic potentials in solution,
ng that moisture transport in the soil ap-
y did not restrict moisture supply to the
he presently accepted upper limits of re-
e for corn growth may be too high.--Copy-
74, Biological Abstracts, Inc.
055

EMENTAL WATER USE IN THE EVER-
ES AGRICULTURAL AREA,
and Southern Florida Flood Control Dis-
est Palm Beach. Resources Planning Dept.
au.
cal Publication 74-4, June 1974. 46 p, 7 fig, 7
f, 1 append.

ptors: *Irrigation, *Water utilization,
ion practices, *Florida, Rainfall, Evapora-
vapotranspiration, Supplemental irrigation,
on permits, Runoff, Water policy,
ge(Water), Agriculture.
ers: *Lake Okeechobee, Everglades.

nentatl water use in a portion of the Ever-
Agricultural Area for the period 1961
1971 was examined. Only supplemental
use for the normal irrigation season,
per through May, was considered. Supple-
water was taken to be that water released
ake Okeechobee into the study area. The
l water was equated with applied irrigation
o meet crop growth requirements, although
ses for water released from the lake were
ledged and discussed. A comparison was
between monthly and seasonal water
into the study area and theoretical crop
ental water demand on a gross area-wide
lso examined, for the same period, were
ual volume of surplus water discharged
e study area to Lake Okeechobee. These
mpared with the annual volumes of water
l from the lake to meet supplemental water
nents. The investigation found that on a
ea-wide basis: (1) there is no significant
plication of supplemental water with
to beneficial use as represented by
cal crop requirements; (2) there is no ap-
waste of water from the Lake Okeechobee
ea system which, in effect, functions as a
system'; and (3) there has been no abuse of
tral and Southern Florida Flood Control
District's criteria established for the present water use permitting system. (Sims-ISWS)
W75-12086

**DESIGN AND OPERATING CRITERIA FOR RURAL WATER SYSTEMS,**
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 6D.
W75-12126

**TRICKLE IRRIGATION SYSTEM,**
J. Rangel-Garza, and J. Leal-Diaz.
U.S. Patent No 3,897,009, 4 p, 14 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 936, No 5, p 1735, July 29, 1975.

Descriptors: *Patents, *Irrigation systems, *Surface irrigation, Irrigation practices, Irrigation operation and maintenance, Irrigation efficiency, Fertilizers, Fungicides, Insecticides.
Identifiers: *Trickle irrigation systems.

The irrigation system consists of hoses and flexible or rigid pipes to which at different intervals, depending on the needs, will be connected tricklers or when necessary secondary lines will be connected to main lines by a reduction T connector. In the branch pipes are tricklers having two part female and male interfitting members. Grooves on the male member engage the inner female surface to provide water flow channels on the inner circumference of the central pipe bore to reuce pressure. These tricklers are coupled in line in a pipe or hose and have structure for locking the parts together and preventing entry of dirt. (Sinha-OEIS)
W75-12184

**DRAFT PROPOSAL FOR LEGISLATION TO CONTROL WATER POLLUTION FROM AGRICULTURAL SOURCES,**
For primary bibliographic entry see Field 5G.
W75-12213

**IRRIGATION APPARATUS,**
C. Grobbelaar.
US Patent No 3,899,132, 5 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 937, No 2, p 542, August 12, 1975.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Sprinkler irrigation, Irrigation practices, Irrigation operation and maintenance, Water distribution(Applied).

An irrigation apparatus is comprised of a elongated flexible irrigation conduit having sprinkler devices at spaced intervals along its length. Each sprinkler device is comprised of a sprinkler pipe having a nozzle at its free end and has a lateral and longitudinal support arrangement associated with each sprinkler device to support the conduit in its operative position. A storage reel adapted to have the conduit rolled up on it with the sprinkler devices extending radially inward has locating means for locating the sprinkler devices within the reel. (Sinha-OEIS)
W75-12302

**EMITTER FOR IRRIGATION SYSTEMS,**
Harmony Emitter Co., Inc., Tucson, Ariz. (assignee).
R. C. Harmony.
US Patent No 3,899,136, 4 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 937, No 2, p 542, August 12, 1975.

Descriptors: *Patents, *Irrigation, *Irrigation efficiency, Surface irrigation, Irrigation operation and maintenance, Water distribution(Applied), Water pressure, Equipment.
Identifiers: Emitters.

An emitter is described which delivers a constant flow of water despite variations in water pressure and is non-clogging, self regulating and self flushing. The emitter having a water discharge outlet and connected to a source of water under pressure for irrigating soil comprises; a pair of imperforate flexible sheets coterminous with one another and defining both the water discharge passageway for a flow of water through the emitter and the water discharge outlet; tranverse ribs within the central part of adjacent surfaces of each of the flexible sheets for establishing a water pressure gradient through the passageway; and pressure means for biasing the pair of sheets toward one another to regulate the lateral expansion of the passageway. The pressure means is responsive and variable in proportion to the water pressure at the source. Therefore the flow of water through the emitter is regulated at a constant rate. (Sinha-OEIS)
W75-12303

**IRRIGATION SYSTEM,**
J. R. Gross.
US Patent No 3,901,447, 4 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 937, No 4, p 1310, August 26, 1975.

Descriptors: *Patents, *Irrigation systems, *Mist irrigation, *Sprays, *Temperature control, Frost protection, Heat exchangers, Distribution systems, Citrus fruits.

An irrigation system is described which includes a pressurized source of water, a number of distribution conduits connected with the source of water and equipped with uniformly spaced spray heads for emitting temperature-controlling bodies of mist. Such a system can be employed in reducing temperatures but more frequently can elevate the temperature in order to avoid frost damage. The invention comprises a continuous-flow heat exchanger including a fire-box of tubular configuration. A water jacket surrounds the fire box in which the stream of water is conducted concentrically around the external surface of the fire box. A pressure burner is adapted to project a pressurized stream of heated gases axially through the tubular fire box in a direction opposite to the direction in which the stream of water is conducted. (Sinha-OEIS)
W75-12309

**IRRIGATION SYSTEM EMITTERS WITH RENEWABLE FILTERS,**
B. P. Babin.
US Patent No 3,901,448, 5 p, 29 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 937, No 4, p 1310-1311, August 26, 1975.

Descriptors: *Patents, *Irrigation systems, *Irrigation practices, *Filters, Flow control.
Identifiers: *Drip irrigation, Emitters, Soil moistening.

The invention relates to irrigation assemblies for use in long run irrigation systems. The emitters are particularly adapted for use in such systems in that a positive slow discharge of water is assured under varying water pressure conditions. The incorporation in the emitters of filters or filtering elements which, in addition to assisting to the regulation of the discharge flow, perform a significant function in eliminating ingress of aperture clogging soil particles while at the same time trapping such contaminants as might be contained in the irrigating fluid itself. The method of mounting or securing the filters is specifically devised so as to enable periodic filter replacements. The emitter assemblies include or are associated with a discharge opening in the fluid carrying tube with the assembly including an aperture overlying filter or filter element and a retainer devised in a manner so as to secure the filter in position and allow for a discharge of fluid at a slow or drip rate. The retainer will normally incorporate a substantially rigid filter overlying cover defining a chamber for

the reception of the filter and includes fluid discharge passages. The cover in turn is affixed to the tube by appropriate securing means engaged between the cover and the tube. (Sinha-OEIS)
W75-12310

PHOSPHORUS METABOLISM AND RESPRIRATION IN WHEAT LEAVES AND ROOTS IN THE CASE OF WATER DEFIENCY, (IN RUSSIAN),
Vsesoyuznyi Institut Rastenievodstva, Leningrad (USSR).
T. A. Rychkova.
S-Kh Biol, Vol 8, No 2, p 247-249, 1973.

Descriptors: *Phosphorus, *Metabolism, *Respiration, *Wheat, Leaves, Roots, Energy, Acids, Lipids.
Identifiers: Nucleic-acid, Nucleotides.

A study of the effect of slight dehydration on P metabolism and respiration of wheat leaves and roots showed that, in the case of a soil water deficiency during the critical period between the start of shooting and start of heading, nucleic acid metabolism was intensified in the leaves of the upper layer and the content of free nucleotides and lipid P increased. A higher level of respiration corresponded to increased P metabolism, on the basis of which it is possible to determine an intensification of energy metabolism in plants in the presence of a slight water deficit.--Copyright 1974, Biological Abstracts, Inc.
W75-12362

# 4. WATER QUANTITY MANAGEMENT AND CONTROL

FLOOD PLAIN INFORMATION: SPRING AND WILLOW CREEKS, HOUSTON METROPOLITAN AREA, TEXAS.
Army Engineer District, Galveston, Tex.
Prepared for Harris Soil and Water Conservation District, Houston, Texas, June, 1972. 38 p, 8 fig, 26 plates, 6 tab.

Descriptors: *Flood control, *Flood data, River basin development, *Flood plain zoning, Floods, *Regional flood, *Flood profiles, Flood discharge, Flood frequency, Flood plains, Flooding, Flood proofing, *Texas.
Identifiers: Intermediate Regional Flood, Standard Project Flood, Spring Creek(Tex), Willow Creek(Tex), *Houston(Tex).

Spring Creek flows 68 miles from west to east along the northern border of Harris County, Texas, 30 minutes commuting time north of downtown Houston. Spring Creek and its major tributary, Willow Creek, drain an area of 760 square miles of increasingly urbanized land. Numerous incorporated and unincorporated communities have developed along their flood plains with extensive residential, commercial, and industrial development. Stream gage records show that the area is subject to frequent summer floods which last several days due to the flat slopes and small channel capacities of the creeks. Thirty-four bridges cross the creeks in the reaches studied. Flood water backs up behind them if trees and other debris collect there and may push a sudden wall of debris and water loose to rush downstream. Millions of dollars of damage were caused by the record May 1929 flood with its discharge of 48,300 cfs. The Intermediate Regional Flood and Standard Project Flood expected in these creeks would be much more severe with discharges of 101,000 cfs and 143,900 cfs respectively. Definitive data is provided for the best planning of the endangered area, although land subsidence due to oil and water withdrawal may somewhat alter the exact flood area boundaries. The situation could be changed by channel improvements, removal of obstructions, or non-structural alternatives including zoning and subdivision regulations. (Herr-North Carolina)
W75-12371

## 4A. Control Of Water On The Surface

PLANNING MODELS FOR WATER SYSTEM DEVELOPMENT IN MISSISSIPPI COMMUNITIES,
Mississippi Univ., University. Dept. of Economics and Finance.
For primary bibliographic entry see Field 6D.
W75-11851

DRAINING TELFORD NEW TOWN.
Surveyor, Vol. 141, No. 4218, p 49, April 13, 1973. 1 fig.

Descriptors: *Drainage area, *Sewers, *Sewerage, Land reclamation, Tunnels, Siphons, Reservoirs, Construction, Waste water treatment
Identifiers: England, River Severn, River Tern.

The original area of approximately 9000 acres for Telford New Town drains to the River Severn in England with the new drainage area of about 10,000 acres flowing to the River Tern, a tributary of the Severn. At the time the designated area was expanded, long lengths of the sewers in the southern area had been constructed with no allowance being made for future development in surrounding sections of the catchment area. The effect of extending the boundary of the new town was to introduce new areas for development within the southern catchment region. It was found possible to alter the proposed sewer network and to introduce an extra balancing reservoir in such a way that flows in the sewers already constructed would not exceed the designed capacity. Two contracts were let for this work: the first, for sewers and land reclamation work; and the second, for sewers in tunnel and open cut and the construction of a siphon draw-off from the balancing reservoir. The Randlay/Hollinswood sewers, used in the projects, will provide drainage for additional areas and will provide the link to divert flows through the extra balancing reservoir. (Sandoski-FIRL)
W75-11917

SEATTLE PROJECT CALLS FOR ROCK WEIRS.
Western City, Vol. 49, No. 4, p16, 19, April, 1973. 1 fig.

Descriptors: *Flood control, *Environmental effects, *weirs, Streams, Geology, Biology, Environmental engineering.
Identifiers: *Environmental Impact Statements, *Rock weir.

An environmental impact statement has been prepared by a project planning and engineering consultant to the Seattle Department of Engineering. Now under construction, the project to collect flood water from 210-acres in the North Greenwood section of the city and channel it into Piper Creek at Carkeek City Park, which flows into Puget Sound, will cost approximately two million dollars. The study took much less staff time than was initially felt necessary and was completed under the direction of 2 landscape architect assisted by several hydraulics engineers. Also contributing were a biologist and an environmental geologist, who aided by conducting an environmental inventory and analysis encompassing geological history of the creek area, superficial and bedrock geology, groundwater, stream economics, water chemistry, aquatic biology, and terrestrial biology. (Sandoski-FIRL)
W75-11922

TRAINING OF SUTLEJ RIVER BELOW RUPAR HEADWORKS FOR THE PROTECTION OF BIST DOAB CANAL: MODEL STUDIES,
Hydraulic Research Station, Malakpur(India).
For primary bibliographic entry see Field 4D
W75-11925

A PARTICULAR COMPARISON OF ANNUAL MAXIMA AND PARTIAL DURATION SERIES METHODS OF FLOOD FREQUENCY PREDICTION,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2E
W75-11929

EXPERIMENTS WITH UNCONVENTIONAL STORM OVERFLOWS,
Loughborough Univ. of Technology (England).
For primary bibliographic entry see Field 5D
W75-11940

FLOOD EVENT DATA COLLATION,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 7C
W75-11943

FLOODS PROTECTION (SCHUTZ VO UEBERSCHWEMMUNGEN).
Wasser, Luft und Betrieb, Vol 17, No 5, p 16 1973. 1 fig.

Descriptors: *Flood protection, *Hoses, Repai ing, Flood control, Check structures, Barriers.
Identifiers: Polyvinyl chloride.

A novel flood protection system has be developed and patented by the Degussa Compa in West Germany, consisting of one-meter diam ter hoses to be carried to the site of protection, u rolled, and filled as required. The hoses are ma of a tear-resistant fabric of endless 'Trevira' fib coated with polyvinyl chloride, have rot-proof su faces, and when placed on uneven ground provi a quickly arranged and absolutely watertight bar er against flood waters rising to 60 centimete One 30-meter hose rolled up weighs about 100 ki grams and replaces 1100 sandbags. Emptied af use, the hoses can be reused. Damaged sectio are repaired by welding or glueing; the hoses resistant against chemicals, and therefore can used as emergency containers for dangero liquids. (Sandoski-FIRL)
W75-11946

A MOBILE SPRINKLER IRRIGATION FACI TY FOR MEASUREMENT OF SURFACE R NOFF AND SOIL EROSION (EINE TRA PORTABLE BEREGNUNGSANLAGE FUER D MESSUNG VON OBERFLAECHENABFLU UND BODENABTRAG),
For primary bibliographic entry see Field 7B.
W75-11948

FLOOD PROFILES IN THE UMPQUA RIV BASIN, OREGON: PART 3, UMPQUA RIV BELOW SCOTTBURG, SCHOLFIELD, C CREEK ABOVE GLENDALE,
Geological Survey, Portland, Oreg.
E. A. Oster.
Open-File report, 1975. 108 p, 88 fig, 7 tab, 6 re

Descriptors: *Flood profiles, *Flood frequer *Hydrologic data, *Streamflow, *Oregon, Fl data, Flow rates, Peak discharge, Hydrogra Analytical techniques, Tidal streams.
Identifiers: *Umpqua River basin(Oreg).

This the third and final report in a series to c approximately 300 miles of Umpqua River b streams in Oregon. The study was made at request of Douglas County Planning Commis to compute profiles for the 10-, 25-, 100-, and

floods and the December 1964 flood. The
es covered in this report are: Umpqua River
Gardiner upstream to Scottsburg, Smith
from the mouth to Sulphur Springs, Schol-
Creek from the mouth to Wind Creek, and
Cow Creek from below Glendale upstream
ow Creek, near Anchor. The flood-frequency
needed to determine project discharges were
uted by the log-Pearson Type III method,
annual peak-flow data for Cow Creek and
Umpqua River. A regional analysis by the
s of Engineers (1969) was used for the Smith
and Scholfield Creek. The frequency curves
are shown. The highest annual flows of the
qua River usually occur from November
gh March as a result of heavy winter rains
ented by snowmelt; some annual floods have
red as late as mid-April, primarily caused by
melt from the high mountains of the Cascade
e. Flood discharges on the Smith River and
field Creek reflect the direct influence of
al storm patterns, which may not penetrate
ough inland to cause Umpqua River flood. In
wer estuary area, extreme high tides and
onshore wind increase flood levels above
caused by high river discharges along.
dard-USGS)
1959

**LITY OF SURFACE WATERS OF THE ED STATES, 1969: PART 8. WESTERN OF MEXICO BASIN.**
gical Survey, Reston, Va.
rimary bibliographic entry see Field 7C.
1966

**ACE WATER SUPPLY OF THE UNITED ES, 1966-70: PART 2. SOUTH ATLANTIC E AND EASTERN GULF OF MEXICO NS - VOLUME 3. BASINS FROM ACHICOLA RIVER TO PEARL RIVER.**
gical Survey, Reston, Va.
imary bibliographic entry see Field 7C.
1967

**ACE WATER SUPPLY OF THE UNITED ES, 1966-70: PART 6. MISSOURI RIVER N--VOLUME 1. MISSOURI RIVER BASIN E WILLISTON, NORTH DAKOTA.**
gical Survey, Reston, Va.
imary bibliographic entry see Field 7C.
1968

**ACE WATER SUPPLY OF THE UNITED ES, 1966-70: PART 7. LOWER MISSISSIP-VER--VOLUME 2. ARKANSAS RIVER**
gical Survey, Reston, Va.
imary bibliographic entry see Field 7C.
1969

**T OF 2,4-D AND VARIOUS SALTS ON SIAN WATERMILFOIL.**
ssee Valley Authority, Muscle Shoals, Ala.
nmental Biology Branch.
Science, Vol 22, No 6, p 591-594, 1974. 3
ref.

ptors: *Herbicides, *2,4-D, *Aquatic weed
, *Salts, Laboratory tests, Water level fluc-
s, Copper sulfate, Sodium chloride, Sodi-
enite, Estuaries, Salinity, Tennessee, Com-
ty, Chemcontrol, Toxicity.
iers: *Eurasian watermilfoil, Aluminum
e, Ammonium chloride, Barium chloride,
tetraborate, Sodium arsenite, Mercuric
e, Lead nitrate, Zinc sulfate, Synergistic ef-
Antagonistic effects.

ement of Eurasian watermilfoil
phyllum spicatum) in the Tennessee Valley
hed involves water level fluctuation and
dal treatment with 2,4-D. Possible addition

of chemicals to make 2,4-D treatment more effective and economical was tested by measuring growth of watermilfoil under laboratory conditions with sublethal levels of 2,4-D and partially inhibitory concentrations of aluminum chloride, ammonium chloride, sodium arsenite, barium chloride, sodium tetraborate, copper sulfate, mercuric chloride, lead nitrate, sodium chloride, and zinc sulfate. Barium chloride, lead nitrate, and zinc sulfate were additive in effect with 2,4-D. Other compounds produced synergism at some concentrations and mutual antagonism at others. Effectiveness of 2,4-D was increased more by mercuric chloride, aluminum chloride, sodium chloride, and sodium arsenite than by copper sulfate. The greatest synergism was observed with mercuric chloride (0.2 micromoles), aluminum chloride (10.0 micromoles), and sodium chloride (200 millimoles). Maximum synergism for sodium arsenite with 2,4-D was at a level slightly above the criterion for potable water. Lower arsenic concentrations and higher 2,4-D concentrations should be explored. The sodium chloride concentration necessary for effective interaction with 2,4-D is too high to be useful but indicates erratic results obtained in estuaries subject to salinity fluctuations may be due to the sodium chloride concentration. (Buchanan-Davidson--Wisconsin)
W75-11990

**THE RISK OF DEOXYGENATION OF WATER IN HERBICIDE APPLICATION FOR AQUATIC WEED CONTROL,**
University of Wales Inst. of Science and Tech., Cardiff.
For primary bibliographic entry see Field 5A.
W75-11996

**EVALUATING THE PRODUCTIVITY OF PINE FORESTS IN THE HINTON-EDSON AREA, ALBERTA, FROM SOIL SURVEY MAPS,**
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
J. Dumanski, J. C. Wright, and J. D. Lindsay.
Can J Soil Sci, Vol 53, No 4, p 405-419, 1973.

Descriptors: *Production, *Canada, Forests, *Pine trees, *Lodgepole pine trees, Climates, Land use, Land management, *Soil surveys, Soil types, *Forest management, *Land classification, Drainage, Slopes, Mapping.
Identifiers: *Alberta.

Effective land use and land management policies are based ideally on data collected from land classification and land evaluation procedures. This paper describes a method employed in classifying and evaluating land for the production of lodgepole pine (Pinus contorta var. latifolia) in the Hinton-Edson area of Alberta (Canada). Initially, a soil survey was conducted in the area. Productivity of various collections of soils was then obtained by statistically comparing soil information derived from the soils map with forest growth information obtained from the continuous forest inventory program of North Western Pulp and Power Limited of Hinton. Results indicate that aspect has minimal effect on pine productivity except for sandy and gravelly soils. General differences in growth were related to soil parent material, climate, drainage, and physiography, and more specific differences were attributed to soil subgroup, soil series, soil reaction, and percent slope. It was relized that pine growth is a function of pedological, landform, and climatological factors, and all must be considered when evaluating productivity.--Copyright 1974, Biological Abstracts, Inc.
W75-12003

**STOCHASTIC HYDROLOGIC SYSTEMS,**
Illinois Univ., Urbana, Dept. of Hydraulic Engineering.
For primary bibliographic entry see Field 2A.
W75-12015

**NONLINEAR RUNOFF KERNELS OF HYDROLOGIC SYSTEM,**
Tokyo Inst. of Tech. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12019

**THE STOCHASTIC KINEMATIC WAVE,**
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12023

**SYSTEMS SIMULATION OF STREAMFLOWS,**
Kyoto Univ., (Japan), Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-12024

**AN APPLICATION OF SIMULATED RAINFALL MODELS TO FORECASTING OF THE LONG TERM VARIATION OF RIVER BED,**
Osaka Univ. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-12028

**A BAYESIAN FRAMEWORK FOR THE USE OF REGIONAL INFORMATION IN HYDROLOGY,**
Resource Analysis, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 6A.
W75-12048

**1974 WATER RESOURCES DATA FOR OREGON, SURFACE WATER RECORDS, PRECIPITATION RECORDS,**
Oregon State Engineers Office, Salem. Water Resources Dept.
For primary bibliographic entry see Field 7C.
W75-12087

**DESIGN AND OPERATING CRITERIA FOR RURAL WATER SYSTEMS,**
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 6D.
W75-12126

**FLOATING AQUATIC PLANTS REMOVE CHEMICALS FROM POLLUTED WATERS.**
For primary bibliographic entry see Field 5G.
W75-12145

**STORM TIDE FREQUENCIES ON THE SOUTH CAROLINA COAST,**
National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 2L.
W75-12160

**A STATISTICAL STUDY OF TROPICAL CYCLONE POSITIONING ERRORS WITH ECONOMIC APPLICATIONS,**
National Hurricane Center, Coral Gables, Fla.
For primary bibliographic entry see Field 2B.
W75-12166

**A STUDY OF FLASH-FLOOD SUSCEPTIBILITY -- A BASIN IN SOUTHERN ARIZONA,**
National Weather Service, Salt Lake City, Utah. Western Region.
G. Williams.
Memorandum NWS WR-99, August 1975. 9 p, 2 fig, 1 tab, 15 ref.

Descriptors: *Floods, *Flash floods, Hydrology, Flood control, Precipitation(Atmospheric), Rainfall, Disasters, Weather, River basins, Forecasting, Water, Topography, Flood damage, *Arizona.
Identifiers: *Flood forecasting, *Flash flooding, *Flash flood susceptibility, *Flood studies, Basin

flooding, Hydrologic analysis, Frequency analysis, *Sabino Canyon(Ariz), Hydrologic events.

Two commonly used methods of hydrologic analyses are parametric reconstruction and development of frequency distributions. Both techniques can be used to develop estimates of potential of damaging flash floods. However, under conditions of limited data, many areas may not have experienced enough flash floods to be recognized as prone to flash flooding. This paper gives a method to infer expected severity for flooding based on frequency analysis, which does not require a complete spectrum of data over a given basin. This method was used to estimate potential peak flows on Sabino Canyon, Arizona, and probability of occurrence of specified magnitudes was analyzed. These estimates indicate a strong possibility of damaging flash floods occurring in areas where none have occurred in several decades. (NOAA)
W75-12167

**REPORT TO THE CONGRESS ON OCEAN DUMPING RESEARCH, JANUARY THROUGH DECEMBER 1974 PUBLIC LAW 92-532, TITLE II, SECTION 201.**
National Oceanic and Atmospheric Administration, Washington, D.C.
For primary bibliographic entry see Field 5B.
W75-12173

**A STUDY OF FLASH-FLOOD OCCURRENCES AT A SITE VERSUS OVER A FORECAST ZONE,**
National Weather Service, Salt Lake City, Utah. Western Region.
For primary bibliographic entry see Field 2E.
W75-12174

**DIVERSION AND WITHDRAWAL OF ADDITIONAL WATER FROM LAKE MICHIGAN INTO THE ILLINOIS WATERWAY.**
Hearings--Subcomm. on Water Resources, Comm. on Public Works, U. S. House of Representatives, 93d Cong, 2d Sess, October 8-9. 1974. 77 p, 2 tab.

Descriptors: *Water control, *Water law, *Legislation, *Water level fluctuations, *Water management (Applied), Water levels, Lakes, Water, Flood control, Flood routing, Flow control, Routing, Water distribution (Applied), Flow, Legal aspects, Water transfer, Administrative agencies, Federal Government, Water policy, Non-structural alternatives, Aesthetics, Public health, Great Lakes, Lake Michigan.
Identifiers: *Congressional hearings, Environmental policy, Navigation obstructions.

Hearings were held before the House Subcommittee on Water Resources of the Committee on Public Works to consider legislation that would permit the diversion and withdrawal of additional water from Lake Michigan into the Illinois Waterway, and for various other purposes. Testimony was given by numerous federal, states, and local officials. The purpose of the water diversion is to alleviate the tremendous human and economic hardships caused by current high waters throughout the Great Lakes. Concern was expressed over preservation of the Lake Michigan shoreline as well as prevention of flood damage. It was felt that the proposed measures would be desirable from esthetic and public health viewpoints. The possibility of such disadvantages as downstream flooding and adverse effects on navigation were mentioned. The general consensus, however, was that the disadvantages could be overcome through careful control of the diversion. (Fernandez-Florida)
W75-12197

**THE FEDERAL COMMON LAW OF ACCRETION: A NEW ELEMENT IN PROPERTY LAW,**
For primary bibliographic entry see Field 6E.
W75-12205

**THE ALLOCATION OF WATERS OF INTERNATIONAL RIVERS.**
Georgetown Univ., Washington, D.C. Law Center.
For primary bibliographic entry see Field 6E.
W75-12219

**FLOOD INSURANCE AND FLOOD PLAIN ZONING AS COMPATIBLE COMPONENTS,**
Clark Univ., Worcester, Mass. Dept. of Geography.
For primary bibliographic entry see Field 6F.
W75-12227

**THE DEEPWATER PORTS ACT OF 1974; HALF SPEED AHEAD,**
For primary bibliographic entry see Field 5G.
W75-12229

**LAND USE CONTROLS UNDER THE FEDERAL WATER POLLUTION CONTROL ACT: A CITIZEN'S GUIDE,**
National Resources Defense Council, Washington, D. C.
For primary bibliographic entry see Field 5G.
W75-12237

**1974 ANNUAL REPORT, GREAT LAKES BASIN COMMISSION.**
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 5G.
W75-12238

**CORPS' GUIDELINES FOR DAM SAFETY INSPECTION NEED REVAMPING,**
Tennessee Valley Authority, Knoxville. Flood Control Branch.
For primary bibliographic entry see Field 8A.
W75-12241

**PROPERTY (WETLANDS REGULATION),**
For primary bibliographic entry see Field 6E.
W75-12247

**RIVER CROSSING PERMITS FOR BUCKEYE PIPE LINE CO. PROPOSED PETROLEUM PRODUCTS PIPELINE SYSTEM BETWEEN LINDEN, NEW JERSEY AND MACUNGIE, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 8A.
W75-12258

**WATER BANK PROGRAM.**
Soil Conservation Service, Washington, D. C.
For primary bibliographic entry see Field 6E.
W75-12259

**ARE CHEMICALS USED ALGAE CONTROL BIODEGRADABLE.**
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5C.
W75-12325

**FLOW QUANTITIES IN RESIDENTIAL WEEPING TILE SYSTEMS--A CALCULATIONAL METHOD,**
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
G. D. Zarnett.
Research Paper No. S2042, February, 1975. 28 p, 8 fig, 10 ref.

Descriptors: *Flow measurement, *Tile drai
Urban drainage, Storm water, Storm drai
Storage tanks, Infiltration, Rainfall, Methodolo
Identifiers: Weeping tile drainage.

The installation of weeping tiles for residen
property drainage has presented several possi
ties of what to do with the collected water incl
ing: connection to sanitary sewer; connectio
storm sewer; proper grading with runoff a
from the house; storage of excess wet weat
flow; overflow treatment; and, diversion of r
leader. The proper choice of disposal method
pends on the flow quantities per subdivisio
calculational method is presented for determi
these quantities based on Darcy's Law and
continuity equation. Requirements for using
calculational procedure are: knowledge of
physiography and soil conditions of the a
proper perspective in the judgement of the hyd
lic situation; and, knowledge of the technique u
in laying the weeping tile. Parameters involve
the estimation of weeping tile flow quantities
infiltration, the initial process of water seep
through dry or drained soil to reach the w
table; weeping tile drainage, the quantity flo
through the drain as a function of the average r
fall intensity; and, time required for drainage a
precipitation ceases. A sample calculation
weeping tile flow is presented for a typical h
and surrounding property using experimental
obtained from a house in Niagara Falls, Can
(Orr-FIRL)
W75-12328

**THE FLOATING COVER: BEST WAY COVER A FINISHED-WATER RESERVOIR,**
For primary bibliographic entry see Field 5F.
W75-12360

**FLOOD PLAIN INFORMATION: MOO CREEK, ALBEMARLE COUNTY AND CH LOTTESVILLE, VIRGINIA.**
Army Engineer District, Norfolk, Va.
Prepared for Charlottesville and Albemarle C
ty, Va, Sept, 1971. 53 p, 9 fig, 15 tab, 19 plates.

Descriptors: *Floods, *Flooding, *Flood pl
*Virginia, Flood control, Flood protection, D
Flash floods.
Identifiers: *Moores Creek(Va), Cha
tesville(Va), Albemarle County(Va), Interme
Regional Flood, Standard Project Flood, Bi
Run(Va), Rivanna River(Va).

Flowing easterly through Albemarle Co
Moores Creek empties into the Rivanna Riv
Charlottesville. The study area also includes
mile long flood plain of Biscuit Run, a tributa
Moores Creek. The entire watershed cove
area of 34.5 square miles. The flood plain is m
undeveloped being used for agricultural and
purposes except for some scattered struc
along the left bank. Increased urbanization
city of Charlottesville may cause exte
development on the flood plain. Main flood s
is spring, although larger floods occur any
resulting from heavy general rains or from in
rainfall produced by tropical storms. Floodin
occur as a result of backwater from Ri
River. Flood duration is short lasting less t
day. No flood control or related measures e
the study area. Ten bridges as well as a lo
obstruct the flood flow. Using data from n
streams and personal interviews, October 16
was determined as the date of the greatest
An Intermediate Regional Flood would h
peak discharge of 20,700 cfs at Virginia Ro
Bridge with maximum channel velocities
ft/sec, remaining out of banks ten hou
Moores Creek. A Standard Project Flo
Moores Creek would have a peak dischar
28,250 cfs at Virginia Route 20 Bridge, ma
channel velocities of 15 ft/sec and remain
banks for 15 hours. (Salzman-North Carolina
W75-12366

LOOD PLAIN INFORMATION--COASTAL LOODING: TOWN OF POQUOSON, VIRINIA.
rmy Engineer District, Norfolk, Va.
ne, 1971. 41 p, 4 tab, 15 fig.

escriptors: *Flood forecasting, *Flood frequen-, *Floods, *Flood data, *Virginia, Water anagement(Applied), Flood peak, Flood protecon, Flood recurrence interval, Flood water, Flow uration, Flood damage, Flood proofing, Tidal aters, Estuaries, Chesapeake Bay.
entifiers: *Poquoson(Va), Intermediate Reonal Flood, Standard Project Flood, Subdivision gulations, Northeasters.

ne tidal flood situation of Poquoson, Virginia, at e eastern tip of York County, situated on the estern shore of Chesapeake Bay between the lal Poquoson and Back Rivers, is presented to lp local officials solve flooding problems and isely use land subject to flooding. Records of lal flood experience have been developed using lal records of the nearby areas, interviews and storical documents. Greatest floods occurred in 33 and 1962, caused by Chesapeake Bay waters iven by a hurricane and a northeast storm, spectively. Standard Project Tidal Flood deterination indicates tide heights as high as elevation .0 are possible and Intermediate Regional Tidal ood heights between elevations 8.0 and 9.0 can expected about once per 100 years. Resulting od damage would be substantial due to the great tent and depth of flooding, since most of oquoson is below elevation 7.0 msl datum. Many uses, roads and streets would become inunted. Main flood season due to hurricane extends m May to November. Water velocity varies dely from a few feet per second for tidal curnts up to 25 feet per second (17 miles per hour) r wind-driven waves. Flooding caused by hurcanes is of shorter duration than that caused by rtheasterns (cyclones). A year seldom passes thout storms severe enough to cause flooding. minimize flood damage, Poquoson should conol flood plain development through zoning and bdivision regulations and construct flood proction works. (Grden-North Carolina)
75-12367

LOOD PLAIN INFORMATION: MEHERRIN IVER, EMPORIA, VIRGINIA.
rmy Engineer District, Norfolk, Va.
epared for the Town of Emporia, Virginia, July, 64. 8 p, 1 fig; technical appendix - 23 p, 5 fig, 7 ates, 6 tab, 25 ref.

escriptors: *Flooding, Floods, *Flood control, Flood profiles, *Flood protection, Water anagement(Applied), *Flood plains, *Virginia.
entifiers: *Meherrin River(Va), Emporia(Va), termediate Regional Flood, Standard Project ood.

raining a long, narrow area of about 749 sq mi, cluding the city of Emporia, a farm market nter, the Meherrin River is subject to flooding used by storms over the entire area lasting 2 to 3 ys. The average rainfall is about 45 inches on the atershed above Emporia. The flood plain inudes residential and commercial development. ne small reservoir owned by Virginia Electric d Power Company has no significant effect on oods due to the small volume of available orage. A county regulation forbides subdivision land subject to flooding for residential use. veral flood reducing proposals including flood oofing, zoning regulations, building codes, alrnate uses of flood plain, and control of filling on od plain are suggested. The greatest flood ocrred in August 1940 with a peak discharge of ,000 cfs. Most recent flood was January 9, 1962 th a discharge of 12,900 cfs. A 50-year flood ould have an estimated peak discharge of 23,000 s, considerably below the 1940 flood, while a andard Project Flood's estimated peak scharge would be 40,000 cfs, about 2 feet higher than the 1940 flood. The purpose of this report is to make people aware of the possibility of flooding and to suggest measures to limit flood damage. (Salzman-North Carolina)
W75-12368

**FLOOD PLAIN INFORMATION, WILLAMETTE RIVER, JOHNSON, KELLOGG AND MT. SCOTT CREEKS, MILWAUKIE-OAK GROVE-LAKE OSWEGO, OREGON.**
Army Engineer District, Portland, Oreg.
Prepared for Clackamas County, Oregon, May 1970. 55 p, 6 fig, 24 plates, 17 tab.

Descriptors: *Floods, *Flooding, *Flood plains, Flood control, Flood protection, Reservoirs, Historic floods, *Oregon, *Flood forecasting.
Identifiers: *Willamette River(Ore), Johnson Creek(Ore), Kellogg Creek(Ore), Mt. Scott Creek(Ore), Milwaukie(Ore), Oak Grove(Ore), Lake Oswego(Ore), Intermediate Regional Flood, Standard Project Flood.

Located just south of Portland, Oregon, on the east bank of Willamette River, Milwaukie and Oak Grove are inundated by flood waters of its tributaries, Johnson Creek and Kellogg Creek respectively. The town of Lake Oswego fronts on the west bank of the Willamette River. Principal residential, commercial and industrial developments lie on these flood plains. Main flood season is winter or spring, depending upon principal source of runoff and the water surface elevations on Columbia River. Heavy rain augmented by snowmelt and intense rainfall cause flooding. Floods last from 1 to 5 days on the creeks, 7 to 14 days on the river. No authorized or proposed flood control measures for Kellogg Creek or its major tributary, Mt. Scott Creek, exist. An authorized channel improvement project for Johnson Creek has not been implemented. Eleven upstream multiple purpose reservoirs on Willamette River operate for flood control. No flood plain regulations are in effect. Greatest known flood occurred in December 1861 on Willamette River and in December 1964 on Johnson, Kellogg and Mt. Scott Creeks. An Intermediate Regional Flood would be 4 ft lower than the December 1964 flood while a Standard Project Flood would be from 2 to 5 ft higher than the December 1964 flood. Flood damage from any major flood would be substantial. This report provides a basis for further study and planning by local governing bodies. (Salzman-North Carolina)
W75-12369

**FLOOD PLAIN INFORMATION: HASSAYAMPA RIVER, VICINITY OF WICKENBURG, ARIZONA.**
Army Engineer District, Los Angeles, Calif.
Prepared for Flood Control District of Maricopa County, Arizona, April, 1972. 27 p, 13 fig, 23 plates, 6 tab.

Descriptors: *Floods, *Flooding, *Flood profiles, *Historic floods, *Erosion, Flash flood, Flood flow, Flood forecasting, Flood data, Flow duration, Deposition(Sediments), *Arizona.
Identifiers: *Hassayampa River(Ariz), Wickenburg(Ariz), Intermediate Regional Flood(IRF), Standard Project Flood.

Originating in the Bradshaw Mountains south of Prescott, the Hassayampa River drains a study area ranging from approximately 1830 ft to 7700 ft above mean sea level. Northern third of the basin is heavily forested mountains, central third is rolling hills, southern third is desert valley. Upstream gradient is about 400 ft/mi; gradient is 20 ft/mi near the downstream study limit. In Wickenburg, a retirement and dude ranch center 50 miles northwest of Phoenix, development in the flood plain includes a sewage treatment plant, a high school, apartments, public utilities and a private airstrip. Since little flat land is available elsewhere pressure for expanding flood plain development is anticipated. In this arid, sub-tropical climate zone of infrequent rainfall, flash floods occur in late summer and early fall from general storms and severe thunderstorms. In 1890 one of the worst flood disasters in the U.S. in terms of loss of life happened when a dam under construction failed killing 76 persons. In 1970 intense rainfall from Hurricane Norma created a major flood causing severe damage to property including the sewage disposal system which created a health hazard. No lives were lost. An Intermediate Regional Flood (IRF) would have a peak discharge at Box Canyon (location of a USGS stream gage) of 77,000 cfs as compared to 58,000 cfs for 1970 flood. Channel velocity will range from 6-20 ft/sec with 1-10 ft/sec overbank flow in flood plain areas. During a Standard Project Flood expected peak discharge would be 140,000 cfs with channel velocities 1 to 5 feet greater than an IRF causing severe erosion plus deposits of silt and debris. An irrigation control dam in Box Canyon proposed in 1945 has not been built. (Hufschmidt-North Carolina)
W75-12370

**FLOOD PLAIN INFORMATION: FOUNTAIN CREEK, COLORADO SPRINGS, MANITOU SPRINGS, COLORADO.**
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2E.
W75-12372

**FLOOD PLAIN INFORMATION: TONAWANDA CREEK AND ITS AFFECTED TRIBUTARIES, ERIE AND NIAGARA COUNTIES, NEW YORK.**
Army Engineer District, Buffalo, N. Y.
For primary bibliographic entry see Field 2E.
W75-12373

**FLOOD PLAIN INFORMATION: ONION CREEK, AUSTIN, TEXAS.**
Turner, Collie and Braden, Inc., Houston, Tex.; and Army Engineer District, Galveston, Tex.
Prepared for the City of Austin, June, 1973. 38 p, 6 fig, 15 plates, 6 tab.

Descriptors: *Floods, *Flood plains, *Flood control, *Flood protection, *Flood plain zoning, Land use, Flood recurrence interval, Flood damage, Flow characteristics, *Texas, Historic floods, Flood forecasting, Nonstructural alternatives.
Identifiers: *Austin(Tex), *Onion Creek(Tex), Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

This examination of past floods and estimation of future floods on 21 miles of Onion Creek near Austin, Texas, was requested as the basis for a flood plain zoning ordinance. Past floods have not done significant damage due to the agricultural use of the land bordering Onion Creek, which slopes about 8 ft/mi with cypress, oak and mesquite in the wooded portions of the flood plain. Pressure has been exerted to encroach on the flood plain with residential developments to accommodate the needs of Austin's anticipated growth of up to 100,000 people by 1983. Part of the City of Austin sewage treatment plant is located in the flood plain and a state park and municipal golf course are proposed. Located within a hydrologic province in the path of tropical and semitropical storms, Onion Creek can experience some of the highest rainfall in the U. S. Because of the creek's narrow valley, flooding does not extend to wide areas but water velocity is high and presents potential damage to structure in the flood path. The major flood of record occurred in September, 1921 with a discharge of 138,000 cfs, almost twice that of subsequent floods. An Intermediate Regional Flood would discharge 83,700 cfs and a Standard Project Flood would have a peak discharge of 162,000 cfs. Eleven bridges span the creek and at six of them the bridge floor is lower than the IRF crest elevation which could cause transportation and evacuation problems if not actual damage to bridges. The report recommends use of nonstructural alternatives including flood plain zoning, subdivision

regulations, building codes, health regulations, and development policies to protect against the hazards of floods on Onion Creek. (Park-North Carolina)
W75-12374

**FLOOD PLAIN INFORMATION: JAMES RIVER, HOWARDSVILLE TO SCOTTSVILLE, ALBEMARLE COUNTY, VIRGINIA.**
Army Engineer District, Norfolk, Va.
Prepared for the Albemarle County Board of Supervisors, November, 1973. 26 p, 17 fig, 13 plates, 5 tab.

Descriptors: *Floods, *Flooding, *Flood forecasting, *Flood profiles, Flood protection, Flood control, Flood plains, Historic floods, *Virginia.
Identifiers: *James River(Va), Howardsville(Va), Scottsville(Va), Albemarle County(Va), Totier Creek(Va), Intermediate Regional Flood, Standard Project Flood.

The 11-mile portion of the James River Basin covered in this report is located on the Piedmont Plateau approximately 200 miles above the river's mouth. The river channel slopes at 2.7 feet per mile and is relatively free of vegetation. Varying from 200 to 2500 feet in width, the flood plain is open and in agricultural use. The only development consists of several business and industrial establishments in the town of Scottsville. A stream gaging station at Scottsville shows that floods are produced by intense rainfall during all seasons but most notable are the hurricane produced floods. Flood stages last for several days due to the size of the drainage area (4,584 square miles). Although an advisory flood protection and management study has been made, no flood damage reduction measures presently exist. An earthfill dam on the Totier Creek tributary has no flood control capacity. The greatest flood occurred on June 22, 1972 as a result of intense rainfall associated with Hurricane Agnes. The river crested at 34.02 feet and had a peak discharge of 301,000 cubic feet per second (cfs). The most recent flood on October 6, 1972 crested at 23.24 feet and had a peak discharge of 97,600 cfs. An Intermediate Regional Flood and Standard Project Flood would inundate the flood plain with peak discharges of 237,000 cfs and 445,000 cfs, respectively. Damage exceeding the $4 million total inflicted by Hurricane Agnes can be expected unless control measures are taken. (Salzman-North Carolina)
W75-12375

**FLOOD PLAIN INFORMATION: SOUTH SANTIAM RIVER, LEBANON, OREGON.**
Army Engineer District, Portland, Oreg.
Prepared for Linn County, Oregon, June, 1973. 30 p, 14 fig, 19 plates, 5 tab.

Descriptors: Floods, *Flood control, *Flood protection, *Water storage, *Flood forecasting, *Flood profiles, Flooding, Flood plain, Flood plain zoning, Reservoirs, *Oregon.
Identifiers: *South Santiam River(Ore), Lebanon(Ore), Intermediate Regional Flood, Standard Project Flood.

South Santiam River, a tributary of the Willamette River, drains 1,037 square miles in central northwestern Oregon. Slope varies from 8 ft/mi upstream to 3 ft/mi downstream. Most of the flood plain in the 22-mile study area is devoted to agriculture. Lebanon (population 6,372) is on the flood plain where South Santiam River emerges from the foothills. Flood season extends from October through April with larger floods in December and January resulting from intense rainfall augmented by snowmelt when the soil is saturated or frozen. The river remains above bankfull stage for 6 to 8 days during floods. Natural and manmade obstructions, including 4 bridges, impede flood flow. Two flood control storage projects regulate runoff for about 75% of the drainage area. Over 20 bank protection projects have been constructed under emergency flood control authorization and channel debris removed. A comprehensive land-use plan makes provisions for county implemented flood plain regulations. Largest known flood occurred in December 1861. The December 1964 flood, the largest since stream flow records have been kept, crested 24.5 feet above bankfull and discharged 95,200 cfs. An Intermediate Regional Flood (IRF) would have discharged 98,000 cfs under natural conditions. With upstream storage provided by Foster and Green Peter Projects, an IRF would discharge 46,500 cfs and Standard Project Flood would discharge 92,000 cfs. (Salzman-North Carolina)
W75-12376

**SPECIAL FLOOD HAZARD INFORMATION: ISSAQUAH AND TIBBETTS CREEKS, ISSAQUAH AND VICINITY, WASHINGTON.**
Army Engineer District, Seattle Wash.
Prepared for the City of Issaquah and King County, Washington, June, 1971. 8 p, 14 plates.

Descriptors: *Flood plains, *Planning, *Flood plain zoning, Flood damage, Land use, Obstructions to flow, Flood profiles, Flood data, Floodways, *Washington, Erosion.
Identifiers: *Issaquah Creek(Wash), *Tibbetts Creek(Wash), Issaquah(Wash), Flood plain management, Intermediate Regional Flood, Lake Sammamish(Wash), Cascade Range, Issaquah County(Wash), King County(Wash).

Extending upstream from Lake Sammamish, Issaquah Creek, its North and East Forks, and Tibbetts Creek drain 59 square miles of the forested foothills of the Cascade Range in Washington. Creek channels are well defined and overgrown with brush. Major flood season extends from October until March. Greatest flooding is caused by rainstorms although melting snow occasionally augments flooding. Brush and materials placed to stabilize creek banks reduce channel capacity and will increase flood depths on adjacent lands. The maximum flood flow at the gage on the Issaquah Creek near the mouth occurred January 5, 1969 and was 1960 cfs. At the same location, an Intermediate Regional Flood (IRF) would have a peak discharge of 4750 cfs and a channel velocity of 15 feet per second, fast enough to create erosion problems. Flood occurrences greater than an IRF were not investigated. Most of the flood prone areas are still undeveloped. The greatest development of the flood plain is at the city of Issaquah which is primarily residential. Thirty-seven bridges cross the creeks, creating potential obstructions to flow. The report recommends that the local governments consider land use zoning measures and the establishment of a floodway to minimize flood damages. (Diefendorf-North Carolina)
W75-12377

**SPECIAL FLOOD HAZARD INFORMATION: PARADISE CREEK, PULLMAN AND VICINITY, WASHINGTON.**
Army Engineer District, Walla Walla, Wash.
Prepared for Whitman County, Washington, January 1970. 10 p, 10 plates, 3 fig, 1 tab.

Descriptors: *Flood plains, *Flood damage, *Planning, *Flood profiles, Land use, Flood data, Obstruction to flow, Flood plain zoning, *Washington, Idaho.
Identifiers: *Paradise Creek(Wash), *Pullman(Wash), Whitman County(Wash), Flood plain management, Standard Project Flood, Intermediate Regional Flood.

Throughout the 6.8 mile study reach of Paradise Creek east of Pullman, Washington, the flood plain is quite narrow, the average stream slope is 25 ft/mi, channel depth averages 6 feet, and mean basin elevation is 2700 ft above sea level. Major floods occurred in March, 1910, and February, 1948, but details on these floods are lacking. Peak flow of future planning floods was determined from meteorological and climatological records and gage data from nearby streams. At the mouth of Paradise Creek in Pullman the discharge of an Intermediate Regional Flood (IRF) would be 2400 cfs. Peak discharge for the Standard Project Flood (SPF) would be 3700 cfs at the mouth. Floods on Paradise Creek are of short duration, usually less than one day. Velocities in the creek channel range up to 18 feet per second. Velocities up to 6 feet per second can occur in the overbank area; velocities over 3 feet per second are considered hazardous. There are 27 bridges within the study reach, some severely restricting flow. They could sustain considerable damage in an IRF or SPF. Flood plain developments include residential and commercial establishments; however, most of the land is used for grazing. Flood plain regulations by the city of Pullman and Whitman County are needed as increasing development is expected along the Creek. (Diefendorf-North Carolina)
W75-12378

**FLOOD PLAIN INFORMATION: HACKBERRY CREEK AND COTTONWOOD BRANCH, DALLAS COUNTY, TEXAS.**
Army Engineer District, Fort Worth, Tex.
Prepared for Dallas County, Texas, December, 1974. 33 p, 7 fig, 11 plates, 5 tab.

Descriptors: *Floods, *Flood plains, *Flood profile, *Flood forecasting, *Flooding, *Flood plain zoning, Obstructions to flow, Maximum probable flood, *Texas.
Identifiers: Irving(Tex), *Hackberry Creek(Tex), Cottonwood Branch(Tex), Dallas County(Tex), Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

The watershed of Hackberry Creek in northwest Dallas County, Texas, has a drainage area of 20.0 square miles primarily rural in nature but with growing development pressures from Irving, 'The Fastest Growing City in Texas.' (From 1950 to 1970 Irving's population grew from 2,621 to 97,260). The Dallas-Ft. Worth Regional Airport is located in the upper portion of the drainage basin and is certain to spur continued growth. Although no records have been kept on flood characteristics of Hackberry Creek and Cottonwood Branch, a major tributary, future flood predictions were based on flood data for neighboring streams and on precipitation data. The Intermediate Regional Flood (IRF) on Hackberry Creek above the confluence with the South Fork of Hackberry Creek would have a peak discharge of 16,200 cfs, a height of rise above bankfull stage of 9.3 feet, and an overbank velocity of 2.8 feet/second while the corresponding figures for a Standard Project Flood (SPF) would be 25,300 cfs, 11.6 feet, and 3.0 feet/second. Accompanying plates show areas subject to flooding by the SPF and IRF. The report recommends investigation and implementation of flood plain zoning ordinances, subdivision regulations, building and health codes, and several other non-regulatory measures to reduce damages. (Park-North Carolina)
W75-12379

**WATERFLOODING OF OILFIELDS IN WYOMING TO 1968,**
Bureau of Mines, Laramie, Wyo. Minera Resources Field Office.
For primary bibliographic entry see Field 8B.
W75-12380

**HYDROGEOLOGIC DATA FOR THE LOWER CONNECTICUT RIVER BASIN, CONNECTICUT,**
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-19954

## B. Groundwater Management

**ISPLACEMENT STABILITY OF WATER RIVES IN WATER-WET CONNATE-WATER-EARING RESERVOIRS,**
oninklijke-Shell Exploratie en. Produktie aboratorium, Rijswijk (Netherlands).
Hagoort.
ociety of Petroleum Engineers Journal, Journal, ol. 14, No. 1, p 63-74, February, 1974. 13 fig, 10 f.

escriptors: *Fluid mechanics, *Mathematical odels, Saturated flow, Aquifers, Hydraulics, ydrology, Flow, Reservoirs, Connate water, Oil servoirs, Groundwater.
entifiers: *Buckley-Leverett model, *Muskat odel, Displacement stability.

is study uses the Buckley-Leverett displace-ent model of a two dimensional reservoir con-dering the effects of viscous and capillary forces t excluding gravitational effects. Stability iteria for the model include: (1) displacement is stable if the mobility ratio of the fluids behind d ahead of the shock is greater than one, pro-ded the wavelength of the instabilities is smaller an the canal width; and (2) the shock mobility is ways smaller than the end-point mobility ratio of uskat's model of displacement. Capillary forces termine the wavelength of the instabilities, and e maximum energy dissipating wavelength minates. This wavelength was calculated for a st-order perturbation; it is proportional to the io of capillary forces to viscous forces, and is a nction of the porous medium characteristics. periments in a transparent flow model verified e calculations. (Bradbeer-NWWA)
75-11870

**OLE-TO-HOLE GEOPHYSICAL MEASURE-ENT RESEARCH FOR MINERAL EXPLORA-ON,**
ological Survey, Denver, Colo.
r primary bibliographic entry see Field 8G.
75-11873

**COHYDROLOGY OF COLLIER COUNTY, ORIDA,**
mes and Moore, Park Ridge, Ill.
A. Deju, and W. L. Miller.
utheastern Geology, Vol 16, No 1, p 67-78, Au-st, 1971. 4 fig, 8 ref.

scriptors: *Hydrogeology, *Florida, *Geology, nestone, Aquifers, Groundwater, Salt marshes, rface waters, Flow, Saline water-freshwater in-faces, Drainage, Hydrology, atersheds(Basins), Water demand.
entifiers: Collier County(Fla), Everglades, oridan aquifer. Tamiami Aquifer, Miocene age.

uthwestern Collier County, Florida is undergo-growth in population with consequent in-eases in their water demand. Although rainfall is ndant, losses due to evapotranspiration and anic discharge are equally large. The subsur-e geology of the two main aquifers underlying area is discussed. Well logs, drillers logs are main tool for understanding the subsurface ology of this low, poorly-drained, flat plain. The llowest aquifer is composed entirely of perme-e limestones in the Tamiami Formation. The per Floridan aquifer is artesian and contains basic parts, an upper one yielding fresh water awthorn Formation) a lower part yielding salt ter (Tampa Formation). The two layers of the oridan aquifer are separated by an aquiclude. rections of flow, water quality and future poten-of all these hydrologic units are also examined. ampbell-NWWA)
75-11874

**NEW LOOK AT SANDSTONE ACIDIZING,**
xon Production Research Co., Houston, Tex.
J. L. Gidley.
Petroleum Engineer, Vol 45, No 11, p 55-62, October, 1973. 1 fig, 4 tab, 1 ref.

Descriptors: *Secondary recovery(Oil), *Injection, *Oil reservoirs, Permeability, Porosity, Reservoir yield, Supply, Water supply, Water yield, Groundwater.
Identifiers: *Sandstone acidizing, *Hydrofluoric acid, *Acid mutual solvent(AMS) technique, Ethylene glycol monobutyl ether(EGMBE).

An improved technique for the use of mixed HF-HCl acids in stimulation of sandstone formations to increase productivity is described. This acid mutual solvent (AMS) technique is a 3-step process which involves: (1) a preflush with a regular hydrochloric acid to buffer formation waters and prevent reaction with the hydrofluoric acid; (2) a mixed stage of HF-HCl that dissolves clay minerals to increase porosity and permeability; and (3) an afterflush using a mutual solvent such as ethylene glycol monobutyl ether (EGMBE) to remove the deposited clay minerals. Some problems associated with this treatment and their prevention are discussed. (Bradbeer-NWWA)
W75-11878

**GEOCHEMISTRY OF OIL-FIELD WATER APPLIED TO EXPLORATION,**
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
A. G. Collins.
Oil and Gas Journal, Vol 72, No 21, p 90-94, May 27, 1974. 3 fig, 25 ref.

Descriptors: *Groundwater, *Hydrocarbons, *Exploration, *Oil wells, *Geochemistry, Brines, Water types, Salinity, Iodides, Ammonium salts, Gulf of Mexico, Sandstone, Mesozoic era, Water utilization, Water chemistry.
Identifiers: Ethane, Butane, Smackover formation, Cretaceous.

Water is involved in the primary mechanisms that cause the accumulation, preservation, and destruction of oil and gas fields. A recent geochemical study on the Smackover (Gulf Coast - Cretaceous) indicated that knowledge of type, class, and dissolved constituents of the water is useful in exploration. The study examined reservoir samples of oil, gas, brine and rock as well as the traps involved. Certain dissolved constituents are favorable indicators of hydrocarbon accumulation such as iodide, ammonium, organic acid salts, ethane, butane, low sulfate concentrations, and the type of class of brine. Dry-hole indicators have also been determined and listed. (Bradbeer-NWWA)
W75-11879

**DECIPHERING OF GROUND WATER FROM AERIAL PHOTOGRAPHS,**
K. E. Nefedov, and T. A. Popova.
NASA TT F-681, 1972, 191 p. Trans of Deshifrirovanie Gruntovykh Vod do Aerofotosnimkam, Gidrometeologicheskoe izd., Leningrad 1969.

Descriptors: *Aerial photography, *Groundwater, *Location, Remote sensing, Mapping, Photography, Soil investigation, Distribution patterns, Cameras, Hydrogeology, Geologic control, Vegetation, Topography, Landscape.

The use of aerial photographs in groundwater studies is discussed. The principles of groundwater photo interpretation, aerial photo sampling and extrapolation of aerial photo indexes are described. A technique for medium-scale mapping of groundwater in areas of dificient precipitation is presented. A number of landscape elements and morphological units are considered in the estimation of groundwater conditions. (Bradbeer-NWWA)
W75-11882

**THERMODYNAMIC AND KINETIC ASPECTS OF ARGILLACEOUS SANDSTONE ACIDIZING,**
Institut Francais du Petrole, Rueil-Malmaison (France).
J. C. Labrid.
Society of Petroleum Engineers Journal, Vol 15, No 2, p 117-128, April, 1975. 18 fig, 3 tab, 12 ref.

Descriptors: *Sandstones, *Acids, *Thermodynamics, *Secondary recovery(Oil), Permeability, Porosity, Injection, Rates, Concentration, Groundwater, Aquifers, Aquifer management.
Identifiers: Hydrofluoric acid, Sandstone acidizing, Dissolution, Stimulated recovery.

The thermodynamic aspect of sandstone acidizing by hydrofluoric acid (HF) is examined. Silica dissolution, with a first order in HF concentration, leads almost exclusively to the formation of fluosilicic acid. Clay and feldspar dissolution is much more complex; after a uniform alteration of the crystalline lattice, partical precipitation of silicic species occurs when the acid is spent. An approach to the kinetic aspect is made by defining, for a naturally complex medium, a reactivity profile that is a characteristics of the medium instead of a single reaction-rate constant. Experimental data enable a correlation between permeability, porosity, and reactivity. Also, a qualitative interpretation of acid response curves is given. The numerical simulation of the acidizing process satisfactorily reproduces the experimental results. When extended to radial flow, the model shows the influence of stimulation parameters, injection rate, concentration, and time. (Campbell-NWWA)
W75-11891

**A LABORATORY STUDY OF THE EFFECTS OF CONFINING PRESSURE ON FRACTURE FLOW AND STORAGE CAPACITY IN CARBONATE ROCKS,**
Amoco Production Co., Tulsa, Okla.
F. O. Jones, Jr.
Journal of Petroleum Technology, Vol 27, p 21-27, January, 1975. 8 fig, 22 ref.

Descriptors: *Fracture permeability, *Reservoir yield, *Compaction, *Permeability, Groundwater, Withdrawal, Hydrostatic pressure, High pressure, Petroleum engineering, Laboratory tests, Fractures(Geologic), Storage capacity, Oil.
Identifiers: Net overburden pressure, Tectonophysics.

A study was made of the effects of increased net overburden pressures on fracture capacity as related to such an increase due to depletion of a fluid reservoir. Cores fabricated for controlled analysis and cores of reservoir rock samples were used similar for both sample types. A linear relationship was found between the cube root of permeability and the logarithm of confining pressure. (Bradbeer-NWWA)
W75-11892

**RESERVOIR PROPERTIES AFFECTING MATRIX ACID STIMULATION OF SANDSTONES,**
Chevron Oil Field Research Co., La Habre, Calif.
C. C. McCune, J. W. Ault, and R. G. Dunlap.
Journal of Petroleum Technology, Vol 27, p 633-640, May, 1975. 7 fig, 6 tab, 6 ref.

Descriptors: *Sandstones, *Permeability, *Flow augmentation, *Acid, *Secondary recovery(Oil), Injection, Oil reservoirs, Clogging, Porosity, Petrography, Mineralogy, Compressive strength.
Identifiers: *Mineral composition, *Matrix stimulation, Matrix dissolution.

Matrix stimulation means the dissolution and removal or relocation of minerals comprising the original formation matrix. A high-pressure, high-temperature acid permeameter was used in laboratory studies of sandstone formations to learn the

characteristics of a formation that make it a good or bad stimulation candidate. The age, compressive strength, mineral composition, original porosity and permeability of each of 20 samples were recoreded and compared to the response of the formation to the acid parmeameter. A single response indicator was derived from the composition, porosity and permeability of the tested sandstone. Generally, well-consolidated sands with high quartz-clay ratios are the best acidizing candidates. (Bradbeer-NWWA)
W75-11894

**THE USE OF A SPECIALIZED DRILLING AND GROUND WATER SAMPLING TECHNIQUE FOR DELINEATION OF HEXAVALENT CHROMIUM CONTAMINATION IN AN UNCONFINED AQUIFER, SOUTHERN NEW JERSEY COASTAL PLAIN,**
Woodward-CLyde Consultants, Clifton, N.J.
For primary bibliographic entry see Field 5A.
W75-11899

**EUROPEAN DEWATERING SYSTEM AIDS QUEBEC PROJECT,**
For primary bibliographic entry see Field 5D.
W75-11918

**LAND SUBSIDENCE IN THE SAN JOAQUIN VALLEY, CALIFORNIA, AS OF 1972,**
Geological Survey, Reston, Va.
J. F. Poland, B. E. Lofgren, R. L. Ireland, and R. G. Pugh.
Available from Supt. of Documents, GPO, Washington, D.C. 20402, price $2.20. Professional Paper 437-H, 1975. 78 p, 78 fig, 8 tab, 39 ref.

Descriptors: *Land subsidence, *Irrigation wells, *California, *Hydrologic data, *Well data, *Aquifer characteristics, Water level fluctuations, Drawdown, Pumping, Withdrawal, Maps, Hydrographs, Water demand, Water yields, Groundwater movment, Groundwater recharge.
Identifiers: *San Joaquin Valley(Calif).

Land subsidence which began in the mid-1920's due to groundwater overdraft in the San Joaquin Valley, Calif., has caused widespread concern for the past two decades. Withdrawals for irrigation increased from 3 million acre-feet in 1942 to 10 million acre-feet 1966. Water levels declined at unprecedented rates during the 1950's and early 1960's. By 1970, 5,2000 square miles of valley land had been affected, and maximum subsidence exceeded 28 feet. Basic-data graphs and computer-plotted stress-strain relationships constitute a major part of this report. They are based on 10-13 years of detailed field measurements of both water-level change and compaction collected by the U.S. Geological Survey at 20 selected locations in the San Joaquin Valley. The recharge characteristics of a groundwater reservoir are indicated roughly by the volume ratio, which is subsidence/pumpage. In the Los Banos-Kettleman City area, the values of this ratio range from less than 0.2 near the perimeter to more than 0.6 in the central part of the area. In the corresponding parts of the Arvin-Maricopa area, the ratio ranges from near 0 to more than 0.4. (Woodard-USGS)
W75-11956

**LAND SUBSIDENCE DUE TO GROUNDWATER WITHDRAWAL IN THE LOS BANOS-KETTLEMAN CITY AREA, CALIFORNIA, PART 2. SUBSIDENCE AND COMPACTION OF DEPOSITS,**
Geological Survey, Reston, Va.
W. B. Bull.
Available from Sutp. of Documents, GPO, Washington, D.C. 20402, price $2.45. Professional Paper 437-F, 1975. 90 p, 66 fig, 9 tab, 39 ref.

Descriptors: *Land subsidence, *Groundwater, *Pumping, *California, Hydrogeology, Data collections, Hydrologic data, Structural geology, Compaction, Stress, Geomorphology, Aquifer characteristics, Groundwater mining, Geology, Water wells, Well data, Water utilization.
Identifiers: *San Joaquin Valley(Calif).

Pumping of groundwater has increased the stresses tending to compact unconsolidated deposits by as much as 50 percent, thereby creating the world's largest area of intense land subsidence in the west-central San Joaquin Valley, Calif. As of 1966, 2,000 square miles had subsided more than 1 foot, and the area that had subsided more than 10 feet was 70 miles long. Maximum subsidence was 26 feet. Subsidence rates increased until the mid-1950's when the maximum observed rate was 1.8 ft per yr, but have decreased since then. During the 1963-66 period the maximum subsidence rate was only 1.1 ft per yr. Subsidence due to artesian-head decline is of greater extent and magnitude than other types of subsidence in the area. In most of the area about 70-95 percent of the compaction occurs in the lower zone below th Corcoran confining bed. As much as 30-40 percent of the compaction occurs in the upper zone in the southern part of the area. Geologic factors that cause differences in specific unit compaction include total applied stress, lithofacies, and source and mode of deposition. (Woodard-USGS)
W75-11957

**LAND SUBSIDENCE DUE TO GROUNDWATER WITHDRAWAL IN THE LOS BANOS-KETTLEMAN CITY AREA, CALIFORNIA, PART 3. INTERRELATIONS OF WATER-LEVEL CHANGE, CHANGE IN AQUIFER-SYSTEM THICKNESS, AND SUBSIDENCE,**
Geological Survey, Reston, Va.
W. B. Bull, and J. F. Poland.
Available from Supt. of Documents, GPO, Washington, D.C. 20402, price $1.90. Professional Paper 437-G, 1975. 62 p, 43 fig, 2 tab, 32 ref.

Descriptors: *Land subsidence, *Groundwater, *Pumping, *Aquifer systems, *California, Aquifer characteristics, Water table, Water level fluctuations, Data collections, Hydrologic data, Structural geology, Compaction, Stress, Geomorphology, Groundwater mining, Geology, Water utilization, Water management(Applied).
Identifiers: *San Joaquin Valley(Calif).

By increasing the stresses tending to compact the deposits by as much as 50 percent, man has created the world's largest area of intense land subsidence in the west-central San Joaquin Valley, Calif. As of 1966, more than 2,000 square miles had subsided more than 1 foot, and the area that had subsided more than 10 feet was 70 miles long. Maximum subsidence was 26 feet. The increase in stress caused by pumping of groundwater can be expressed in feet of water. A seepage of 1 foot of water occurs for each foot of head differential resulting from either artesian-head change or change in water-table position. Stress increase resulting directly from artesian-head decline has caused most of the compaction and subsidence. Changes in aquifer-system thickness may be both elastic (are reversible and occur with minor time delay) and inelastic (are irreversible and occur with large time delay). As of 1966 excess pore pressures existed in many of the aquitards and net aquifer-system expansion occurred briefly or not at all, but elastic changes did effect the monthly amounts of measured compaction. Importation of surface water has resulted in alleviation of subsidence in the Delta-Mendota Canal service area and in the vicinity of Stratford and Lemoore. (Woodard-USGS)
W75-11958

**WATER RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE NORTHERN GREAT PLAINS COAL REGION OF WYOMING, MONTANA, AND NORTH DAKOTA, 1975.**
Geological Survey, Denver, Colo. Water Resources Div.
For primary bibliographic entry see Field 5A.
W75-11961

**GROUND-WATER BASIC DATA FOR EMMONS COUNTY, NORTH DAKOTA,**
Geological Survey, Bismarck, N. Dak.
C. A. Armstrong.
North Dakota Geological Survey, Bismarck, County Ground-Water Studies 23--Part II, and North Dakota Geological Survey Bulletin 66--Part II, 1975. 375 p, 2 fig, 1 plate, 7 tab, 22 ref, append.

Descriptors: *Groundwater resources, *Basic data collection,s *North Dakota, *Aquifer characteristics, *Water quality, Water wells, Well data, Groundwater movement, Water yield, Groundwater recharge, Transmissivity, Chemical analysis, Groundwater, Streams, Lakes, Particle size, Cores, Mineralogy, Sediments.
Identifiers: *Emmons County(N Dak).

This basic data report of groundwater in Emmons County, N.D. provides geologic and hydrologic information needed for the orderly development of water supplies for municipal, domestic, livestock, irrigation, industrial, and similar uses. Specifically, the objectives were to: (1) determine the location, extent, and nature of the major aquifers and confining beds; (2) evaluate the occurrence and movement of groundwater, including the sources of recharge and discharge; (3) estimate the transmissivity of the aquifer and the potential yields of wells; (4) determine the quality of the groundwater; and (5) estimate the water use. The data were collected chiefly between 1970 and 1973 and consist of the following: (1) Geologic and hydrologic records for 1,193 wells and test holes; (2) water-level measurements in 76 observation wells; (3) lithologic and geophysical logs of 413 test holes and wells; (4) 265 chemical analyses of groundwater; (5) 24 chemical analyses of water from streams and lakes; (6) 14 particle-size distribution graphs; and (7) heavy mineral determinations made from three cores taken from the Fox Hills Formation. (Woodard-USGS)
W75-11963

**HYDROLOGIC SYSTEMS IN HAWAII,**
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 2A.
W75-12022

**HYDROLOGICAL STUDIES OF EVAPOTRANSPIRATION AND GROUNDWATER FLOW IN SANDY LAND,**
National Research Inst. of Agricultural Engineering, Hiratsuka (Japan).
For primary bibliographic entry see Field 2D.
W75-12032

**ARTIFICIAL GROUNDWATER RECHARGE, I. CIRCULAR RECHARGING AREA,**
California Univ., Davis. Dept. of Water Science and Engineering.
M. A. Marino.
Journal of Hydrology, Vol 25, No 3/4, p 201-208, May 1975. 4 fig, 14 ref.

Descriptors: *Artificial recharge, *Water spreading, *Numerical analysis, Digital computers, Aquifers, Water supply, Groundwater movement, Groundwater, Hydraulic properties, Hydraulic conductivity, Specific yield, Water table.
Identifiers: *Spreading basins, *Groundwater mound, *Dupuit equation, Water table profiles.

Artificial groundwater recharge is of increasing importance as an essential component of water management programs. The fluctuation of the

ater table in response to recharge depends on the ze and shape of the recharging area, on the dura- on and the type of variation of the recharge rate, nd on the hydraulic and geometric parameters of ie underlying aquifer. Numerical solutions escribing the formation of groundwater mounds ere obtained by applying the Douglas-Jones pre- ictor-corrector methods to the second order, non- near, partial-differential equation characterizing ie unsteady flow in an unconfined aquifer eneath a circular uniformly recharging area. An dvantage of using the method is that the predic- or-corrector equations result in a tridiagonal set f simultaneous equations which can be solved apidly in a digital computer. Furthermore, the ethod is computationally stable. (Schicht-ISWS)
75-12040

**EOCHEMISTRY OF STRONTIUM IN THE CIOTO RIVER DRAINAGE BASIN, OHIO,**
iami Univ., Oxford, Ohio. Dept. of Geology.
or primary bibliographic entry see Field 2K.
75-12052

**SE OF ENVIRONMENTAL ISOTOPE IETHODS AS A RECONNAISSANCE TOOL IN ROUNDWATER EXPLORATION NEAR SAN NTONIO DE PICHINCHA, ECUADOR,**
esellschaft fuer Strahlen- und Umweltforschung .b.H., Neuherberg bei Munich (West Germany).
stitut fuer Radiohydrometrie.
or primary bibliographic entry see Field 2F.
75-12080

**ATER CONSUMPTION TRENDS WITHIN HE CENTRAL AND SOUTHERN FLORIDA LOOD CONTROL DISTRICT,**
entral and Southern Florida Flood Control Dis- ct, West Palm Beach. Resources Planning Dept.
or primary bibliographic entry see Field 6D.
75-12085

**RTIFICAL GROUNDWATER RECHARGE, II. ECTANGULAR RECHARGING AREA,**
alifornia Univ., Davis. Dept. of Water Science d Engineering.
. A. Marino.
urnal of Hydrology, Vol 26, No 1/2, p 29-37, ly 1975. 4 fig, 14 ref, append.

escriptors: *Artificial recharge, *Pit recharge, Vater table aquifers, Equations, Numerical anal- is, Mathematical studies, Flow system, Hydrau- conductivity, Water table, Groundwater charge, Water management(Applied), Storage pacity, Water supply, Water storage, Percola- n, Water level fluctuations, Height, Ground- ter movement.
entifiers: *Rectangular recharge area, Alternat- g-direction implicit method.

e nonlinear, partial-differential equation aracterizing the unsteady flow in an unconfined uifer receiving uniform vertical recharge from a ctangular spreading basin was solved numeri- lly. The method of solution consisted of the al- nating-direction implicit scheme with an in- mogeneous grid spacing. The numerical solution as compared with an available linearized solution r a flow system in which the rate of recharge was uch smaller than the hydraulic conductivity of e underlying aquifer. The comparison showed at the values of the maximum height of the water ble obtained from the numerical scheme are al- ys higher than those calculated from the earized solution. (Visocky-ISWS)
75-12097

**FFECTIVE USE OF HIGH WATER TABLE REAS FOR SANITARY LANDFILL. VOLUME**
TN, Inc., Orlando, Fla.
r primary bibliographic entry see Field 5E.
75-12111

**POLLUTION OF GROUNDWATER DUE TO MUNICIPAL DUMPS,**
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 5B.
W75-12119

**HYDROGEOLOGICAL ASPECTS OF SOLID WASTE DISPOSAL,**
Wisconsin Univ., Madison. Water Resources Management Program.
For primary bibliographic entry see Field 5E.
W75-12121

**GROUND-WATER AND ENGINEERING GEOLOGY IN SITING OF SANITARY LAND-FILLS,**
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 5E.
W75-12122

**THE POTENTIAL FOR ENERGY PRODUCTION FROM GEOTHERMAL RESOURCES.**
Report--Subcomm. on Water and Power Resources--Comm. on Interior and Insular Affairs, U.S. Senate, 93d Cong, 1st Sess, December 1973. 40p.

Descriptors: *Geothermal studies, *Steam, *Electric power demand, Land, United States, Leases, Resources, Energy, Electricity, Electric power, Electric power production, Heat, Brines, Environment, Environmental effects, Environmental control.
Identifiers: *Environmental impact statement, Energy crisis.

The Geothermal Steam Act of 1970 was enacted to promote the orderly development of geothermal resources on public lands. The major device for achieving this objective is the authorization to the Secretary of the Interior to issue leases for the development and utilization of geothermal resources on public lands. The Subcommittee's 1973 report found that the geothermal resources of the United States hold a potential for the production of substantial amounts of energy in the form of heat and electric power. These potential geothermal technologies offer the possibility of providing environmentally attractice energy production. Geothermal resources occur in a variety of types and situations: dry-steam systems; wet-steams systems; hot dry-rock systems; and geopressured brines. The subcommittee recommended that the Department of Interior take steps to insure prompt issuance of final environmental impace statements, that a lead agency be designated to take responsibility for advancing geothermal energy resources and development, that exploration activity for geothermal energy resources be greatly accelerated, that research and developmental funding be increased, and that a financial assistance program be initiated to overcome some of the uncertainties associated with new technology development. (Gagliardi-Florida)
W75-12199

**MANAGEMENT OF INTERSTATE GROUND WATER,**
Fischer and Beatty, Fort Collins, Colo.
W. H. Fischer.
Natural Resources Lawyer, Vol 7, No 3, p 521-546 (1974). 26 p, 85 ref.

Descriptors: *Groundwater availability, *Interstate compacts, *Equitable apportionment, Legal aspects, Legal review, Governments, State governments, Interstate commissions, Federal-state water rights conflicts.

The interstate compact and interstate litigation are presented as the best alternatives for solving managerial problems of depletion and pollution of interstate groundwaters. Private litigation tends to be sporatic and ineffective, while uniform groundwater laws or interstate groundwater districts, are limited legally and politically. Except for pollution control, federal legislation in the area is unlikely. The interstate compact is the most effective, sound and flexible solution to the problem, but unless increased responsibility and political accountability can be expected from the states, litigation between the various states resulting in equitable apportionment of groundwater may be the only practical implement for actual management of this resource. (Knocke-Florida)
W75-12251

**UNITED STATES V. CAPPAERT (ACTION FOR DECLARATION OF RIGHTS OF UNITED STATES TO UNDERGROUND WATERS APPURTENANT TO DEVIL'S HOLE, DEATH VALLY NATIONAL MONUMENT).**
For primary bibliographic entry see Field 6E.
W75-12281

**RECYCLING ALLOWS ZERO WASTEWATER DISCHARGE,**
Black, Crow, and Eidsness, Inc., Clearwater, Fla.
For primary bibliographic entry see Field 5D.
W75-12364

**FLUID FLOW IN CHANNELS, CAPILLARIES, AND POROUS MEDIA UNDER THE INFLUENCE OF AN ELECTRIC FIELD,**
Bureau of Mines, Morgantown, W. Va. Petroleum Research Lab.
For primary bibliographic entry see Field 2F.
W75-12381

**GROUND WATER AND GROUND-WATER CONTROL,**
R. L. Loofbourow.
SME Mining Engineering Handbook, Vol 2, Section 26, p 26-2 to 26-55, 1973. 17 fig, 3 tab, 124 ref.

Descriptors: *Mining, *Groundwater, Drilling, Aquifer characteristics, Drainage, Wells, Dewatering, Wells, Cements, *Mine water, Permeability, Grouting, Tracers, Legal aspects, Pumping, Pumps, Water treatment, Water control.
Identifiers: Pumping cost, Underground mining, Pressure tests, Drill-stem tests, Lab tests on core, Centrifugal pumps, Sumps, Pump stations, Submersible pumps, Pollution control, Pilot hole, Underground bulkheads.

Ground water flow has an important effect on the cost and progress of most mining operations. The presence of ground water limits the methods which can be used in some circumstances and presents hazards in others. However, the water table may reduce the flow of springs and wells, with legal liability. Some mine water is used directly, some must be treated before discharge, and some contains dissolved solids that can be recovered profitably. Topics covered in this chapter include: mine-water occurrence, effects and control; forecast of inflow; pumping and drainage; water in surface mining; mine-drainage pollution control; special construction for water control; and legal aspects of ground water control. (Campbell-NWWA)
W75-12386

**FRAGMENTATION.**
For primary bibliographic entry see Field 8E.
W75-12387

**SPECIALIZED UNDERGROUND EXTRACTION SYSTEMS.**
For primary bibliographic entry see Field 8B.
W75-12388

CHEMICAL FRAGMENTATION,
For primary bibliographic entry see Field 8E.
W75-12389

WELL STORAGE,
For primary bibliographic entry see Field 8B.
W75-12390

BACTERIAL PROCESSES FOR IMPROVED OIL RECOVERY.
Tulsa Univ., Okla.
For primary bibliographic entry see Field 2F.
W75-12391

WATER-LEVEL FLUCTUATIONS AND EARTHQUAKES ON THE SAN ANDREAS FAULT ZONE,
Stanford Univ., Calif. Dept. of Geophysics.
R. L. Kovach, A. Nur, R. L. Wesson, and R. Robinson.
Geology, Vol 3, No 8, August, 1975. p 437-440, 2 fig, 17 ref.

Descriptors: *Water wells, Aquifer characteristics, Earthquake engineering, Seismic waves, *Faults(Geologic), Ground water, *California, Earthquakes, *Water level fluctuations.
Identifiers: *San Andreas Fault Zone(Calif.), Creep events, In situ pore pressure changes, Zone of active tectonic creep, Zone of seismicity.

Observations of the water-level changes in a well drilled into the San Andreas fault zone have been under way since May, 1971, with the objective of studying in situ pore pressure changes in a zone of active tectonic creep and seismicity. Small water-level changes, characterized by a decrease and subsequent rise have been followed by earthquakes of moderate size on the San Andreas fault zone. Compatibility of these observations with either a dilatancy-type behavior or a dislocation-type behavior for the pre-earthquake process can be demonstrated. Additional water-level observations at other sites in the fault zone are needed to examine the spatial and temporal extent of the actual preseismic process that is responsible for observed creep events, water-level changes, and tilt changes. (Campbell-NWWA)
W75-12392

CEMENTING OFF, PLUGGING, AND REDRILLING,
Dow Chemical Co., Tulsa, Okla. Dowell Div.
For primary bibliographic entry see Field 8F.
W75-12394

CONTROL OF GROUNDWATER AT BANCROFT MINES, ZAMBIA,
W. J. Whyte, and R. A. Lyall.
In: Ninth Commonwealth Mining and Metallurgical Congress 1969, Mining and Petroleum Geology Section, Paper 16, 32 p, 13 fig, 2 tab, 6 ref.

Descriptors: *Groundwater, Wells, *Mining, *Dewatering, Aquifer characteristics, Drilling, Hydrogeology, Groundwater recharge, Pumping, *Africa.
Identifiers: Wet mine, *Zambia, Surface drainage modifications, Cone of dewatering.

Bancroft Mines, Ltd., a copper-producing company situated at the northern end of the Zambian Copperbelt, hoisted 160,000 tons of ore per month and pumped an average daily volume of 65,000,000 gal of water to surface in mid-1968. The large volumes of water encountered and expected during mining are a major consideration in mine planning. The progress of dewatering relative to stoping is checked by regular estimates of the water level in each main aquifer, by underground observations, pressure measurements on underground boreholes and water-level measurements in surface boreholes. The main pumping installations at the mine are currently capable of delivering to surface a sustained volume of 75,000,000 gal/day. Underground water control measures in the event of a major power failure involve the flooding of selected levels, providing a no-pumping storage capacity of not less than four hours before shaft installations are affected. On surface, extensive modifications have been made to the natural drainage in order to divert a major tributary of the Kafue River from an area subject to caving overlying the orebodies and to increase runoff during seasonal storms and, hence, reduce recharge into the aquifers. An understanding of the geological characteristics of the various aquifers and an appreciation of the reliability or limitations of available geological data are essential to any assessment of the water hazards involved in underground development at Bancroft. (Campbell-NWWA)
W75-12395

RECENT APPLICATION OF GEOPHYSICAL METHODS IN COAL MINING,
National Coal Board, London (England).
For primary bibliographic entry see Field 8B.
W75-12396

TURBO-DRILLING AS APPLIED TO POTASH DEVELOPMENTS IN THE SASKATCHEWAN FIELD,
Cementation Mining, Ltd., London (England).
For primary bibliographic entry see Field 8B.
W75-12397

APPLICATION OF WELL LOGGING TECHNIQUES TO MINING EXPLORATION BOREHOLES,
British Petroleum Co. Ltd., Sunbury-on-Thames (England). Research Centre.
For primary bibliographic entry see Field 8G.
W75-12398

FRESH WATER STRATA OF MISSISSIPPI AS REVEALED BY ELECTRICAL LOG STUDIES,
Millsaps Coll., Jackson, Miss.
R. R. Priddy.
Mississippi State Geological Survey, Jackson, Bull 83, 71 p, 1955. 7 fig, 1 tab.

Descriptors: *Groundwater, *Water wells, Well logging, *Subsurface waters, Water quality, Mississippi, Electrical logging, *Drilling, Oil wells.
Identifiers: *Fresh-water sands, Paleozoic aquifers, Tertiary aquifers, Mesozoic aquifers.

The probable geographic (Lateral) distribution of the subsurface fresh-water-bearing sands of Mississippi and their stratigraphic (Vertical) distribution were determined by a study of nearly 500 electric logs of oil tests, selected from more than 3,500 logs. Most of the data--distribution of wells, and number and stratigraphic position of the aquifers they show--were obtained from 158 logs. The overall purpose of the investigation was to provide aid for planning to drill for drinking water, water for industrial use, or water for agricultural use. (Campbell-NWWA)
W75-12399

HYDROGEOLOGIC DATA FOR THE LOWER CONNECTICUT RIVER BASIN, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-19954

WATER-QUALITY DATA, 1948-73, ANCHORAGE AND VICINITY, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 5A.
W75-19955

## 4C. Effects On Water Of Man's Non-Water Activities

CRITICAL CHOICES SAVE SHORELINE,
For primary bibliographic entry see Field 6G.
W75-12231

## 4D. Watershed Protection

TRAINING OF SUTLEJ RIVER BELOW RUPAR HEADWORKS FOR THE PROTECTION OF BIST DOAB CANAL: MODEL STUDIES,
Hydraulic Research Station, Malakpur(India).
G. Singh, and B. D. Sharma.
Indian Journal of Power and River Valley Development, Vol. 22, No. 12, p 479-484, December, 1972. 8 fig, 1 tab.

Descriptors: *Model studies, *Erosion, *Rivers, River training, Bank erosion, Erosion control, Bank protection, Structural models.
Identifiers: *India, Armored spurs.

The Sutlej River below Rupar Barrage, India, started eroding its right bank opposite the Bist Doab Canal, which runs parallel. The river edge had come as close to the canal as 48.77 meters. The Punjab Irrigation and Power Research Institute investigated remedial measures to check further erosion of the river bank. A model of Sutlej River, Rupar Barrage, and the necessary reach of the Bist Doab Canal was constructed to a horizontal scale of 1/150 and a vertical scale of 1/30. The model was run with different discharges and different remedial measures were examined. Ultamately a scheme comprising construction of three armored spurs, each 33.53 meters long, on the right bank of the river was finalized. Balli sarkanda spurs were constructed in 1970. These temporary structures function satisfactorily and give the necessary protection to the right bank. (Sandoski-FIRL)
W75-11925

EFFECTS OF MOVEMENT OF PRECIPITATION AREA UPON RUNOFF PHENOMENA,
Tokyo Univ., (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12026

NUMERICAL SIMULATION OF WATERSHED HYDROLOGY,
Texas Univ., at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12027

A THREE-COMPONENT, NONLINEAR WATER-YIELD MODEL,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
For primary bibliographic entry see Field 2A.
W75-12031

INTRODUCTION OF SHORE EROSION CONTROL LEGISLATION.
For primary bibliographic entry see Field 6E.
W75-12279

FLOOD PLAIN INFORMATION: HASSAYAMPA RIVER, VICINITY OF WICKENBURG, ARIZONA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-12370

# . WATER QUALITY MANAGEMENT AND PROTECTION

## A. Identification Of Pollutants

**ELATIVE THROUGHFALL ENRICHMENT Y BIOLOGIC AND BY AEROSOL-DERIVED ATERIALS IN LOBLOLLY PINES,**
ississippi Univ., University. Dept. of Geology d Geological Engineering.
r primary bibliographic entry see Field 5B.
75-11853

**BSERVATIONS ON THE ATOMIC ABSORP-ON BEHAVIOR OF SOME OF THE EARTH LEMENTS,**
e Unicam Ltd., Cambridge (England).
R. Thomerson, and W. J. Price.
alytica Chimica Acta, Vol. 72, No. 1, p. 188-3, September 17, 1974, 1 fig, 3 tab, 15 ref.

escriptors: *Analytical techniques, *Heavy etals, *Trace elements, *Spectrophmetry, ollutant identification.
entifiers: Interferences, *Rare earth elements, tomic absorption spectrometry, Gadolinium, sprosium, Neodymium, Samanium, Yttrium.

e inherently poor sensitivities and detection nits for most of the rare earth elements, when mpared with some of the more common ele-ents, makes difficult the application of atomic sorption to the determintation of trace concen-tions. Many chemical interferences occur in the termination of these elements. This was con-med by measuring the absorbance of the ele-ents Gadolinium, Dysprosium, Neodymium, marium and Yttrium in a mixed solution on a nicam SP1900 double beam spectrophotometer, d comparing the results with the absorbance of eir individual solutions. Careful attention must given to the problem of interferences arising om minerial acids and other rare-earth elements; so the critical nature of the basic instrumental rameters must be realized. (Delfiner-Vanderbilt)
75-11862

**OXICITY OF COPPER COMPLEXES TO FRESHWATER MOLLUSKS,**
r primary bibliographic entry see Field 5C.
75-11863

**HE USE OF A SPECIALIZED DRILLING AND ROUND WATER SAMPLING TECHNIQUE OR DELINEATION OF HEXAVALENT HROMIUM CONTAMINATION IN AN UN-ONFINED AQUIFER, SOUTHERN NEW JER-EY COASTAL PLAIN,**
oodward-CLyde Consultants, Clifton, N.J.
S. Yare.
eology and Ground Water, Vol 1, p 151-154, pril, 1975, 4 fig, 1 tab, 5 ref.

escriptors: *Groundwater, Pollution, *Sampling, racking techniques, *Testing procedures, quifers, Chromium, Measurement, Drilling sam-es, Drilling, Drill holes, Well data, Well screens, est wells, *New Jersey, Coastal plains, Pollutant entification, Water pollution sources.
entifiers: Unconfined aquifer, Hexavalent romium.

technique for sampling formation water at ecific horizons during drilling was developed in investigation of contamination by chromium. e technique consists of: (1) drilling a borehole to e base of a sampling horizon; (2) lowering a wire-ound well screen and riser pipe to the bottom of e hole and gravel-packing the screen; (3) pump-g the borehole well until the discharge is clear of illing fluid; and (4) pumping at least 100 gallons of formation water before collecting the sample and performing field water quality tests. Analysis of water samples withdrawn from five wells, drilled to and screened at specific depths, verified the new technique was valid. This new procedure was then used to substantiate surface earth-resistivity data and determine the vertical distribution of the contaminant with time as the wells are also screened for sampling after drilling completion. (Bradbeer-NWWA)
W75-11899

**A RADIOISOTOPE MONITORING SYSTEM FOR SEWAGE EFFLUENT,**
California Univ., Livermore. Lawrence Livermore Lab.
J. L. Cate, Jr., and T. O. Hoeger.
American Industrial Hygiene Association Journal, Vol. 33, No. 10, p 693-699, October, 1972. 6 fig, 1 tab, 2 ref.

Descriptors: *Monitoring, *Sewage effluents, Radioisotopes, California, *Pollutant identification.
Identifiers: Alarm systems.

An automatic, on-line monitoring system for the sanitary sewage effluent from the Lawrence Livermore Laboratory in California has been constructed. It can detect, at levels lower than United States Atomic Energy Commission guidelines, all radioisotopes in use at the Laboratory, and it monitors pH continuously. It is wired into a central alarm system which alerts personnel on a 24-hour basis. (Sandoski-FIRL)
W75-11914

**MEASUREMENT OF EXTREMELY SMALL PRESSURE DIFFERENCES IN WATER,**
Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics.
For primary bibliographic entry see Field 7B.
W75-11915

**NEW COMPUTER SYSTEM MONITORS BATON ROUGE SEWERS.**
For primary bibliographic entry see Field 7C.
W75-11927

**COMPUTER'S MASTER PLAN SIGNALS SEWER PROBLEMS BEFORE THEY START,**
Thousand Oaks Utilities Dept., Calif.
For primary bibliographic entry see Field 7C.
W75-11928

**THE MANAGEMENT OF WATER IN NORTHERN IRELAND, WITH PARTICULAR REFERENCE TO WATER POLLUTION,**
For primary bibliographic entry see Field 5G.
W75-11939

**MERCURY CONCENTRATIONS IN OPEN OCEAN WATERS: SAMPLING PROCEDURE,**
Connecticut Univ., Groton. Marine Sciences Inst.; and Connecticut Univ., Groton. Dept. of Geology.
W. F. Fitzgerald, and W. B. Lyons.
Limnology and Oceanography, Vol 20, No 3, p 468-471, May, 1975. 1 tab, 18 ref.

Descriptors: *Heavy metals, *Mercury, Analytical techniques, *Oceans, *Sea water, *Sampling, Trace elements, Atlantic Ocean, *Pollutant identification.
Identifiers: Teflon ware, PVC.

Accurate Hg determination in sea water depends significantly on careful sampling at sea and on the sample storage procedure. Unusually large blank values were occasionally observed both for pyrex containers and glass BOD bottles. Collections made in PVC samplers and relatively expensive Teflonware showed no significant difference. Cold-trap preconcentration was followed by measurement of Hg by gas phase atomic absorption spectrophotometry. The PVC sampler was found suitable for collecting sea water samples at depth for Hg determinations. Hg concentrations averaged 8 plus or minus 3 ng per liter in surface water in the northwest Atlantic ocean. (Delfiner-Vanderbilt)
W75-11953

**WATER RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE NORTHERN GREAT PLAINS COAL REGION OF WYOMING, MONTANA, AND NORTH DAKOTA, 1975.**
Geological Survey, Denver, Colo. Water Resources Div.
Open-file report, May 1975. 110 p, 27 fig, 27 ref.

Descriptors: *Water resources development, *Water quality, *Projects, *Coal mine wastes, *Great Plains, Wyoming, Montana, North Dakota, Water pollution sources, Programs, Evaluation, Data collections, Chemical analysis, Sediment transport, Streamflow, Groundwater resources, Observation wells, Water quality control.
Identifiers: *Northeast Great Plains, *Coal regions(U.S.).

The Geological Survey's Water Resources Division has for many years maintained a program of water-resources investigations that includes the coal regions of Wyoming, Montana, and North Dakota. The recent interest in coal has added new dimensions and greater intensity to the investigations. The work has expanded to include monitoring the environmental effects of coal mining and processing and to determine the availability of additional water supplies for coal-conversion plants and related demands. This report describes the water-resources investigation program that is currently in operation. Locations of gaging stations and water-quality measuring sites, frequencies and parameters, and areas of groundwater studies are included. Brief descriptions of coal-related studies by investigators who are headquartered outside the Northern Great Plains coal regions are also included. Such studies are research in topics related to coal extraction, water supply, and post-mining reclamation. (Woodard-USGS)
W75-11961

**WATER RESOURCES DATA FOR CALIFORNIA, 1973: PART 2. WATER QUALITY RECORDS.**
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-11962

**GROUND-WATER BASIC DATA FOR EMMONS COUNTY, NORTH DAKOTA,**
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 4B.
W75-11963

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 6. MISSOURI RIVER BASIN.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11964

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 8. WESTERN GULF OF MEXICO BASINS.**
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11965

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 8. WESTERN GULF OF MEXICO BASIN.**
Geological Survey, Reston, Va.

For primary bibliographic entry see Field 7C.
W75-11966

**PHOTOGRAPHIC QUANTIFICATION OF WATER QUALITY IN MIXING ZONES,**
Wisconsin Univ., Madison. Inst. for Environmental Studies.
T. M. Lillesand, F. L. Scarpace, and J. L. Clapp.
Available from the National Technical Information Service, Springfield, Va. 22161 as N74-20016. NASA-CR-137268 (Undated). 26 p, 8 fig, 2 tab, 19 ref. NASA NGL 50-002-127.

Descriptors: *Aerial photography, *Analytical techniques, *Water pollution, *Waste dilution, Spectrophotometry, Mixing, Pulp wastes, Wisconsin, Discharge measurement, Waste water(Pollution), Suspended solids.
Identifiers: *Mixing zone, Kimberly-Clark Corp.(Wis.), Fox River(Wis.).

To quantitatively delineate waste concentrations throughout waste effluent mixing zones, a method was developed based on densitometric measurements obtained from aerial photography. Simultaneously acquired color infrared photography and suspended solids water samples were used to delineate the mixing zone resulting from discharge of a Kimberly-Clark paper mill effluent at Kimberley, Wisconsin. A mixing zone is defined as the extent a receiving water body utilizes to dilute a waste discharge to a concentration characteristic of a totally mixed condition. Digital scanning microdensitometer data was used to estimate and delineate suspended solids concentrations on the basis of a semi-empirical model. It is shown that photometry, when predicated on a limited amount of ground sampling, can be used to measure and define mixing zone waste distributions are reliably and in more detail than conventional surface measuring techniques. The method has direct application to the establishment of definite and rational water quality guidelines, the development of sampling and surveillance programs for use of government and primate agencies, and the development of design and location criteria for industrial and municipal waste effluent outfalls. (Buchanan-Davidson--Wisconsin)
W75-11970

**THE RISK OF DEOXYGENATION OF WATER IN HERBICIDE APPLICATION FOR AQUATIC WEED CONTROL,**
University of Wales Inst. of Science and Tech., Cardiff.
M. P. Brooker.
Journal Institution of Water Engineers, Vol 28, No 4, p 206-210, 1974. 2 fig, 1 tab, 9 ref.

Descriptors: *Aanerobic conditions, *Herbicides, *Aquatic weed control, *Oxygen demand, Diquat, Paraquat, Submerged plants, Aerobic conditions, Aquatic plants, Decomposing organic matter, Phytoplankton, Fishfill, Estimating, Equations, Europe.
Identifiers: Barry Reservoir(Wales), Oxton Lake(England).

One danger of application of herbicides (such as diquat and paraquat) to control aquatic submerged plants is risk of water deoxygenation due to aerobic decomposition of dead plant material. Aerobic decomposition of aquatic macrophytes and phytoplankton can be described by a first order equation relating rate of decomposition change to biodegradable mass. A scheme is described to enable those responsible for water management to assess the risk of deoxygenation during herbicide application. Dissolved oxygen concentration levels to avoid fish mortality can be calculated. Oxygen resources available for aerobic decay processes in relation to oxygen requirements for fish survival at varying water depths and the maximum plant freshweight per unit area which can be treated with herbicide without producing severe water deoxygenation can be calculated. Hypothetical examples of how to assess deoxygenation risk are presented. The method was used successfully in Barry Reservoir, South Wales, but minimum recorded oxygen concentrations were higher than predicted; no fish deaths were recorded. In Oxton Lake, Nottinghamshire, treatment with paraquat resulted in reduction in dissolved oxygen concentrations and fish deaths occurred; the predicted minimum concentration was higher than the observed minimum concentration. (Buchanan-Davidson--Wisconsin)
W75-11996

**ENVIRONMENTAL RESEARCH LABORATORIES, 1973 ANNUAL REPORT.**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
Report ATDL-106, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, December 1974. 310 p.

Descriptors: *Air pollution, *Model studies, *Dispersion, *Fallout, Atmosphere, Mathematical models, Distribution patterns, Meteorology, Cooling towers, Deciduous forests, Evaporation, Smog, Solar radiation, Pollutants, Hygrometry, Theoretical analysis, On-site investigations, Rural areas, Cities, Path of pollutants.
Identifiers: *Plumes, Photochemical smog.

Research contributions for 1973 were compiled. Titles of the 14 contributions are: Distribution of Solar Radiation within a Deciduous Forest; A Note on the Elevation of the Mean and the Mode of the Gaussian Concentration Distribution; Lidar vs. Photometer, a One Month Comparison; Application of a Simple Dispersion Model to a Rural Industrial Region; The Simple ATDL Urban Air Pollution Model; Diffusion Estimation for Small Emissions; Parameterization of Surface Moisture and Evaporation in a Planetary Boundary Layer Model; The Form of the Frequency Distribution of Air Pollution Concentrations; Application of a Simple Model of Photochemical Smog; Urban Air Pollution Models - Why; Radiation Doses from Hypothetical Exposures to Rulison Gas; Estimates of Dry Deposition and Plume Depletion Over Forests and Grassland; Meteorological Effects of the Cooling Towers at the Oak Ridge Gaseous Diffusion Plant. Part I. Description of Source Parameters and Analysis of Plume Photographs and Hygrothermograph Records; and Theoretical Estimates of Lift-Off of Buoyant Gas Initially on the Ground. (See W75-12034 thru W75-12039) (Humphreys-ISWS)
W75-12033

**DISTRIBUTION OF SOLAR RADIATION WITHIN A DECIDUOUS FOREST,**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 2I.
W75-12034

**A NOTE ON THE ELEVATION OF THE MEAN AND THE MODE OF THE GAUSSIAN CONCENTRATION DISTRIBUTION,**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
F. A. Gifford.
In: 1973 Annual Report; Report ATDL-106, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 31-35, December 1974. 2 fig.

Descriptors: *Model studies, *Mathematical models, *Powerplants, *Path of pollutants, Equations, Winds, Average, Distribution patterns, Atmosphere, Air pollution.
Identifiers: *Plumes, Plume models, Concentration distributions, Powerplant stacks, Gaussian distributions.

In an infinite atmosphere with constant wind, u, the elevation of a Gaussian plume would be constant. The usual assumption of complete ground reflection alters this, as would the assumption of absorption. In view of the widespread use of this plume model, it is of interest to obtain the equations governing the height of the mean and the mode of the concentration distribution. The behavior exhibited by these curves agrees at least qualitatively with what would be expected. Near the stack both the mean and the mode are located at stack height. Farther downwind, near the point at which the vertical spreading, sigma sub z, grows to near the stack height, the pattern changes. The height of the mean then increases for both reflection and absorption as sigma sub z increases, whereas, for reflection, the mode decreases abruptly to zero. (See also W75-12033) (Sims-ISWS)
W75-12035

**LIDAR VS. PHOTOMETER, A ONE MONTH COMPARISON,**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
W. M. Culkowski, and S. D. Swisher.
In: 1973 Annual Report; Report ATDL-106, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 37-46, December 1974. 4 tab, 6 ref.

Descriptors: *Air pollution, *Instrumentation, *Measurement, Turbidity, Photometry, Remote sensing, Optical properties, Air environment.
Identifiers: *Lida, Particulates.

Results were presented for September 1972 of a comparison between turbidity data and lidar backscattering data. Correlations of +0.99 were obtained for one set of data, but on a semilogarithmic rather than linear basis. The monthly turbidity from the photometer averaged 0.281 (10 cases). The turbidity derived from the lidar reading was 0.305 (20 cases). Comparisons with a distant particulate sensing station were also presented. The correlation between Oak Ridge lidar and Chattanooga particulate matter suggested that most particulate matter observed is from natural, or at least ubiquitous, sources. (See also W75-12033) (Sims-ISWS)
W75-12036

**APPLICATION OF A SIMPLE DISPERSION MODEL TO A RURAL INDUSTRIAL REGION,**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
S. R. Hanna.
In: 1973 Annual Report, Report ATDL-106, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 47-62, December 1974. 4 fig, 4 tab, 10 ref.

Descriptors: *Model studies, *Air pollution, *Tenneessee, *Dispersion, Mathematical models, Powerplants, Industries, On-site data collections, Winds, Wind velocity, Pollutants, Path of pollutants, Rural areas.
Identifiers: *Particulate concentrations.

A simple dispersion model for multiple point and area sources was applied to the Rockwood-Harriman, Tennessee, region, which contains two small towns and two major industries. Predicted annual average suspended particle concentrations were well correlated (r = 0.95) with observations at four stations. Variations in daily average concentrations at the four stations were partly accounted for (r = 0.5) by variations in daily average wind speed. (See also W75-12033) (Sims-ISWS)
W75-12037

HE SIMPLE ATDL URBAN AIR POLLUTION ODEL,
ational Oceanic and Atmospheric Administra-on, Oak Ridge, Tenn. Air Resources Atmospher- Turbulence and Diffusion Lab.
. A. Gifford.
: 1973 Annual Report, Report ATDL-106, Air esources Atmospheric Turbulence and Diffusion aboratory, Oak Ridge, Tennessee, p 63-81, ecember 1974. 2 tab, 16 ref, 1 append.

escriptors: *Model studies, *Mathematical odels, *Air pollution, *Cities, Path of pollutants, ollutants, Industries, Diffusion, Air circulation, tmosphere.
dentifiers: *Pollutant concentrations.

he simple urban air pollution model in use at the tmospheric Turbulence and Diffusion Laborato-, Oak Ridge, was described. Experience with is model was reviewed. The ATDL philosophy f air pollution modelling was discussed. It was own that this simple model consistently gave ightly better results than more complex models. was argued that some of the more complex odels have been pushed on too rapidly with eoretical modelling without adequate experi-ental checks against the real atmosphere. (See so W75-12033) (Sims-ISWS)
/75-12038

IFFUSION ESTIMATION FOR SMALL EMIS-IONS,
ational Oceanic and Atmospheric Administra-on, Oak Ridge, Tenn. Air Resources Atmospher- Turbulence and Diffusion Lab.
. A. Briggs.
: 1973 Annual Report; Report ATDL-106, Air esources Atmospheric Turbulence and Diffusion aboratory, Oak Ridge, Tennessee, p 83-145, ecember 1974. 4 fig, 1 tab, 19 ref, 5 append.

escriptors: *Air pollution, *Diffusion, Dispersion, Fallout, Pollutants, Effluents, owerplants, Industries, Industrial wastes, uoyancy, Winds, Wind velocity, Path of pollu-ns, Air circulation.
dentifiers: *Stack effluents, Small emission, erodynamic effects, Particle concentrations, round level concentrations.

simplified approach to the calculation of ground vel concentrations of effluents from sall industri- and fuel burning installations was described. It as intended to serve as a first approximation to a ery complex process. Because each stack, build-g, and terrain configuration is different, actual round concentration may frequently differ from e calculated values by a factor of two. Nonethe-ss, this procedure should be useful for determing hether ambient air quality standards are likely to e met, exceeded, or only marginally obtained. It lso predicts the locations where the highest and ost frequent ground concentrations are likely. ampling at several such locations is very advisa-le, unless the predicted concentrations are quite w. These procedures were designed especially r source heights of less than 100 m. Some of the mplifications made are not valid for large emis-ons. (See also W75-12033) (Sims-ISWS)
/75-12039

NFLUENCE OF ENVIRONMENTAL STRESS N ENUMERATION OF INDICATOR BAC-ERIA FROM NATURAL WATERS,
lontana State Univ., Bozeman. Dept. of licrobiology.
or primary bibliographic entry see Field 5C.
/75-12053

IRUS REMOVALS IN TRICKLING FILTER LANTS,
or primary bibliographic entry see Field 5D.
/75-12068

INORGANICS, (LITERATURE REVIEW),
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
R. A. Minear, J. S. Henderson, C. L. McEntyre, and R. R. Rose.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1118-1162, June, 1975. 429 ref.

Descriptors: *Reviews, *Water analysis, *Chemical analysis, *Inorganic compounds, Lakes, Rivers, Oceans, Radiochemical analysis, Neutron activation analysis, Spectrophotometry, Colorimetry, Sampling, *Bibliographies, *Pollutant identification.

An in-depth review of current literature on the nature and analysis of chemical species, with inorganics in particular, is presented. Water samples from various types of oceans, lakes, and rivers as well as effluent discharges were analyzed. Sample concentration and separation techniques are described. Much literature has been reported on the application of instrumental techniques including atomic absorption spectrophotometry, flameless atomic absorption, atomic fluorescence, emission spectroscopy, gas and liquid chromatography, electrochemical analysis, neutron activation analysis, and other radiochemical techniques. Tables are given for a cross reference to the specific analytical methods and individual constituents. Colorimetric and titrimetric methods were conducted for halogens, ozone, sulfur compounds, cyanide, boron, silicon, phosphorus, nitrogen, iron, manganese, and aluminum, as well as for various transition metals. (Kramer-FIRL)
W75-12072

WATER CHARACTERISTICS, (LITERATURE REVIEW),
Maine Univ. Orono.
J. A. Olofson, and M. M. Ghosh.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1161-1169, June, 1975. 73 ref.

Descriptors: *Reviews, *Water analysis, Heavy metals, Analytical techniques, Eutrophication, Water quality, Water chemistry, Suspended solids, Turbidity, Odor, Toxicity, *Bibliographies, *Pollutant identification.
Identifiers: Ligands, Voltammetry, Spectrophotometry.

A review of the literature on analytical techniques for determination of water characteristics is presented. Attention has been given to the finding of heavy metals and associated ligands in natural waters. Analytical procedures such as voltammetry and pulse polarography are described. Naturally occurring Fe fractions in seawater have been examined. Calculations have also been made to assess the degree to which Hg(II), Cd(II), Zn(II), and Pb(II) form complexes with hydroxyl and chloride ions in natural systems. Transport of heavy metals by water and bottom sediments has been investigated. Other methods of water analysis were atomic absorption spectrophotometry for arsenic determination, uv and visible spectrophotometric methods for trace metal speciation, and liquid-liquid extraction of organic compounds. Further studies included the retention of phosphate and sulfate by muscovite, thermal aspects of aquatic chemistry as related to effects upon physical-chemical parameters, and a phosphorus model related to lake eutrophication. A new index of water quality has been proposed, based on temperature, nutrients, ss, turbidity, coliform bacteria, DO, color, odor, and toxicity; it has been applied to surface waters in Tennessee. Reviews have also been made of various aspects of natural water chemistry with regard to bioassay evaluation of water quality. (Kramer-FIRL)
W75-12073

TREATMENT PLANT TO BE TESTED FOR CARCINOGENS,
Western Kentucky Univ., Bowling Green. Dept. of Engineering Technology.
For primary bibliographic entry see Field 5F.
W75-12130

BIOCHEMICAL CHARACTERISTICS OF DIGESTED CHEMICAL SEWAGE SLUDGES,
Environmental Protection Service, Ottawa (Ontario). Water Technology Centre.
For primary bibliographic entry see Field 5D.
W75-12132

VIROLOGICAL INVESTIGATIONS ON SLUDGES FROM SELECTED ONTARIO SEWAGE PLANTS,
Ontario Ministry of Health, Toronto.
For primary bibliographic entry see Field 5D.
W75-12133

ANALYSIS OF HEAVY METALS IN SEWAGE SLUDGE AND LIQUIDS ASSOCIATED WITH SLUDGES,
Toronto Univ. (Ontario). Dept. of Geology; and Toronto Univ. (Ontario). Dept. of Chemistry,
J. C. Van Loon.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2 September 18-19, 1974, Toronto, Ontario, Canada, p 234-248. (1974) 9 tab, 10 ref.

Descriptors: *Analytical techniques, *Heavy metals, *Sewage sludge, *Pollutant identification, Iron, Lead, Copper, Cadmium, Nickel, Zinc.

The equipment and techniques for the analysis of heavy metals in sewage sludge and liquids associated with sludges are presented. It is questionable whether a grab sludge sample can be considered as representative of the sludge in a digester tank. Data presented suggest that the majority of the sludge water metal is bound tightly and therefore is not readily detectable using extractable metal procedures. Nickel, copper, and cadmium appear to be little affected by filter porosity size. Lead was found in the solids residue trapped by a 60 micron porosity filter. The metal contents of sludges ranged from: 2-147 ppm Cd; 16-16000 ppm Cr; 85-4000 ppm Pb; 7-1500 ppm Ni; 162-3000 ppm Cu; 1-24 ppm Hg; 60-500 ppm Mn; 4-60 ppm Ag; 610-19000 ppm Zn; 0.33-7.4 ppm Fe; and, 0.10-3.9 ppm Al. The analytical techniques used allowed the detection of cadmium and zinc above 0.2 ppb and the detection of iron, lead, copper and nickel above 1.0 ppb. The high metal levels detected in sewage treatment plant products in this study demonstrate a need for research into the fate of these metals after reacting with terrestrial and acquatic environments. (See also W75-11715) (Orr-FIRL)
W75-12140

CHEMICAL TESTS FOR PLANT AVAILABLE METALS IN SOILS.
Guelph Univ. (Ontario). Dept. of Land Resource Science.
T. E. Bates, and A. Haq.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2 September 18-19, 1974, Toronto, Ontario, Canada, p 267-268. (1974) 3 ref.

Descriptors: *Soils, *Nutrients, Crops, Sewage sludge, *Cadmium, *Copper, *Metals, Pollutant identification, Canada.
Identifiers: Ontario, EDTA, DTPA, Ammonium acetate.

The amount of nutrient in soil available to plants is not necessarily related to the total amount in the soil. A study is now in progress to determine a suitable extractant to measure plant available metals in soils in Ontario. Emphasis has been placed on cadmium and copper which are important pollutants of sewage sludge. Thirty-five soils with varying amounts of copper and cadmium contamination have been collected in Ontario. Swiss Chard has been grown on the soils. An analysis

will be made of the chard to determine the metal content in soils extracted with EDTA, DTPA, ammonium acetate, and other chemicals. The metal extracted from the soils will be correlated with the metal uptake by the Swiss Chard. It is hoped that this experiment will determine an extractant that will give satisfactory measure of plant available metals. (See also W75-11715) (Dean-FIRL)
W75-12142

**PRIMARY DEVELOPMENTS OF AIR-BORNE BACTERIA IN THE OECD ACTIVATED SLUDGE SYSTEM,**
CIBA-GEIGY Ltd., Basel (Switzerland). Dyestuffs and Chemical Div.
For primary bibliographic entry see Field 5D.
W75-12143

**DETECTION OF POLLUTANTS BY FISH TESTS,**
W. E. Jones.
Water Treatment and Examination, Vol 24, pt 2, p 132-139, 1975. 1 tab.

Descriptors: *Pollutant identification, *Methodology, *Freshwater fish, Toxicity, Metals, Halogenated pesticides, Organic compounds, Organophosphorus pesticides, Paraquat, DDT, Zinc, 2-4D, Dieldrin, Endrin, Flourine, Cadmium, Chromate, Mercury, Fish physiology, Lethal limit, Laboratory tests, Bioindicator.
Identifiers: Bioaccumulation, Guppies, *Lebistes reticulatus, MCPA, BHC, Endosulphan, Parathion, Demeton, Phenkapton, Rotenone, Trichloroethylene, Acetonitrile, Alkybenzene sulphonate, Cyanide.

Methodology for toxicity testing and the effects of various toxins on guppies, Lebistes reticulatus, were described. Concentrations of the toxic agents, period of exposure, and reactions were recorded. The toxic agents included Cd, Cr, Hg, Zn, F, CN, 2-4D, MCPA, Paraquat, BHC, DDT, Dieldrin, Endrin, Endosulphan, Parathion, Demeton, Phenkapton, Rotenone, Trichloroethylene, Acetonitrile, and Alky benzene sulphonate. (Katz)
W75-12193

**NITROGEN, PHOSPHORUS, AND EUTROPHICATION IN THE COASTAL MARINE ENVIRONMENT,**
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W75-12236

**COLUMN SETTLING TESTS FOR FLOCCULANT SUSPENSIONS,**
Envirex, Inc. Milwaukee, Wis. Environmental Science Div.
For primary bibliographic entry see Field 5D.
W75-12322

**APPLICATION OF THE METHYLTHYMOL BLUE SULFATE METHOD TO WATER AND WASTEWATER ANALYSIS,**
Ontario Ministry of the Environment, Rexdale, Water Quality Branch.
J. M. Adamski, and S. P. Villard.
Analytical Chemistry, Vol 47, No 7, p 1191-1194, June, 1975. 3 fig, 2 tab, 6 ref.

Descriptors: *Analytical techniques, *Sulfates, *Water analysis, Gravimetric analysis, Economics, *Pollutant identification, Methodology.
Identifiers: *Methylthymol blue method, Precision analysis.

The present standard sulfate method for water and waste water analysis is the gravimetric method. However, this method is tedious and time consuming. A faster Methylthymol Blue technique has tested to be satisfactory. A comparative study of the two methods is presented. Both methods were evaluated by finding the differences between duplicate analyses for samples of 'waters'(clear samples from water supplies), 'rivers' (natural surface waters), and 'sewage' (raw inputs from domestic treatment plants as well as final effluents from both municipal and industrial sources) containing sulfate in a 0-50 mg/liter and a 0-200 mg/liter range. For precision, sensitivity, and number of interferences, the automated Methylthymol Blue method was analytically superior to the gravimetric method. It was also economically advantageous, having lower costs per analysis, a greater analysis speed, and smaller bench space requirements for performing the analysis. (Kramer-FIRL)
W75-12324

**LIGHT AND ASSIMILATION NUMBER IN A SMALL DESERT, RECHARGED-GROUNDWATER POND,**
Arizona State Univ., Tempe. Dept. of Zoology.
J. M. Foster, and B. I. Sherwood.
Oecologia, Vol 18, No 2, p 155-194, 1975. 4 fig, 1 tab, 34 ref.

Descriptors: *Groundwater, *Recharge, *Water reuse, Analytical techniques, Monitoring, Chlorophyll, Photosynthesis, Carbon, Lakes, Eutrophication, Arizona, *Pollutant identification.
Identifiers: Phoenix(Ariz), Physico-chemical studies, Biological analysis.

A study was made to evaluate the potential of water reclamation as a solution to water pollution and water storage problems. Physico-chemical and biological studies of recharged-groundwater at the Flushing Meadows Infiltration basins in Phoenix, Arizona, have been carried out, where part of the reclaimed waste water is stored in small artificial ponds. One desert pond (West Pond) was monitored for irradiance, chlorophyll a concentration, respiration, and net and gross photosynthesis. Over a six-month period, chlorophyll a concentration averaged 119 mg/cu m. Gross primary productivity in terms of mean daily carbon fixation rate was 8.29 C/cu m, which is less than many polluted eutrophic lakes and streams and is roughly equivalent to productive fish and farm ponds. A maximum value of gross assimilation number at 0.16 cal/sq cm/min of 30 mg C/hr per ml chlorophyll a indicate that this pond has an excellent photosynthetic capacity. (Prague-FIRL)
W75-12326

**ENVIRONMENTAL WATER QUALITY PROGRAM,**
Chicago Dept. of Aviation, Ill.
For primary bibliographic entry see Field 5G.
W75-12331

**RECENT DEVELOPMENTS OF INSTRUMENTATION, CONTROL AND AUTOMATION SYSTEMS FOR WASTEWATER TREATMENT SYSTEMS,**
Tokyo (Japan). Sewerage Bureau.
For primary bibliographic entry see Field 5D.
W75-12341

**ORGANIC RESIDUE IN A RECYCLED EFFLUENT, PART I,**
Utah State Univ., Logan.
For primary bibliographic entry see Field 5D.
W75-12348

**DETERMINATION OF NTA IN ENVIRONMENTAL WATER BY GAS CHROMATOGRAPHY,**
Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
R. J. Stolzberg, and D. N. Hume.
Anal Lett, Vol 6, No 9, p 829-837, 1973.

Descriptors: *Pollutant identification, *Gas chromatography, Analytical techniques, *Nitrilotriacetic acid, Organic acids, Biodegradation, Water pollution sources
Identifiers: Acetate, Amino, Anions, Bacterial, Biological, Carboxylate, Cation, Chelating, Chromatography, Degradation, Detergent, Determination, Environmental Esters, Growth, Interference, Laundry, Media, Methylsilyl, Nitrilo, Poly, Replacement, River, Spiked, Tri, USA, Water.

A rapid, sensitive gas chromatographic method for the determination of NTA (nitrilo-triacetate) as its trimethylsilyl ester was developed. The method is not subject to interference by common cations, a wide variety of anions, or other aminopolycarboxylate chelating agents. Satisfactory determinations of NTA in the low ppm range were carried out in artificial standards, spiked river water and bacterial growth media. The method is suitable for following biological degradation of NTA which has been suggested as partial replacement for phosphates in laundry detergents in the USA.--Copyright 1974, Biological Abstracts, Inc.
W75-12363

**DETERMINATION OF RESIDUAL QUANTITIES OF THE BUTYL ESTER OF 2,4-DICHLOROPHENOXYACETIC ACID IN ENVIRONMENTAL OBJECTS BY GAS-LIQUID CHROMATOGRAPHY, (IN RUSSIAN),**
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
R. D. Vasyagina, and V. D. Chmil'.
Gig Sanit., Vol 38, No 5, p 69-72, 1973.

Descriptors: *Pollutant identification, *Gas chromatography, *Organic acids, *Pesticides residues, Standards, Chromatography, Water quality standards, Analytical techniques.
Identifiers: Esters, Gas-liquid chromatography.

Quantitative methods were developed for determining residual quantities of the vapors of the butyl ester of 2,4-D in air (sensitivity 0.3 ug/1) and of this butyl ester in water (sensentivity 10 ug/1) by means of gas-liquid chromatography. There is no need for a quantitative analysis if an internal standard having similar physiocochemical properties to the pesticides being analyzed is added to the sample before extraction. In the given case the methyl ester of 2,4,5-trichlorophenoxyacetic acid was used as the internal standard.--Copyright (c) 1974, Biological Abstracts, Inc.
W75-12393

**WATER-QUALITY DATA, 1948-73, ANCHORAGE AND VICINITY, ALASKA,**
Geological Survey, Anchorage, Alaska.
D. E. Donaldson, P. J. Still, and C. Zenone.
Open-file report, 1975. 59 p, 1 fig, 1 plate, 10 tab, 12 ref.

Descriptors: *Basic data collections, *Water quality, *Surface waters, *Groundwater, *Alaska, Chemical analysis, Inorganic compounds, Biochemistry, Physical properties, Streamflow, Sediment transport, Sediment yield, Particle size, Sampling, Sites, Maps.
Identifiers: *Anchorage(Alaska).

This compilation of selected water-quality data was collected in Anchorage and vicinity, Alaska, between 1948 and 1973. The surface and groundwater data include concentration of individual constituents, as well as certain properties or characteristics such as hardness, specific conductance, pH, temperature, and color. Fluvial-sediment data include suspended-sediment concentration, suspended-sediment discharge, and particle-size distribution of suspended sediment. In 1973, wells were drilled within and adjacent to the Greater Anchorage Area Borough's landfill (solid-waste disposal site) near the Anchorage International Airport and at a landfill on Elmendorf Air Force Base to determine the presence and

emical characteristics of any leachate produced the landfills. Water-quality data from the wells e included in tables. (Woodard-USGS)
75-19955

## B. Sources Of Pollution

**ELATIVE THROUGHFALL ENRICHMENT Y BIOLOGIC AND BY AEROSOL-DERIVED ATERIALS IN LOBLOLLY PINES,**
ississippi Univ., University. Dept. of Geology d Geological Engineering.
J. Banaszak.
vailable from the National Techincal Informa-n Service, Springfield, Va 22161, as PB-245 258, .75 in paper copy, $2.25 in microfiche. Mississip-Water Resources Research Institute, Mississip-State, Completion Report, August 1975. 28 p, 3 , 1 tab, 13 ref. OWRT A-083-MISS (1).

escriptors: *Throughfall, *Nutrients, Rain, erosols, *Loblolly pine trees, Coniferous trees, lica, Phosphates, Ammonia, Sulfates, Nitrates, kalinity, Potassium, Sodium, Calcium, ydrogen ion concentration.

he objective was to provide an estimate of the lative importance of nutrient enrichment from o sources, biologic materials and aerosols, as-ciated with rain falling through a pine canopy. A ot of loblolly pines was divided into one half that as left as it was and the other half that was en-osed in an attempt to isolate it from aerosols. ain water and water from the throughfall and emflow of the trees were analyzed for silica, osphate, ammonium, sulfate, nitrate, pH, al-linity, potassium, sodium, and calcium. It ap-ars that there is little difference in enrichment ctors from the enclosed versus the open trees, at the contribution of aerosol material to the dis-lved load of throughfall is minimal. There also pears to be no net loss of constituents from the nopy of young, growing loblolly pines in very nse stands except for potassium.
75-11853

**COMPARISON OF THE METHODS USED TO ALCULATE FIRST ORDER BOD EQUATION ONSTANTS,**
utgers - the State Univ., New Brunswick, N. J. ept. of Environmental Science.
P. Hewitt, and J. V. Hunter.
Vater Research, Vol. 9, No.7, p 683-687, 1975. 8 b, 12 ref. OWRT A-0250-NJ (6). 14-31-0001-3830.

escriptors: *Biochemical oxygen demand, Ox-gen demand, Water quality, Water pollution ef-cts, Kinetics, Methodology, Equations.
dentifiers: *BOD rate constants, First order netics.

comparison of seven published methods for cal-ulating first order BOD equation constants for ver water samples showed that six of the ethods gave k values that varied up to 57% from ose obtained using the reference Reed-Theriault rocedure. Variations of Lo values from those of e reference method were as high as 51%. In addi-on certain methods tended to give higher k and/or O values and others to give low k and/or Lo alues. The cause of these deviations was not defi-encies in the calculation methods but probably oor adherence to first order kinetics.
75-11855

**HE USE OF A SPECIALIZED DRILLING AND ROUND WATER SAMPLING TECHNIQUE OR DELINEATION OF HEXAVALENT HROMIUM CONTAMINATION IN AN UN-ONFINED AQUIFER, SOUTHERN NEW JER-EY COASTAL PLAIN,**
Voodward-CLyde Consultants, Clifton, N.J.
or primary bibliographic entry see Field 5A.
75-11899

**THE EFFECT OF WIND ON THE SPREAD OF CONTAMINATION IN THE YEISK ESTUARY, (IN RUSSIAN),**
V. A. Prokopenko, O. L. Davydov, O. V. Mezhera, and Y. M. Khabakhbashev.
Gig Sanit, Vol 3, p 101-103, 1974.

Descriptors: *Estuaries, Water pollution, Soil contamination, *Winds, Beaches, *Sewage effluents, Sea water, Analysis, *Water pollution sources, *Path of pollutants.
Identifiers: *Yeisk(RFSFR), USSR.

The influence of wind on the effect of sewage discharge on water usage areas, such as beaches, in the Yeisk estuary and the city of Yeisk (Russian SFSR, USSR) was investigated during 1967-1970. During the summer, the city was inhabited by 70,000-75,000 people. The sewage was discharged into the Yeisk estuary. The mean yearly wind velocity in Yeisk was 6.1 m/s. Pollution reached the beach areas in 4 h. The chemical and bacteriological quality of the sea water in the sewage discharge area was studied. East and northeast winds led to pollution of the mouth of the estuary. West and southwest winds favored pollution of the beach areas between Yeisk and Shirochanka. The intensity of the dilution process with increasing wind strength increased only in the areas nearest to the sewage outlet.--Copyright 1975, Biological Abstracts, Inc.
W75-11983

**ENVIRONMENTAL RESEARCH LABORATORIES, 1973 ANNUAL REPORT.**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W75-12033

**DISTRIBUTION OF SOLAR RADIATION WITHIN A DECIDUOUS FOREST,**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 2I.
W75-12034

**A NOTE ON THE ELEVATION OF THE MEAN AND THE MODE OF THE GAUSSIAN CONCENTRATION DISTRIBUTION,**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W75-12035

**APPLICATION OF A SIMPLE DISPERSION MODEL TO A RURAL INDUSTRIAL REGION,**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W75-12037

**THE SIMPLE ATDL URBAN AIR POLLUTION MODEL,**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W75-12038

**DISPERSION AND SETTLING AROUND A WASTE DISPOSAL POINT IN A SHALLOW SEA,**
Liege Univ. (Belgium). Institut de Mathematique.
J. C. J. Nihoul, and Y. Adam.
Journal of Hydraulic Research, Vol 13, No 2, p 171-186, 1975. 5 fig, 5 ref.

Descriptors: *Waste disposal, *Tidal effects, *Mathematical models, *Turbidity, *Diffusion, Shear, Sediment transport, Dispersion, Data collections, Estuaries, Numerical analysis, Fluid mechanics, Shallow water, Sea water, Tides, Water pollution sources, *Path of pollutants.
Identifiers: *Belgian coast, Tidal cycle.

Waste disposal into the sea gives rise to pollution problems associated with local increases in turbidity and the deposit of sediment on the sea bed. Turbidity reduces depth of penetration of sunlight and hence the chlorophyll synthesis intensity. The diffusion mechanism in shallow seas is essentially two-dimensional, and estuary diffusion models have to be generalized to make allowance for the rotation of the earth. Equations were derived that govern the horizontal dispersion of a pollutant in the sea under the influence of the two-dimensional shear effect on settling and removal of sediment from the bottom during the part of the tidal cycle when bed shear stress exceeds the critical value. It was shown that the shear effect gives rise to anisotropic dispersion. A numerical method of solution was developed and applied to actual dumping of wastes off the Belgian coast. Tidal currents predominated in the example area. The results obtained were in agreement with observations made in the course of dump supervision operations. (Singh-ISWS)
W75-12043

**VERTICAL TEMPERATURE PROFILES IN OPEN-CHANNEL FLOW,**
Dar es Salaam Univ. (Tanzania).
E. J. Schiller, and W. W. Sayre.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY6, Paper 11389, p 749-761, June 1975. 7 fig, 16 ref, 2 append. OWRT C-3140(3692)(2). NSF GK-5918.

Descriptors: *Dispersion, *Thermal stratification, *Water pollution, *Open channels, Hydraulics, Stratified flow, Thermal pollution, Temperature, Open channel flow, Mixing, Heat transfer, Buoyancy, Turbulent flow, Distribution, Profiles.
Identifiers: Bulk mixing coefficient.

Methods were presented for predicting vertical mixing of heated surface effluents in the far-field mixing region. A set of laboratory flume experiments covered a range of flows from well-mixed to nearly stably stratified conditions, over a range of conditions commonly encountered in practice. The data, together with analysis based on the convection-diffusion equation, were used to determine: (1) the distance for nearly complete mixing; (2) a bulk mixing coefficient, K sub y, for rapidly mixing flows; and (3) the vertical distribution of the overall vertical heat transfer coefficient, E sub Ty, at downstream cross sections. Buoyancy effects were reflected in the vertical distribution of E sub Ty. Stratification sharply inhibited vertical mixing near the surface and reduced vertical mixing throughout most of the depth. For rapidly mixing flows, the vertical heat transfer coefficient agreed closely with the turbulent mass and momentum transfer coefficient. (Lee-ISWS)
W75-12047

**GEOCHEMISTRY OF STRONTIUM IN THE SCIOTO RIVER DRAINAGE BASIN, OHIO,**
Miami Univ., Oxford, Ohio. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W75-12052

**POLLUTION EFFECTS ON SURFACE WATERS AND GROUNDWATERS,- (LITERATURE REVIEW),**
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
R. H. F. Young.
Journal Water Pollution Control Federaton, Vol. 47, No. 6, p 1600-1610, June, 1975. 95 ref.

Descriptors: *Water pollution, *Reviews, *Groundwater, *Surface water, *Water pollution sources, *Water pollution effects, Water pollution control, Nutrients, Phosphorus, Nitrogen, Heavy metals, Phenolics, Organic compounds, Urban runoff, Model studies, *Toxicity, Aquatic organisms, Thermal pollution, Pesticides, Radioactive wastes, Bibliographies.
Identifiers: Non-point sources.

The 1973-74 literature dealing with the pollution of surface and groundwaters was reviewed. Topics covered included: nutrients in surface waters; runoff and waste discharges; groundwater pollution; land and subsurface disposal of waste water; heavy metals; radionuclides; biological contamination; thermal discharges; and models and indexes of water quality. Phosphorus and nitrogen studies were performed with regard to levels, relationship to productivity, sources, and control. Carbon chloroform extract, phenol, DDT, PCB, heavy metals, soil and grease, and coliforms are constituents of runoff and waste discharge. The toxicity of chlorine residuals to aquatic organisms was investigated. Hydrocarbons in sediments and the environmental effects of outboard motor subsurface exhausts were reported. Urban runoff and non-point sources received more attention than in previous years. Causes, effects, controls, and monitoring of groundwater pollution are discussed. Sources and toxic effects of heavy metals are reported. Orr-FIRL
W75-12070

**ORGANICS, (LITERATURE REVIEW),**
Drexel Univ., Philadelphia, Pa. Dept. of Environmental Engineering and Science.
I. H. Suffet, S. Friant, C. Marcinkiewicz, M. J. McGuire, and D. T-L. Wong.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1169-1241, June, 1975. 13 tab, 701 ref.

Descriptors: Water pollution, *Reviews, *Organic compounds, *Water pollution sources, Water pollution control, Pollutant identification, Pesticides, Oil pollution, Detergents, Surfactants, Water analysis, Plastics, Toxicity, Environmental effects, *Bibliographies.

An extensive review of the 1974 literature on organics in water pollution (identification, analytical procedures, treatments, sources) is presented. Topics covered included: oxygen demand and organic carbon; detergents and surfactants; oil and grease, pesticides and related chlorinated hydrocarbon compounds such as chlorinated hydrocarbon pesticides, polychlorinated biphenyls, napthalenes and paraffins, organophosphorus pesticides, carbamates and ureas, herbicides, and other pesticides; and, organic analysis of water including waste water analyses, drinking water and natural water analyses, and analyses of humic acids, organic mercury compounds, plastics, plasticizers-phthalate acid esters, taste and odor compounds, organic acids, nitrogen compounds, carcinogenic compounds, and sulfur compounds. The following information was presented in table form: toxicity and biological effect of detergents, surfactants, and detergent builders on aquatic organisms; toxicity and biological effects of petroleum contaminants on aquatic organisms; toxic effects of chlorinated hydrocarbon biocides in aquatic organisms; residuals of chlorinated hydrocarbons in aquatic related organisms; residuals of chlorinated hydrocarbons in soils and sediments; photolysis studies of chlorinated hydrocarbons; toxic effects of PCB's on aquatic related organisms; summary of studies of environmental impact of pesticides; toxic effects of herbicides to aquatic related organisms; herbicide adsorption studies, photolysis studies of herbicides; collection methods for identification of trace organics in water; and, toxicological levels and effects of mercury. (Orr-FIRL)
W75-12071

**INORGANICS, (LITERATURE REVIEW),**
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W75-12072

**EFFECTIVE USE OF HIGH WATER TABLE AREAS FOR SANITARY LANDFILL. VOLUME I,**
VTN, Inc., Orlando, Fla.
For primary bibliographic entry see Field 5E.
W75-12111

**EFFECTS OF AERIAL FOREST FERTILIZATION WITH UREA PELLETS ON NITROGEN LEVELS IN A MOUNTAIN STREAM,**
Pacific Northwest Water Lab., Corvallis, Oreg.
K. W. Malueg, C. F. Powers, and D. F. Krawczyk.
Northwest Sci., Vol 46, No. 1, p 52-58. 1972.

Descriptors: *Forests, *Fertilization, *Ureas, *Nitrogen, Streams, Rainfall, Water pollution effects, *Path of pollutants.
Identifiers: Aerial fertilization, Mountain streams, Pellets.

Effects of urea pellets introduced directly into the water during the application were considered, in addition to wash-off and leaching from the adjacent forest land. Aerial application of fertilizer resulted in rapidly increased urea concentration in the water, and this was probably due to direct fallout into the water. Fertilization of the watershed immediately adjacent to the stream resulted in movement of N to the water during periods of rainfall.--Copyright (c) 1973, Biological Abstracts, Inc.
W75-12113

**POLLUTION OF GROUNDWATER DUE TO MUNICIPAL DUMPS,**
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
G. Hughes, J. J. Tremblay, H. Anger, and J. D'Cruz.
Water and Pollution Control, Vol 110, No 1, p 15-17, 1972.

Descriptors: *Groundwater, *Water pollution control, *Landfills, *Leachate, Garbage dumps, Gases, Regulation, Precipitation(Atmospheric), Hydrology, Surface waters, Methane, Carbon dioxide, *Water pollution sources.

Major investigations of the production and movement of dissolved solids and gases from solid waste disposal sites have been made in California and Great Britain. Other investigations have been conducted in New York, Illinois, Pennsylvania, South Dakota, West Virginia and Wisconsin. The studies revealed that a polluting leachate can be produced by refuse in contact with water, either groundwater or surface precipitation. In Britain, Illinois, and Wisconsin, investigations have demonstrated that precipitation will infiltrate refuse to produce a leachate unless measures are taken to seal the complete landfill surface. Methane and carbon dioxide, as well as dissolved solids, are produced by the refuse decomposition; the former may create explosion problems and carbon dioxide may increase groundwater hardness. The design of protective measures for otherwise unsuitable sites appears feasible and is being studied in California and Illinois. Currently regulations range from generalities to those specifying that certain physical conditions exist at the site to prevent pollution which may be unduly restrictive or hopelessly complex. The effectiveness of various types of liners, mechanisms by which contaminants are removed from leachate by natural processes, effects of slope, materials, and vegetation on infiltration into a landfill, and methods of leachate treatment require investigation. (Auen-Wisconsin)
W75-12119

**NITROGEN TRANSFORMATION AND UPTAKE,**
Guelph Univ. (Ontario). Dept. of Land Resource Science.
E. G. Beauchamp and J. Moyer.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2 September 18-19, 1974 Toronto, Ontario, Canada, p 159-173. (1974) 9 fig, 10 ref

Descriptors: *Sludge disposal, *Fertilization, *Nitrogen cycle, *Crop response, Nitrification, Denitrification, Nitrogen fixation, Leaching, Groundwater, Surface waters, Absorption.
Identifiers: Land application.

Some of the more important transformations of sludge nitrogen and their importance to crops and the environment are discussed. Nitrogen is one of the limiting factors in the disposal of sewage sludges on argicultural land. The total organic N content of anaerobically digested sludges may vary between 0.1 and 0.3 on a fluid basis. The ammonium nitrogen (NH4-N) content may be between 2 and 50% of the total N. Transformations discussed include: mineralization of organic N; conversion of NH4 to NO3 via nitrification; volatilization of NH3; immobilization of organic N, NH4, and NO3 by soil microorganisms; NH4 fixation in clays; and, denitrification of NO3. The nitrification process involving the conversion of NH4 to NO3 is the most important from the point of view of crop uptake and ground or surface drainage water pollution. Sludge should not be applied in quantities which supply more available N (NH4) than the crop requires. This will prevent NO3 pollution of ground and drainage waters as well as an excessive uptake of NO3-N by plants which could be harmful to ruminants. (See also W75-11715) (Orr-FIRL)
W75-12136

**RUNOFF AND EROSION LOSSES,**
W. E. Curnoe.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2 September 18-19, 1974, Toronto, Ontario, Canada, p 174-184. (1974) 6 tab, 2 ref.

Descriptors: Runoff, Erosion, Sludge, Clay loam, Nutrients, Heavy metals, Precipitation(Atmospheric).
Identifiers: Soil conditions, Experiments.

Experiments were conducted to determine nutrient and heavy metal losses through runoff and erosion. The experiments began in the fall of 1972 and were conducted through the spring of 1974. The soil was a sandy clay loam with tile drains on a 2% and 6% slope. The sludge was applied in November, January, and May. Water was collected and measured and samples were taken for analysis after each runoff. Precipitation patterns and runoff events are directly related. The experimental period had a precipitation rate slightly above average. The highest nitrogen loss occurred during the winter months. The sludge application time did not seem to affect the phosphorus loss which was low. Heavy metal losses were also generally low. The conclusions were: before applying sludge, weather probabilities, snow cover, and soil conditions should be considered; application rates can increase nutrient runoff and should be restricted; and the amount of metal in the sludge has an effect on the amount of heavy metal loss. (See also W75-11715) (Dean-FIRL)
W75-12137

**SOME MICROBIOLOGICAL ASPECTS OF THE LAND DISPOSAL OF SLUDGE,**
Guelph Univ. (Ontario). Dept. of Microbiology.
For primary bibliographic entry see Field 5D
W75-12138

ATION DISTRIBUTION IN SOILS AS RE-ATED TO SEWAGE SLUDGE DISPOSAL ON AND,
uelph Univ. (Ontario). Dept. of Land Resource cience.
. Protz.
n: Sludge Handling and Disposal Seminar, Con-erence Proceedings No 2 September 18-19, 1974, oronto, Ontario, Canada, p 192-206. (1974) 15 fig, tab, 10 ref.

escriptors: *Sludge disposal, *Fertilization, Soil science, *Cations, *Soil profiles, Soil orizons, Soil moisture, Soil physical properties, oil structure, Path of pollutants.

esearch being conducted at the University of uelph, Ontario on the land disposal of sewage udge includes a study to demonstrate variation of oils at the macro (field plot) and micro (cation) cales. This type of data will be included in the evelopment of final guidelines for soil sampling nd analyses. Clay content influences the pH and ariability of CaCO3 content by influencing the mount of water passing through the soil. The otential maximum variability of cations in a soil is emonstrated with two profiles 12 inches apart in oarse textured soils. This variability is caused by he inherent fluvial parent material and the in-uence of trees on soil formation. Distribution of ations within the soil profile is under the ultimate ontrol of their solubility products, porosity of the oil, and the micro variations in the soil moisture egime. The "final" distributions of cations within he soil on the microscopic scale are illustrated by iicrographs of the different pedological recipitates and concretions found in soils. In rder to dispose of waste on agricultural land for ood production under environmentally safe con-itions, it is necessary to understand the variabili-y of cations in soils to accurately monitor the ystem. (See also W75-11715) (Orr-FIRL)
W75-12139

MINE DRAINAGE ABSTRACTS, A BIBLIOG-RAPHY. 1972 SUPPLEMENT.
ituminous Coal Research, Inc., Monroeville, Pa.
ennsylvania Dept. of Environmental Resources, arrisburg,(1973), 72 p. 103 ref.

escriptors: *Mine drainage, *Abstracts, Bibliographies, Waste treatment, Water pollution ontrol, Abatement, Analytical techniques, Water ollution sources, Pollutants, Water pollution ef-ects, Economics, Legal aspects, Waste disposal, ennsylvania, Alabama, Missouri, West Virginia, hio, Virginia, Kentucky, Indiana, Illinois, Mon-na, Foreign countries.
dentifiers: Denmark, Japan, Germany, United ingdom.

his 1972 supplement contains 103 abstracts of all ublications and reports added to the Coal Mine rainage Library at the Bituminous Coal esearch, Inc., during that year and was prepared or the Pennsylvania Department of Environmen-l Resources. It excludes, however, abstracts elating to surface strip mining and reclamation. he 'Subject Classification Index' lists pollution ources, pollutant material, quality and analysis, batement procedures, and legal, economic, eological and hydrological considerations. The Geographical Index' lists Denmark, the Federal epublic of Germany, Japan, United Kingdom, nd lakes in Pennsylvania, Ohio, and Missouri; ine discharges in Pennsylvania; rivers and treams in Pennsylvania, Alabama, Missouri, Vest Virginia, Ohio, Virginia, Kentucky, Indiana, linois, Montana; and strip-mined lands in Ken-ucky, Pennsylvania, and West Virginia. Other in-ices list the authors and their affiliations. (Auen-Visconsin)
W75-12158

ASSESSMENT OF OFFSHORE DUMPING IN THE NEW YORK BIGHT, TECHNICAL BACKGROUND: PHYSICAL OCEANOGRAPHY, GEOLOGICAL OCEANOGRAPHY, AND CHEMICAL OCEANOGRAPHY.
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
Available from Superintendent of Documents,U.S. Government Printing Office, Washington, D.C. 20402, as C55.13:ERL 332-MESA 3. NOAA TR ERL 332-MESA-3, April 1975, 83 p.

Descriptors: *Marine geology, *Sewage sludge, *Sludge disposals, *Wastes, Water circulation, Oceanography, Ocean circulation, Ocean currents, Tides, Bays, Sludge, Solid wastes, Sediments, Sediment discharge, Sedimentation, Water pollution, Water sampling, New York.
Identifiers: *Offshore dumping, *New York Bight, Physical oceanography, Geological oceanography, Chemical oceanography, Bottom sediments, Tidal currents, Nutrient distributions, Bight wastes, Bight waters.

This report deals with the offshore dumping in the New York Bight, primarily its physical, geological, and chemical oceanographic effects. Physically, the analysis shows two distinct circulation regimes. (1) near the harbor mouth and along the New Jersey coast, New York Harbor discharge flows southward parallel to the New Jersey coast; at depth, there is a return flow of external water into the estuary. (2) Outside the region of strongest influence from river discharge, a persistent clockwise circulation or eddy appears to exist. Geologically, fine-grained waste dumped in New York Bight is entrained in a clockwise circulation pattern and is dispersed to the north. A significant portion is deposited in the low area (Christiaensen Basin) immediately northwest of the dumpsites. Chemically, the data from water sampling show that nutrient (nitrates, silicates, and phosphates) distributions are dominated by the lower New York Bay outflow, with dumped sewage sludge contributing very small amounts. Bottom grab samples were analyzed for total organic carbon and total carbohydrates. (NOAA)
W75-12171

OCEAN DUMPING IN THE NEW YORK BIGHT,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program.
R. L. Swanson.
Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, as C55.13: ERL 321-MESA 2. NOAA Technical Report ERL 321 - MESA 2, March 1975. 78 p, 40 fig, 5 tab, 117 ref.

Descriptors: *Sewage sludge, *Sewage disposal, *Waste disposal, *Water pollution, *Water pollution effects, Wastes, Disposal, Sewage, Industrial wastes, Aquatic environment, Path of pollutants, Marine geology, Ocean circulation, New York, Pollutants.
Identifiers: *Ocean dumping, *New York Bight, *Sewage dumping, *Dumping, Dredge spoils, Waste acid, Cellar dirt, Oceanographic studies, Geological oceanography, Physical oceanography, Chemical oceanography, Biological oceanography, Dump ites, Marine environment, Fish polluting, Fin-root disease.

The New York Bight extends seaward over 15,000 square miles from Long Island and New Jersey to the edge of the continental shelf, some 80-100 nautical miles offshore. Wastes from 20 million people are discharged to the Bight. These wastes arrive by a variety of routes: ocean dumping, outfall sewers, air pollution, river discharge, land runoff, thermal discharges, vessel wastes, and occasional spills. Although impacts of these wastes on the marine environment are not clearly understood, there is evidence that the waters, bottom sediment, and living resources are under stress. In 1973 the amount of raw and digested sewage sludge was 150 million ft 3 (4.3 x 106 m3). An average of 260 million ft3 (7.4 x 106 m3) per year of dredge spoils were dumped each year between 1965 and 1970, as well as waste acid, and construction and demolition debris. The hazards of this dumping are not known, however above normal incidence of fin-rot disease in fish in the area and the closing of the area to shellfishing are indictions that something is wrong. However, there is no evidence of massive shoreward movement of the sludge, or of imminent bacteriological hazard to the beaches. It is recommended that land-based disposal alternatives be developed. (NOAA)
W75-12172

REPORT TO THE CONGRESS ON OCEAN DUMPING RESEARCH, JANUARY THROUGH DECEMBER 1974 PUBLIC LAW 92-532, TITLE II, SECTION 201.
National Oceanic and Atmospheric Administration, Washington, D.C.
Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 for $1.10. June 1975. 48 p, 6 fig, 1 tab, 27 ref.

Descriptors: *Oceans, *Sewage sludge, *Water pollution, *Water pollution effects, *Water pollution treatment, *Waste disposal, Wastes, Disposal, Waste treatment, Dredging, Water law, Dredging, Sewage, Industrial wastes, Aquatic environment, Pollutants, Marine geology, Path of pollutants.
Identifiers: *Ocean dumping, Sewage dumping, New York Bight, Waste materials, Dredged materials, Nondredged materials, Geological oceanography, Physical oceanography, Chemical oceanography, Biological oceanography, Dump sites, Ocean disposal.

This is the second annual report submitted to Congress on the federally sponsored research on the effects of ocean dumping, as required under Section 201. The report describes significant Federal research programs and activities carried out in 1974. It also includes a summary of 1974 studies relative to the requirements of Section 203. It contains sections on research on ocean disposal of dredged and nondredged material, dumpsite characterizations, Coast Guard R and G for ocean dumping surveillance and enforcement, dredged material disposal in the Great Lakes, and research on alternatives to ocean dumping. During 1974 approximately 130 million tons of material were dumped in U.S. coastal waters. Dredged material accounted for 118 million tons, or over 90% of the total tonnage dumped in 1974. This amount was twice the dredged material deposited in the ocean in 1973. The increase was due to extensive flooding and silting in the Mississippi River basin in recent years. Dredged material is an environmental concern because of the large quanitities involved and the presence of contaminated sediments. The ocean disposal of wastes other than dredged materials occurs mainly in the New York Bight. (ETJA)
W75-12173

THE MUSSEL WATCH--A FIRST STEP IN GLOBAL MARINE MONITORING,
Scripps Institution of Oceanography, La Jolla, Calif.
E. D. Goldberg.
Marine Pollution Bulletin, Vol 6, No 7, p 111, July 1975, 5 ref.

Descriptors: *Mussels, *Monitoring, *Bioindicators, Oceans, Coasts, Water Pollution Sources, Pollutant Identification, Heavy Metals, Halogenated pesticides, Oil, Laboratory studies, Economics, Pollutant identification.
Identifiers: Transuranics, Bioaccumulation.

A world mussel watch (using e.g. Mytilus edulis) of specimens from 100 coastal and open ocean sites was suggested. Mussels, which are especially

suitable for measuring pollutant levels, would be analyzed for their concentrations of halogenated hydrocarbons, transuranics, heavy metals and petroleum. This project was presented as economically reasonable. (Katz)
W75-12187

**ACTIVITY OF ENZYMES (PROTEASE AND UREASE) AND FORMS OF MOBILE NITROGEN IN THIN PEAT SOIL OF THE SECOND YEAR OF USE, (IN RUSSIAN),**
Akademiya Navuk BSSR, Minsk. Inst. of Experimental Botany.
T. A. Shcharbakova, H. Ya. Korabava, and S. M. Barodz'ka.
Vyestsi Akad Navuk B SSR syer Biyal Navuk, No 1, p 47-54, 1973.

Descriptors: *Enzymes, *Nitrogen, *Peat, Potatoes, Soils, Crop production, Grasses, Mineralogy, Hay, Water pollution sources, *Path of pollutants.
Identifiers: Mineralization, *Protease, *Urease.

The thin peat soil with a groundwater level at a depth of 80-120 cm displayed a high urease and proteolytic activity. The appreciable accumulation of mobile N substances produced high yields of potatoes and hay of perennial grasses. Ammonia N was the predominant form of mobile N. In most cases a direct correlation was observed between urease activity and total content of mobile N. Mineralization processes of the organic N-containing substances in the peat soil occurred more intensely during cultivation of potatoes in comparison with perennial grasses. The activity of enzymes and accumulation of mobile N substances in the drained bog were at a level close to cultivated soils.--Copyright 1974, Biological Abstracts, Inc.
W75-12216

**SALT RECOVERY SYSTEM,**
B. Keilin, and J. M. Hebert.
US Patent No 3,899,421, 8 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 937, No 2, p 631-632, August 12, 1975.

Descriptors: *Patents, *Water softening, *Water quality treatment, *Water pollution treatment, *Water pollution sources, *Water pollution control, Cleaning, Equipment, Recycling.
Identifiers: Backwash.

During a resin regeneration cycle of water softeners the effluents are sent to the sewer with the result that not only does a considerable amount of salt go to waste but also the salt adds to the pollution in the waste water. In this invention the recovery of salt is accomplished by selectively bleeding off the high salt content portion of the effluent passing through the drain line of an automatic water softener and collecting it for reuse or selective disposal, while permitting those portions of the effluent stream containing little or no salt to pass to waste. The salt recovery system includes sensing means for the detection of high salt concentration in the effluent stream passing a given point adapted to actuate a diverter valve in the drain line to shunt the flow of effluent through a downpipe and into a collecting tank. This is accomplished by means of circuitry containing a conductivity cell, a relay and a solenoid. The collecting tank for the diverted salt solution is an evaporator tank fitted with a float-actuated immersion heater. When the liquid in the tank reaches a predetermined level, it moves a float into position to close the heater circuit and an immersed heater element comes on to heat the liquid. (Sinha-OEIS)
W75-12306

**THE IMPACT OF CHEMICAL POLLUTION ON WATER UTILIZATIONNUTZUNG),.**
**(CHEMISCHE GEWAESSERVERUNREINIGUNG UND WASSER**
Karlsruhe Univ. (West Germany). Carl Engler-und Hans-Bunte-Institut fuer Mineraloel-und Kohleforschung.
H. Sontheimer.
Schweizerische Zeitschrift fuer Hydrologie, Vol 37, No 1, p 118-134, June, 1975. 9 fig, 3 tab, 12 ref.

Descriptors: *Water quality control, *Analytical techniques, *Water pollution sources, *Industrial wastes, *Organic compounds, Chemical oxygen demand, Chemical analysis, Biological treatment, Waste discharge, Waste water treatment.
Identifiers: *Rhine River, Physico-chemical treatment, Refractory compounds.

Potable water from natural reservoirs is threatened by pollution by synthetic chemicals. The Rhine river is described; its lower reach is enriched with refractory organic compounds which are the result of self-purification of industrial pollution from the upper part of the river. Changes in water composition are detected by various analytical methods, such as the quantitative determination of individual substances or groups of substances. In addition, methods have been applied which indicate the organic content by overall parameters such DOC, COD, or UV-extinction. Studies in the winter of 1971-1972 indicated that refractory compounds in industrial waste water should be eliminated by physico-chemical techniques in addition to the conventional biological treatment before discharge to the river. (Kramer-FIRL)
W75-12314

**STUDIES OF PREVENTION OF WATER POLLUTION, III. ON THE BIODEGRADATION OF SYNTHETIC DETERGENTS, (IN JAPANESE),**
O. Sakaguchi, K. Yokota, and S. Takashita.
Eisei Kagaku, (Jour of Hygienic Chemistry), Vol 21, No 2, p 51-54, 1975. 4 fig.

Descriptors: *Biodegradation, *Detergents, Alkylbenzene sulfonates, Water pollution, Sewage, Municipal wastes, Aerobic conditions, Anaerobic conditions.

The biodegradation of synthetic and commercial detergents has been examined at various conditions. Domestic sewage was incubated at 30 degrees, to study the degradation of linear alkyl benzenesulfonate (LAS) and alkyl benzenesulfonate (ABS). Twenty ppm LAS degraded easily and was about 50% consumed after seven days under aerobic conditions, but was only slightly degraded under anaerobic conditions. On the other hand, the higher fatty acid ABS was easily biodegraded under both aerobic and anaerobic conditions after one day. Biodegradation of LAS was delayed in the presence of nutrients. When detergent-grown cells separated from domestic sewage were observed, they showed two optimal peaks of 2,3,5-triphenyltetrazolium chloride (TTC) reduction activities at pH 7.0 and 8.5. (Kramer-FIRL)
W75-12316

**DETERMINATION OF NTA IN ENVIRONMENTAL WATER BY GAS CHROMATOGRAPHY,**
Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-12363

## 5C. Effects Of Pollution

**TOXICITY OF COPPER COMPLEXES TO RFRESHWATER MOLLUSKS,**
V. T. Kapkov.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-763 967, $3.25 in paper copy, $2.25 in microfiche. ranslation FSTC-HT-23-1987-72, March 1973. Translated from Prochvoved, Vol. 26, No. 2, 1971. 5 p.

Descriptors: *Mollusks, *Freshwater, *Copper, *Copper compounds, *Toxicity, *Spectrophotometry, Gastropods, Separation techniques, Antifouling materials, Aquatic environment, *Pollutant identification, Water pollution effects.
Identifiers: Copper pyridinates, *Copper complexes, Pyridine complexes, Alpha-beta-picoline, 2,6-lutidine, ligands.

The toxicity of some complex compounds of copper with pyridine and its homologues on freshwater mollusks was evaluated. The pyridine complexes evaluated were Alpha, Beta-picoline, and 2-,6-lutidine in concentrations of 0.01-5.0 mg Cu in one liter. Contents of copper in the water and in the organic mollusks was determined spectrophotometrically using a SF-4a spectrophotometer with sodiumdiethyldithiocarbamate in the presence of a citrate-versene mixture at a pH of 8.0 with subsequent extraction of the stained complexes with carbon tetrachloride. Alpha-picoline-copper and 2,6-lutidine of copper exerted a less toxic effect than cupric chloride. The toxicity of dichloropyridinecopper and a complex of copper with Beta-picoline was higher in all experiments than the toxicity of CuC12 in the same concentrations. In concentrations less than 0.1 mg Cu in one liter, neither the copper complexes tested nor the CuC12 led to the death of bivalve mollusks tested 30 days. In all experiments gastropod mollusks were more resistant to the effects of the toxicants than bivalve mollusks. (Delfiner-Vanderbilt)
W75-11863

**EFFECTS OF OILFIELD BRINE ON MARINE ORGANISMS, AN ECOLOGICAL EVALUATION OF THE ARANSAS BAY AREA, JOB NO. 1,**
Texas Parks and Wildlife Dept., Austin.
T. L. Heffernan, J. Monier, and S. Page.
In: Coastal Fisheries Project Report 1971, p. 209-212, 6 ref.

Descriptors: *Crabs, *Shrimp, *Crustaceans, *Brines, Saline Water, Drilling Fluids, Lethal Limits, *Toxicity, Laboratory Tests, Water Quality, Chemical Analysis, Environmental Effects, Water pollution effects, *Texas.
Identifiers: *Brown Shrimp, *Blue Crabs, Penaeus aztecus, Callinectes sapidus, Sublethal Concentrations, LC-50, *Aransas Bay(Texas).

Toxicity studies were made of oilfield brine from two separator locations in conjunction with the Sinton oilfields: Haas' Ditch, emptying into Chiltipin Creek, and Southwestern Oil and Refinery emptying into Copano Bay. Salinity of this brine ranged from 82.4 to 91.6 parts per thousand. Mortalities were noted in all tests using brown shrimp (Penaeus aztecus), white shrimp (Penaeus setiferus), and juvenile blue crabs (Callinectes sapidus). Brine concentrations of above 40 per cent produced 100 per cent mortalities on all species tested. (Katz)
W75-11864

**ACID MINE DRAINAGE IN CANE CREEK BASIN, NEAR OAKMAN, WALKER COUNTY, ALABAMA,**
Geological Survey of Alabama, University.
For primary bibliographic entry see Field 5G.
W75-11871

**SEISMIC EXPLORATION: ITS NATURE AND EFFECT ON FISH,**
Fisheries and Marine Service, Winnipeg (Manitoba).
For primary bibliographic entry see Field 8G.
W75-11877

TUDIES ON EFFECTS OF CERCARIAL CONENTRATION AND LENGTH OF EXPOSURE N INFECTION OF MICE BY ST. LUCIAN CHISTOSOMA MANSONI CERCARIAE IN A ATURAL RUNNING-WATER HABITAT,
int Lucia Research and Control Dept., Castries.
S. Upatham.
rasitilogy, Vol 68, No 2, p 155-159, 1974.
entifiers: *Cercariae, Cercarial concentration, xposure, Habitat, *Human infection, Mice, atural, Running, *Schistosoma-mansoni, St-Lun(West-Indies), Water pollution effects.

he effects of cercarial concentration and length exposure on the infection of mice by St. Lucian Vest Indies) S. mansoni cercariae were instigated in a running-water habitat. For all expore times, mice exposed to cercarial concentraons from 2.5-40 cercariae/mouse acquired no inctions. At higher concentrations, infection rates d worm burdens of mice increased in direct proortion to cercarial concentrations and exposure nes. The highest infection rate (57.9%) and worm rden (46 worms) were obtained in mice exposed r 256 min to 1280 cercariae/mouse. Cercarial ncentrations are low in St. Lucian running aters, a fact suggesting that the risk of persons coming infected while fording, collecting omestic water, washing clothes and swimming in abitats with reasonable flows is very low. Most fected individuals probably acquire a low worm rden over a rather long period of time.--Copyght 1974, Biological Abstracts, Inc.
75-11903

EHAVIOURAL RESPONSES OF WHITEFISH ND RAINBOW TROUT TO DRILLING LUIDS,
sheries and Marine Service, Winnipeg Manitoba).
. Lawrence, and E. Scherer.
echnical Report No 502, 1974. 47 p, 14 fig, 3 tab, ref.

escriptors: Biology, Pollution, *Environmental fects, *Drilling fluid, *Rainbow trout, Offshore atform, Sodium compounds, *Fish behavior, cology, Habitats, Persistence, *Water pollution fects.
entifiers: *Whitefish, Lignosulfates, Barite, odium hydroxide.

ehavioral responses of whitefish (Coregonus clueaformis) and rainbow troup (Salmo gairdneri) to illing mud (1 to 1000 ul/l) and its supernatant action (55 to 10,000 ul/l) were tested in laboratory experiments. Experiments were run under inared as well as under visible light, to separate notically from chemically elicited responses. our response parameters were recorded and nalysed: (1) percent test time spent in pure comared to contaminated water, (2) effect of contact ith contaminant on swimming speed, turning te, and frequency of movements across the centrline of the test chamber (boundary between ure and contaminated water), (3) extent of enetration by fish into pure vs contaminated ater, (4) time spent at the end walls of the pure vs ontaminated water side. Conclusions on reference or avoidance are derived from these ehavioral elements. The results are discussed ith regard to LC50 values of drilling fluids. Both hitefish and rainbow trout showed preference r mud suspensions at the maximum concentraon tested, namely 1000 ul/l; this value represents 04 and 0.013 of the 96 hr LC50 for whitefish and inbow, respectively. In tests with supernatant, oth species showed a shift in their reaction from reference at 1000 ul/l toward avoidance at 10,000 /l. These two values equal 0.02 and 0.2 of a conentration still found to be non-lethal to whitefish a static bioassay lasting 28 days. (Bradbeer-WWA)
/75-11952

A COMPUTER PROGRAM USED TO ESTIMATE PRIMARY PRODUCTIVITY FROM PH AND CARBON DIOXIDE DATA EMPLOYING THE UPSTREAM-DOWNSTREAM METHOD,
Battelle-Pacific Northwest Labs., Richland, Wash.
E. G. Wolf, and R. J. Olson.
Available from the National Technical Information Service, Springfield, Va 22161 as BNWL-1828, $4.25 in paper copy, $2.25 in microfiche. BNWL-1828, May 1974. 24 p, 7 ref. AEC AT (45-1)1830.

Descriptors: *Computer programs, *Primary productivity, *Streams, Hydrogen ion concentration, Carbon dioxide, On-site investigations, Estimating equations, Data collections, Upstream, Downstream, Respiration, Streamflow.

A computer program to estimate primary productivity was adapted using the upstream-downstream method and conversion of pH to carbon dioxide in lotic systems. The program was modified to include multiple station sampling and interpolate readings that did not occur at hourly intervals. It utilizes mathematical equations fitted to carbon dioxide-pH conversion data. To apply the formula for estimating productivity to computer analysis, pH values were read in and converted to millimoles carbon dioxide; downstream pH values were offset by average flow time; accural correction was used to adjust upstream or downstream carbon dioxide values to account for any carbon dioxide addition to the area; millimoles carbon dioxide/l were converted to grams carbon dioxide/sq meter; carbon dioxide values were corrected for diffusion and downstream carbon dioxide was subtracted from upstream values and divied by average flow time. This yielded positive values representing grams/hour community respiration and negative values representing grams/hour net productivity. The program integrates respiration and productivity values yielding daily values, average productivity, respiration per hour, integration of data annually, and total productivity of stream discharge volume per hour. The program was written for a UNIVAC 1108 computer using the FORTRAN level 5 language. (Buchanan-Davidson-Wisconsin)
W75-11971

COMPARATIVE SURVIVAL OF ENTEROCOCCI, COLIFORMS AND SALMONELLAS IN WATER, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow(USSR).
G. G. Kalina.
Gig Sanit, Vol 5, p 102-104, Illus, 1974.

Descriptors: *E. coli, *Coliforms, *Salmonella, Rivers, *Streptococcus, Microorganisms, Enteric bacteria, Bioindicators, Mortality.
Identifiers: Enterococci, Escherichia-coli, Escherichia-freundii, Fecal, Salmonella-typhi, Salmonella-typhimurium, Streptococcus-faecalis, Streptococcus-faecium.

Data is presented on the survival of enteroccoci, coliforms and salmonellas (Streptococcus faecalis, Streptococcus faecium, Salmonella typhimurium, Salmonella typhi, Escherichi coli, Escherichia freundii) in river water. The ability of these organisms to multiply and survive in river water depended on the experimental methods and condition of the microorganisms used in the experiment. S. faecalis, dying more quickly in water than S. faecium, can indicate fresh fecal contamination with greater reliability than the enterococci.--Copyright 1975, Biological Abstracts, Inc.
W75-11973

EFFECTS OF THE COMMERCIAL POLYCHLORINATED BIPHENYL MIXTURE AROCLOR 1242 ON GROWTH, VIABILITY, PHOSPHATE UPTAKE, RESPIRATION AND OXYGEN EVOLATION IN SCENEDESMUS,
Stockholm Univ. (Sweden). Botany Inst.
C-M. Larsson, and J-E. Tillberg.
Physiologia Plantarum, Vol 33, No 4, p 256-260, 1975. 3 fig, 2 tab, 37 ref.

Descriptors: *Plant physiology, *Inhibition, *Aroclors, *Algae, Polychlorinated biphenyls, Viability, Chlorophyta, Phosphates, Respiration, Pesticides, Absorption, Food chains, Oxygen.
Identifiers: *Scenedesmus obtusiusculus, Aroclor 1242, Phosphorylation, PCB.

To gain knowledge about physiological responses of microalgae to polychlorinated biphenyls, the unicellular green alga Scenedesmus obtusiusculus was grown in liquid media containing the commercial PCB mixture, Aroclor 1242 (10-1000 ppb). The algae did not respond to PCBs even in very high doses if they were added just before the experiment, so the algae were cultured in PCBs before the experiment. Growth was inhibited at 300 ppb and above and viability was only affected at 1000 ppb. Inhibition of phosphate uptake had almost the same appearance in light as in darkness, and may be largely caused by PCB action on the plasmalemma. Lower inhibiting concentrations did not affect oxygen uptake or oxygen evolution in light. At 800 ppb some experiments indicated an upcoupling of oxidative phosphorylation and induced an increased respiration rate, but at 1000 ppb respiration was inhibited and oxygen output reduced. Although the PCB concentrations discussed are higher than those normally found in natural waters, it would not be impossible for some of these effects to occur under natural conditions, resulting in disturbance of basic food production in aquatic ecosystems. (Buchanan-Davidson-Wisconsin)
W75-11974

N AND P DISTRIBUTION IN LAKE KINNERET (ISRAEL) WITH EMPHASIS ON DISSOLVED ORGANIC NITROGEN,
Israel Oceanographic and Limnological Research Ltd., Haifa.
C. Serruya, U. Pollingher, and M. Gophen.
Oikos, Vol 26, No 1, p 1-8, 1975. 7 fig, 4 tab, 26 ref.

Descriptors: *Nitrogen, *Phosphorus, *Eutrophication, Subtropic, Nitrogen cycle, Ammonification, Denitrification, Nitrogen compounds, Plankton, Lake sediments, Anaerobic conditions, Fluctuations, Seasonal, Turnovers, Chelation, Distribution.
Identifiers: *Lake Kinneret(Israel), *Israel, Dissolved organic nitrogen, Peridinium cinctum, Nitrogen sources.

Fluctuations in the amount and distribution of different forms of nitrogen and total phosphorus and the role of dissolved organic nitrogen in the nitrogen cycle were studied in Lake Kinneret, Israel. Organic nitrogen originates from the watershed, plankton, and sediments. The high nitrogen input was compensated by denitrification during the anoxic period. Phosphorus concentration was limited by chemical equilibria. A dense dinoflagellate bloom develops in winter-spring. Distributions of nitrogen and phosphorus showed that lake water was the largest nitrogen pool, and sediments were the main phosphorus reservoir. There were seasonal and vertical fluctuations in dissolved organic nitrogen. Cell autolysis after the bloom released large amounts of dissolved organic nitrogen into the upper water layers. Another fraction sedimented and remained unchanged during the anoxic period. At the next turnover, the oxidative process produced more disssolved organic nitrogen which ammonified rapidly. Delay in ammonification and dissolved organic nitrogen accumulation may retard Peridinium cinctum bloom, probably because of the chelating effect of dissolved organic nitrogen. Large amounts of phosphorus are stored in sediments but relatively small amounts are released under anoxia, but phosphorus represents a potential danger of eutrophication. Minor lake level modifications may affect factors controlling storage and release

of phosphorus in sediments. (Buchanan-Davidson-Wisconsin)
W75-11975

**RESPONSE OF LAKE SUPERIOR ALGAE TO NUTRIENTS AND TACONITE TAILINGS,**
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
R. H. Plumb, and G. F. Lee.
Journal Water Pollution Control Federation, Vol 47, No 3, p 619-629, 1975. 1 fig, 3 tab, 7 ref.

Descriptors: *Algae, *Eutrophication, *Lake Superior, *Nutrients, Phosphates, Carbon, Trace elements, Manganese, Magnesium, Zinc, Nitrates, Silica, Toxicity, Minnesota.
Identifiers: *Taconite tailings, *Reserve Mining Co., Silver Bay(Minn).

To determine the algal-limiting nutrients in Lake Superior, whether the limiting nutrient changes with time, the stimulation potential of taconite tailings, and algal response to taconite tailings at different times of the year, a nutrient spiking study was made primarily in the western arm of Lake Superior from November 1971 to May 1973. Approximately 70-80% of all samples receiving phosphate in the study had a greater rate of carbon fixation. Trace metals (magnesium, copper, boron, iron, zinc, cobalt, molybdenum) stimulated 20% of the samples and manganese 8%, but nitrate and silica did not stimulate algal populations in Lake Superior. No seasonal fluctuations were observed in the responses of algae to nutrient spiking. Additions of taconite tailings did not stimulate the algae. Less than 5% of the tailings suspensions produced a net carbon fixation that was greater than that of lake water controls. It was concluded that Lake Superior algae will respond to phosphate additions. The fact that the algae responded to tailings plus phosphate but not to tailings along suggests that tailings do not contribute to eutrophication of the lake and that taconite tailings are not toxic to algae. (Buchanan-Davidson-Wisconsin)
W75-11976

**PRIMARY PRODUCTION IN THE PLANKTON COMMUNITY OF A TROPICAL LAKE,**
Savannah River Ecology Lab., Aiken, S.C.
W. M. Lewis.
Ecological Monographs, Vol 44, No 4, p 377-409, 1974. 13 fig, 12 tab, 82 ref NSF GB 16054, AEC AT (38-1)310.

Descriptors: *Tropical regions, *Plankton, *Primary productivity, *Lakes, Weather, Water chemistry, Light penetration, Standing crops, Distribution, Fluctuations, Photosynthesis, Inhibition, Mixing, Stratification, Euphotic zone, Seasonal, Nutrients.
Identifiers: *Lake Lanao(Philippines), Philippines.

Primary production, weather, chemistry, light penetration, and standing crop studies of autotrophs and heterotrophs were made of Lake Lanao, Philippines. Diurnal rhythms in photosynthetic efficiency per lake surface area were not observed. Vertical profiles of photosynthesis exhibited light inhibition except on overcast days. Inhibition threshold at the surface was lower in windy than calm weather. The mean inhibition threshold one meter or more deep was lower than at the surface. The lake was exceptionally transparent considering its high productivity and had a vertical dispersion of production due to low amounts of dissolved and suspended matter in the euphotic zone, high production per unit of standing crop, and extensive mixing in the upper water column. Autotrophs accounted for 80% of euphotic zone respiration. Seasonal variations were related to resource supply rather than to temperature or biomass removal. Incident light accounted for 12-30% of seasonal production variations. Light was limited by thickening of mixing zone during the circulation periods and storms. Nutrient supply was the dominant controlling factor during stratification. Nutrient depletion was relieved by changes in mixing depth during storms. High sustained production on a low nutrient base in explained by rapid nutrient transfer from the decomposition zone to the euphotic zone. (Buchanan-Davidson-Wisconsin)
W75-11978

**CLASSIFICATION OF WISCONSIN LAKES BY TROPHIC CONDITION.**
Wisconsin Dept. of Natural Resources, Madison. Bureau of Water Quality.
Report April 15, 1975. 108 p, 3 tab, 18 append.

Descriptors: *Wisconsin, *Lakes, *Trophic level, *Classification, Water pollution, Legislation, Rehabilitation, Pollution abatement, Protection, Nuisance algae, Aquatic weeds, Winterkilling, Financing, Planning, Monitoring, Water management(Applied).
Identifiers: Inland Lakes Renewal Program.

In compliance with the 1972 Federal Water Pollution Control Act Amendments, all publicly owned, named lakes of all sizes, and unnamed lakes 20 acres or larger in Wisconsin are listed. There are 14,977 tabulated lakes covering 947,384 acres. Four different classifications schemes are discussed. Of 1,153 lakes 100 acres or larger, 335 (29%) covering 402,157 acres show signs of eutrophication (winterkill, pollution, nuisance algae, macrophyte problems), while 818 (71%) covering 367,504 acres did not. Another survey of 1,130 Wisconsin lakes (mostly 100 acres or larger) classified 28 lakes (2%) very oligotrophic, 308 (27%) oligotrophic, 586 (52%) mesotrophic, 158 (14%) eutrophic, and 50 (4%) very eutrophic. Seven appendices discuss techniques and experiences in developing methods and procedures for lake protection and rehabiliation in Wisconsin. Six appendices describe the various Wisconsin programs associated with lake classification and management. Also included are copies of the Wisconsin Inland Lake Protection and Rehabilitation Law and Administrative Rules for feasibility studies and project planning and implementation. (Buchanan-Davidson-Wisconsin)
W75-11979

**THE UPTAKE AND UTILIZATION OF ORGANIC CARBON BY ALGAE: AN ESSAY IN COMPARATIVE BIOCHEMISTRY,**
Stockholm Univ. (Sweden). Arrhenius Lab.
A. H. Neilson, and R. A. Lewin.
Phycologia, Vol 13, No 3, p 227-264, 1974. 8 tab, 324 ref.

Descriptors: *Organic compounds, *Absorption, *Carbon, *Algae, *Biochemistry, *Metabolism, Reviews, Light, Lipids, Nitrogen, Amino acids, Chlorophyta, Cyanophyta, Carbon dioxide, Bacteria, Respiration, Photosynthesis, Alcohols, Carbohydrates, Mode of action, Nutrient requirements, Plant growth substances.
Identifiers: *Heterotrophic algae, *Organic carbon, Acetate, Fatty acids, Obligate photolithotrophy, Glycollate, Glycerol, Hexose, Pentose, Pyrimidine, Purine.

Organic compound uptake and utilization by algae in light and dark is reviewed and the mode of action compared with bacteria. No algae grows under anaerobic conditions or heterotrophically using only carbon compounds. Many assimilate exogenous acetate into lipids in light and dark. Some grow heterotrophically using saturated fatty acids. Obligately photolithotrophic algae incorporate long-chain fatty acids into lipids without prior degradation. Some assimilate glycollate in light. Glycerol is a substrate for many in light and dark. Hexoses are also used for heterotrophic growth. Pentoses inhibit growth of many algae in light, but ribose and xylose support heterotrophic growth of some green and blue-greens. Amino acids are used as nitrogen sources by several algae for growth in light and sometimes improve heterotrophic growth in dark. Pyrimidines and purines do not support heterotrophic growth, but uracil, uric acid, and adenine can be nitrogen sources for growth of green and blue-green algae in light. Hypotheses to explain obligate photolithotrophy are discussed. No single explanation reconciles the reasons why many algae which grow in light using carbon dioxide cannot grow heterotrophically in dark. Generally heterotrophic algae have too low an affinity for most substrates to compete effectively with bacteria under natural conditions. (Buchanan-Davidson-Wisconsin)
W75-11980

**GEOCHEMISTRY AND NUTRIENT REGIME OF SALINE EUTROPHIC LAKES IN THE ERICKSON-ELPHINSTONE DISTRICT OF SOUTHWESTERN MANITOBA.**
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
J. Barica.
Technical Report No 511, 1975. 86 p, 24 fig, 19 tab, 86 ref, 1 append.

Descriptors: *Geochemistry, *Nutrients, *Eutrophication, *Saline lakes, *Canada, Chemical properties, Ice cover, Salinity, Ions, Sodium, Potassium, Magnesium, Manganese, Calcium, Iron, Chlorides, Sulfates, Hydrogen ion concentration, Specific conductivity, Seasonal, Fluctuations, Water properties, Dissolved oxygen, Hydrogen sulfide, Nitrogen, Phosphorus, Carbon, Silica, Plankton, Biomass, Chlorophyll, Fishkill, Amonia, Aquaculture, Winterkilling.
Identifiers: *Manitoba, Summerkill.

A chemical characterization of prairie winterkill lakes of the aquaculture experimental area in the Erickson-Elphinstone district, southwestern Manitoba, is presented. The 79 saline winterkill pothole lakes studied showed variability in salinity and ionic composition: total ions 268-9720, sodium 1.6-980, potassium 11.2-248, magnesium 9-1236, calcium 28-336, iron 0-0.18, manganese 0-2.14, chloride 1-191, sulfate 12-6571 mg/l. The pH varied 7.4-9.6; and specific conductance 305-7837 micromhos/cm. Of these lakes, 44.4% belonged to the true sulfate-magnesium type; 16.7% to the intermediate sulfate-bicarbonate, magnesium type; 11.1% to the intermediate sulfate-bicarbonate, magnesium-calcium type; and 27.8% to intermediate and mixed types. Seasonal variations in water composition were observed. Fifty-one lakes used for summer fish farming were monitored for dissolved oxygen, hydrogen sulfide, nitrogen, phosphorus, carbon, silica, and plankton biomass (as particulate carbon, nitrogen, phosphorus, and chlorophyll-a). Winterkill and summerkill anoxic conditions were studied. Summer fish kills occurred in lakes with chlorophyll-a concentrations exceeding 100 micrograms/l and specific conductance between 800-2000 micromhos/cm. Correlation between winter maxima of ammonia-nitrogen and chlorophyll-a maxima the following summer was found. Major nutrient sources in lake basins were evaluated. (Buchanan-Davidson-Wisconsin)
W75-11982

**THE EFFECT OF WIND ON THE SPREAD OF CONTAMINATION IN THE YEISK ESTUARY, (IN RUSSIAN),**
For primary bibliographic entry see Field 5B.
W75-11983

**ENDOCYTOSIS OF MICROCYSTIS AERUGINOSA BY OCHROMONAS DANICA,**
Texas Univ. at Austin. Dept. of Botany.
G. T. Cole, and M. J. Wynne.
Journal of Phycology, Vol 10, No 4, p 397-410, 1974. 27 fig, 68 ref.

Descriptors: *Algal control, *Ochromonas, *Chrysophyta, *Algae, Diets, Cyanophyta, Cytological studies, Digestion, Biocontrol.

ifiers: *Endocytosis, *Microcystis aeru-
a, Ochromonas danica, Cannibalism.

omonas danica Prings. is a chrysomonad alga
shows a high degree of nutritional versatili-
d is capable of feeding on the toxic blue -
alga, Microcystis aeruginosa Kuetz. Light
scopic, electron microscopic, and
hemical examinations of endocytosis in
omonas showed engulfment of M. aeruginosa
ubsequent digestion. Contact occurred at the
or end of Ochromonas. Two kinds of
les formed. M. aeruginosa was enclosed by a
ry food vacuole or primary endosome, which
diately began to migrate toward the posterior
f the cell causing lateral distension. This pri-
endosome soon fused with the posterior food
le or secondary endosome and released its
nts into this digestive organelle. Six or eight
ruginosa cells can accumulate in the secon-
ndosome until Ochromonas become spheri-
shape. Digestion occurs in the secondary en-
e and M. aeruginosa is completely broken
The greatest rate of endocytosis occurred
the first nine minutes after combining the
ganisms. Onset of endocytosis had a disrup-
ffect on the anterior microtubule nucleating
The chrysomonad was cannibalistic but also
appetite for many different kinds of organ-
This alga could be used to develop a
nism of biological algal control. (Buchanan-
son-Wisconsin)
1985

**UTILIZATION OF PHOSPHORUS FROM BY THE PHYTOPLANKTER, EDESMUS DIMORPHUS, AND THE SIG-ANCE OF THESE FINDINGS TO THE TICE OF POND FERTILIZATION,**
na Agricultural Experiment Station, Au-

niou, and C. E. Boyd.
biologia, Vol 45, No 4, p 345-355, 1974. 1
ab, 17 ref.

ptors: *Fish farming, *Algae, *Phosphorus,
water interfaces, *Soil types, *Growth
Phytoplankton, Scenedesmus, Fertilization,
ity, Bottom sediments, Phosphates, Cul-
norganic compounds.
iers: Phosphorus sources.

dy the availability of phosphorus in muds
ytoplankton growth, muds were prepared
welve soil types and used as the only
orus source for growth of Scenedesmus
hus. Some muds supported as much algal
as was obtained with 0.075 to 0.5 mg P/l
ittle or no growth occurred with cultures
ther muds. When the soils were extracted
phosphorus-free nutrient solution, a mix-
hydrochloric acid and sulfuric acids, a solu-
sulfuric acid and potassium sulfate, or a
n of hydrochloric acid and ammonium
e, it was shown that soils differed primarily
quantity of phosphorus present rather than
ms of phosphorus present. The soils con-
various proportions of iron, aluminum, and
phosphates. Additions of phosphorus to
s prior to their use as mud increased the
ity of some as phosphorus sources but in
oils the added phosphorus was so tightly
that little or no phosphorus was available
imorphus growth. The type of soil in a pond
ly have a large influence on the efficiency
ization with phosphate fertilizers to sustain
ankton growth in fish ponds. (Buchanan-
on-Wisconsin)
986

**FFECT OF HYDROGEN IN CONCEN-ONS IN SIMULATED RAIN ON THE TORTULA RURALIS (HEDW.)SM,**
a Univ., Missoula. Dept. of Botany.
eridan, and R. Rosenstreter.
gist, Vol 76, No 1, p 168-173, Illus, 1973.

Descriptors: *Chlorophyll, *Hydrogen ion concentration, Simulated rainfall, *Mosses, Photosynthesis, Respiration, Sulfuric acid, Oxygen.
Identifiers: *Tortula-ruralis.

Gametophores of T. ruralis were treated with sulfuric acid solutions at pH values of 1.0-6.0. The concentration of chlorophylls a + b decreased between pH6 and pH3 followed by a more rapid decline between pH3 and pH1. Chlorophyll a was more sensitive to acid than chlorophyll b. Oxygen production based on chlorophyll was relatively unaffected between pH6 and pH2, whereas photosynthesis based on dry weight decreased uniformly in relation to decrease in pH. Respiration was insensitive to pH values as low as pH2. Simulated acid rain appeared to effect a reduction in photosynthesis largely through acid hydrolysis of chlorophyll a.--Copyright 1973, Biological Abstracts, Inc.
W75-11987

**STUDIES ON METABOLIC ACTIVITY OF BENTHIC BACTERIA ISOLATED FROM THREE LAKES,**
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Microbiology.
E. Strzelezyk, U. Leniarska, and W. Donderski.
Acta Microbiologica Polonica, Ser. B, Vol 6, No 13, p 125-132, 1974. 4 fig, 1 tab, 15 ref.

Descriptors: *Metabolism, *Bottom organisms, *Carbohydrates, *Bacteria, Respiration, Trophic level, Food habits, Nutrient requirements, Seasonal, Oxygen requirements.
Identifiers: *Poland, *Lake Jeziorak(Poland), *Lake Tynwald(Poland), *Lake Jasne(Poland), Glucose, Fructose, Maltose, Arabinose, Xylose, Ribose, Cellobiose, Casamino acids.

Metabolic activities of 480 isolates of benthic bacteria on nine substrates (glucose, fructose, maltose, arabinose, xylose, ribose, cellobiose, soluble starch, and casamino acids) which are often in respiratory studies and which possibly occur in natural environments were studied. The bacteria were obtained from bottom sediments of Lakes Jeziorak and Tynwald (eutrophic) and Jasne (mesotrophic) in northern Poland. Glucose and fructose were the most frequently attacked carbohydrates, but some strains isolated from all lakes in winter failed to utilize these sugars. Depending on time of isolation, some strains respired actively on the substrates but others did not. The most metabolically active strains were from Lake Jasne, the least active from Lake Tynwald. Many isolates did not attack arabinose; those which respired actively. With many isolates no oxygen uptake was observed on ribose, xylose, cellobiose, and starch; those from Lakes Jasne and Jeziorak which used these carbohydrates respired more actively than Lake Tynwald isolates. Most benthic bacteria did not attack soluble starch. Respiratory values on casamino acids were generally higher than those on carbohydrates, but many strains showed no oxygen uptake. In general metabolic activity depended on time of isolation. No differences were observed between chromogenic and non-chromogenic bacteria. (Buchanan-Davidson--Wisconsin)
W75-11988

**BIOLOGICAL AND CHEMICAL MECHANISMS IN EUTROPHICATION OF FRESHWATER LAKES,**
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. W. Schindler, and D. R. S. Lean.
Annals New York Academy of Sciences, Vol 250, p 129-135, 1974. 4 fig, 21 ref.

Descriptors: *Biological properties, *Chemical properties, *Eutrophication, *Analytical techniques, Methodology, Testing procedures, Estuaries, Lakes, Measurement, Limiting factors, Phosphorus, Primary productivity, Standing crops, Mode of action, Productivity, Phosphorus compounds, Chemical analysis, Nitrogen compounds, Carbon, Crop response, Light penetration, Turbidity, Hudson River.
Identifiers: *Hudson Estuary.

No methodology has been developed to study estuarine eutrophication. Errors in accepted limnological methods and beliefs affect interpretations of results. Phosphorus is the element most responsible for eutrophication but no technique positively identified any form of phosphorus in natural waters as different methods provide differing results. High phosphorus concentrations in the lower hypolimnion of lakes may not be due to feedback from sediment but toe phosphorus-containing seston sedimentation; little phosphorus that reaches sediments is returned to the euphotic zone. Under oxic conditions phosphorus should precipitate as ferric phosphate or coprecipitate with ferric hydroxide; under anoxic conditions reduction to iron should precipitate iron sulfide and release phosphate ions, but little phosphorus release is observed. Bioassays indicate nutrients limiting productivity but do not identify nutrients which caused earlier productivity increases. Standing crop determinations are more relevant than primary production results and are determined by phosphorus and nitrogen supplies (carbon influences growth rate); standing crops are also affected by both death and birth rates. Primary production is dependent on light; but silt loads may reduce photosynthesis and prevent algal growth. Attempts to alleviate eutrophication of Hudson Estuary should not be based on single factors with simplistic solutions which could be costly or dangerous. (Buchanan-Davidson--Wisconsin)
W75-11992

**DISTRIBUTION AND BIOMASS OF MACROPHYTES IN LAKE DGAL MALY,**
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland).
For primary bibliographic entry see Field 8I.
W75-11993

**TRANSFER OF HEAT, FRESH WATER AND NUTRIENTS THROUGH THE SEASONAL THERMOCLINE,**
Institute of Oceanographic Sciences, Wormley (England).
R. D. Pingree, and L. Pennycuick.
Journal Marine Biological Association of the United Kingdom, Vol 55, No 2, p 261-274, 1975. 9 fig, 1 tab, 23 ref.

Descriptors: *Mixing, *Sea water, *Salinity, *Phosphates, *Seasonal, *Thermocline, Water temperature, Vertical migration, Advection, Circulation, Productivity, Heat, Fresh water, Cycling nutrients.
Identifiers: *English Channel.

Changes in water column temperature at an English Channel station between 1902-1961 were used to determine the mean monthly heating and mean rate of vertical mixing of the water column. Lower layers are heated by mixing heat downwards, not by advection. Rate of vertical mixing at different depths was derived from rate of warming beneath the thermocline. In summer transfer of fresh water through the thermocline reduced salinity in the bottom mixed water layer. Major changes in mean salinity below the thermocline were caused by vertical mixing. In winter advection of salty water was largely responsible for increase of salinity. Mixing rates were used to estimate inorganic phosphate transfer rate through the thermocline. Phosphate distribution was stationary and at a minimum in summer. Balance between regeneration and uptake was achieved and maximum production, based on phosphate utilization, occurred in the thermocline. Maximum rate of inorganic phosphate regeneration occurred in May/June, with a minimum in February. Salini-

ty variations due to advection and horizontal turbulence maintained their identities despite local evaporation, precipitation, and vertical mixing. Monthly changes in phosphate are partly due to local effects plus development and dissipation of the thermocline; large advective effects do not significantly affect monthly variations. (Buchanan-Davidson--Wisconsin)
W75-11994

**SEASONAL PREVALENCE OF CHONDROCOCCUS COLUMNARIS INFECTION IN BLACK BULLHEADS FROM CLEAR LAKE, IOWA,**
Iowa State Univ., Ames. Dept. of Zoology and Entomology.
P. R. Bowser.
J Wildl Dis, Vol 9, No 2, p 115-119, 1973.

Descriptors: *Iowa, *Fish diseases, *Bullheads, Seasonal, Lakes, Infection, Fish pathology.
Identifiers: Black bullheads, *Chondrococcus-columnaris, *Clear Lake(Iowa).

The prevalence of asymptomatic columnaris infection in black bullheads (Ictalurus meals) from Clear Lake, Iowa, during 1971 was the highest during the spring when the lake was warming, very low as summer approached and nil from July 28 through the autumn. The mean condition factor of adult black bullheads decreased through June and fluctuated at a lower level through the remainder of the summer and autumn. Mean hematocrit of adult black bullheads followed the same trend as that of condition factor. A positive correlation was evident between weekly mean condition factor and hematocrit (r = 0.90; P - 0.01).--Copyright 1973, Biological Abstracts. Inc.
W75-11995

**MORPHOLOGY AND ULTRASTRUCTURE OF SOME CHLOROCOCCAL ALGAE FROM THE COLLECTION PF ALGAL STRAINS IN LENINGRAD UNIVERSITY. II. MONORAPHIDIUM BRAUNII (NAG, IN KUTZ.) KOMARKOVA-LEGNEROVA STRAIN (GROMOV) 1967/231,**
Leningrad State Univ. (USSR). Biological Inst.
B. V. Gromov, K. A. Mamkaeva, and V. E. Vasilieva.
Archiv fue Hydrobiologie/Supplement 46, Algological Studies 11, p 140-150, 1974. 4 plates, 2 tab, 22 ref.

Descriptors: *Plant morphology, *Chlorophyta, *Systematics, Soil algae, Life cycles, Cytological studies.
Identifiers: *Monoraphidium braunii, Chlorococcus.

Monoraphidium braunii strain Gromov 1967/231 was isolated from a cotton field near Tashkent, USSR, and possesses ultrastructural patterns usual for chlorococcal algae. Its cells are solitary, 6-40 microns long, 3-18 microns thick. Young cells are straight or slightly curved with pointed ends. During reproduction 4-16 autospores form by division of the protoplast and are liberated by transverse rupture of the mother cell. The pyrenoid is in the middle of the cell in the periphery of the chloroplast, and contains thylakoid stacks and sometimes granum-like stacks interconnected by thylakoids. Starch grains are often located near the pyrenoid but do not form a regular envelope. Several types of large vesicles are found in the cytoplasm of young cells consisting of microbodies, lamellated inclusions, and large electrontransparent homogeneous ovoid globules. Microbodies are especially numerous in cells from old cultures. Dictyosomes are well-developed. Vesicles bud off the golgi cisternae. The outer membrane of the nuclear envelope is continuous with the endoplasmic reticulum. Chlorophylls-a and -b, alpha- and beta-carotenes, canthaxanthin, cryptoxanthin, lutein, luteinmonepoxide, violaxanthin, neoxanthin NeoA, neoxanthin, and trigydroxy-alpha-carotene are present. Alpha-cryptoxanthin and trihydroxy-alpha-carotene are detected only in young cells; canthaxanthin and luteinmonoe-poxide were found only in old cells. (Buchanan-Davidson--Wisconsin)
W75-11997

**MORPHOLOGY AND ULTRASTRUCTURE OF SOME CHLOROCOCCAL ALGAE FROM THE COLLECTION OF ALGAL STRAINS IN LENINGRAD UNIVERSITY. I. PSEUDOSPONGIOCOCCUM PROTOCOCCOIDES GEN. NOV., SP. NOV.,**
Leningrad State Univ. (USSR). Biological Inst.
B. V. Gromov, and K. A. Mamkaeva.
Archiv fur Hydrobiologie/Supplement 46, Algological Studies 10, p 1-9, 1974. 1 fig, 3 plates, 9 ref.

Descriptors: *Plant morphology, *Chlorophyta, *Systematics, *Soil algae, Life cycles, Cytological studies.
Identifiers: *Pseudospongiococcum protococcoides, Chlorococcus.

A taxonomical description of the newly identified Pseudospongiococcum protococcoides and its ultrastructural morphology is given. It was isolated from the surface of a Crimean soil. It forms a compact sediment in liquid media; on agar it forms round, dark green colonies. No slime was observed. Cells were usually isolated or in small groups and are nonmotile. Young cells are spherical or ellipsoidal and mature cells are spherical with a maximum diameter of 25 microns. The cell wall is thick with no extracellular matrix, contains cellulose, and has an outer membrane-like layer and an inner electron-transparent matrix which is not homogeneous. Invaginations of cell wall material into the cell body and tubular or lamellar protrusions of the cell wall were sometimes observed. Cytoplasmic material formed tubules in the cell wall matrix. Mature cells are multinucleate, liberating 2-32 autospores through the cell wall; autospores contained one nucleus. Reproduction is only by autospores. In small young cells the chloroplasts are spongy and in large cells net-like. Mature cell chloroplasts consist of oblong partitions interconnected by short bridges with small mitochondria and vacuoles between them; the partitions included 3-10 thylakoid stacks, each of three thylakoids. (Buchanan-Davidson--Wisconsin)
W75-12000

**DETERGENT PHOSPHORUS AND ALGAL GROWTH,**
Wabash Coll., Crawfordsville, Ind. Dept. of Biology.
W. N. Doemel, and A. E. Brooks.
Water Research, Vol 9, No 3, p 713-719, 1975. 6 fig, 3 tab, 24 ref.

Descriptors: *Phosphorus, *Detergents, *Growth rates, *Algae, Eutrophication, Sewage treatment, Chemical precipitation, Chlorella, Chlamydomonas, Euglena, Anabaena, Indiana, Nutrient removal.

The effects of phosphorus reduction by chemical precipitation in sewage and use of non-phosphorus detergents on algal growth were determined by mixing treated sewage with lake and river waters and measuring the growth of Chlorella pyrenoidosa. The total biomass of two strains of C. pyrenoidosa, Chlamydomas reinhardtii, Euglena gracilis, Anabaena flos-aquae, and Plectonema boryanum were determined when the algae were grown in three Indiana lake waters which had been supplemented with sewage effluents. Algal growth was not significantly decreased when the total phosphorus was reduced 50% by alkaline treatment. When C. pyrenoidosa was grown in water to which sewage effluents from a motel treatment system were added, in which reactive phosphorus was reduced 57% by supplying the motel with non-phosphorus cleaning products, no reduction in algal growth was also observed. Only when sewage effluents were advance treated so that reactive phosphorus levels were below 1 2 mg (reduced 92%) was algal growth significantly decreased. The data support the contention that the only effective means of phosphorus removal is by advanced treatment in which 90-95% of the phosphorus is removed from municipal wastes and that the removal of phosphorus from detergents will be insufficient to reduce algal growth in most bodies of water. (Buchanan-Davidson--Wisconsin)
W75-12001

**DANGER SIGNS FOR TAHOE'S FUTURE,**
California Univ., Davis. Div of Environmental Studies.
C. R. Goldman, and T. A. Cahill.
Cry California, Spring 1975. 6 p, 4 fig, 1 tab.

Descriptors: *Water quality, *Lakes, *Eutrophication, Urbanization, Primary productivity, California, Daphnia, Algae, Fish stocking, Zooplankton, Nevada, Land use, Planning, Fish food organisms, Air pollution, Sulfur.
Identifiers: *Lake Tahoe(Calif), Carbon monoxide.

Since 1959 qualitative measurements of Lake Tahoe's water have shown increasing fertility. Algal growth rose 25% between 1968-1971; since then algal growth has increased but the annual rate of increase has dropped. Synoptic studies show that high-fertility water masses are gradually spreading over the entire lake surface. Zooplankton--Daphnia rosea, Daphnia pulex, and Bosmina longirostris--have disappeared, perhaps due to introducrion of opossum shrimp (Mysis relicta) and red salmon fry. Their disappearance may be contributed to the lake's green algal crop increase. Tahoe is still oligothrophic; if nutrient inflow can be retarded, this low fertility might be preserved. Air quality of the basin is also declining. A 19 California Air Resources Board study revealed that eye-stinging oxidants were half as dense in Tahoe as in Los Angeles, but carbon monoxide, hydrocarbon, and lead levels were higher. Atmospheric aerosols--sulfur-containing particulates, fine soil, and automobile pollutants--are the major cause of reduced visibility. Sulfur-containing particulates result from combustion of fuel by automobiles and planes, are a by-product of automobile catalytic converters, and may be carried into the area by wind. Through sound, strictly enforced land development restrictions, Tahoe's beauty can still be preserved. (Buchanan-Davidson--Wisconsin)
W75-12002

**AN ECOLOGICAL EVALUATION OF HEATED WATER DISCHARGE ON PHYTOPLANKTON BLOOMS IN THE POTOMAC RIVER,**
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
G. M. Simmons, and B. J. Armitage.
Hydrobiologia, Vol 45, No 4, p 441-465, 1974. 7 fig, 6 tab, 21 ref.

Descriptors: *Phytoplankton, *Eutrophication, *Potomac River, *Thermal pollution, Virginia, Dominant organisms, Biological communities, Algae, Cyanophyta, Growth rates, Nuisance algae, Powerplants, Nutrients, Oxygen, Nitrogen, Nitrates, Phosphates, Water temperature, Variables.
Identifiers: Microcystis aeruginosa.

An eight month ecological study of the Virginia side of the Potomac River indicated that the thermal discharge of the Possum Point Power Station had no effect on the density or composition of algal blooms in the Potomac River. Of the 47 species of algae identified, blue-green species predominated during periods of accelerated growth. Microcystis aeruginosa was the dominant species in algal mats. Evidence of nuisance algal blooms was first observed upstream from the power plant, and mean algal densities were 40-

ıter upstream. The mean nutrient levels ɔecially nitrate nitrogen and orthophsophate) at tream control stations were slightly less due to l uptake. It was concluded that the Occoquan upper Potomac River areas are sites of major l blooms caused by nutrient loadings from upam areas; then the mats appear to drift into vnstream areas. There was no evidence that the sum Point Power Station added nutrients. The n temperature of the water in the heated water e was approximately 4.5C higher than water in t of the plant or upstream; oxygen requireits were reduced 0.9 mg/l but oxygen saturation es were elevated 20.0%. (Buchanan-Davidsonsconsin)
5-12004

QUANTITATIVE MEASURE OF SUCCESN RATE AND ITS APPLICATION TO THE TOPLANKTON OF LAKES,
fornia Univ., Davis. Inst. of Ecology.
. Jassby, and C. R. Goldman.
erican Naturalist, Vol 108, No 963, p 688-693, . 2 fig, 6 ref. NSF GB-35371

criptors: *Succession, *Phytoplankton, de of action, Biological communities, Mathecal models, Measurement, California, nass.
tifiers: *Succession rate, Castle Lake(Calif).

quantitatively analyze relationships between ession and macroscopic ecosystem processes ved responsible for succession, the parameter cession rate' is introduced to measure rate of ge of species composition in natural commu-. A time series of component species asses is the only data required to evaluate ession rate for a given community. Succession in Castle Lake, California, a dimictic otrophic lake, are given. Phytoplankton were cted about every five days at 0-30 m following g overturn, counted in a phase contrast oscope, converted to cell volume for each of 40 species, and the total volume of each spen a water column determined by trapezoidal ration. Succession rates decreased with time May to August and were consistent with station of the community composition after exl perturbation. Decreasing succession rates be attributable to decreasing fluctuations in endent factors. The succession rate can mine the relative importance of factors ing succession and help identify man-made rbances of aquatic ecosystems before connces such as accelerated eutrophication . Introduction of molybdenum into the nion caused the succession rate to reach abally high values immediately because of a oryon sertularia biomass increase. Correla- between succession rate and watershed s can pinpoint disturbances. (Buchananlson--Wisconsin)
12005

ES OF SUPPLY OF NITROGEN AND PHORUS TO LAKE WINNIPEG, TOBA, IN RELATION TO THE DIVEROF MISSOURI RIVER WATER INTO THE ND ASSINIBOINE RIVERS,
ies Research Board of Canada, Winnipeg toba). Freshwater Inst.
Brunskill.
water Institute Reprint No 341, from son Diversion Project Presentations, 'W. G. and J. J. Keleher, editors. Manitoba Enental Council Study No 2, September 1974. fig, 3 tab, 3 ref.

ptors: *Eutrophication, *Alteration of flow, ents, Water quality, Ecology, Migration, migration, Environmental effects, Canada, ion, North Dakota, Lakes, Rivers, Missouri Phosphorus, Nitrogen, Irrigation water.
iers: *Garrison Diversion(ND), *Lake WinManitoba), Red River(Manitoba), Asne River(Manitoba).

To study rate of nutrient supply to Lake Winnipeg in relation to the Garison Diversion Project in North Dakota, water samples were analyzed. Levels of phosphorus and nitrogen in the rivers of the watershed and lake indicated mesotrophy. However over 80% of the phosphorus and 60% of the nitrogen were added to the South Basin which indicated eutrophication. Frequent blooms of Anabaena flos-aquae and Microcystis aeruginosa were observed. C14 uptake studies indicated that algal growth was probably limited by light penetration. The North Basin received less suspended sediment, was clearer, and concentrations of nitrogen, phosphorus and silica were reduced in mid-summer after blue-green algal blooms. Addition of Missouri River water to the watershed sould be less than 1% of total Red River inflow, might carry about 70 metric tons of phosphorus, 280 tons nitrogen, and 28,000 tons suspended sediment per year; and would probably have an undetectable effect on eutrophication of Lake Winnipeg. At least 12 species of fish occur in the Missouri drainage basin which are absent in the Lake Winnipeg drainage basin; of these the gizzard shad (Dorosoma cepedianum) may be detrimental. Migration of aquatic plants and animals may also be of concern. (Buchanan-Davidson--Wisconsin)
W75-12006

**PICK-UP AND METABOLISM OF DDT, DIELDRIN AND PHOTODIELDRIN BY A FRESH WATER ALGA (ANKISTRODESMUS AMALLOIDES) AND A MICROCRUSTACEAN (DAPHNIA PULEX),**
Illinois Univ., Chicago. Dept. of Biological Sciences.
S. Neudorf, and M. A. Q. Khan.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 4, p 443-450, 1975. 2 fig, 3 tab, 27 ref. PHS ES-00808.

Descriptors: *Chlorinated hydrocarbon pesticides, *Pesticide residues, *Uptake(Biological), Metabolism, DDT, Dieldrin, Algae, Daphnia, Absorption, Adsorption, Metabolism, Solubility.
Identifiers: *Chemical transformation, Photodieldrin, Ankistrodesmus amalloides, Daphnia pulex, Biological magnification.

To determine the fate of insecticides in fresh water food chains, the absorption/ adsorption and metabolism of DDT, dieldrin, and photodieldrin by the fesh water alga, Ankistrodesmus amalloides, and microcrustacean, Daphnia pulex, were studied. Total pick-up of DDT by A. amalloides, during 1-3 hours was 2.5 times higher than that of dieldrin and 10 times higher than that of photodieldrin and seemed related to their water solubilities. Uptake efficiency decreased with increased cell density. For A. amalloides maximum absorption time was 120 minutes for DDT, 30-60 minutes for dieldrin, and 30 minutes for photodieldrin. The cells continued to absorb-adsorb DDT and dieldrin slowly, but photodieldrin concentration in cells did not increase up to three hours. Dieldrin was magnified 2-3 times less and photodieldrin about 6 times less than DDT by A. amalloides. This alga has a very low affinity for photodieldrin, the most polar (least lipohilic) of the insecticides. A. amalloides metabolized DDT to DDE (3.5%) ang DDD (0.8%). Daphnia pulex showed 13.6% conversion of DDT to DDE. No other DDT metabolites were detected. (Buchanan-Davidson--Wisconsin)
W75-12007

**1974 ANNUAL REPORT OF THE FRESHWATER BIOLOGICAL INVESTIGATION UNIT.**
Ministry of Agriculture, Antrim (Northern Ireland). Freshwater Biological Investigation Unit.
Department of Agriculture for Northern Ireland. 19 p, 5 fig, 9 tab.

Descriptors: *Water pollution sources, *Eutrophication, *Investigations, *Algae, Phosphorus, Nutrients, Fertilizers, Phosphorus compounds, Nitrates, Nitrogen, Cultures, Growth rates, Agricultural runoff, Sewage effluents, Nutrient removal, Watersheds(Basins), Forestry, Forest soils, Limiting factors, Bioassays, Cyanophyta, Diatoms, Zooplankton, Silica.
Identifiers: Nutrient sources, *Ireland, Lough Neagh(No Ireland), River Main(No Ireland), Lough Erne(No Ireland), Alkaline phosphatase activity, Otho-phosphate budget, Creatine.

The Freshwater Biological Investigation Unit of Northern Ireland was established to investigate algal blooms in Lough Neagh, and was expanded to other water bodies. Phosphorus is the critical nutrient limiting algal production in Lough Neagh. Soluble ortho-phosphate is the form most readily utilized; 24% comes from agriculture and land drainage. In the River Main catchment area, less that 10% nitrate nitrogen and other nutrients were from point sources indicating that nutrients other than phosphorus cannot be significantly reduced by removal at point sources. The effects of afforestation of nutrients in upland water bodies were studied. Reservoir phosphorus concentrations were close to values predicted from known phosphorus fertilizer applications, but high phosphorus concentrations were not necessarily associated with algal blooms; some other nutrient was limiting algal growth. Although high alkaline phosphatase activity levels indicated phosphorus-limited algal growth, the level in the River Main was higher than in Lough Neagh. Cultures of algae were prepared to study growth characteristics and nutrition. The relationship between phosphorus concentration and growth rate of Oscillatoria redekei was studied. Algae grew faster in Lough Neagh than in the laboratory due to light conditions. Chlorphyll-a distribution and the phsophorus budget for Lough Erne were determined. (Buchanan-Davidson--Wisconsin)
W75-12008

**EUTROPHICATION,**
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. W. Schindler.
In: 'The Allocative Conflicts in Water-Resource Management,' Agassiz Center for Water Studies, University of Manitoba, Winnipeg, 1974, p 255-266, 2 fig, 10 ref. (FWI Reprint No 342).

Descriptors: *Eutrophication, *Water pollution sources, Phosphorus, Nitrogen Fertilization, Agricultural runoff, Sewage effluents, Feed lots, Forest management, Environment, Pesticides, Social aspects, Governments, Water pollution control, Recycling, Sewage treatment, Sewage disposal, Water treatment, Watershed management, Canada.
Identifiers: Sewage irrigation systems, Sewage recycling.

Phosphorus and nitrogen account for most eutrophication problems. Fertilization of terrestrial ecosystems can be controlled, but no satisfactory domestic waste controls have been devised. Algal species responding to these nutrients often produce noxious tastes, odors, toxins, mats, or scums. Oxygen used in the decay processes suffocates other organisms. Sewage effluents, Feedlots, agricultural fertilizers, and poor forest management all contribute to eutrophication. Present Canadian agencies are inefficient in controlling pesticides which can act as toxins. A sewage irrigation system that can jointly act as a terrestrial nutrient source and water purification plant could recycle nutrients in an ecosystem with less danger of pollution and eutrophication than importation of fertilizers. Soil percolation and crop demand could serve as sewage treatment plants. Cost of fertilizers, eutrophication control, sewage disposal, and water purification could be substituted by cost of transporting sewage for terrestrial recycling and could be shared by urban and rural dwellers. Problems of accumulation of heavy metals, pesticides, and toxic wastes in farm produce; health and odor problems in sewage irrigated areas; leakage of nitrogen in soils; and

winter storage of effluents would have to be resolved. A long range, sound environmental policy must be instituted. (Buchanan-Davidson--Wisconsin)
W75-12010

**WILL BAIKAL AND TAHOE BE SAVED,**
California Univ., Davis. Div. of Environmental Studies.
C. R. Goldman.
Cry California, Winter 1973/74. 7 p.

Descriptors: *Eutrophication, *International commissions, *Foreign research, California, Commercial fish, Urbanization, Water pollution effects, Aquatic life, Aquatic populations, Lumbering, Soil erosion, Tourism, Nevada, Industrial wastes, Water pollution sources, Limnology, Hydrology, United States, Environmental effects, Air pollution, Snow removal, Sediment discharge.
Identifiers: *Lake Baikal(USSR), *Lake Tahoe(Calif.-Nev.), Scientific exchange program.

An exchange program between the United States and the Soviet Union to reduce water pollution investigates Lake Tahoe, California-Nevada and Lake Baikal, USSR. Lake Baikal, the world's oldest, largest, and deepest freshwater lake is very clear, low in minerals, and contains nearly 600 plant and 1200 animal species, three-quarters of which are endemic. Although cellulose plant effluents meet water quality standards for human consumption, they may be lethal to lake organisms. Omul are declining due to overfishing and use of spawning streams for log flotation. Logging, soil erosion, tourist activities, and industrial developments are causing eutrophication. USSR's Hydrometeorological Services conduct extensive limnological research on effects of man's activities on the lake's hydrological, chemical, and biological processes. Lake Tahoe is less complex and has a less diversified aquatic population. An environmental research program, Research Applied to National Needs, is monitoring Tahoe's physical and biological condition and surrounding terrestrial environment. University Extension and political science programs have been established to speed application of research results. Both areas have air pollution and snow removal problems; California is now studying the Soviet Union's method of snow disposal. Solutions to these problems will depend on governmental ability to use scientific evidence and act to protect mankind's natural heritage. (Buchanan-Davidson--Wisconsin)
W75-12012

**EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. VI. BIOMASS AND PRODUCTION OF PHYTOPLANKTON,**
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
I. Spodniewska, and A. Hillbricht-Ilkowska.
Ekologia Polska, Vol 21, No 32, p 521-532, 1973. 1 fig, 8 tab, 22 ref.

Descriptors: *Biomass, *Productivity, *Phytoplankton, *Fish stocking, Herbivores, Carp, Diatoms, Nannoplankton, Decomposing organic matter, Dinoflagellates, Chlorophyta, Periphyton, Cyanophyta, Photosynthesis.
Identifiers: *Lake Warniak(Poland), Bream.

Changes in phytoplankton biomass and production were studied in Lake Warniak, a small pond type lake in Poland, for three years (1967-1969) after introduction of carp and bream. No large differences were observed in phytoplankton development at the various sampling sites; the observed differences between sites became smaller in consecutive years. There was a decrease in phytoplankton biomass and production; an increase in the amount of nannoplankton in biomass and production; a decrease in the efficiency of phytoplankton production; an increase in relative photosynthetic activity due to the presence of more nannoplankton in the total phytoplankton biomass; and an increase in the destruction of organic matter in consecutive years. The whole lake became more uniform as shown by smaller differences in phytoplankton biomass, production, and amount of organic matter destruction, possibly due to increased turbidity due to increased fish penetration. The relative photosynthetic activity of phytoplankton increased due to changes in species composition, but the total phytoplankton production decreased. This increased activity may have been the result of changes in the environment caused by the fish. (Buchanan-Davidson-Wisconsin).
W75-12013

**GROWTH OF THE GREEN ALGA CODIUM FRAGILE IN A CONNECTICUT ESTUARY,**
Yale Univ., New Haven, Conn. Dept. of Biology.
K. C. Malinowski, and J. Ramus.
J Phycol, Vol 9, No 1, p 102-110, 1973.

Descriptors: *Connecticut, Estuaries, *Chlorophyta, *Algae, *Eutrophication, Salinity, Seasonal, Temperature, Nitrogen, Reproduction, Water pollution effects.
Identifiers: *Codium-fragile, *Niantic River(Conn), Seaweed.

An in situ comparison of environmental and physiological factors was undertaken in 1971-72 (15 months) in the Niantic River estuary to elucidate some of the important aspects of the growth and development of the seaweed C. fragile. In general, Codium in the estuary has a growing season of from 6-9 mo. Growth increments during this period are relatively constant. Temperature and salinity are the main limiting factors, although low summer concentrations of inorganic N may also be involved. Repoduction by means of swarmers occurs only in late summer or autumn. Codium appears highly adapted to the role of a colonizing species. It not only possesses the capability to occupy the harshest of environments, but also a system of reproductive alternatives which facilitates rapid colonization. The availability of substrate for attachment is the chief factor limiting is spread in this estuarine system.--Copyright 1973, Biological Abstracts, Inc.
W75-12051

**INFLUENCE OF ENVIRONMENTAL STRESS ON ENUMERATION OF INDICATOR BACTERIA FROM NATURAL WATERS,**
Montana State Univ., Bozeman. Dept. of Microbiology.
G. K. Bissonnette, J. J. Jezeski, G. A. McFeters, and D. G. Stuart.
Applied Microbiology, Vol 29, No 2, p 186-194, 1975. 2 fig, 4 tab, 25 ref. OWRR B-035 MONT(3) and B-040 MONT(2).

Descriptors: *Water injury, *Coliforms, *Stress, *Enteric bacteria, *Bacteria, E. coli, Streptococcus, Cultures, Plant physiology, *Bioindicators, Pollutant identification.
Identifiers: *Environmental stress, Injury.

With the aid of membrane filter chambers, it was possible to follow the survival, injury, and recovery characteristics of populations of indicator organisms (Escherichia coli and Streptococcus faecalis) as a function of exposure time in various aquatic environments. It was observed that upon exposure to the aquatic environment a significant proportion of cells lost their ability to produce colonies on a selective medium yet retained this capability on a nutritionally rich, nonselective medium. Discrepancies in colony-forming units between nonselective and selective media indicated that a substantial portion of bacterial cells may become physiologically injured due to the environmental stress imposed by the aquatic environment. The extent of injury was observed to vary considerably among eight different stream environments. It was observed that the injury induced to a population of E. coli during exposure to the aquatic environment could be rapidly repaired in a nutritionally rich, nonselective medium. A the injured cell population was exposed to th rich nonselective broth, increasing proportions cells were able to repair themselves so that the became insensitive to inhibitory agents in a selective media (Jones-Wisconsin).
W75-12053

**POLLUTION EFFECTS ON SURFACE WATER AND GROUNDWATERS,- (LITERATUR REVIEW),**
Hawaii Univ., Honolulu. Dept. of Civil Enginee ing.
For primary bibliographic entry see Field 5B
W75-12070

**ORGANICS, (LITERATURE REVIEW),**
Drexel Univ., Philadelphia, Pa. Dept. of Enviro mental Engineering and Science.
For primary bibliographic entry see Field 5B.
W75-12071

**EFFECTS OF AERIAL FOREST FERTILIZ TION WITH UREA PELLETS ON NITROGE LEVELS IN A MOUNTAIN STREAM,**
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5B
W75-12113

**MINE DRAINAGE ABSTRACTS, A BIBLIO RAPHY. 1972 SUPPLEMENT.**
Bituminous Coal Research, Inc., Monroeville, P
For primary bibliographic entry see Field 5B.
W75-12158

**OCEAN DUMPING IN THE NEW YO BIGHT,**
National Oceanic and Atmospheric Administ tion, Boulder, Colo. Marine Ecosystems Analy Program.
For primary bibliographic entry see Field 5B.
W75-12172

**THE MUSSEL WATCH--A FIRST STEP GLOBAL MARINE MONITORING,**
Scripps Institution of Oceanography, La Je Calif.
For primary bibliographic entry see Field 5B.
W75-12187

**EFFECT OF BROMEX-50 ON PLANKT POPULATION IN FISH PONDS,**
Agricultural Research Organization, Dor (Isra Fish and Aquaculture Station.
G. L. Schroeder.
Bamidgeh, Vol 27, No 1, p 3-7, March 1975. 2 f tab, 4 ref.

Descriptors: *Plankton, *Primary produc *Zooplankton, Ponds, *Toxins, *Biom Phytoplankton, Mortality, Parasitism, parasites.
Identifiers: *Lernaea, Bromex-50.

Four fish ponds were treated with Bromex-5 the eradication of the parasite Lernaea. Plan concentrations, dissolved oxygen, and pH monitored prior to and following the Brome treatment. In moderately and heavily sto ponds zooplankton decreased from 0.8 mg weight per liter to 0.05 mg/l and 0.1 mg/l to mg/l respectively. Analysis of the pond wat hours after the Bromex treatment revealed zooplankton activity. At plus 2 days zooplan activity had returned and at plus 7 to 9 zooplankton concentrations were similar to Bromex values. No changes related to Br were observed in phytoplankton standing st pH or DO. (Katz)
W75-12188

ACT OF INTRACOASTAL WATERWAY NTENANCE DREDGING ON A MUD BOT- 1 BENTHOS COMMUNITY,
away Inst.of Oceanography, Savannah, Ga.
Stickney, and D. Perlmutter.
gical Conservation, Vol 7, No 3, p 211-226, 1975. 2 fig, 7 tab, 8 ref, append.

riptors: *Channels, *Dredging, *Mud, thic Fauna, Habitats, Biological Communi- Methodology, Channel improvement, Suc- on, Surveys, Growth stages, Water pollution ts.
ifiers: Hydraulic dredging, Spartina alter- a, Recolonisation.

effects of hydraulic dredging on the benthic na of a mud bottom area were investigated in gia in the Atlantic Intracoastal Waterway. plete displacement of the benthic community caused by dredging; however, the community to recover within a month following the tion of dredging. Within two months the sity and species composition of the dredged el were similar to that of a control area and change in sediment composition resulted. no apparent limitation was imposed on the al benthic population by habitat alteration. lonisation was too rapid to have been caused e settling of immature or larval stages from ater column alone. Bank slumping and migra- f adult forms have been postulated as other s of recolonisation. (Katz)
12189

ERIMENTAL DATA FOR ESTABLISHING CONTENT OF ALPHA, ALPHA, BETA- HLOROPROPIONIC ACID AND ITS SODI- ALTS IN RESERVOIR WATER,
sinskii Institut, Saratov (USSR). Dept. of al Hygiene.
Yes'kina.
able from the National Technical Informa- Service, Springfield, Va 22161, as AD/A-006 $3.25 in paper copy, $2.25 in microfiche. lation AD/A-006 094. Trans from Aktual. Teor., Praktich, Medits, 1970.

iptors: *Herbicides, Organic compounds, nts, Reservoirs, Animal Physiology, *Salts, onmental effects, Sodium compounds, tical tests, Sewage, Water quality, *Acids, r pollution effects, *Organic acids, Toxicity. fiers: Alpha, Alpha, Beta- oropropionic Acid, Tissue analysis, Bioac- lation, LD-50, Sublethal effects.

oxicity of the widely used herbicide alpha, beta-trichloropropionic acid and its sodium as studied on mice, rats and rabbits. The ge LD-50 was 4500-7000 mg/kg. When doses to 1/5 and 1/20 LD-50 were given daily for 20 not one animal died, but the animals who ceived 1/5 LD-50 put on weight the slowest, decrease in SH-groups in the blood serum, rease in the weight coefficient for the liver, s and an increase in the vitamin C content adrenals. (Katz)
2190

OBIOLOGY OF A FORMER DREDGE DISPOSAL AREA,
east Nuclear Energy Co., Waterford, Conn. ne Environmental Lab.
Bireley, and J. D. Buck.
e Pollution Bulletin, Vol 6, No 7, p 107-110, 975. 4 fig, 3 tab, 34 ref.

ptors: *Bacteria, *Coliforms, *Aerobic bac- *Enteric bacteria, *Sewage bacteria, ging, Wastes, *Sewage, *Microbiology, icators, Water pollution sources, Bottom ng, Speciation, Biochemistry, Water, Sedi- Sampling, Environmental effects, Primary ctivity.
iers: *Dredge spoil disposal site, rotrophic bacteria, Comparative analysis.

A microbiological study of an historically active dredge spoil disposal area in Long Island Sound showed no obvious long-term effects on the bacterial populations of water and sediment. Observations were made 4 years after the last deposition of dredge spoils. Determinations included total and faecal coliforms and numbers, hydrolytic types, and taxonomic groupings of 'total' heterotrophic bacteria. Comparisons with water and sediment from other areas of the sound indicated that the dump site was not bacteriologically unique. (Katz)
W75-12191

**FILTRATION OF NEUTRAL RED BY FRESH WATER CLAMS IN AEROBIC AND HYPOXIC CONDITIONS,**
Kalamazoo Coll., Mich, Dept. of Biology.
D. G. Badman.
Comparative Biochemical Physiology, Vol 51A, August 1975. 741-744, 1 fig, 1 tab, 10 ref.

Descriptors: *Molluscs, *Clams, *Animal physiology, *Biochemistry, *Filtration, *Oxygen requirements, Analytical techniques, Laboratory tests, Aerobic conditions.
Identifiers: *Fresh water clams, Neutral red, *Hypoxic condition, *Anaerobiosis, Valve activity (Clams), Elliptio dilatatus, Pleurobema coccineum, Actinonaias carinata.

Rates of filtration of neutral red by aerobic and hypoxic fresh water clams were measured to determine the role of previously observed hypoxic intense valve activity. Aerobic clams filtered readily, showing a mean initial rate of 0.051 plus or minus 0.008 mg/min (Actinonaias carinata), 0.025 plus or minus 0.006 mg/min (Elliptio dilatatus) and 0.019 plus or minus 0.006 mg/min (Pleurobema coccineum). The hypoxic rate was reduced to 0.011 plus or minus 0.006 mg/min (E. dilatatus) and 0.016 plus or minus 0.006 mg/min (P. coccineum), even though measurements were taken only when individuals had active valves and open siphons. It is concluded that the hypoxic intense valve activity does not have the replenishment of tissue oxygen as a major function. (Katz)
W75-12192

**DETECTION OF POLLUTANTS BY FISH TESTS,**
For primary bibliographic entry see Field 5A.
W75-12193

**NITROGEN, PHOSPHORUS, AND EUTROPHICATION IN THE COASTAL MARINE ENVIRONMENT,**
Woods Hole Oceanographic Institution, Mass.
J. H. Ryther, and W. M. Dunstan.
Science, Vol 171, p 1008-1013, March 1971. 6 p, 7 fig, 31 ref.

Descriptors: *Bioassay, *Algae, *Nitrogen, *Phosphates, *Eutrophication, Water pollution effects, Coastal marshes, Coasts, Detergents, Ammonia, Nitrogen compounds, Phosphorus, Aquatic life, Algal control, Aquatic weed control, Control, Chemical analysis, Pollutant identification, Water analysis, Water pollution, Water pollution sources.
Identifiers: *Coastal marine environment, Coastal waters, Effluent limitations.

The importance of nitrogen in coastal marine waters is discussed. Nitrogen is described as the critical limiting factor to algal growth and eutrophication. Bioassay experiments and the distribution of phosphorus and inorganic nitrogen compel this conclusion. Experiments show that approximately twice the amount of phosphate usable by algae is present. Factors contributing to the surplus include: the low nitrogen to phosphorous ratio in terrigenous contributions containing human waste; and the quicker regeneration of phosphorus, from decomposing organic matter, in contrast to ammonia. In conclusion, the report comments that eutrophication in coastal marine waters is not likely to be retarded by removing phosphates from detergents; and further, replacing phosphorus with nitrogen-containing nitrilotriacetic acid may be even more harmful. (Hoffman-Florida)
W75-12236

**ARE CHEMICALS USED ALGAE CONTROL BIODEGRADABLE.**
Wisconsin Univ., Madison.
G. P. Fitzgerald.
Water and Sewage Works, Vol 122, No 5, p 82-85, May, 1975. 5 tab, 7 ref.

Descriptors: *Algicides, *Toxicity, *Biodegradation, Chemicals, Copper, Silver, Analytical techniques, Environmental effects, Aquatic organisms, Water pollution effects, *Algal control.
Identifiers: Methyl mercuric choloride.

Concern about the use of toxic chemicals to control the growth of nuisance algae has led to a study on the biodegradability of these substances. The simple procedure used for testing various commercial algicides was to apply the initial dosage required to stop the growth of the algae present, reinnoculate with algae, and then observe whether additional algicide was needed to stop the growth of reintroduced algae. If no additional dose was required, this was taken as an indication that the chemical was not biodegraded by the algae. If additional chemical was needed, it was assumed that the initial dose had been biodegraded. Of the products containing copper, silver, mercuric chloride, phenyl mercuric acetate, and quaternary ammonium compounds tested over the last 11 years, all were found to be biodegraded by the treated algae. However, methyl mercuric chloride is not detoxified by the action of treated algae and its use as an algicide would be a threat to the aquatic environment. It is recommended that because methyl mercuric chloride has been determined to be non-biodegradable, all chemicals to be added to aquatic environments should be evaluated. (Orr-FIRL)
W75-12325

**LIGHT AND ASSIMILATION NUMBER IN A SMALL DESERT, RECHARGED-GROUNDWATER POND,**
Arizona State Univ., Tempe. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W75-12326

**WATER QUALITY AND SALT WATER INTRUSION IN THE LOWER NECHES RIVER,**
Lamar Univ. Beaumont, Tex. Dept. of Biology.
R. C. Harrel.
The Texas Journal of Science, Vol 26, No 1 and 2, p 107-117, February, 1975. 7 fig, 2 tab, 6 ref.

Descriptors: *Water pollution effects, *Saline water intrusion, Saline water barriers, Oil, Municipal wastes, Irrigation, Water quality, Indicators, Benthic fauna, Texas.
Identifiers: *Neches River(Texas).

The water of the lower Neches River is used to supply: a large industrial complex consisting of petrochemical refining and manufacturing, and production of lumber products; municipal water for over 350,000 people; and irrigation for 60,000 acres of rice land. The effects of salt water intrusion, carrying with it toxic and organic waste effluents from the industrialized lower reaches, are discussed. The toxic effects are augmented by the erection of salt water dams(to protect the potable water intake points) which cause a concentration of the salt water and effluents. The effects of salt water intrusion on water quality were determined from physico-chemical data and benthic macroinvertebrate studies: dissolved oxygen and pH decreased below the salt water barrier; alkalinity,

turbidity, and specific conductance increased below the barrier; the bottom substrate above the barrier was clean fine and coarse sand; below the barrier, the bottom sand was covered with several centimeters of black silt smelling of hydrogen sulfide and oil; density per individual of benthic macroinvertebrates indicated a less stable community structure below the barrier and is indicative of polluted waters; and the particular species collected below the barrier have been previously reported as living in polluted waters while those above the barrier were typically clean water species. (Orr-FIRL)
W75-12327

**TOXICITY OF AQUATIC ORGANISMS CAUSED BY CHLORINATION,**
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia). Environmental Conservation Div.
For primary bibliographic entry see Field 5D.
W75-12353

## 5D. Waste Treatment Processes

**INDIVIDUAL HOME WASTEWATER CHARACTERIZATION AND TREATMENT,**
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
E. R. Bennett, and K. D. Linstedt.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 259, $5.75 in paper copy, $2.25 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No. 66, July 1975. 137 p, 27 fig, 38 tab, 52 ref. OWRT A-021-COLO (5). 14-31-0001-5006.

Descriptors: *Waste Water treatment, *Waste identification, *Colorado, *Domestic wastes, Septic tanks, Aerobic treatment, *Water reuse, Water pollution, *Path of pollutants, Water utilization.
Identifiers: Gray water treatment, Aerobic home sewage treatment units, Evaporation-Transpiration beds, Water reuse(domestic).

Disposal of wastewater from isolated homes in mountainous and rural locations in Colorado presents unique and difficult problems. The purpose of the study was to evaluate the flow and pollution patterns from individual homes and to evaluate existing and potential treatment methods. Field evaluation of home wastewater flow and pollutional characteristics was accomplished. The average per capita water use in the home was 44.4 gallons per day; the waste strength was 0.11 lb day of BOD per person. Data for individual fixtures and appliances were obtained with measurement of many pollutional parameters. A brief evaluation of the home treatment methods was accomplished. Laboratory bench scale studies were made to evaluate methods for treatment of the soap related wastes in the home for reuse as toilet flushing water.
W75-11852

**SPRAY IRRIGATION OF TREATED MUNICIPAL SEWAGE,**
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
W. K. Oldham.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 227-239, 1975. 2 fig, 5 tab, 3 ref.

Descriptors: *Waste water treatment, *Irrigation, *Waste water disposal, *Water reuse, Groundwater, Nutrients, Phosphorus, Nitrogen, Agriculture, Crop response, Alfalfa, *Canada.
Identifiers: *Spray irrigation.

Research was conducted to determine a water and nutrient budget for spray irrigation of secondary effluent from a municipal waste water treatment plant in the Okanagan Valley of British Columbia, Canada. The usefulness and acceptability of the forage crop produced was also considered. The long-term usefulness of such a disposal method at various rates of application was estimated. The application rate (0.32 inches/day) used in irrigating the alfalfa was close to the optimum rate for water and macro-nutrient utilization. Limiting the irrigation period to the alfalfa growing season will produce an ideal phosphorus balance. At the application rate used over the irrigation season, the average annual phosphorus increase in the five-foot deep soil horizon was 0.7 ppm. Other impurities were well absorbed by the soil and their rates of concentration increase were much lower than that for phosphorus. The alfalfa crops grown compared well with similar crops grown using non-waste water irrigation. The amount of impurities released to the groundwater was negligible. (Orr-FIRL)
W75-11856

**PACKAGE TREATMENT PLANTS AND FACTORS AFFECTING SERVICE,**
Northern Purification Services Ltd., North Vancouver (British Columbia).
P. H. Martin.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 219-225, 1975.

Descriptors: *Waste water treatment, *Sewage treatment, *Domestic wastes, Treatment facilities, *Biological treatment, Design criteria, Corrosion control, *Canada.
Identifiers: *Package plants.

Package plants of less than 20,000 gpd that use biological treatment methods are discussed. Package plants are usually chosen because of economics unsuitability of the conventional septic system, or the unavailability of a conventional municipal sewage collection service. Improvements in package plants over the last ten years are described. The use of non-corrosive long lived materials result in reduced preventative maintenance of the shell, extended life and a guaranteed reuse factor for the product. Concrete technology has produced concrete finishes that are essentially inert if properly applied. Plastic piping, valving and fastenings have aided in minimizing corrosion and easing the disassembly and reassembly of components. Control and fail safe systems are now available. Processes to minimize the adverse effects of fluctuating organic and hydraulic loads have been refined. Plant design has become more aesthetically pleasing. Package plants have clearly defined performance limits and cannot be expected to perform outside these limits. The performance of a package plant will be dependent on the quality of the engineering design. Regular trained service or preventative maintenance procedures are a necessity. ()(Orr-FIRL)
W75-11857

**ALTERNATIVE METHODS OF DISINFECTION,**
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
K. J. Roberts.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 183-193, 1975. 2 fig, 1 tab, 18 ref.

Descriptors: *Disinfection, *Waste water treatment, *Chlorination, *Ozone, Gamma rays, Ultraviolet radiation, Oxidation, Pilot plants.
Identifiers: Chemical oxidation, Chlorine dioxide.

Alternatives to chlorine disinfection of waste water, such as dechlorination, chemical oxidation, ultraviolet and gamma ionizing radiation, are examined. Dechlorination is the removal of all or part of the total chlorine residual through the addi tion of sulfur dioxide or other sulfur bearing com pounds. Chemical oxidation can be accomplishe by the application of ozone or chlorine dioxide Ozone is a powerful oxidizing agent, an efficien disinfectant, and leaves a beneficial dissolved ox ygen residual. The bactericidal efficiency o chlorine dioxide is comparable to that of chlorin in the neutral pH range and increases significantl with pH. Ultraviolet radiation does not appear t be a feasible method for disinfection of wast water because the water to be treated by UV mu be free of suspended particles that would act as shield to keep the electromagnetic waves from a tually striking and killing the organisms. A pil plant study for the disinfection of activated sludg effluent by gamma irradiation is presented detail. Results show: coliform organisms are th most sensitive to irradiation treatment; good disi fection can be achieved with the application of dose of 100,000 rads; the disinfecting process is r liable because the applied radiation is constant an predictable; and, the effluent from the irradiatio reactor was nontoxic to fish. Each method treatment has its own advantages and disa vantages. (Orr-FIRL)
W75-11858

**NITROGEN REMOVAL FROM MUNICIPA WASTEWATER,**
Du Pont of Canada Ltd., Montreal (Quebec).
D. C. Climenhage.
Environment Canada Research Report No. (1974). 33 p, 6 fig, 5 tab, 29 ref.

Descriptors: *Waste water treatment, *Biologic treatment, *Denitrification, Nitrification, Sewa treatment, Nitrogen cycle, Pilot plants, Biochem cal oxygen demand.
Identifiers: *Nitrogen removal.

A biological treatment process has been develop to remove nitrogen from industrial waste wat The denitrification stage is first, followed by extended aeration stage that effects BOD redu tion and nitrification. Mixed liquor from aerated stage is recycled at a high rate to anaerobic stage where nitrate is denitrified usi the sewage as the organic carbon source. The a vantage of this process is that the need for carb addition to the denitrification stage is eliminat A pilot plant study was performed to test the fectiveness of this process on municipal wa water. The domestic waste water that was to used as the test substrate had a very low BOD a was therefore mixed with hexamethylene diam and methanol to raise the BOD and orga nitrogen concentration. An overall nitrog removal efficiency of 85-90% was achieved o mixture of 25% sewage and 75% chemical ad tives. The efficiences were based on total nitrog in the influent and filtered effluent and w achieved with recycle to feed ratios of 1:1 to 1. About 18% of the nitrogen removal was accoun for by recycle to the anaerobic first stage about 13% was accounted for by cell synthe Further experimentation is recommended to c firm the results of this test using full stren sewage without chemical additives, and to vestigate the mechanism of nitrogen removal the effect of important parameters on nitro removal efficiency. (Orr-FIRL)
W75-11859

**STUDY ON DIRECT RAPID FILTRATI USING REDUCED COAGULANTS, JAPANESE),**
S. Tsunoda, and Y. Aoyanagi.
Gesuido Kyokai-shi, (Journal of Japan W Works Association), No. 486, p 2-10, March, 19

Descriptors: *Filtration, *Kaolinite, *Suspensi *Waste water treatment, Filters, Sands, Hydro ion concentration, *Coagulation, *Suspen solids.
Identifiers: Metal ions, Coagulated partic *Direct sand filtration.

irect filtration of kaolinite suspensions by
eds was investigated. The coagulant metal
ised in the direct filtration process were
lized in water forming various polynuclear
exes. The pH was the most important factor
rect filtration; the particle attachment
nism was controlled by pH. The kaolinite
sion under certain circumstances showed a
red orientation on the sand surface. The
ated particles in pH 4-5 settled into filter
and the pressure drop of the filter bed was
Particles in pH 6-6.5 showed no preferred
tion with respect to the sand surface, and
d the sand particles uniformly. In pH 7-10,
rticles settled mainly on sand surfaces al-
covered with coagulated particles, and pres-
op increased significantly. (Murphy-FIRL)
1860

**GRAPHICAL HYDROGRAPHS METHOD THE INTERMEDIARY OF STORM FLOWS AND FLOOD RETENTION S (DAS GRAFISCHE AFLUSS-LINIENVERFAHREN MIT CHENSCHALTUNG VON RUE UND RB),**
trich.
und Boden, Vol. 27, No. 5, p 112-115, 975. 8 fig, 1 tab, 7 ref.

tors: *Hydrographs, Rainfall intensity, Runoff, Rainfall-runoff relationships, low, *Waste water treatment.
ers: *Storm overflow, *Flood retention Storm overflow basins.

mple of the application of the graphical ru-drograph method to systems such as storm w and flood retention basins is presented. od curve gives a true picture of the effects erlaps of the runoff peaks at different rain ies. The flow curve, and consequently the curve should be drawn with the computa-nt as a starting point opposite to the flow n. The compensating effect of several verflow basins can be correctly determined off curve only. (Takacs-FIRL)
861

**PLASTIC PIPE FOR SEWERS,**
Municipal Water District, Spring Valley,

nary bibliographic entry see Field 8G.
907

**ABLE PLUG CUTS MESS, CLEANUP VERLINE BYPASS,**
dale Water and Sewer Superintendent's Minn.
ary bibliographic entry see Field 8C.
08

**NED WASTEWATER OVERFLOWS,**
John A.) and Associates, Engineers, San o, Calif.
en, and W. W. Saxton.
Water Pollution Control Federation, Vol. , p 434-448, March, 1973. 13 fig, 3 tab, 11

ors: *Combined sewers, *Analytical es, *Overflow, Treatment facilities, Rain-off forecasting, Waste water treatment.
rs: Storm storage tanks.

to meet more stringent pollution control ents, municipalities have found it neces-orrect problems created by existing com-wer systems which suffer from waste erflows. Preceding correction, analysis of l sewer overflow systems must be per-nd the usual method is based on flow g programs at specific overflow points. hod provides accurate results only if the stallation is functioning properly. Thus a rational method of analysis has been developed which determines the number, duration, and volume of overflows occurring in a system with various intercepting capacities as well as the capacities of storm storage tanks and overflow treatment facilities required to provide various degrees of overflow reduction. This concept may be adapted to any region provided that rainfall data are available and the percentage of runoff can be determined. (Sandoski-FIRL)
W75-11912

**A RADIOISOTOPE MONITORING SYSTEM FOR SEWAGE EFFLUENT,**
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5A.
W75-11914

**DRAINING TELFORD NEW TOWN.**
For primary bibliographic entry see Field 4A.
W75-11917

**EUROPEAN DEWATERING SYSTEM AIDS QUEBEC PROJECT,**
R. L. Consedine.
Engineering and Contract Record, Vol. 86, No. 5, p 80, May, 1973. 2 fig.

Descriptors: *Sewerage, *Groundwater, *Installation, Pumps, Hydrants, Wellpoints, Excavation, *Dewatering, *Canada.
Identifiers: Quebec City(Canada), Groundwater control, Couplings, Pipelaying.

A fast, effective dewatering system is overcoming severe water problems and speeding excavation and pipelaying operations at a major housing project near Quebec City, Canada. The Keller method of groundwater control is used to install sanitary sewers and watermains for Development Iberville at Ville de Belair. To predrain, a series of 2-inch diameter wellpoints have been sunk. The wellpoints are self-jetting with pressure supplied using either a water hydrant or a special portable jetting pump. Once in position at the desired depth, the wellpoints are connected to a 6-inch diameter header pipeline by flexible hoses. This header line runs on the surface to a high-capacity suction and dewatering pump. The main advantage for the method lies with its speed since up to 60 wellpoints can be installed per 10-hour shift. A key reason for the quick installation is the use of Kardan couplings which permit connections to be made without tools in about 10 seconds or less. (Sandoski-FIRL)
W75-11918

**TOUGH DIGGING, TIGHT QUARTERS HAMPER HULL COLLECTOR SEWER JOB,**
R. L. Consedine.
Engineering and Contract Record, Vol. 86, No. 4, p 42-43, April, 1973. 3 fig.

Descriptors: *Sewers, *Storm drains, Excavation, Trenches, Construction equipment, Construction materials, *Waste water treatment, Canada.
Identifiers: Hull, Quebec, Canada.

An $889,078 contract awarded to Fedex Ltd., in October 1972 consists of placing 1600 feet of 10-foot diameter concrete horseshoe storm collector and 36-inch diameter sanitary sewer pipe in open cut to depths of 30-feet between the Maisonneuve and St. Etienne Street intersection in Hull, Quebec. Crews have been hampered by a serious lack of working area. Thus the patented Contact Sheeting system to shore up both sides of the 24-foot-wide trench was employed. This system involves driving a row of wide flange steel soldier beams along both sides of the proposed excavation, and as the excavation advances, short lengths of heavy timber sheeting are cut and fitted in front of the vertical beams. Equipment to handle the earth and rock moving operations, consist of three backhoes - plus a dozer, front-end crawler loader, a rubbertired loader, and four tandem dump trucks. The method employed is to operate a 1.25-yard backhoe on the floor of the trench and have the unit deposit excavated material off to one side of the machine. From the side of the trench wall and the hydraulic backhoe, the loader moves the material to another backhoe located at the top of the advancing trench. The 2-yard machine in turn reloads the material and dumps it into the tandem trucks. (Sandoski-FIRL)
W75-11919

**SANITARY SEWER SUSPENDED WITHIN STORM SEWER,**
Civil Engineering - ASCE, Vol. 43, No. 5, p 93, May, 1973. 2 fig.

Descriptors: *Sewers, *Storm drains, Pipes, Corrosion control, Conduits, Steel pipes, Concrete pipes, Joints(connections), Waste water treatment, Michigan.
Identifiers: Pontiac(Mich), Exfiltration.

A 30-inch corrugated steel sanitary sewer has been suspended from the ceiling of a 9-foot concrete storm sewer, 6400 feet long, in Pontiac, Michigan. With the strom drain serving as the conduit for the sanitary sewer line, substantial cost savings were realized over two separate lines. Both sanitary and storm sewers are new in the project known as the Joslyn Drain. The corrugated steel pipe, with asbestos fibers embedded in its zinc coating, was specified for its high degree of corrosion resistance. Tight joints, givng the necessary water-tightness, were specified to eliminate exfiltration. In addition to being reasonably light in weight, the steel pipe offers the necessary high beam strength. Inside the pipe, the corrugations are filled to improve flow. U-shaped steel bands support the sanitary sewer pipe with each leg anchored by bolts to the roof of the storm drain. Grouting in the minimal space between the two conduits at each support band ties the sewer structure together and helps it resist end forces. (Sandoski-FIRL)
W75-11920

**STEEL, CONCRETE FORM SEWER SUPPORT SYSTEM.**
Excavating Contractor, Vol. 67, No. 4, p 31, April, 1973. 3 fig.

Descriptors: *Combined sewers, *Storm drains, *Pipes, *Sewerage, Installation, Soil properties, Steel pipes, New York.
Identifiers: Bronx(NY).

The installation of sanitary sewer lines and storm drainage was an early priority forCo-op City in Bronx, New York since new owners were moving into their apartments as soon as each building unit was completed. Over 60,000 feet of sanitary lines, force sewer mains, and storm drains were laid in the troublesome loose soil environment. For the force main portion of the sewer network, 20-inch diameter, 3/8-inch wall spiral-welded steel pipe and fittings were used. The pipe and fittings were made to order. The pipe was treated to a cold coat of coal tar primer and a hot coat of coal tar enamel. Then it was wrapped in fiberglass and given another hot coat of coal tar enamel. A final wrap was made of kraft paper. The pipe has a cement lining approximately 3/8-inch thick. All fabricated elbows and offsets were custom designed to meet site requirements. The fabricated fittings were tested at a minimum of 125 psi. (Sandoski-FIRL)
W75-11921

**SUPERPOSITION OF TWO PIPES IN A COMMON, MIXED SEWER SYSTEM (RECOURS A LA SUPERPOSITION DE DEUX CONDUITES DANS UN RESEAU D'ASSAINISSEMENT UNITAIRE).**
A. Burry.
L'Eau, Vol. 68, No. 4, p 173-174, April, 1973. 3 fig.

Descriptors: *Sewerage, *Combined sewers, *Separated sewers, Dairy industry, Hospitals, Concrete pipes, Corrosion, Storm runoff, Pipes, Effluents, Treatment facilities, Waste water treatment.
Identifiers: Stoneware pipes.

Superposition of two pipes in a common, mixed sewer system in Mulhouse, France is described. The risk of premature corrosion of concrete pipes due to effluents from recently connected hospital and dairy sources prompted their separation from storm runoff in the pipes. The effluents, diluted at a ratio of 1:3, are carried by old, stoneware pipes located at the bottom of the sewer, while runoff has been switched to new concrete pipes of ovoid shape placed above the former. The upper duct discharges to the collector at a given delay caused by a retention basin while the lower duct has direct passage to the old collector. Effluent separation makes it possible to convey all or part of the effluent to a waste water treatment facility. (Takacs-FIRL)
W75-11923

**YAPHANK COUNTY CENTER WASTEWATER TREATMENT PLANT.**
Suffolk County Dept. of Buildings and Grounds, New York.
Consulting Engineer, Vol. 40, No. 6, p 108, June, 1973.

Descriptors: *Waste water treatment, *Treatment facilities, Effluents, Aquifers, Recycling, Nitrogen, Flow, Groundwater, Tertiary treatment, *New York.
Identifiers: Yaphank(NY).

The Department of Buildings and Grounds of Suffolk County, N. Y., retained Holzmacher, McLendon and Murrell, P.C., as environmental project consultants for an advanced waste water collection and treatment center to serve a rapidly expanding county governmental center at Yaphank, Suffolk County, New York. Flow characteristics, coupled with severe effluent limitations set up by Suffolk County for discharge to groundwater aquifers, dictated a system utilizing the most recent state-of-the-art processes. For this project waste water renovation for recycle to groundwater with the following characteristics was required: maximum effluent total nitrogen concentration of 10 mg/liter, means of equalizing the flow of influent raw waste, means to handle a 12-hour flow pattern, expansion from 250,000 gpd to an ultimate flow of 1.6 million gpd, and a total nitrogen concentration of 74 mg/liter. The process as designed meets all of the stipulated requirements with regard to effluent quality. Plant operation is simple with no stringent biological controls nor sludge recycle or mixed liquor concentration control required. Maintenance of dissolved oxygen levels is noncritical and control is not required. (Sandoski-FIRL)
W75-11924

**PROCESS AND AGENTS FOR REMOVAL OF INORGANIC AND ORGANIC MATTER FROM WASTE WATER SYSTEMS,**
J. J. Odom, T. P. Shumaker, and D. B. Griffin.
Canadian Patent 925,633. Issued May 1, 1973. Patent Office Record, Vol. 100, No. 18, p 1477, May 1, 1973.

Descriptors: *Waste water treatment, Wastes, *Inorganic compounds, *Organic compounds, *Patents, Detergents, Phenols, Color, Nitrogen compounds, Linear alkylate sulfonates, Alkylbenzene sulfonates, Phosphates.
Identifiers: Phenolic aldehyde resins, Chromates.

A process and agents are provided for removal of both inorganic and organic contaminants from waste water systems. These systems are treated with a phenolic aldehyde resin solubilized by alkali to effect removal of uranium salts and other inorganic salts such as phosphates, chromates, in inorganic pigments; partially or wholly nonbiodegradable detergents such as alkyl benzene sulfonates and linear alkyl sulfonates; and organic materials such as decayed plant life, other nitrogen-bearing substances, phenol and phenol derivatives, and color-bearing matter. (Sandoski-FIRL)
W75-11926

**NEW COMPUTER SYSTEM MONITORS BATON ROUGE SEWERS.**
For primary bibliographic entry see Field 7C.
W75-11927

**COMPUTER'S MASTER PLAN SIGNALS SEWER PROBLEMS BEFORE THEY START,**
Thousand Oaks Utilities Dept., Calif.
For primary bibliographic entry see Field 7C.
W75-11928

**REFRIGERATED SURGE TANK FOR USE WITH AEROBIC SEWAGE DIGESTION SYSTEM,**
R. J. Fletcher, and R. I. Fletcher.
United States Patent 3,737,382. Issued June 5, 1973. Official Journal of the United States Patent Office, Vol. 911, No. 1, p 208, June 5, 1973.

Descriptors: *Surge tanks, *Sewage, *Refrigeration, *Waste water treatment, *Sewage treatment, Aerobic treatment, Odor, Oxygenation, *Patents.
Identifiers: *Aerobic digestion.

A refrigerated surge tank is used to hold sewage at a reduced temperature and provide an aerobic digestion system with a regulated sewage feed. There is no substantial loss of bio-nutrients nor the generation of offensive odors while the sewage is being held. Preferably the surge tank is also provided with means for oxygenating the sewage. (Sandoski-FIRL)
W75-11930

**FLEXIBLE JOINT FOR SEWER PIPE,**
B. B. Garrett.
United States Patent 3,741,570. Issued June 26, 1973. Official Gazette of the United States Patent Office, Vol 911, No 4, p 1346, June 26, 1973.

Descriptors: *Sewers, *Pipes, *Joints(Connections), *Patents, Clay pipes, Waste water treatment.
Identifiers: Flexible joints, Gaskets.

A flexible joint for sewer pipes, particularly clay pipes, is described for connecting a bell pipe section and a spigot pipe section. The bell section has an internal circumferential rib forming a support for the spigot end upon which it may fulcrum during relative tilting movements of the sections. The inner surface of the bell is relieved on one side of the supporting rib, and on the other side is formed with a groove for a sealing gasket of resilient deformable material, such as rubber, the groove having a peripheral space or cavity into which the gasket material can flow or expand under operating applied compression forces. (Sandoski-FIRL)
W75-11931

**SAFETY INSTALLATION FOR PREVENTING POLLUTION BY PIPELINES,**
For primary bibliographic entry see Field 8G.
W75-11934

**UP-FLOW SEPARATOR,**
Sweco, Inc., Los Angeles, Calif. (assignee).
T. R. Westfall.
United States Patent 3,737, 038. Issued June 5, 1973. Official Gazette of the United States Patent Office, Vol 911, No 1, p 124, June 5, 1973.

Descriptors: *Combined sewers, *Screens, Flow rates, Effluents, Cleaning, *Patents, Overflow, Separation techniques, *Waste water treatment.
Identifiers: Influent, Flow pattern

Equipment and methods for screening and concentrating waste water overflow from combined sewer systems are described. Exemplary equipment includes a separator employing a substantially cylindrical rotating screen. Influent is piped upwardly into the equipment and deflected outwardly toward the inner surface of the screen in a manner to achieve a desired flow rate and flow pattern of the influent into the screen. Means are provided for controlling the flow rate and for suitably directing the influent in a plurality of substantially discrete inclined streams toward the inner surface of the rotating screen. The screen is rotated at a speed to achieve a desired centrifugal force. Effluent passes through the screen to an outlet and the remaining concentrate passes to an outlet. The screen is in the form of a screen cage having a plurality of removable screen panels for facilitating replacement of damaged screens or changing of screen type or mesh size. Cleaning means is provided for directing a cleaning flow periodically at the screen. The methods disclosed involve the manner in which the influent, effluent, concentrate and backsplash are handled, and the manner in which the influent is screened to achieve a fluid concentrate which is pumpable to other treatment equipment for ultimate disposal. Additionally, a sequence of influent feed and screen cleaning is described. (Sandoski-FIRL)
W75-11936

**A PRACTICAL PROPORTIONAL WEIR,**
Sri Venkateswara Univ., Tirupati (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8C.
W75-11937

**EXPERIMENTS WITH UNCONVENTIONAL STORM OVERFLOWS,**
Loughborough Univ. of Technology (England).
Y. R. Reddy, and J. Pickford.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 99, No EE3, p 177-185, June, 1973. 6 fig, 5 ref.

Descriptors: *Storm runoff, *Model studies, Siphons, Overflow, Suspended solids, Water pollution control, Waste water treatment.

Models of four typical jet siphon type stilling pots for storm overflows, the bypass being through an unregulated siphon, were tested. The main objective was to reduce the saturation of the stilling pot with light solids. To obtain a comparison of the performance of different models, several hundred polymer beads of various densities were introduced into the upstream system of the overflow. The efficiency of the storm overflow, defined as the fraction of the solids not discharged through the bypass siphon, was then estimated. The influence of the location of the bypass siphon on the efficiency of the system investigated. (Sandoski-FIRL)
W75-11940

**THE USE OF STORM TANKS FOR TERTIARY TREATMENT OF SEWAGE,**
Rotherham Dept. of Water Pollution Control (England).
J. O'Neill.
Water Pollution Control, Vol 72, No 1, p 87-1973. 1 fig, 3 tab.

Descriptors: *Tertiary treatment, *Sewage, Effluents, Rainfall, Water levels, Outlets, Weirs, Penstocks, *Waste water treatment, Tanks.
Identifiers: Rotherham, England, *Storm sewage tanks.

63 four storm sewage tanks were constructed dwarke sewage works, Rotherham, England, 62 x 15 x 1.67 to 2 meters and equipped with a er scraper and transfer carriage. In time it ound that these tanks were being used less ten percent of the time, which was a poor n on the capital investment, and that in- ent use was causing deterioration of the er scraper and particularly of the electrical ol gear and limit switches. It was concluded ne cheapest and most effective way of over- g the problem would be to keep the tanks final effluent was used for this purpose. The ne involved pumping the effluent to the When the sewage flow is less than 3 dwf, irst tank remains empty in readiness to e the firdt flush of storm sewage when rain- ccurs. If and when the water level in the first eaches 0.3 meters below the sill of the outlet electrodes in the tank actuate the mechanism opens the penstock between tanks 1 and 2, the penstock in the diversion chamber, and the Spaans pump. Storm sewage then flows nks 2, 3, and 4, mixing with and displacing al effluent in those tanks. When the rainfall ased and the flow has fallen below 3 dwf, all nks are desludged using the Mieder scraper e contents are returned to the works' inlet. cleaning, tanks 2, 3, and 4 are brought into gain as tertiary settlement units. (Sandoski-

1941

**EN RETAINER ASSEMBLY,**
tshaw Controls Co, Richmond, Va.
imary bibliographic entry see Field 8C.
1942

**AULIC SEWER PIPELINE CLEANER,**
n Mfg. Co., Inc., Chicago, Ill. (assignee).
Latall.
l States Patent 3,740,785. Issued June 26,
Official Gazette of the United States Patent
, Vol 911, No 4, p 1147, June 26, 1973.

ptors: *Pipelines, *Cleaning, *Patents, ge, Maintenance, *Waste water treatment.
iers: *Hydraulic pipeline cleaner.

-mounted, jet-propelled, hydraulic pipeline r is activated from a stationary high pres- ater pumping unit connected by a flexible A novel skid arrangement of extreme rigidi- electively positionable water jet capable of ng either a propelling position or a tool g position, and a jet propulsion system is so designed that the jets produced y discharge directly into the pipeline void o not impinge against any portion of the e cleaner as a whole so that no retarding in- e is offered to the free forward motion of aner, constitute the salient features of this (Sandoski-FIRL)
944

**G A MAIN SEWER IN THE RESERVA- AREA OF THE ST. POELTEN WATER- S (VERLEGUNG EINES ABWASSER- LERS IM SCHUTZ- UND SCHOEN- ET DES WASSERWERKES ST. POEL-**

woda.
asser/Waerme, Vol 27, No 2, p 31-33, 1973.

tors: *Treatment facilities, *Sewers, Sewage, Joints(Connections), Waste water nt.
ers: Austria, Traisen River.

mmunities along the presently polluted River from Wilhelmsburg to the Danube in , have voted to build a new sewage treat- lant and a trunk sewer, since the existing s at St. Poelten are inadequate and the community desires to make the Traisen a bathing river again. The sewer, now under construction, passes the waterworks areas using wells 6 to 7 meters deep with part below groundwater level and discharges at a new sewage treatment plant on the Danube. The sewer pipe, egg-shaped, with a maximum cross sectional area of 2.4 x 2.4 meters, is being built of pre-fabricated sections with specially sealed joints using putty with a tin strip to ensure perfect tightness. (Holz-FIRL)
W75-11947

**FAIRFAX GOES FOR AWT.**
Fairfax County Wastewater System, Va.
Water and Wastes Engineering, Vol 10, No 3, p 38-39, March, 1973. 1 fig.

Descriptors: *Treatment facilities, *Sewers, *Waste water treatment, Filtration, Chlorination, Filters, Biochemical oxygen demand, Nutrient removal, Potomac River, Virginia, *Tertiary treatment.
Identifiers: Fairfax County(Va).

The Fairfax County, Virginia, Wastewater System consists of over 1400 miles of sanitary sewer lines, 32 pumping stations, and nine treatment plants. The total waste water flow in the county is approximately 50 mgd, of which 33 to 35 mgd is treated by county plants. In July 1970, Fairfax County embarked on a major sewer improvement program with the objective of reducing the total pounds of BOD5 discharged to the Potomac river. As a result of investigations, three treatment plants will be taken out of operation and major emphasis placed on expansion and additions of advanced treatment processes at the Lower Potomac Plant, one of four major facilities. Advanced Wastewater Treatment (AWT) facilities to be installed during 1973-1974 at the Lower Potomac Water Pollution Control Plant will have an average daily capacity of 36 mgd and a peak flow rate of 68 mgd. Based on raw sewage concentrations of BOD5, phosphorus, and nitrogen of 225 mg/liter, 15 mg/liter, and 50 mg/liter respectively, the AWT facilities are designed for overall treatment plant removal efficiencies as follows: BOD5 - 98.3%, phosphorus - 98.7%, and nitrogen - 98%. The AWT process consists of the following: chemical treatment with calcium of secondary effluent in solids contact treatment tanks; recarbonation in two stages with intermediate settling; filtration on granular multi-media filters to assure removal of unsettled phosphorus precipitates; and, breakpoint chlorination. (Sandoski-FIRL)
W75-11950

**SEWER SYSTEM EVALUATION AND REHABILITATION COST ESTIMATES,**
For primary bibliographic entry see Field 6C.
W75-11951

**EFFICIENCY OF MEASURES FOR THE SANITARY PROTECTION OF SURFACE WATERS IN THE REGION OF CHEMICAL INDUSTRY ENTERPRISES, (IN RUSSIAN),**
Gorkovskii Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 5G.
W75-11977

**HYGIENIC EFFECTIVENESS OF MEASURES FOR TREATING THE INDUSTRIAL WASTEWATERS OF THE KONAKOVO STATE REGIONAL ELECTRIC POWER PLANT, (IN RUSSIAN),**
Sanitary Epidemiology Station, Konakovo (USSR).
V. K. Boichenko.
Gig Sanit, Vol 4, p 98-100, 1974.

Descriptors: *Waste water treatment, Public health, Industrial wastes, Electric powerplants, Oil pollution, Treatment facilities, Reservoirs.
Identifiers: *Konakovo(USSR).

Investigations to determine the hygienic effectiveness of treating the wastewaters of the Konakovo state (USSR) regional electric power plant, operating on fuel oil and discharging, after treatment, wastewaters contaminated mainly with petroleum products from the drainage system of the generator room into the Ivankovo reservoir on the Volga, showed that the plants for treating the oil-containing effluents deserve a favorable evaluation. The treatment plants are effective and protect the reservoir against pollution by petroleum products.--Copyright 1975, Biological Abstracts, Inc.
W75-11984

**FILTER PRESS, PARTICULARLY FOR DEWATERING SLUDGE IN SEWAGE TREATMENT PLANTS,**
A. Bahr.
US Patent No 3,896,030, 4 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 936, No 4, p 1386, July 22, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water pollution control, *Filtration, *Sewage sludge treatment, Filters, Dewatering, Equipment.
Identifiers: *Filter presses.

A filter press for dewatering sludge in sewage treatment plants is described. It is comprised of two endless filter belts that retain the sludge between them. The two filter belts circulate simultaneously and are guided in concentric paths around a rotary drum against which they are held by adjustable pressure rollers so that the liquid is squeezed out of the sludge. The dewatering takes place in a sequence of five stages, the material being worked in each stage in a manner suited to its condition on leaving the previous stage. In the first stage the material, spread out over the surface of the first filter belt, is allowed to drain under gravity without the application of pressure. This is followed by a vibration stage, after which the material enters the wedge-shaped feed inlet and then passes along the horizontal pressure section. Finally the material is kneaded and pressed, between the filter belts, on its way around the asynchronous rotary roller cage. The raw material is assumed to be a watery sludge capable of flowing very easily. On its way through the press the material gradually loses water and becomes stiffer. Finally it is pressed to form a hard filter cake and kneaded to remove residual water. The more intense the kneading action the less water remains in the final hard filter cake. (Sinha-OEIS)
W75-12056

**RECOVERING PROTEINS FROM WASTE WATER,**
Secretary of Agriculture, Washington, D.C. (assignee).
J. W. Finley.
US Patent No 3,898,160, 5 p, 7 ref; Official Gazette of the United States Patent Office, Vol 937, No 1, p 202, August 5, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water pollution control, Water quality control, Water purification, Separation techniques, Ion exchange, Proteins, Industrial wastes, Effluents.

A method is described for removing proteins, starch, and other materials from proteinaceous waste water thereby producing both an effluent capable of disposal into municipal waste treatment systems or waterways and a solid ferric-protein-phosphate complex. The complex is susceptible to facile recovery of the valuable proteins contained in it. The process is comprised of: adding to the proteinaceous waste water an alkali metal salt of a molecularly-dehydrated phosphate until the concentration is 0.0001 M to 0.1 M and a source of ferric ions until the concentration is 0.001 M to 0.1 M; precipitating a ferric-protein-phosphate complex and avoiding precipitation of a protein-phosphate

complex by raising the pH of the so-treated waste to 7.0; and separating the effluent from the ferric-protein-phosphate complex precipitate. (Sinha-OEIS)
W75-12057

**FLOCCULATING AGENTS,**
Allied Colloids Ltd., Bradford (England). (assignee).
J. R. Field, and G. Smalley.
US Patent No 3,897,333, 6 p, 7 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 936, No 5, p 1834, July 29, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, *Flocculation, *Separation techniques, Sludge treatment, Dewatering, Biological degradation.
Identifiers: Paper mill effluents.

A method is disclosed in which an organic suspension selected from raw sewage sludges and sludges obtained by biological degradation is flocculated by adding an aqueous solution of a polymer to the suspension. The water soluble polymers characterized by high molecular weight contain a substantial proportion of recurring quaternised aminomethyl acrylamide or methacrylamide groups. While these polymers can be used to assist in the dewatering of a wide variety of suspensions they show the greates advantage on sludges of organic matter which are proteinaceous or cellulosic in origin or which have been obtained by biological degradation of such matter. (Sinha-OEIS)
W75-12058

**PROCESS AND APPARATUS FOR RECOVERING CLEAN WATER AND SOLIDS FROM DILUTE, AQUEOUS, SOLIDS CONTAINING SOLUTIONS OR DISPERSIONS,**
Hanover Research Corp., East Hanover, N.J. (assignee).
C. Greenfield, R. E. Casparian, and A. J. Bonanno.
US Patent, No 3,898,134, 9 p, 2 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 937, No 1, p 194-195, August 5, 1975.

Descriptors: *Waste water treatment, *Patents, *Water pollution control, *Water purification, Water quality control, *Evaporation, *Condensation, Dehydration, Separation techniques, Heat transfer, Solid wastes, Equipment.

A process and apparatus are described for recovering clean water and essentially dry solids from dilute aqueous solids. A dilute stream of aqueous solids is concentrated by heat evaporation and the evaporated water is condensed and recovered. The concentrated aqueous solids are mixed with relatively non-volatile fluidizing oil and subjected to dehydration by heat evaporation. The steam formed in the dehydration step is used to supply heat for the concentration step. The solids are separated from the fluidizing oil and recovered in an essentially dry state while the fluidizing oil is recycled. If desired, a light, relatively volatile oil may be mixed with the dilute aqueous solids to prevent scaling and fouling in the concentration evaporator. (Sinha-OEIS)
W75-12059

**SINGLE BASIN AERATED SEWAGE LAGOON WITH SPRING TIME INTENSIFIED AERATION,**
Atara Corp., Montreal (Canada). (assignee).
D. S. Murphy.
US Patent No 3,897,334, 4 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 935, No 5, p 1834-1835, July 29, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Aeration, Water pollution treatment, Aerated lagoons, Seasonal, Temperature control.

An aerated sewage lagoon has aerators placed densely near the inflow, then gradually less densely proceeding towards the outflow and then densely placed again and finally an area of no aeration. The aerators can be shut off so that in spring there is a second high intensity area to cope with the suddenly increased demand due to winter dormancy. In summer the high intensity aeration is followed by an area over which the aeration continues but at gradually reduced intensity as the sewage moves downstream to the outflow. In winter aerators nearer the outflow can be shut off entirely. (Sinha-OEIS)
W75-12060

**METHOD OF TREATING SEWAGE TO ENHANCE AEROBIC DECOMPOSITION,**
K. A. Digney, and A. P. Gallauresi.
US Patent No 3,896,027, 4 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 936, No 4, p 1385, July 22, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Aerobic treatment, *Aeration, Water pollution treatment, Dissolved oxygen, Aerobic bacteria, Domestic wastes.
Identifiers: *Aerobic decomposition.

The method described increases the level of air or other gas entrained or dissolved in a liquid. The principal application is to enhance aerobic decomposition in sewage by recirculation through a pump where a high level of dissolved oxygen is maintained by mixing atmospheric air into the sewage as it passes through the pump. A hollow shaft, which may conveniently comprise the pump impeller drive shaft, extends from an air intake opening above the sewage level to communicate with the hollow interior of the impeller blades. The air is discharged through openings preferably at or near the tips of the blades, thereby entering the stream of sewage passing through the pump at the point of highest velocity. Oxygen in the air is ultimately mixed and retained in the sewage to stimulate bacterial activity. (Sinha-OEIS)
W75-12061

**AEROBIC SEWAGE TREATMENT SYSTEM,**
Coate Burial Vault, Inc., West Milton, Ohio. (assignee).
K. J. Yost.
US Patent No 3,879,285, 7 p, 12 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 933, No 4, p 1741, April 22, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, *Aeration, *Aerobic treatment, Domestic wastes, Septic tanks, Anaerobic bacteria, Biodegradation.

Sewage water is directed into an enclosed generally circular shallow tank to expose a large surface area of the sewage water per unit volume. Air is circulated over the surface of the sewage water in a generally circular direction to effect horizontal circulation of the sewage water within the tank and diffusion of the air into the liquid. The water treated in the first aerobic tank is directed from a center outlet in the first tank into a similarly constructed second tank which also provides for horizontal circulation of the treated water and diffusion of the air in response to a generally circular flow of air. The air flow within each tank is produced by connecting the air outlet of the tank to a chimney which projects upward adjacent the outer wall of the residence and creates a natural draft. In another embodiment, the horizontal air flow is produced by a number of circumferentially spaced air conduits which slope downward towards the surface of the sewage water and are connected to an air supply pump. (Sinha-OEIS)
W75-12063

**REMODELLING AT NORWICH,**
A. McVie.
The Consulting Engineer, Vol 39, No 5, p 30-31, May, 1975.

Descriptors: *Treatment facilities, *Waste water treatment, Filtration, Activated sludge, Digestion, Aeration, Automatic control, Butterfly valves, Methane, Sludge disposal.
Identifiers: Norwich(England), River Yare, Flow meters.

The Norwich, Great Britain, sewage treatment plant is currently being remodelled. Integration of the existing plant and the new extensions will provide four parallel treatment streams. In two of the parallel systems, sewage will be treated by biological filtration and activated sludge. The other two parallel systems will process sludge by digestion and pressure filtration. A new inlet works comprised of main flow measuring facilities, duplicate rotating fine drum screens, and duplicate detritors to deal with the whole flow has been constructed. The new activated sludge plant has four radial flow primary settlement tanks and six diffused-air aeration channels. It uses magnetic flow meters and butterfly valves so automatic control can be employed to control the process. The effluent passes to four final radial-flow settlement tanks before discharge into the River Yare. The present sludge digestion system is also being modified. The site services have also been extended. Methane produced by the digestion system is used as the primary fuel for the new boilers. (Dean-FIRL)
W75-12065

**OKLAHOMA PLANS AHEAD FOR WASTE WATER REUSE,**
Benhan-Blair and Affiliates, Inc., Oklahoma City.
D. B. Benham, L. C. Fountaine, and P. Brune.
The American City, Vol. 90, No. 7, p 34-35, July 1975.

Descriptors: *Waste water treatment, *Treatment facilities, Tertiary treatment, Sewage treatment, Nutrient removal, Filtration, Trickling filter, Nitrification, Dewatering, Incineration, Chlorination, Water reuse, Water quality standards.
Identifiers: Effluent standards.

A new municipal waste water treatment facility for Lawton, Oklahoma, has been designed to meet state effluent criteria with less than 15.0 mg/liter BOD21 and phosphorus concentrations under 1 mg/liter. Resultant water of this high quality will be purchased by the electric utility serving the area for cooling use in the generation of electric power. Within the facility, raw sewage will pass through a set of three mechanically-cleaned bar screens for solids removal. Preaeration tanks will operate with a detention time of 58 minutes to provide flocculating action, enhancing the removal of ss in primary tanks, and introducing some dissolved oxygen. Three FMC primary settling tanks will be included, with space allowed for a fourth. Secondary treatment will consist of two steps: carbonaceous treatment with plastic media trickling filters; and nitrification by the activated sludge process. Final clarifiers will remove biological sludge formed from the nitrification tank, using suction type sludge removers rather than conventional scrapers. A tertiary stage will be employed to remove phosphorus from the waste water by chemical precipitation using lime, aium, and coagulant-aid polymers. After chemical phosphorus removal, two-stage recarbonation with intermediate settling filtration through sand anthracite filter beds, and final chlorination disinfection will be accomplished. Sludge from the primary and secondary processes will be dewatered and incinerated; sludge from phosphorus removal will be thickened and stored on site for periodic removal. (Kramer-FIRL)
W75-12066

S REMOVALS IN TRICKLING FILTER
TS,
Sherman, K. Kawata, V. P. Olivieri, and J.
parstek.
and Sewage Works, Reference Numbr, p
40, 42, 44, April 30, 1975. 2 fig, 4 tab., 19 ref.

ptors: *Trickling filters, *Viruses,
tant identification, *Waste water treatment,
nation, Treatment facilities, Recreation
es.
iers: *Viral removal.

has been suggested of no more than one in-
is virus particle per 10 gallons of receiving
for waters used for contact recreation.
ture on the number of viruses found in waste
and on viral removal in sewage treatment
conflicting information. An experiment was
med in order to assess viral removal effi-
s in two conventional trickling filter plants
yland. Plant capacities were 2.5 mgd and 1.5
The f2 bacterial virus was used as seed;
were seeded to a high titer so that it would
sible to observe up to 99.999% removal effi-
. Little virus removal, as expected, oc-
in the preliminary treatment units. In the
y sedimentation basins of the two plants,
e virus removals were 32.2 and 37.1 percent.
gh the trickling filter beds, average removal
ncies were 18.9 and 9.0 percent. In the
ary sedimentation basins, average virus
ls were 30.1 and 28.4 percent. Consistent
emoval was achieved with chlorination,
when aqueous chlorine was simply in-
ed at the head of the chlorine contact basin
n a diffuser. The chlorine contact units had
e virus reductions of 60.7% and 59.4%.
virus reduction was 88.6% and 85.2%.
o meet the suggested goal of one virus par-
r ten gallons, a greater efficiency in the dis-
on process must be accomplished. (Kramer-

2068

R-TREATMENT SLUDGE FILTRATION
ES,
Univ., Ala. Dept. of Civil Engineering.
awkins, J. F. Judkins, Jr., and J. M.
.
of the American Water Works Associa-
ol. 66, No. 11, p 653-658, November, 1974.
tab., 37 ref. OWRT A-024-ALA(3).

tors: *Sludge treatment, *Groundwater,
e water, *Filtration, *Water treatment,
disposal, Alum, Purification, Dewatering,
lisposal, *Waste water treatment.

results from the treatment of water impuri-
m groundwater and from surface water.
udge must be disposed of properly. By
g the volume of sludge, disposal may be ac-
hed more easily. The results of previous
on the effects of coagulant dosage, mag-
hardness and calcium hardness on specific
ce are detailed. It was concluded that:
resistance decreases with increasing
oncentration for alum sludge and becomes
y constant at high solids concentration;
cle of preformed aluminum-sulfate sludge
duce a more filterable sludge during the
tion process; and the alum dosage yielding
ge with minimum specific resistance cor-
s approximately to the optimum dosage
ned by jar test. Surface water is conven-
treated by alum to remove impurities such
silt, and bacteria. Groundwater may con-
rdness-causing minerals, which must be
l by lime-soda softening, before it may be
lomestic use. Treatment of the sludges,
dewatering, and subsequent disposal is
ized. (Prague-FIRL)
969

**ANAEROBIC PROCESSES, (LITERATURE REVIEW),**
Institute of Gas Technology, Chicago, Ill.
S. Ghosh, and J. R. Conrad.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1278-1805, June, 1975.

Descriptors: *Waste water treatment, *Anaerobic conditions, *Anaerobic digestion, Bacteria, Thermodynamics, Denitification, Microbial degradation, Reviews, Fermentation, Methane bacteria, Organic wastes, Industrial wastes, Municipal wastes, *Bibliographies.

A literature review on the subject of anaerobic processes has been prepared. Some of the many studies included: observation of pathways of glutamate fermentation; detection of Na as an obligate growth requirement of several strains of common rumen bacteria; degradation of various organochlorine and organophosphorus insecticides in flooded soils; review of thermodynamics, pathways, and mechanisms of anaerobic fermentation and anaerobic sulfate reduction by bacteria present in marine sediments; effect of facultative growth on the redox potential of the microbial cultures; and study of factors affecting biological dentrification of waste water by pure cultures. It was suggested that more research be conducted on the fundamental microbiology and mechanism of the energy-yielding, hydrolytic, and gas-forming processes in anaerobic waste fermentation. Many investigations describe the role of anaerobic denitrification for nitrogen removal in soil strata used for the treatment and/or final disposal of applied wastes. Design and operation of digestion tanks and related equipment are outlined. Comparisons were also made between several sludge stabilization systems. Specific applications of anaerobic digestion are detailed, such as for food processing wastes, textile wastes, agriculture and livestock wastes, muncipal solid wastes, and landfill leachate treatment. Additionally, the potential for energy reclamation by anaerobic bioconversion of all types of organic wastes to CH4 is under serious consideration. (Kramer-FIRL)
W75-12074

**SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL, (LITERATURE REVIEW),**
Delaware Univ., Newark. Dept. of Civil Engineering.
R. I. Dick.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1306-1323, June, 1975. 255 ref.

Descriptors: *Reviews, *Waste disposal, *Sludge treatment, *Sludge disposal, Reuse, Public health, Toxicity, Heavy metals, Dewatering, Ultimate disposal, Simulation analysis, Incineration, *Waste water treatment, *Bibliographies.
Identifiers: Sludge conditioning, Ocean dumping.

A review of recent literature discusses treatment, utilization, and disposal of sludge. Recycling and landspreading procedures must consider public health and safety before new methods of sludge management will gain public acceptance. Sludge properties, such as viscosity, rate of solubilization of carbohydrates, and chemical composition, have been measured. Recovery of potentially valuable waste constituents, which might also be toxic, is suggested. Of particular interest is heavy metals, and the possibility of recovery by solvent extraction, ion exchange, reverse osmosis, electrochemical methods, adsorption, or complex formation with polyelectrolytes. Water treatment plant alum sludge handling presents another set of alternatives. Sludge conditioning by chemicals and by polyelectrolytes has been investigated. The effect of thickener size on the cost effectiveness of other sludge treatment processes was reported. Sludge dewatering processes were also reviewed, with simulation models and pilot scale tests. Incineration, wet oxidation, and heat drying are viable solutions for disposal in some situations. Reclamation of sludges as fuels is currently under study. Types of ultimate disposal include the controversial ocean dump practices, liquid sludge application of agricultural land, trenching, heat drying and sale as fertilizer, and application to abandoned strip mines. Ecological impact of application must be considered, particularly the sources, fate and effects of trace elements in sludges, when applied to soils. (Kramer-FIRL)
W75-12075

**WASTEWATER COLLECTION, (LITERATURE REVIEW),**
Nottingham (H.D.) and Associates, Inc., McLean, Va.
T. Singh.
Journal of Water Pollution Control Federation, Vol 47, No 6, p 1335-1338, June, 1975. 41 ref.

Descriptors: *Reviews, *Waste water treatment, *Sewers, *Sewerage, *Sewage treatment, Outfall sewers, Maintenance, Combined sewers, Monitoring, Infiltration, Inspection, Inflow, Plastic pipes, Linear programming, *Bibliographies.
Identifiers: Television inspection, Sewer monitoring, Waste water collection.

A review of current literature on waste water collection systems is given. Sewer design was studied, and use of lower per capita flows and a design period of 25 years rather than 50 years were recommended. Models to optimize drainage networks based on linear programming have been developed. Construction details of long outfall seweres are outlined. Combined sanitary and storm sewer plans, aligned by laser light, are also described. Flow smoothing in sanitary sewers has been investigated; holding basins are meant as a supplemental tool rather than a replacement for the conventional gravity system. The use of materials such as polyethylene pipes was also discussed. Infiltration/inflow problems are major areas of concern. Sewer monitoring methods and measuring devices have been tested. Smoke detection of leaks and surface flows has been implemented as has closed circuit TV for sewer inspection. Sewer maintenance, repair, and cleaning are areas of neglect. Attention should be given to preventive maintenance, such as regular hydraulic cleaning, and rehabilitation by slip-lining with ultra high molecular weight polyethylene pipe in the cases of deteriorating concrete pipes. (Kramer-FIRL)
W75-12076

**THE EFFECT OF LEGISLATION OF THE FUTURE USE OF WATER IN THE LEATHER INDUSTRY,**
Water Pollution Research Lab., Stevenage (England).
D. A. Bailey.
Journal of the Society of Leather Technologists and Chemists, Vol. 57, No. 1, p. 5-12, 1973. 4 fig, 4 tab, 5 ref.

Descriptors: *Water conservation, *Tannery wastes, *Waste water treatment, *Standards, Europe, Legislation, Industrial wastes, Sludge disposal, Costs, Water reuse.
Identifiers: *England, *Leather industry.

As the scarcity of water in England and Wales increases its value and in anticipation of stricter standards for effluent disposal by the Region Water Authorities, recommendations are made to the leather tanning industry for water conservation, re-use, and waste treatment. While new water is unlikely to increase production costs, waste effluent disposal costs will have a pronounced effect on production. It is suggested that the industry reduce the total throughput of water by better housekeeping, alteration of processes to use less water, separate cleaner fractions of the waste for direct re-use without treatment, and recycle after complete or partial treatment. Smaller volumes of concentrated wastes would facilitate the application of advanced treat-

ment techniques, such as high-rate biological systems, and this industry's under-exploited, chemical precipitation. Several methods are proposed to reduce water usage. The industry as a whole should establish the optimum water quantity requirements for each state of processing and set target figures at which to aim. Minimum water quality requirements must also be determined for each process. This information will prove valuable if supplies of cheaper second-grade water are made available, inasmuch as in some instances good quality sewage effluent is used industrially. (Auen-Wisconsin)
W75-12112

**COAL MINE DRAINAGE POLLUTION--1973,**
Pennsylvania State Univ., University Park. Mine Drainage Research Section.
For primary bibliographic entry see Field 5G.
W75-12114

**BIO-OXIDATION PROCESS SAVES H20,**
Sun Oil Co., Toledo, Ohio.
E. F. Mohler, and L. T. Clere.
Hydrocarbon Processing, Vol. 52, No. 1, p. 84-88, 1973. 1 fig, 9 tab, 10 ref.

Descriptors: *Waste water treatment, *Reclaimed water, *Biological treatment, *Oil, Cooling towers, Cooling water, Industrial wastes, Sulfur, Phenols, *Oxidation.
Identifiers: Oil refineries, Hydrocarbons, *Bio-oxidation.

This process successfully handles oil refinery waste water and conserves fresh water. Water consumption is 214 gallons per barrel (gpb) of crude oil on the national average compared to 28 gallons with this system, and consumption has been further reduced to as little as 17 gpb of crude. The process has evolved from experiments in the Toledo refinery of Sun Oil Company based on the use of cooling towers to provide bio-oxidation of phenolic materials while using the waters for conventional equipment process cooling. The mechanism, design, operation and maintenance data are given. Over 90% of the reaction occurs during the fall through the tower structure. The balance of bio-oxidation is carried out in the cooling tower basin before the water is pumped in the circulating system. Over-all removal exceeds 99.9%. Upflow sand filtration allowed the establishment of a high-solids loading which extends the operating cycle, makes addition of chemicals easier with excellent agglomeration of suspended solids throughout the entire sand bed. Additional reuse from the operation of the sand filter system will reduce consumption below 10 gpb, amounting to a saving of $174,000, plus that required for chemically treating fresh water, for a refinery producing 120,000 barrels per day. (Auen-Wisconsin)
W75-12115

**SODIUM HYDROXIDE TREATMENT OF ACID MINE DRAINAGE,**
Environmental Protection Agency, Rivesville, W. Va. Croion Mine Drainage Control Field Site.
For primary bibliographic entry see Field 5G.
W75-12116

**EFFLUENT TREATMENT FOR A SMALL TANNERY,**
Research Advisory Service, Inc., Western Springs, Ill.
H. H. Young.
Journal American Leather Chemists Association, Vol 63, No 8, p 308-315, 1973. 11 fig.

Descriptors: *Waste water treatment, *Tannery wastes, Sludge, Chromium, *Illinois, Recycling, Filters, Treatment facilities.

The described treatment facility was based on standard procedures for handling fluid wastes on a 70,000 gpd volume, fluctuating from 2000-10,000 gallons/hr over a 12-hr period. The tannery used a hair-saving operation, chrome tanning with some vegetable or synthetic re-tan was employed, the waste streams' composition were unvaried but flow distribution was variable. The municipal standards prescribed that at no time could the fat or grease exceed 100 ppm, the chromium exceed 25 ppm, and the pH fall outside the 4.5-10 range. Recovered fats or settleable solids as sludge would have to be separated and hauled away. The system will cost $1 for each gallon of daily flow; for larger units the cost would be proportionately less. A new filtering mechanism separated fine thixotropic solids from the fluids. Demonstrations suggested its possible use for the separation of chromium hydroxide. The Dyno-Filter produced 30 lbs of dewatered cake and 420 lbs of filtrate containing 10 ppm of chromium metal equivalent, from 450 lbs of settled sludge. 450 lbs of spent chrome liquor containing 0.13% chromium as metal yielded 440 lbs of filtrate containing 8.5 ppm of chromium metal and 10 lbs of filter sludge cake containing 5.6% chromium metal, reflecting a 95.5% chromium recovery. (Auen-Wisconsin)
W75-12118

**SOME ASPECTS OF A CHEMICAL TREATMENT OF THE WASTE WATERS FROM THE BEAMHOUSE,**
Institute TNO voor Leder en Schoenen, Waalwijk (Netherlands).
A. J. J. van Meer.
Journal American Leather Chemists Association, Vol 68, No 8, p 339-345, 1973. 7 fig.

Descriptors: *Waste water treatment, *Tannery wastes, *Oxidation, Industrial wastes, Organic loading, Sulfides, Manganese, Aeration, Hydrogen ion concentration, Chemical oxygen demand, Nitrogen, Sulfur, Water reuse, Europe.
Identifiers: *Beamhouse liquors, Process modification, Acidification.

Chrome leather tanning waste water contains 75-80% of oxygen consuming substances and nitrogenous materials resulting from the soaking, unhairing, and liming processes. When alkaline liquors are mixed with the acid liquors, the pH is reduced to 8.5-9.5, which precipitates proteins, thus decreasing the pollutants of the mixed and settled waste water by 35-45%. This is accompanied by the formation of large sludge quanties with a water content of 95-98% and is difficult to handle. Moreover, 4000-7000 gals/1000 lbs of hides of waste water has to be treated. Presuming that combined soaking and unhairing can be consistent with good leather quality, three experiments were conducted which indicated that the waste load from soaking and unhairing can be collected in a volume of about 300-500 gals/1000 lbs of hides. The oxidative removal of sulfur decreases the alkalinity of the waste water considerably. When the waste water from the combined soaking and unhairing process is acidified, by a small amount of sulfuric acid, to pH 3.5, the organic matter in the settled effluent is reduced about 90%, resulting in a 58% total waste load reduction. The filtering and dewatering properties of the protein precipitate are very good. The spent lime liquor can be reused. (Auen-Wisconsin)
W75-12120

**SOME ASPECTS OF TANNERY EFFLUENT CONTROL,**
Garden State Tanning Co., Reading, Pa.
S. De Mohan.
Journal of American Leather Chemists Association, Vol 68, No 8, p 316-321, 1973. 4 tab, 9 ref.

Descriptors: *Tanning wastes, *Effluents, *Waste water treatment, *Industrial wastes, Chromium, Water conservation, *Pennsylvania, Sludge.
Identifiers: Beamhouse liquors.

The Garden State Tanning Company, Reading, Pennsylvania manufactures upholstery leather by a chrome tanning method. By adopting the bio-processor water use was reduced and sulfide requirements were reduced by about 40%. Pilot plant experiments with manganese sulfate at the rate of 200 g/cu m as a catalyst in sulfide oxidation by aeration indicated that sulfide can be reduced considerably. After aeration for 8 hours the pH of the liquor was reduced to 9.5 then 10 g alum/gallon was added. When the precipitate was allowed to settle the BOD5 of the liquor was reduced by 77.5% the sludge volume was about 12% of the total volume. To every 45 gallons of exhaust chrome liquor 1.88 lbs lime powder was added then 157.5 g of Primafloc A-10 was added gradually and allowed to stand for 4 hours. The top supernatant liquor can be easily decanted or siphoned off and contains only 0.4 ppm chromium. The pH of the water is 8.2 and the water can be reused in pickling and chrome tanning. The chrome sludge was dissolved in concentrated hydrogen sulfate to convert it to basic chromium sulfate. The pH of the recovered chrome solution was 2.7-2.8. (Auen-Wisconsin)
W75-12123

**NO-EFFLUENT TANNERY PROCESSES,**
Rhodes Univ., Grahamstown (South Africa). Leather Industries Research Inst.
D. A. Williams-Wynn.
Journal American Leather Chemical Association, Vol 68, No 1, p 5-13, 1973. 15 ref.

Descriptors: *Tannery wastes, *Effluents, Sodium chloride, Lime, Industrial wastes, *Waste water treatment, Water reuse, Recycling.
Identifiers: Process modification, Vegetable tanning, Beamhouse liquors, Liritan process, South Africa.

At various stages in the conversion of raw hide to tanned leather, steps can be taken which will result in lower effluent volumes and a reduction in the amount of solids, both in solution and as sludge which needs to be discharged. Salt from curing is a major contributor to the total dissolved solids in effluent and alternatives to salt curing are discussed. Processes in the beamhouse result in the greatest amounts of contaminating substances in tannery effluent, some originating from the hides, while others are from chemicals used in depilation. Excessively large amounts of lime are frequently used by tanners, whereas not more than 2% is adequate for liming and assuring that no undissolved material is left, thus reducing the amount of sludge to negligible proportions. Soluble protein is easily destroyed by aerobic digestion and sulfide is converted to harmless substances by manganese-catalyzed oxidation. The use of closed circulator tanning systems in vegetable tanning ensures that the minimum amount of tannin is lost in discharge into the effluent. The original Liritan process and the Liritan semi-rapid pit/drum process are described, as are the use of low float or nofloats procedures for chrome tanning, retanning, dyeing, and fatliquoring. (Auen-Wisconsin)
W75-12124

**COMPLETE INDUSTRIAL WASTE-WATER REUSE GOAL OF REFINING STUDY,**
Bechtel Corp., San Francisco, Calif. Ecology and Water Quality Group.
J. W. Porter, J. H. Blake, and R. T. Milligan.
Oil and Gas Journal, p 70-74, October 1, 1973. 3 fig, 3 tab, 5 ref.

Descriptors: *Water conservation, *Recycling, *Oil industry, *Pollution abatement, Industrial wastes, Waste water treatment, Model studies, Cooling water, Salts, *Water reuse.
Identifiers: Oil refineries.

The requirements to provide ever-higher levels of treatment for industrial waste waters and to re-

ational goal of zero discharge of pollutants to ways by 1985 provide incentives to reduce olume of effluents from oil refineries. A typi-00,000-b/d integrated oil refinery is con-d in this study. A block flow diagram shows aste water collection and treatment system. ase of an inland refinery is considered first, ved by modifications to the system to show a al location where discharge of clean, salty would be permitted. The treatment system inland refinery is designed on the premise the only discharges will be petroleum cts, solid salts, and allowable emissions to mosphere. The various treatment steps are ated. In reducing pollutant discharges to n the coastal refinery it is assumed that the ration of salty waters can be eliminated and ater would be reused if its salt content is low h. Since the cooling tower blowdown must ated thoroughly to remove heavy metals and ics, its volume would also be reduced. Esti-are made of both capital and operating and enance costs associated with 'best practica-echnology' in these base cases. (Auen-nsin)
2125

ATIONAL VARIABLES AND LIMITA-S OF DIRECT FILTRATION,
io Ministry of the Environment, Toronto. ion Control Branch.
imary bibliographic entry see Field 5F.
2127

UATION OF A COAL-SEWAGE TREAT-PILOT PLANT.
ale by the Superintendent of Documents, Government Printing Office, Washington, 0402, Price $1.00. Office of Coal Research, rch and Development Report No. 63, (1971). 4 ref. 14-32-0001-1205.

ptors: *Waste water treatment, *Sewage ent, *Coals, Filters, Suspended solids, Dis-solids, Adsorption, Costs, Activated car-ilot plants.
iers: *Coal filtration.

plant study on the feasibility of a coal filter s for treating raw sewage was performed. ent comprises passing sewage through a small uniformly sized coal particles where on of the suspended solids and adsorption of ed organics occurs. The coal treatment s and the equipment it requires, the efficien-costs of the method, the applicability and developments of the process are discussed. ltration is also discussed in relation to other ent methods. Coal filtration is an excellent d for suspended solids removal, but only y reduces the dissolved organics content. ep coal filtration will not produce water meets current water quality standards. er, the use of coal char or activated carbon crease the efficiency sufficient to allow for ne-step treatment of sewage. The most ing application of coal filtration is as a pre-st-treatment step for suspended solids al combined with a treatment step for dis-solids removal. Coal filtration can be nically competitive if heat is recovered ll the coal used. This can be achieved by ing coal from a pulverized coal user. The ed cost of development, construction, and on of a one mgd demonstration plant for ar is $1,500,000. (Orr-FIRL)
2128

EMICAL CHARACTERISTICS OF TED CHEMICAL SEWAGE SLUDGES,
nmental Protection Service, Ottawa o). Water Technology Centre.
Chawla, J. D. Stephenson, and D. Liu.
dge Handling and Disposal Seminar, Con-Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 63-94, (1974) 9 fig, 15 tab.

Descriptors: Treatment facilities, *Sludge, *Nutrient removal, *Waste water treatment, Phosphrus, Nitrogen, Heavy metals, Polychlorinated biphenyls, Pesticides, Organic compounds, Lipids, Aerobic bacteria, Lime, *Canada, Pollutant identification.
Identifiers: *Phosphorus removal systems, Ontario, Biochemical characteristics, Precipitating agents, Petroleum hydrocarbons.

Phosphorus removal systems are being incorporated into many sewage treatment facilities in Ontario. Precipitating agents are ferric chloride, lime or alum. The differences in chemical composition of these phosphorus rich chemical sludges have caused concern about the potential pollution of surface waters and groundwater, as well as of soil and plant systems. An extensive program was started in 1973 to study the biochemical characteristics of these sludges. Samples were taken from four sewage treatment plants over a fifteen month period and analyzed for nutrients and heavy metals, microbial contents, pesticides, polychlorinated biphenyls (PCBs), lipids and petroleum hydrocarbons. The results showed that each plant has to be considered individually due to variations in concentration of the materials studied. The amount of aerobic heterotrophic bacteria was relatively constant. There was a random variation of heavy metals and only one plant had a high concentration of petroleum hydrocarbons. (See also W75-11715) (Dean-FIRL)
W75-12132

VIROLOGICAL INVESTIGATIONS ON SLUDGES FROM SELECTED ONTARIO SEWAGE PLANTS,
Ontario Ministry of Health, Toronto.
T. P. Subrahmanyan.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2 September 18-19, 1974, Toronto, Ontario, Canada, p 95-109, (1974) 7 tab, 9 ref.

Descriptors: Treatment facilities, *Viruses, *Waste water treatment, Sludge, Sewage, Effluents, Sewage treatment, Pollutant identification.
Identifiers: Ontario Ministry of the Environment, Toronto Works Department.

In cooperation with the Ontario Ministry of the Environment and the Toronto Works Department, the Virus Laboratory of the Ministry of Health conducted an investigation of viral isolation in sewage and sludge. Three hundred and fifty three specimens were collected between April and December 1973, from four sewage treatment plants. These specimens included sewage, raw sludge, digested sludge, and effluents. Viruses were isolated in 38.7% of the sewage, 13% of the raw sludge, and 0.9% of the digested sludge samples. During the colder months enteroviruses were rare or absent and reached their peak during August and September. The results showed low viral hazards. Further surveillance and routine monitoring are necessary. (See also W75-11715) (Dean-FIRL)
W75-12133

REGULATORY ASPECTS OF SLUDGE UTILIZATION ON LAND,
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
For primary bibliographic entry see Field 5G.
W75-12134

LAND DISPOSAL OF SEWAGE SLUDGE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
T. E. Bates, E. G. Beauchamp, J. W. Ketcheson, R. Protz, and J. R. Moyer.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2 September 18-19, 1974, Toronto, Ontario, Canada, p 143-149, (1974).

Descriptors: *Sludge disposal, *Fertilization, Soil science, *Sewage sludge, *Heavy metals, *Pathogenic bacteria, *Nutrients, Crops, Nitrogen, Rates of application.
Identifiers: Land application, Crop quality.

An outline is presented of research being performed at the University of Guelph, Ontario, on the land disposal of sewage sludge. The major objective is to determine maximum rates of sewage sludge application which can be used on agricultural soils without contaminating subsurface water with nitrate nitrogen and surface water with pathogenic organisms, and without lowering the quality of the crops grown. Specific research is being performed to determine rates of sewage sludge which may be safely applied to certain slopes at specified times of the year and to examine the movement of nutrients and other components of sludge on field plots. Field rate and source studies should provide conditions for nutrient, metals, bacteriological and soil characterization studies. Research is being done to determine the application rates of chemically treated sludges which may be used on typical Ontario soils without being detrimental to crop and soil nutrient and heavy metals content. Studies on nitrogen have two objectives: to determine the availability to plants of nitrogen in chemically treated sludges, and to estimate the losses of nitrogen to groundwater. Also, research is being conducted to establish a simple test for plant available metals in soils by selecting suitable extractants with particular emphasis on copper and cadmium, to determine the numbers of total coliforms, fecal coliforms and fecal streptrococci in the sludges, and to characterize the soils in terms of soil structure and movement of Ca, Fe, and Al used in sludge treatment. (See also W75-11715) (Orr-FIRL)
W75-12135

NITROGEN TRANSFORMATION AND UPTAKE,
Guelph Univ. (Ontario) . Dept. of Land Resource Science.
For primary bibliographic entry see Field 5B.
W75-12136

RUNOFF AND EROSION LOSSES,
For primary bibliographic entry see Field 5B.
W75-12137

SOME MICROBIOLOGICAL ASPECTS OF THE LAND DISPOSAL OF SLUDGE,
Guelph Univ. (Ontario). Dept. of Microbiology.
R. A. Johnston.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2 September 18-19, 1974, Toronto, Ontario, Canada, p 185-191. (1974) 1 fig, 2 tab.

Descriptors: *Sludge disposal, *Fertilization, *Bioindicators, *Pathogenic bacteria, Runoff, Salmonella, Shigella, Public health, Water pollution sources, Canada.

Research being conducted at the University of Guelph, Ontario, on land disposal of sewage sludge includes studies to establish the numbers of some groups of indicator bacteria in run-off waters and sludges, and to determine the presence or absence of pathogens such as Salmonella and Shigella in sludges, run-off waters and on plants harvested from areas receiving sludge. Examination was made of sludge applied, runoff from control and treated plots, and plots growing corn and grass. Preliminary observations include: the examination of sludge and run-off water for the estimation of commonly employed indicator organisms has little value in assessing the influence of

sludge on run-off water; the number of Salmonella and Shigella bacteria found in sludge and run-off water appears to be quite low; and, some Salmonella and Shigella forms seem to be capable of surviving for a short time in sludge and sludge-soil mixtures. (See also W75-11715) (Orr-FIRL)
W75-12138

**CATION DISTRIBUTION IN SOILS AS RELATED TO SEWAGE SLUDGE DISPOSAL ON LAND,**
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 5B.
W75-12139

**ANALYSIS OF HEAVY METALS IN SEWAGE SLUDGE AND LIQUIDS ASSOCIATED WITH SLUDGES,**
Toronto Univ. (Ontario). Dept. of Geology; and Toronto Univ. (Ontario). Dept. of Chemistry,
For primary bibliographic entry see Field 5A.
W75-12140

**EXTRACTABLE METALS IN MIXTURES OF SOIL AND SEWAGE SLUDGE,**
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
M. D. Webber, and J. D. Gaynor.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2 September 18-19, 1974, Toronto, Ontario, Canada, p 249-266. (1974) 6 tab, 12 ref.

Descriptors: *Sewage sludge, Land, *Metals, Soil texture, Canada, Waste water treatment.
Identifiers: Ottawa.

There has been evidence primarily from England that the use of sewage sludge on farmland can result in trace metal pollution. The Soil Research Institute, Ottawa, Canada, has conducted studies on the solubilities of sludge metals in soils. Six acid soils with wide ranges of organic matter and clay content were used. Five anaerobic digested sewage sludges from various points in Ontario were incubated and mixed with the soil. The sludges were iron chloride treated sludges from two different locations, alum treated sludge, untreated sludge, and a lime treated sludge, each from a different location. The extractable metals were measured either before and/or after incubation in 0.05M EDTA, 0.005 DTPA, and 0.01M CaCl2. Increased levels of extractable metals seemed related to the addition of sludge. A large increase in soil pH was caused by adding the lime treated sludge. Although soil texture affected the extractability of zinc it did not appear to do so with other metals. (See also W75-11715) (Dean-FIRL)
W75-12141

**CHEMICAL TESTS FOR PLANT AVAILABLE METALS IN SOILS.**
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 5A.
W75-12142

**PRIMARY DEVELOPMENTS OF AIR-BORNE BACTERIA IN THE OECD ACTIVATED SLUDGE SYSTEM,**
CIBA-GEIGY Ltd., Basel (Switzerland). Dyestuffs and Chemical Div.
H. R. Hitz, G. Plichta, J. E. P. Young, and J. M. Shewan.
International Biodeterioration Bulletin, Vol 11, No 1, p 31-35, 1975. 4 fig, 1 tab, 23 ref.

Descriptors: *Bacteria, *Activated sludge, *Waste water treatment, Infection, Pseudomonas, Biodegradation, Detergents, Analytical techniques, Bioindicators, Pollutant identification.
Identifiers: OECD Confirmatory Test Procedure, Bacillus spp., Air-borne bacteria.

The OECD (Organization for Economic Cooperation and Development) Confirmatory Test Procedure is routinely used for testing the biodegradability of detergents in a modified Husmann Apparatus. Laboratory experiments were conducted to investigate the self-infection processes by air-borne bacteria. The system does not need to be inoculated by bacteria from an outside treatment plant; the activated sludge can form its own flora by self-infection of air-borne bacteria. As an open continuous culture fermenter, the OECD system tends towards a "flow-balance" within the first 72 hours. The flow-balance is affected by physicochemical and biological factors such as temperature, pH, nutrients, microbial antagonism, symbiosis, and metabiosis. More than half of the bacteria isolated and identified belonged to the genus Pseudomonas. The majority of the remaining bacteria were Bacillus spp. The results of the experiments were reproducible. (Orr-FIRL)
W75-12143

**FACTORS AFFECTING OXYGEN TRANSFER DURING BUBBLE AERATION UNDER LABORATORY SCALE CONDITIONS,**
Iowa Univ., Iowa City.
C-Y. Huang.
Available from University Microfilm Inc., Ann Arbor, Michigan, 48106. Order No. 75-13765, PhD Thesis, 1974, 109 p.

Descriptors: *Oxygen, *Waste water treatment, Suspended solids, Electrolytes, Surfactants, Dissolved oxygen, Oxygenation, Water treatment.
Identifiers: *Oxygen transfer rate, Surface active agents.

Factors affecting oxygen transfer from air into liquid, such as inorganic electrolytes, suspended solids, and surface active agents, were studied in laboratory scale tanks. The effects were expressed by the alpha prime factor which is defined as the ratio of (K sub L)a in solution to (K sub L)a in demineralized water. The alpha prime factor increased in the electrolyte concentrations. The presence of suspended solids in the solution decreased the oxygen transfer rate. Significant decreases were observed with bentonite, asbestos fibers, and activated sludge. The combination of the additives produced a different effect as compared to the effect of the additives alone. A combination of the surface active agent and suspended solids produced a smaller decrease in the oxygen transfer rate than when either additive was present alone. The inorganic electrolyte increased the oxygen transfer rate but when it was present with the surface active agents, a larger decrease occurred. The effects of the additives were analyzed by considering the change of water molecular structure, hydrodynamics of the solution, and the interaction between the additives. The magnitude of the effect of each substance was not a simple function of substance or ionic concentration but also involved the orientation of water molecules and the nature of the substance. The saturated oxygen concentrations were also evaluated. (Orr-FIRL)
W75-12144

**FLOATING AQUATIC PLANTS REMOVE CHEMICALS FROM POLLUTED WATERS.**
For primary bibliographic entry see Field 5G.
W75-12145

**UNUSUAL FEATURES IN PLANT DESIGN.**
For primary bibliographic entry see Field 5F.
W75-12146

**CONTROL SYSTEM FOR SHOWA WATER PURIFICATION PLANT, (IN JAPANESE),**
For primary bibliographic entry see Field 5F.
W75-12147

**ADSORPTION OF POLIOVIRUS ONTO ACTIVATED CARBON IN WASTEWATER,**
Baylor Coll. of Medicine, Houston , texas. Dept. of Virology and Epidemiology.
C.P. Gerba, M. D. Sobsey, C. Wallis, and J. L. Melnick.
Environmental Science and Technology, Vol 9, No 8, p 727-731, August, 1975. 8 fig, 4 tab, 19 ref.

Descriptors: *Waste water treatment, *Activated carbon, *Adsorption, Hydrogen ion concentration, *Sewage treatment, *Viruses, Acidity, Coagulation.
Identifiers: Lime coagulation, Batch studies, *Poliovirus, Viral removal, Freundlich isotherms.

An investigation was made to determine how to optimize activated carbon adsorbion of viruses from treated sewage. Poliovirus removal from sewage effluents was improved significantly (by about 25 times) by lowering the pH from near neutral (8) to 3.5-4.5 or by reducing the concentrations of soluble organic matter by lime coagulation. However, further study is required to determine if carbon column operation under acidic conditions would be economically feasible and practical. Batch studies showed that Freundlich isotherms could be used to describe virus adsorption to activated carbon. Column studies indicated that viral removal efficiency was dependent on column length and hydraulic loading, with greater removals at lower loading. (Kramer-FIRL)
W75-12148

**BIOLOGICAL WASTE WATER TREATMENT,**
T. Yamauchi, and K. Matsumoto.
Mitsubishi Juko Giho, Vol 12, p 118-124, January, 1975. 11 fig, 12 tab, 11 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Activated sludge, *Trickling filters.
Identifiers: *BIO-PAC Process, Japan.

Various biological methods for waste water treatment have been developed. The most widely used biological method is the activated sludge process. A description is given of a new process for the treatment of waste water containing a high concentration of salt. One problem with activated sludge treatment is the development of bulking which prevents the waste water from being treated. In this case a trickling filter is required. A new process, the Mitsubishi BIO-PAC Process, has been developed for the treatment of waste water when bulking is a problem. The results of application of this new BIO-PAC Process are also discussed. (Orr-FIRL)
W75-12149

**BERRY HILL SLUDGE TREATMENT WORKS,**
Wessex Water Authority (England). Avon and Dorset Recovery Div.
J. E. Cassidy.
Water and Waste Treatment, Vol 18, No 4, p 17-19, April, 1975. 6 fig, 3 ref.

Descriptors: *Treatment facilities, *Sewage treatment, *Waste water treatment, *Sludge treatment, Channels, Aeration, Activated sludge, Filters, Odor, Dewatering, Sludge disposal, Digestion tanks, Settling basins.
Identifiers: Comminutors, Detritors, Land application, Sedimentation tanks, Settling tanks, Storm tanks, Sludge drying beds, Sludge thickening wells.

The sewage treatment facility for Bournemouth has been constructed in two stages and at two locations and was designed to serve a population of 200,000. The main sewage treatment works located at Holdenhurst consists of inlet channels, comminutors, detritors, sedimentation tanks, aeration activated sludge units, final settling tanks, nitrifying filters, and storm tanks. In order to override certain objections, the sludge treatment works were constructed two miles away at Berry Hill

rry Hill plant consists of raw sludge
ng wells, primary and secondary sludge
tanks, sludge drying beds, and a site for
nkers which dispose of the digested sludge
ands. The sludge is pumped from the main
reatment plant at Holdenhurst. In order to
odor problems at Berry Hill, sludge
ng tanks have been equipped with
s covers and deodorizing systems. (Dean-

50

ELATIONSHIP BETWEEN PROCESS
URATION AND PROCESS PER-
NCE,
ty Coll. of Swansea (Wales). Dept. of
l Engineering.
nroeder.
Water Pollution Control Federation, Vol.
5, p 1005-1011, May, 1975. 4 fig, 1 tab, 7

ors: *Activated sludge, Analytical
es, *Performance, Flocculation, Ef-
*Waste water treatment, Nutrient

rs: Plug flow process, Continuous flow,
nk reactor (CFSTR), Effluent quality.

tical study was conducted to compare the
nce of the ideal continuous flow, stirred
tor (CFSTR) with the ideal plug flow ac-
ludge process. Both the CFSTR and the
flow process may be designed using the
teria. This is unusual because plug flow
s are normally considered more efficient
CFSTR because of higher average reac-
It has been suggested that either funda-
biological differences exist between the
esses or that backmixing is so great in
onally designed processes, that they
similar to CFSTR's. Neither explanation
accepted as complete, and this analysis
ried out to demonstrate that in real
required operating constraints force the
at both ideal plug flow and ideal CFSTR
s effectively produce the same effluent
Mass balance equations for both plug flow
TR processes were outlined. Rate coeffi-
ues and yield were also described. Per-
es of the two processes were compared by
ing effluent concentration values over a
cell resident times. The most significant
vas that, in the cell residence time region
for good cell flocculation with respect
eparation, both systems gave acceptable
The critical factor in activated sludge
esign must therefore be to accomplish or-
moval by producing well flocculated
Kramer-FIRL)
52

Y SOLIDS/LIQUID SEPARATION.
rvices, Vol. 79, No. 951, p 200-201, May,
g.

ors: *Flotation, *Waste water treatment,
reatment, Suspended solids, Pilot plants,
Color, Flocculation, *Separation
es.
s: *Dissolved air flotation, *Solids

ved air flotation process has been
for the primary solids/liquid separation
essary in the treatment of many potable
trial waters and waste waters. Treatment
d by air microbubbles which attach to the
ds creating a positive buoyancy which
e solids to float rapidly to the surface in-
settling slowly. The floatation process
eparation rates in the range from 8 to 11
m/hr so that smaller, more economical
n the usual settlement tanks can be con-
The advantages of flotation include its
ity to a wide range of application, its flex-

ibility in operation, and its rapid plant start-up and shut-down. Coagulation and flocculation are required for the effective removal of color and colloidal matter. The use of microbubbles in the flotation system produces a smaller floc which reduces the time needed for flocculation as compared to a settlement system. Compressed air is dissolved in a small quantity of recycled water at pressures at or above 4.0 atmospheres. The saturated air/water solution is released under controlled conditions in the flotation tank to produce a cloud of microbubbles which envelops the solids in the feed flow. Studies using a pilot water treatment plant incorporating chemical treatment, flocculation, flotation, and filtration have substantiated the viability of flotation as a primary solids/liquid separation process. A typical process flow diagram for primary solids/liquids separation by flotation is presented. (Orr-FIRL)
W75-12153

**PRINCIPLES AND TECHNIQUES FOR CONDITIONING OF WASTE-ACTIVATED SLUDGE BY DIRECT SLURRY FREEZING,**
Virginia Polytechnic Inst. and State Univ., Blacksburg.
M. Z. A. Khan.
PhD Thesis, 1974, 256 p.

Descriptors: *Waste water treatment, *Sludge treatment, *Freezing, Dewatering, Domestic wastes, Industrial wastes, Pulp and Paper industry, Filtration, Costs, *Activated sludge.

Direct slurry freeze conditioning of waste-activated sludge achieves a significant improvement in dewatering. Dewatering characteristics were defined by the specific resistance and coefficient of compressibility values, by settling, and by filter cake quality when vacuum filtration and gravity drainage on sand beds were used. Sludge samples were taken from plants treating domestic sewage, combined industrial wastes and domestic sewage, and pulp and paper wastes. Direct microscopic and wet sieve analysis indicated that the primary mechanism of conditioning was the promotion of flocculation by freezing. The degree of conditioning is a function of the 'butane contact' or freezing time with better conditioning occurring with longer detention times. The direct slurry freezing process is more economical than other sludge conditioning processes such as direct freezing and heat treatment. The estimated cost per ton of dry solids processed was $6-20. (Orr-FIRL)
W75-12154

**THE INFLUENCE OF OXYGEN CONCENTRATION AND TURBULENCE INTENSITY ON COMPLETE-MIX ACTIVATED SLUDGE PERFORMANCE,**
Vanderbilt Univ., Nashville, Tenn.
A. J. Englande, Jr.
PhD Thesis, 1974, 178 p.

Descriptors: *Waste water treatment, *Activated sludge, Mixing, Oxygenation, Phenols, Pilot plants, Laboratory tests, Oxygen requirements, Dissolved oxygen.
Identifiers: Complete-mix activated sludge, Floc characteristics, Oxygen utilization, Food/Microorganism ratio.

The relationships between oxygen concentration, turbulence intensity, and pertinent process parameters in a complete-mix activated sludge 10 gpm pilot plant treating a phenol waste water were studied. Bench-scale studies were conducted to determine the effect of other factors, such as food-to-microorganism ratio (F/M), the nature of the substrate, the nature of the turbulence, and solids concentration, on the floc size and consequently on the oxygen transfer efficiencies. Bench-scale models are capable of simulating prototype performance as expressed by kinetic substrate removal rate, oxygen uptake rate, floc size, and dehydrogenase activity. Substrate removal for the phenol sludge substantially decreased below a critical oxygen concentration of 0.5 mg/liter DO. Floc size was a function of the nature of the turbulence, the mixing intensity, the nature of the substrate, and the F/M loading. The scale of turbulence must be similar to that of the floc particles to influence floc size. A mixing intensity increase corresponded to a decrease in floc size. The flocs were essentially filament-free and their sizes were small enough so that oxygen diffusion could not be limiting. Two oxygen utilization rate monitoring methods, the DO probe and the off-gas analysis, produced the same results. The oxygen uptake test is an adequate substitute for monitoring bioactivity because of the observed linear relationship between dehydrogenase activity and DO uptake; both parameters increased in value with increasing loading rate. (Orr-FIRL)
W75-12155

**MATHEMATICAL MODELS AND SIMULATION OF WASTEWATER TREATMENT SYSTEMS,**
Tokyo Sewerage Bureau (Japan).
M. Koide, S. Nogita, M. Tanuma, and M. Shioya.
Hitachi Review, Vol. 24, No. 1, p 49-55, January, 1975. 11 fig, 2 tab, 12 ref.

Descriptors: *Waste water treatment, *Mathematical models, Activated sludge, Water quality, Sewage, Model studies, Computers, Simulation analysis.
Identifiers: *Japan, Computer control, *Tokyo(Japan).

In hierarchical multilevel control systems for waste water treatment, computer control achieves mode changing and parameter correcting to effect feed-forward, optimum, and adaptive control. However, advances in this field have been impeded by difficulty in defining the characteristics of the activated sludge treatment process. Hitachi, Limited, in conjunction with the Tokyo municipal authorities, is studying and developing mathematical models for influent volumes in waste water treatment systems and water quality, and is observing their accuracy at the Mikawashima Sewage Treatment Plant of the Sewerage Bureau of Tokyo Metropolitan Government. New control systems are being discovered through the use of these models, which include a sewage inflow prediction model, an aeration tank model, a final clarifier model, static simulation, and dynamic simulation. (Murphy-FRIL)
W75-12156

**WASTE DISPOSAL SYSTEM,**
Standard Products Co., Cleveland, Ohio. (Assignee).
J. S. Reid.
U.S. Patent No 3,898,161, 5 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 937, No 1, p 202, August 5, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Water pollution control, Domestic wastes, Waste disposal, Heat transfer, Flash distillation.
Identifiers: Vaporization, Sterilization.

The disposal of liquid and organic human bacteriological waste material by vaporization described. The system has vaporizing means comprised of a boiler which is heated. Liquid and organic human bacteriological waste material is metered into the heated boiler for vaporization and sterilization. The interior walls of the boiler become caked with ash and mineral residue which greatly reduces the efficiency of heat transfer. Such deposits must be cleaned at periodic intervals in order to maintain optimum efficiency of the system. The system includes an arrangement for shutting off waste material and starting flow of fresh water to sweep deposits from the vaporizer. Introduction of fresh water causes the fresh water to flash into steam for helping break deposits from

the internal walls. The caked deposits are then swept from the boiler when the fresh water exhaust line is open. The entire internal peripheral surface of the boiler is coated with a non-stick material such as polytetrafluorethylene. (Sinha-OEIS)
W75-12185

**LITIGATION UNDER THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1974,**
Environmental Law Inst., Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-12212

**OVERLAND FLOW: ANSWER TO WATER CLEANUP CHALLENGE.**
Louisiana State Univ., Baton Rouge. Office of Sea Grant Development.
Aquanotes, Vol 4, Issue 1, p 3-4, March 1975. 2 p, 1 photo.

Descriptors: *Sewage, *Overland flow, *Sewage bacteria, *Sewage disposal, *Sewage treatment, Wastes, Domestic wastes, Sanitary engineering, Sewage effluents, Water pollution, Water pollution sources, Environmental sanitation, Waste water disposal, Waste water(Pollution), Microorganisms, Microbial degradation, Biodegradation, Tertiary treatment, Water pollution treatment, Discharge(Water), Research and development, Marshes, Spoil banks.
Identifiers: *Hazardous substances(Pollution), Environmental policy.

Researchers are studying the feasibility of putting the nutrient materials in sewage back to work, while making water supplies cleaner and safer for human use. This article discusses a technique called overland flow, which is currently being investigated. This technique could save state industries millions of dollars, while simultaneously making beneficial use of dredge spoil banks. Because of the enormous costs of tertiary treatment of waste water, scientists are investigating the use of a marsh to effect a natural clarification. The overland flow technique involves application of effluents on the soil surface. Purification and removal of nutrients is accomplished through natural activity of microbes and the plant community, under suitable land conditions. The article continues with a more detailed explanation of the process and concludes that the findings as a result of this project may offer a more economical alternative to sewage waste treatment. (Fernandez-Florida)
W75-12228

**MARITIME ADMINISTRATION PROPOSED SHORE FACILITY FOR TREATMENT AND DISPOSAL OF SHIP GENERATED OILY WATER WASTES.**
Maritime Administration, Washington, D. C.
Available from the National Technical Information Service, Springfield, Va 22161 as EIS-AA-73-1850-F, $5.25 in paper copy, $2.25 in microfiche. November 1973. 120 p, 2 map, 3 tab, 19 ref, 2 append.

Descriptors: *Oil wastes, *Oily water, *Water quality, Water, Wastes, Ships, Water quality control, Virginia, Fuels, Barges, Marine biology, Environmental effects, Oil spills.
Identifiers: *Environmental impact statement, *York County(Va).

The Maritime Administration proposes to lease to the Virginia Port Authority the surplus fuel farm portion of the U. S. Navy Complex, known as Cheatham Annex, located in York County, Virginia, for processing oily water wastes from ship's tanks, bilges and ballast operations. The oily water wastes will be transported by barge from the ships in the Hampton Roads area to the processing facility. Historically, it has been the practice to discharge oily bilge and ballast waters into the open oceans, territorial seas, and coastal and harbor waters. The proposed project will be beneficial in providing a facility where oily water wastes can be collected and treated prior to discharge into the York River. The expected adverse environmental impacts of the project include an increase in barge traffic on the York River between the facility and the Hampton Roads area and the creation of oily odors in the vicinity as a result of the treatment process. Additionally, solid wastes from the treatment process will have to be disposed of and measures will have to be taken to alleviate oil spills due to barge collisions, the loading or unloading process or through error at the treatment facility. The following alternatives were considered: use of another land-based facility; use of a floating facility; equiping of vessels with devices for separating oil from water; and no project. (Gagliardi-Florida)
W75-12256

**MAMALA BAY WASTEWATER TREATMENT AND DISPOSAL SYSTEM, OAHU, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Environmental Protection Agency, San Francisco, Calif. Region IX.
National Technical Information Service, Springfield Va 22161, USDC, as EIS-HI-74-0011-F, $9.25 in paper copy, $2.25 in microfiche. January 2, 1974. 319 p, 24 fig, 23 tab.

Descriptors: *Waste water treatment, *Waste water disposal, *Water quality control, Estuaries, Hawaii, Waste treatment, Water, Disposal, Treatment, Treatment facilities, Water quality, Water quality standards, Estuarine environment, Wastes, Environmental effects, Dusts, Turbidity, Pollutants.
Identifiers: *Environmental impact statement, *Mamala Bay, Oahu(HI).

The proposed action involves construction of a regional wastewater treatment and disposal system to serve the Mamala Bay area of Oahu, Hawaii. The area will be served by two unconnected collection treatment and disposal systems which are designed to improve coastal and estuarine water quality. The discharge of 55 mgd of raw wastes off Sand Island and 14 mgd of inadequately treated wastes into Pearl Harbor will be eliminated. Project construction will result in a number of short-term minor adverse impacts. These include noise, dust, inconvenience to residents, removal of limited acreage from agricultural production, and turbidity and disturbance of benthic organisms in underwater sections. The project will support continued urbanization of the area and will aid in increasing sources of air, water and noise pollution and congestion. Alternatives considered included construction of only one plant and one outfall, and no construction. (Gagliardi-Florida)
W75-12257

**THE $5 BILLION FLUSH.**
Congressional Record, Vol 118, p E 7145 (daily ed. July 27, 1972). 1 p.

Descriptors: *Sewage treatment, *Water treatment, *Potable water, Legislation, Water pollution control, Water quality, Water quality control.
Identifiers: Emergency community facilities, Public Investment Act, Revenue sharing.

Representative John E. Hunt of New Jersey commended his fellow Representative who voted down the Emergency Community Facilities and Public Investment Act of 1972. This bill would have authorized the Secretary of Housing and Urban Development to commit up to $5 billion for water and sewer projects in communites with substantial unemployment. Such a bill, its backers felt, would put people back to work, give cities essential public works, and lift financial burdens from the budgets of little towns. According to Mr. Hunt, however, it was a redundant, inflationary measure. He pointed to the fact that there was al ready an $18 billion, 3-year water pollution contro bill in conference. The Representative also in troduced into the Record a Washington Post edi torial which conveyed the same message. The Pos editorial found the bill lacking in fiscal respons bility, especially in light of the fact that th backlog of pending water and sewer grants is onl $2 billion. (Hoffman-Florida)
W75-12277

**METHOD OF REMOVING HEAVY METAL FROM WATER AND APPARATUS THEREFOR**
Rockwell International Corp., El Segundo, Cali (assignee).
M. L. Iverson, and L. R. McCoy.
US Patent No 3,899,405, 5 p, 3 fig, 1 tab, 1 ref; O ficial Gazette of the United States Patent Offic Vol 937, No 2, p 627, August 12, 1975.

Descriptors: *Patents, *Waste water treatmen *Industrial wastes, Water pollution control, Wat quality control, *Heavy metals, Separatio techniques, Mercury, Nickel, Zinc, Lead, Cadm um, Copper Electrochemistry, Cathodes, Anode Equipment.
Identifiers: Tin, Tin-coated particles.

The invention provides a method of and apparat for removing heavy metals from an aqueous sol tion. The apparatus comprises an electrochemic cell including a liquid container, liquid inlet a outlet, an oxidation resistant anode, a catho comprising a body of particles having tin surfac and electrical means for the passage of a dire electric current between the anode and cathod The method comprises passing the aqueous sol tion containing heavy metals through a bed of t or tin-coated particles and passing a direct curre from an anode through the solution and the par cles whereby the heavy metal is deposited up the particles. After a desired amount of the hea metal has been deposited upon the particles, t particles then may be transferred from the cell a regenerated using either an electrochemical chemical technique. (Sinha-OEIS)
W75-12304

**SEWAGE TREATMENT SYSTEMS,**
Lee, Meyer and Associates, Inc., Westlake V lage, Calif. (assignee).
T. F. McGrath.
US Patent No 3,899,423, 7 p, 4 fig, 9 ref; Offic Gazette of the United States Patent Office, V 937, No 2, p 632-633, August 12, 1975.

Descriptors: *Patents, *Sewage treatment, *Wa water treatment, *Water pollution control, M ing, Biodegradation, Filtration, Oxygenati Coagulation, Disinfection, Equipment.
Identifiers: Small volume sewage system, Porta system.

A process and a system is described for carry out the process which accomplishes biologi digestion of sewage in a small volume followed chemical treatment to assure that all effluent safe for discharge. The system can be adapted use in watercraft, mobile equipment and wh sewage treatment facilities are not available. T system includes the means for receiving, mace ing and delivering the sewage to a mixing tank at least one settling tank connected to the mix tank for the separation of solid sewage from liq sewage. A filter tank receives clarified sew from the settling tank. A coagulant is injected the mixing tank and the settling tank. Oxygen is jected into the mixing and settling tanks and b tericide is injected in the filter tank. The vane the mixing tank are placed so as to cause turbul flow to direct heavy solid particles to the bot of the tank for bacterial digestion and to direc cloud of floculated sewage to the bottom of tank. Pockets of oxygen beneath the vanes prov constant contact between oxygen and the sew under treatment. (Sinha-OEIS)
W75-12308

**CESS FOR DEMINERALIZING WATER,**
siglio Nazionale delle Ricerche, Rome (Italy).
ignee).
primary bibliographic entry see Field 3A.
-12311

**THOD FOR PROCESSING SLUDGE,**
zaki Paper Mfg. Co. Ltd., Hyogo (Japan); and
ata-Zimpro Ltd., Tokyo (Japan). (Assignees).
)huchi, T. Kitahori, T. Maitoko, and K.
guchi.
. Patent No 3,901,804, 5 p, 2 fig, 6 ref; Official
ette of the United States Patent Office, Vol
No 4, p 1423, August 26, 1975.

criptors: *Patents, *Waste water treatment,
dge treatment, *Water pollution control,
ustrial wastes, *Coagulation, Separation
niques, Aluminum, Hydrogen ion concentra-

ethod of processing sludge resulting from
ulation-separation treatment of industrial
ewater is described. A coagulant which com-
es an aluminum compound or compounds is
in which the sludge resulting from the waste-
r treatment is subjected to wet air oxidation
ment under a special conditions. The alu-
m compounds in the treated sludge are
vered to reuse. It is important to control the
n proper range to prevent the insoluble alu-
m compounds from forming in the oxidized
ge after wet air oxidation treatment. For that
ose the pH of sludge is adjusted beforehand
eep the pH of oxidized sludge at the range
w 1.5 or above 9.0. (Sinha-OEIS)
-12312

**H ENERGY ELECTRON TREATMENT OF TER,**
Voltage Engineering Corp., Burlington,
s. (Assignee).
Trump.
. Patent No. 3,901,807, 5 p, 11 fig, 3 ref, Offi-
Gazette of the United States Patent Office,
937, No 4, p 1424, August 26, 1975.

criptors: *Patents, *Waste water treatment,
vage treatment, *Water pollution treatment,
ter pollution control, *Water quality control,
lation, Microbial degradation, *Irradiation,
mical degradation, Equipment.

microbiological and chemical activity of water
aining microorganisms and other impurities is
ced by irradiating such water with high energy
trons. A device mixes the water with a gas to
ly the water with oxygen and the water passes
ugh a constricted region where the electron
n irradiates the water. The conduit for the
r is an enclosure which includes a narrow
llic duct of extended cross section, having at
one extended end formed of a thin walled re-
permeable to high energy electrons. By hav-
he duct in the region of the high energy elec-
beam, economics in pumping power are
eved while providing the desired high velocity
luid flow. Before the water is irradiated, it
es through a region where a gas is injected into
water to reduce the density of the water. The
as mixture increases the effective size of the
area which further economizes the operation
ermitting the use of lower energy electrons.
n the gas contains oxygen, the contaminated
r receives oxygen and desirable oxidation oc-
at the time of irradiaton or shortly after.
ha-OEIS)
-12313

**E IMPACT OF CHEMICAL POLLUTION ON TER UTILIZATIONNUTZUNG),. EMISCHE GEWAESSERVERUN-NIGUNG UND WASSER**
sruhe Univ. (West Germany). Carl Engler-und
s-Bunte-Institut fuer Mineraloel-und
leforschung.
For primary bibliographic entry see Field 5B.
W75-12314

**STUDIES OF PREVENTION OF WATER POLLUTION, III. ON THE BIODEGRADATION OF SYNTHETIC DETERGENTS, (IN JAPANESE),**
For primary bibliographic entry see Field 5B.
W75-12316

**WATER CONSERVATION IN SWEDEN: II. POLLUTION CONTROL,**
National Swedish Environment Protection Board, Stockholm.
For primary bibliographic entry see Field 5G.
W75-12317

**NEW ORLEANS CHOOSES OXYGEN ACTIVATED SLUDGE.**
Civil Engineering, ASCE, Vol 45, No 6, p 84, June, 1975.

Descriptors: *Waste water treatment, *Activated sludge, *Sewage treatment, *Construction costs, Treatment facilities, Pilot plants, Biochemical oxygen demand, Oxygen costs, *Louisiana.
Identifiers: Secondary treatment, New Orleans (La), Oxygen activated sludge.

A secondary treatment plant is being built to handle New Orleans waste water. Because this is a new facility, a choice existed between air activated sludge and oxygen activated sludge. With air activated sludge, reductions in BOD and SS were predicted at 85%. In a pilot test of an oxygen system, BOD removals were 90-95% and SS removals were 87-93%. Thus, the oxygen activated sludge process was implemented, and will be complete in 1976. Advantages of the oxygen method are that it requires less aeration tank space; it can handle more variation in flow rate, sewage strength, and storm flows; it utilizes covered aeration tanks, eliminating hazards of splashing, aerosols, and odors; and costs will be lower. Disadvantages of the system are that preventive measures must be taken against leaks; careful selection of metals must be made, as oxygen is corrosive to many metals; and about every two years, on-site generators will have to be repaired and/or overhauled, necessitating temporary and expensive trucked-in oxygen. The new facility will require on-site oxygen generation using two 70 ton cyrogenic generating units. Plant costs will be about $29 million, or about $240,000 per mgd treated effluent. (Kramer-FIRL)
W75-12318

**MINNEAPOLIS KEEPS ON TRUCKIN',**
Minneapolis Water Works, Minn.
C. O. Taflin, N. F. Weber, A. J. Kramer, and J. Whitaker.
Water and Wastes Engineering, Vol 12, No 5, p 24-29, May, 1975. 3 fig, 3 tab.

Descriptors: *Treatment facilities, *Waste water treatment, *Dewatering, Sludge treatment, Construction, Lime, Economic feasibility, Magnesium, Polymers, Testing, Minnesota, Calcium, *Recycling.
Identifiers: Minneapolis (Minn), Sludge storage, Tanks, Lime recycling.

Minneapolis has instituted a three part program for pollution control of its water works, which includes recycling filter washwater, construction of a sludge dewatering plant, and an investigation to determine the feasibility of lime recycling. The sludge dewatering plant is a building in two parts, a single story low portion which is made of face brick with concrete block backing, and a higher portion which is insulated sandwich paneling over a structural steel frame. The earth color scheme and attractive landscaping give it an acceptable appearance. The building which houses the water softening opeation contains the office of the management of the complex. Two steel tanks were provided for in-process sludge storage. The larger is outdoors, and the smaller (used for polymer storage) is indoors. A 1500 KVA substation was constructed to power the plant. The plant is expandable to house a future calcining operation. The major mechanical failure during the first 1 1/2 years of operation was leakage from the sludge tank sludge gates, which were replaced. Also, freezing of the sludge cake in the surge tank occurred during plant start up. By increasing lime dose in the softening plant this problem was solved. The feasibility of lime recycling with the standard lime-alum softening treatment was investigated. It is economically feasible only if the purchase of lime and CO2, and dewatering trucking are eliminated. Experimentation was begun on a lime-magnesium biocarbonate softening process. No conclusive data is available; further testing with magnesium will include the use of polymers. (Murphy-FIRL)
W75-12319

**ANALYSIS OF REVERSE OSMOSIS FACILITIES, GREENFIELD, IOWA,**
For primary bibliographic entry see Field 5F.
W75-12320

**NUTRIENT REMOVAL IN BIOLOGICAL SYSTEMS,**
Pretoria (South Africa).
J. L. Barnard.
Water Pollution Control, Vol 74, No 2, p 143-154, 1975. 11 fig, 1 tab, 24 ref.

Descriptors: *Nutrient removal, *Waste water treatment, *Biological treatment, Nitrogen, Phosphorus, Nitrification, Denitrification, Activated sludge, Precipitation (Chemical), Sludge treatment, Aeration.
Identifiers: *Bardenfo process, Phosphate removal, Solids retention time (SRT), Physico-chemical treatment.

Purely biological methods of nutrient removal are discussed. Removal of nutrients may be due to sludge synthesis or to wastage and the amount is dependent to a large degree on whether the assimilated nutrients in the waste cellular material are returned to the aeration basin. Fixed-media denitrification and suspended media dentrification systems are detailed. A modified activated sludge plant to remove nitrogen through nitrification/denitrification was developed, called the Bardenfo process. In this method, the need for methanol addition is eliminated but the basin size must be increased. Nitrates are used as a source of oxygen, and less sludge, which is more stable, is produced by a long solids retention time (SRT). If the Bardenfo method were applied to an extended aeration plant, costs would include partitions and an additional pump for recycling mixed liquor. These costs would be offset by savings in power due to no necessary increase in the basin size. Phosphorus precipitation in the final clarifiers of some activated sludge plants to which no chemicals have been added has been attributed to several factors. It seems that phosphate removal is greater with a low MLSS in the aeration basin and a low SRT. It has also been postulated that an increased pH is responsible for precipitation of phosphate. It was concluded that additional research is necessary to provide for better biological systems of nutrient removal without the use of expensive physico-chemical methods. (Kramer-FIRL)
W75-12321

**COLUMN SETTLING TESTS FOR FLOCCULANT SUSPENSIONS,**
Envirex, Inc. Milwaukee, Wis. Environmental Science Div.
A. E. Zanoni, and M. W. Blomquist.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 101, No EE3, p 309-318, June, 1975. 7 fig, 7 ref, 3 append.

Descriptors: *Waste water treatment, *Laboratory tests, Sedimentation, Columns, Plastics, Suspensions, Suspended solids, Sampling, Settling basins, Analytical techniques, *Pollutant identification.
Identifiers: Column settling tests, Flocculant suspensions.

The sedimentation process is used in almost all waste water treatment and many water purification plants. No one design approach can be used for all applications. The settling behavior of flocculant suspensions is not amenable to a mathematical description. It is necessary to employ a settling test in order to predict the performance of a settling basin. A recommended standard column settling procedure for suspensions with 2,000 mg/liter solids is as follows: construct a 2.67 in settling column out of 100 m ID clear plastic with wall thickness of 6.3 mm: drill eight 13 mm holes in a straight line at 0.3 m intervals along column length, beginning with first hole 0.38 m from top; insert and seal 13 mm OD by 6.3 mm ID clear plastic nipples 50 mm long each hole, making certain they do not extend beyond the inside face of the column; attach a 76 mm length of latex tubing on each and seal ends with pinch clamp; seal column bottom with clear plastic disk (wall thickness of 13mm); tap center of disk with a 19 mm pipe thread and insert a 19 mm galvinized nipple and brass gate valve with a 19 mm threaded outlet for a garden hose; support columns to wall tightly; place 25 liters of waste water in a 0.08 cu m plastic garbage can; stir; bring to room temperature quickly; pump test liquid into column using the open gate valve (leaving the stirrer on); close valve and let suspension stand 5 minutes; start timer and sample from each port from top down, then sample again after 25, 50, 75, and 100 minutes; proceed with suspended solids analyses; calculate percentage suspended solids removal values; plot removal values at appropriate depth and settling times; interpolate between plotted values to construct 130 percentage removal lines. (Murphy-FIRL)
W75-12322

**THE EFFECTS OF AEROBIC AND ANAEROBIC INCUBATION ON THE EXTRACTABILITIES OF HEAVY METALS IN DIGESTED SEWAGE SLUDGE,**
Rothamsted Experimental Station, Harpenden (England).
C. Bloomfield, and G. Pruden.
Environmental Pollution, No 8, p 217-232, 1975. 10 fig, 1 tab, 16 ref.

Descriptors: *Heavy metals, *Extraction, *Aerobic treatment, *Anaerobic treatment, Zinc, Nickel, Copper, Lead, Cadmium, Chromium, Sludge, Solubility, Sewage, Hydrogen ion concentration, Lime, *Waste water treatment.

The solubilities of Zn, Ni, Cu, Pb, Cd, and Cr in sludge were investigated as affected by aerobic and anaerobic incubation. Digested sludge from the Upper Tame Drainage Authority, Great Britain was used as taken from the drying bed. Variation in pH of the digested sludge during various treatments was shown graphically. Wide variation in the extractability of the metals as well as in the reagents commonly used to assess availabilities of trace metals to plants, such as acetic acid and EDTA, were found. This extractability may increase or decrease, depending both on whether the conditions are anaerobic or aerobic and upon the element and the extractant. No consistent trends were found in the addition of soil and/or lime to sludge as it related to solubilities of these metals during aerobic incubation. (Prague-FIRL)
W75-12330

**DIGESTER GAS: VALUABLE PLANT FUEL,**
South Burlington Waste Treatment Plant, N. C.
For primary bibliographic entry see Field 8C.
W75-12332

**BIOLOGICALLY MEDIATED INCONSISTENCIES IN AERATION EQUIPMENT PERFORMACE,**
Eimco Corp., Salt Lake City, Utah.
O. E. Albertson, and D. DiGregorio.
Journal Water Pollution Control Federation, Vol 47, No 5, p 977-988, May, 1975. 9 fig, 5 tab, 4 ref.

Descriptors: *Waste water treatment, *Aeration, *Activated sludge, Dissolved oxygen, Bubbles, Costs, Equipment, Treatment facilities.
Identifiers: *Oxygen transfer.

The basic methods used to evaluate the performance of aeration equipment are based on classical aeration theory which states that oxygen transfer is a function of dissolved oxygen (DO) driving forces and the overall transfer coefficient of the physical- liquid system only. However, performance data suggests that this basis is incorrect. Aerator efficiency, corrected to standard conditions, has been shown to be directly related to activated sludge respiration rate. Steady-state oxygen transfer evaluations were performed at several full-scale activated sludge plants. These demonstrated a relationship between mixed liquor uptake rate and the measured standard oxygen transfer capacity. The direct transfer of oxygen from gas bubbles present within the mixed liquor to the microorganisms is concluded to be responsible for this phenomenon. The evidence shows that oxygen is available not only through the two-film oxygen diffusion pathway of classical theory, but also by direct transfer of oxygen from air bubbles to the active mass. Activated sludge system design should be modified to take advantage of direct bubble contact. This would achieve savings in capital and operating costs. (Orr-FIRL)
W75-12333

**ENERGY CONSERVATION: AN ESSENTIAL AND URGENT PROBLEM FOR THE WATER INDUSTRY,**
Wessex Water Authority (England). Avon and Dorset Recovery Div.
J. A. Young.
Water, No 3, p 12-14, April, 1975. 3 fig, 5 ref.

Descriptors: *Water treatment, *Sewage treatment, Filters, Oxygenation, Activated sludge, Sewage disposal, Methane, Sludge digestion, *Waste water treatment.
Identifiers: *Energy conservation, Water industry.

Water authorities as well as other industries are now confronted with the urgent and essential need to conserve energy. The water industry has its peak electricity demand during the summer as opposed to the general peak demand during the winter months. The advanced technology in treatment of water and sewage has proven to be more energy consuming than older methods. The slow sand filter method of water treatment which from a bacteriological viewpoint produces a better filtrate than the newer more energy consuming rapid gravity filter is regaining favor. The traditional rotary biological filters used in sewage disposal operated on gravity but have been replaced by oxygenation ditches, and activated sludge which require energy. Sewage disposal at sea could provide an energy conserving, efficient method of disposal in coastal areas. At the Essex Water Authority's Avonmouth Recovery Works the methane gas produced by sludge digestion in producing 55% of the electricity used to power the works. (Dean-FIRL)
W75-12334

**RESORT COMMUNITY PUTS ALL UTILITIES UNDERGROUND.**
For primary bibliographic entry see Field 8G.
W75-12338

**COMPOSTING AND USE OF COMPOST IN SWEDEN,**
National Swedish Environment Protection Board, Stockholm.
For primary bibliographic entry see Field 5E.
W75-12339

**RECENT DEVELOPMENTS OF INSTRUMENTATION, CONTROL AND AUTOMATION SYSTEMS FOR WASTEWATER TREATMENT SYSTEMS,**
Tokyo (Japan). Sewerage Bureau.
S. Kato, K. Kinbara, and T. Oto.
Hitachi Review, Vol 24, No 1, p 35-48, January, 1975. 22 fig, 5 tab, 31 ref.

Descriptors: *Waste water treatment, *Computers, *Activated sludge, *Control systems, Flow control, Analytical techniques, *Instrumentation, Flow measurement, Sludge treatment, Pumps, Equipment, Pollutant identification.
Identifiers: *Japan, Energy consumption.

A review of the development of modern waste water treatment and control systems in Japan is presented. This includes field type digital controllers as well as computer control systems with man/machine/process interfaces. Control systems for machinery and drive, with energy saving as a goal have been improved. Instrumentation being manufactured by Hitachi includes the large-bore electromagnetic flow meter, a sludge settling rate meter, a respiration rate meter, and a total organic carbon/total nitrogen analyzer. Minor control systems for unit operations of the activated sludge process are described. Such systems are a dissolved oxygen concentration/air flow control, a MLSS/return sludge volume control, and a sludge age/drawing volume of excess sludge control. Computer control systems have been designed for effluent quality control and for centralized supervision. Control of machinery and power consumption is effected by aeration blowers, and by pumps for waste water, rainwater, and sludge. (Kramer-FIRL)
W75-12341

**ON THE COMPARISON OF REVERSE OSMOSIS MEMBRANE PERFORMANCE,**
Zagreb Univ. (Yugoslavia). Inst. of Physical Chemistry.
For primary bibliographic entry see Field 3A.
W75-12347

**ORGANIC RESIDUE IN A RECYCLED EFFLUENT, PART I,**
Utah State Univ., Logan.
V. D. Adams, E. J. Middlebrooks, and P. D. Nance.
Water and Sewage Works, Vol 122, No 6, 82-84, June, 1975. 7 fig, 2 tab.

Descriptors: *Water reuse, *Waste water treatment, *Organic compounds, Chlorine, Analytical techniques, Chemical analysis, Carbon, Effluents, *Recycling.
Identifiers: Physical treatment, Organic residues.

Use of recycled effluent from a waste water treatment facility, for flushing purposes has been proposed. Such a system consists of utilizing physical treatment in conjunction with a catalyzed hypochlorite generating waste water treatment process. One difficulty of this is the accumulation of organic compound residue in the recycled effluent. An investigation using sophisticated chemical detection techniques was carried out to identify the compounds that accumulated in recycled effluents at a package treatment plant such as for a recreation area. Total and inorganic carbon concentrations were measured; over 60 percent of the carbon was in the organic form. Ether and chloroform extractions were completed with the various peaks in the infrared and nuclear magnetic

nce spectra identified. Extractions were nade of houseboat effluent, obtaining a NMR spectrum. It was concluded that the conditions used for sewage effluent ent, the majority of the excreted nitrogen unds should be oxidized to lesser com- ts. Most organic species should be treated lorination. Some free radical chlorination proceed on alkane species present in the ef- with alkene type compounds to be readily ted by chlorine to saturated compounds ning two atoms of chlorine attached to ad- compounds. (Kramer-FIRL)
2348

**Y RESIN APPLICATION AT SEWAGE KS.**
and Waste Treatment, Vol 18, No 5, p 23, 1975.

ptors: *Waste water treatment, *Sewage ent, *Algal control, *Eposy resins, Treat- facilities, Construction materials, Main- e.
iers: Polyvinyl chloride, Polyester resin.

xpansion of the Chicken Hall Water Treat- Works, Eastleigh, Hants, U. K., to ten 80 ft ter concrete tanks to handle 600,000 gal of rial effluent, and domestic sewage from a ation of 62,000 was accompanied by a m of algal growth. Algae had to be cleaned tank channels and weirs daily by manual ng. The application of an epoxy primer and t based upon resins and curing agents has ed the necessary cleaning to once a week by g a smooth resin surface which prevents from attaching firmly. The resin incorporates otropic agent to aid even application on verti- rfaces, a modified amine to facilitate curing temperature and in damp environments, and forced with silica flour. The epoxy resin was led onto the tank channel and weirs to a of 2 mm. The coating is self levelling which les a smooth finish to reduce turbulence and e abrasion. The fully cured topcoat is also resistent to leaching. A new polyester resin en formulated for bonding PVC and is being as the standard bonding agent for the stix range of rigid PVC penstocks and . The polyester resin provides a means for g to PVC without the necessity of abrading hing the PVC with solvents which could permanent softening of the PC. (Orr-
2349

**EEDINGS OF THE ANNUAL CON- NCE OF THE BRITISH COLUMBIA ER AND WASTE ASSOCIATION.**
imary bibliographic entry see Field 5F.
2350

**FECTION TO PROTECT RECREA- AL AREAS AND POTABLE WATER SUP- S,**
n Columbia Dept. of Health, Vancouver. Oc- onal Health Div.
nder.
oceedings of the Annual Conference of the n Columbia Water and Waste Association, 9-11, 1974, British Columbia, p 147-151.

iptors: *Public health, *Waste water treat- *Chlorination, *Disinfection, *Potable Ozone, Coliforms, Enteric bacteria, genic bacteria, Water treatment.
fiers: *Recreational waters.

reasons for the necessity of disinfecting tional and potable water supplies are out- The chief reason is the fact that enteric genic bacteria are carried by water and will minate the aquatic environment. Some of the ntly held standards for recreational water quality are based on the fecal coliform count since this nonpathogenic bacteria is associated with the more difficult to isolate Salmonella. However, the recent information concerning the carrying of resistance factors (R factors) by coliforms may result in a change in the current water standards. Disinfection of waste water may be accomplished by using chlorine, bromine, iodine, ozone or ultraviolet light. Chlorine disinfection is the most widely used method. The medical consensus in Canada is that chlorination of waste water discharged to recreational water is essential. Chlorination is also the current most feasible method of disinfecting potable water. A few of the factors which influence the efficacy of chlorine disinfection include: the level of SS; ammonium content; pH; nitrites; iron; and, reaction time. (See also W75-12350) (Orr-FIRL)
W75-12351

**MUNICIPAL SEWAGE TREATMENT TO PROTECT SHELLFISH GROWING WATERS,**
Environmental Protection Service, Vancouver (British Columbia). Pacific Region.
T. J. Tevendale.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 153-170. 3 tab, 8 ref, 2 append.

Descriptors: *Public health, *Waste water treatment, *Commercial shellfish, Sewage treatment, Mollusks, Lagoons, Coliforms, Water quality control, Water pollution control, Canada.
Identifiers: *British Columbia.

Environment Canada is responsible for the sanitary control of the Shellfish Fisheries in British Columbia. Their duties include assessing and classifying the growing water quality of shellfish waters. The bacteriological critieria for an approved shellfish growing water is that the coliform median MPN does not exceed 70/100 ml and not more than 10% of the samples ordinarily exceed a MPN of 230/100 ml for a 5 tube, 3 decimal dilution test in those portions of the area most probably exposed to fecal contamination during the most unfavorable hydrographic and pollution conditions. The percent reduction of coliform bacteria expected from various types of treatment processes is discussed. The highest reduction is expected from stabilization ponds. The operational reliability of treatment plants and sewage collection systems is the most important factor in the protection of shellfish growing waters. Suggested methods for the protection of growing waters include: more effective methods of disinfection; zero discharge to shellfish waters of domestic wastes; utilization of seasonal holding lagoon systems during the harvesting season; and, institution of the concept of positioning sewage treatment plants and outfalls in accordance with plans developed by agencies responsible for administration of public health, installation of treatment systems, land use, and protection of renewable resources. (See also W75-12350) (Orr-FIRL)
W75-12352

**TOXICITY OF AQUATIC ORGANISMS CAUSED BY CHLORINATION,**
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia). Environmental Conservation Div.
J. A. Servizi.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 171-182. 1 tab, 24 ref.

Descriptors: *Public health, *Waste water treatment, *Chlorination, *Fish, *Toxicity, *Aquatic animals, Sewage treatment, Pathogenic bacteria, Water pollution effects.

Field and laboratory studies have been performed which have demonstrated the toxicity of chlorinated municipal sewage to fish and other aquatic organisms. It has been proposed that the total residual chlorine should not exceed 0.002 mg/liter in areas receiving chlorinated wastes continuously. In areas where disinfection is required to protect public health, alternative methods of disinfection should be used, such as chlorination-dechlorination and ozonation. Chlorination-dechlorination has been shown to be beneficial in protecting both public health and aquatic life. Dechlorination can be impounding freshly chlorinated sewage in lagoons. Although lagooning results in secondary regrowth of coliforms, it is hygienically acceptable since there is presumably no regrowth of pathogenic bacteria. In the absence of chlorination, primary sewage effluents were found to be toxic to fish, while effluents from secondary treatment were essentially nontoxic. Acute toxicity or sublethal toxic conditions for fish are present when chlorine residuals exceed 0.02 mg/liter. Chlorinated municipal sewage may have a combined available chlorine residual from 0.1 mg/liter to 3-4 mg/liter. Therefore, the major step in obtaining a nonlethal treated municipal sewage is limitation of chlorine residual to less than 0.02 mg/liter. Current technology and principles make it possible to discharge a suitable treated waste water which is nontoxic to aquatic organisms and which will not cause public health problems. (See also W75-12350) (Orr-FIRL)
W75-12353

**WATER QUALITY MANAGEMENT IN A METROPOLITAN AREA,**
British Columbia Univ., Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 5G.
W75-12354

**COMPUTER CONTROLLED WASTEWATER RECLAMATION PLANT,**
Central Contra Costa Sanitary District, Walnut Creek, Calif.
G. A. Horstkotte, Jr., and D. L. Eisenhauer.
Public Works, Vol 105, No 6, p 63-66, June, 1974. 2 fig, 1 tab.

Descriptors: *Water reuse, *Waste water treatment, *Reclaimed water, *Digital computers, Industries, Flocculation, Quality control, Water treatment, Nitrification, Lime, Water supply, Automatic control, Electronic equipment, *California.

The world's first fully computer controlled wastewater reclamation facility is being constructed in the San Francisco Bay area. Central Contra Costa Sanitary District with a 735 square mile service area has limited future reserves of fresh water in an area with potential for heavy industry expansion. A $48 million 30 mgd wastewater reclamation plant with ultimate design capacity of 120 mgd will recycle domestic sewage as a source for industrial process and cooling water. The plant design was adopted after a detailed 2-year study utilizing a full-scale pilot plant. Most of the district's wastewater influent is normal domestic sewage since industries are required to pretreat their wastes. The reclamation is an expansion of the existing primary treatment plant. Lime clarification added to the primary treatment, biological nitrification-denitrification, and a 2-stage sludge conditioning process that includes lime recovery make this an advanced treatment system capable of meeting the rigid requirements of industrial water users. Exacting standards are maintained by a direct digital control dual computer system. One computer monitors plant data and uses this information to control all treatment processes. The second computer handles off-line functions such as maintenance scheduling and cost analysis, and serves as a stand-by control computer. The operator can override computer control if necessary. Two color graphic cathode ray tube (CRT) display units with keyboards and lightpens allow fast information retrieval and color coded display of process com-

ponents. The system is designed for maximum flexibility. (HerrgNorth Carolina)
W75-12361

**RECYCLING ALLOWS ZERO WASTEWATER DISCHARGE,**
Black, Crow, and Eidsness, Inc., Clearwater, Fla.
L. A. Dove.
Civil Engineering-ASCE, Vol 45, No 2, p 48-51, Feb, 1975. 4 fig, 2 tab.

Descriptors: *Recycling, *Water reuse, *Impaired water use, *Injection wells, *Waste water treatment, Irrigation water, Salvage value, Water conservation, Drawdown, Experimental farms, Viruses, Waste disposal wells, Land spreading, *Florida.
Identifiers: *St. Petersburg(Fla).

A carefully monitored wastewater recycling system in St. Petersburg, Florida, is committed to total recycling of wastewater with zero discharge to surrounding bays. This will reduce the damaging drawdown on the Floridan Aquifer, comply with the 1972 Wilson-Grizzle Act requiring advanced wastewater treatment or its equivalent for all facilities in the Tampa Bay Region, and make use of the nutrients in treated wastewater and sludge. The primary reuse will be in lawn sprinkling, which now uses 15% to 40% of the public water supply. All virus will be removed by holding the effluent to 0.5 JTU (Jackson Turbidity Units) followed by breakpoint chlorination of 0.5 ppm for at least 60 minutes, a process approved by the administrator of the State Epidermiology Research Center in Tampa. A deepwell injection system is also being prepared as a backup for the recycling system for periods when treated wastewater supply exceeds demand or when quality standards are not met. The injection zone has high transmissivity and already contains water similar in quality to seawater. Disposal of digested sludge from the 4 treatment plants will be by controlled truck spraying on the city-owned 150-acre sod farm and nursery. Leachate will be collected by drain tiles, treated, and used for spray irrigation. (Herr-North Carolina)
W75-12364

## 5E. Ultimate Disposal Of Wastes

**SPRAY IRRIGATION OF TREATED MUNICIPAL SEWAGE,**
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-11856

**DISPERSION AND SETTLING AROUND A WASTE DISPOSAL POINT IN A SHALLOW SEA,**
Liege Univ. (Belgium). Institut de Mathematique.
For primary bibliographic entry see Field 5B.
W75-12043

**SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL, (LITERATURE REVIEW),**
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-12075

**EFFECTIVE USE OF HIGH WATER TABLE AREAS FOR SANITARY LANDFILL. VOLUME I,**
VTN, Inc., Orlando, Fla.
R. A. Beluche, G. I. Bergstrom, N. W. Hall, and W. McLellon.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-236 462, $5.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency SW-57d.1, 1973. 143 p, 40 fig, 10 tab, 45 ref.

Descriptors: *Garbage dumps, *Water table, *Feasibility studies, *Landfills, *Florida, Evaluation, Groundwater movement, Observation wells, Sites, Facilities, Waste disposal, Solid wastes, Drainage engineering, Cost analysis, Cost comparisons, Path of pollutants, Surface waters, Surface drainage, Leachate, Earth handling equipment, Access routes, Land use, Operating costs, Operation and maintenance, Environmental effects, Water pollution control, Analytical techniques.
Identifiers: *High water table, Orange County(Fla.), Little Econlockhatchee River(Fla.), Demonstration project.

A demonstration project was designed and operated to determine the feasibility of a solid waste landfill operation in Orange County, Florida, an area containing a high groundwater table. The selection of the 1500-acre site was based on investigation of surface topography and subsurface geology and hydrology which determined the master drainage plan, allowing operation with certain portions dewatered below the level of refuse deposition. Heavy operating equipment was evaluated as to its effectiveness and capabilities under both wet and dry construction and filling operations. The economic assessment includes equipment operating and maintenance, landfill development, capital improvement, and other operating and maintenance costs, and is compared to an incineration facility with equivalent solid waste disposal capacity (280,047 tons). The drainage system proved to be effective in preventing flooding of the total area during intense rainfall and localized flooding was controlled with temporary pumping. Drainage improvements minimized leachates but did not prevent changes in water quality of the upper groundwaters. Procedural refinements and operation techniques were expected to stabilize total costs at approximately $1.50/ton. A landfill in a high groundwater area can only be built successfully if the generated leachate can be contained and controlled to avoid pollution of ground and/or surface waters. (Auen-Wisconsin)
W75-12111

**HYDROGEOLOGICAL ASPECTS OF SOLID WASTE DISPOSAL,**
Wisconsin Univ., Madison. Water Resources Management Program.
A. Zaporozec, and D. A. Stephenson.
Institut fur Sozial-und-Wirtschaftspolitische Ausbildung, Information Bulletin. Vol 7, No 3, p 3-9, 1972. 1 fig.

Descriptors: *Waste disposal, *Landfills, *Sites, Hydrogeology, Solid wastes, Social aspects, Political aspects, Leachates, Aquifers.

The two trends in the approach to the solution of solid waste disposal problems are technological and regional evaluation of hydrogeological conditions. A technological approach assumes that nearly all sites are or can be designed to be suitable for solid waste disposal. The critical factors are then costs analysis, site acquisition, site modification, and carefully controlled operation using high-level engineering techniques. The knowledge of hydrogeological conditions is essential in this approach for determining whether or how to modify the site. The approach is applicable to metropolitan areas where land and transportation costs are high, and where there is a paucity of open land for disposal sites. A regional approach rests on the evaluation of the physical conditions of the region and selection of suitable areas for future disposal sites. The search for suitable sites can be concentrated either on ideal sites where no pollution can occur or on sites suitable for 'controlled pollution.' A regional approach is of the 'advanced-planning' type and will gradually gain greater importance with increasing recognition of the necessity to plan waste disposal on a regional basis. Both technological and regional trends have their advantages and disadvantages, and both are equally important in solid waste disposal. (Auen-Wisconsin)
W75-12121

**GROUND-WATER AND ENGINEERING GEOLOGY IN SITING OF SANITARY LANDFILLS,**
Illinois State Geological Survey, Urbana.
K. Cartwright, and F. B. Sherman.
Transactions, Society of Mining Engineers, AIME, Vol 250, No 1, p 1-6, 1971. 4 fig, 28 ref.

Descriptors: *Landfills, *Sites, *Illinois, *Groundwater, Garbage dumps, Sanitary engineering, Geologic formations, Impervious soils, Water pollution control, Hydrogeology, Geologic mapping.

The salient features of the sanitary landfill concept are summarized and policies are suggested for landfill siting. Illinois regional evaluations of landfill disposal conditions are mapped to show favorable, locally favorable, and unfavorable areas. However, operational practice may preclude the selection of many sites that have less than 10 to 20 ft of unconsolidated material above the bedrock. The map does not show the potential for pollution at individual sites, nor does it take into account the exact physical character of the unconsolidated material or the bedrock formations. Potential landfill sites must be individually investigated before put into operation. The criteria used as a basis for preliminary investigations of hydrogeologic conditions and the potential for groundwater pollution at sanitary landfill sites in Illinois are type of unconsolidated material; thickness of unconsolidated material; type of bedrock; local and potential water sources; and site topography. The engineering approaches that most directly relate to the prevention of water pollution are diversion of surface drainage, interception or diversion of groundwater, collection of leachate for treatment and installation of clay liners. Many strip-mine areas would probably make excellent landfill sites since they are generally in nonurban areas and the coal-producing rocks are not interbedded with important aquifers. (Auen-Wisconsin)
W75-12122

**LAND DISPOSAL OF SEWAGE SLUDGE,**
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 5D.
W75-12135

**EXTRACTABLE METALS IN MIXTURES OF SOIL AND SEWAGE SLUDGE,**
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 5D.
W75-12141

**BERRY HILL SLUDGE TREATMENT WORKS,**
Wessex Water Authority (England). Avon and Dorset Recovery Div.
For primary bibliographic entry see Field 5D.
W75-12150

**ASSESSMENT OF OFFSHORE DUMPING IN THE NEW YORK BIGHT, TECHNICAL BACKGROUND: PHYSICAL OCEANOGRAPHY, GEOLOGICAL OCEANOGRAPHY AND CHEMICAL OCEANOGRAPHY.**
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 5B.
W75-12171

**AN DUMPING IN THE NEW YORK HT,**
onal Oceanic and Atmospheric Administra- Boulder, Colo. Marine Ecosystems Analysis ram.
primary bibliographic entry see Field 5B.
-12172

**TE DISPOSAL SYSTEM,**
dard Products Co., Cleveland, Ohio. ignee).
primary bibliographic entry see Field 5D.
-12185

**AN DUMPING OVERSIGHT.**
primary bibliographic entry see Field 5G.
-12194

**IMCO CONFERENCE ON MARINE POL-ION FROM SHIPS.**
primary bibliographic entry see Field 5G.
-12202

**LUTION CONTROL UNDER THE NSYLVANIA CLEAN STREAMS LAW,**
primary bibliographic entry see Field 5G.
-12209

**RLAND FLOW: ANSWER TO WATER ANUP CHALLENGE.**
siana State Univ., Baton Rouge. Office of Sea t Development.
primary bibliographic entry see Field 5D.
-12228

**GON SURVEYS ITS HAZARDOUS TES,**
on State Dept. of Environmental Quality, and.
primary bibliographic entry see Field 5G.
-12239

**GH SOLID-WASTE LAWS BREWING ON ITOL HILL.**
primary bibliographic entry see Field 5G.
-12243

**ED DISPOSAL AREA SITE NO 12, CLEVE-D HARBOR, CUYAHOGA COUNTY, OHIO.**
y Engineer District, Buffalo, N. Y.
ary 2, 1973. 90 p, 16 tab, 9 map.

riptors: *Ohio, *Waste disposal, *Channel ovement, *Dredging, *Turbidity, Environ-al effects, Aquatic habitats, Odor, Discharge r, Harbors, Construction, Recreation, tic environment.
ifiers: *Cleveland Harbor, Rock and slag nd.

environmental impact statement recommends the Diked Disposal Area Site No. 11 be con-ted as proposed. The proposals called for the truction of a rock or rock and slag mound to ide for the disposition of 2,880,000 cubic s of dredge spoil to be removed from the eland harbor during a two-and-a-half to three-a-half year period. The dredging was found to equired to permit the continued maintenance peration of the existing harbor. Adverse ef- considered included the loss of the area oc-ed by the disposal area as an aquatic habitat, dity during construction, and temporary mild ungent odors during use of the structure. r environmental effects considered included evelopment of 60 acres of new land when the l area is filled and the discharge of surplus rs contained in dredged material into harbor rs. The statement noted that precautions will to be taken to lessen any possible effects the project will have on recreational activities. (Hoffman-Florida)
W75-12255

**MARITIME ADMINISTRATION PROPOSED SHORE FACILITY FOR TREATMENT AND DISPOSAL OF SHIP GENERATED OILY WATER WASTES.**
Maritime Administration, Washington, D. C.
For primary bibliographic entry see Field 5D.
W75-12256

**MAMALA BAY WASTEWATER TREATMENT AND DISPOSAL SYSTEM, OAHU, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Environmental Protection Agency, San Francisco, Calif. Region IX.
For primary bibliographic entry see Field 5D.
W75-12257

**SALT RECOVERY SYSTEM,**
For primary bibliographic entry see Field 5B.
W75-12306

**METHOD FOR PROCESSING SLUDGE,**
Kanzaki Paper Mfg. Co. Ltd., Hyogo (Japan); and Niigata-Zimpro Ltd., Tokyo (Japan). (Assignees).
For primary bibliographic entry see Field 5D.
W75-12312

**ENERGY CONSERVATION: AN ESSENTIAL AND URGENT PROBLEM FOR THE WATER INDUSTRY,**
Wessex Water Authority (England). Avon and Dorset Recovery Div.
For primary bibliographic entry see Field 5D.
W75-12334

**COMPOSTING AND USE OF COMPOST IN SWEDEN,**
National Swedish Environment Protection Board, Stockholm.
G. Hovsenius.
Journal Water Pollution Control Federation, Vol 47, No 4, p 741-747, April, 1975. 3 tab.

Descriptors: *Sewage sludge, *Sludge treatment, *Sludge disposal, Treatment facilities, Waste water treatment, Testing, Chemical analysis, Cost analysis, Wastes, Groundwater, Water pollution, Heavy metals, Soils, Public health, Bioassay.
Identifiers: *Compositing, *Sweden, Health hazards.

A number of municipal waste water treatment plants for biological oxygen demand (BOD) and phosphorus removal have been constructed over the past ten years as a result of a strong environmental policy in Sweden. This in turn has resulted in a rapid increase in the quantity of waste water sludge. The presence of more than 1,000 treatment plants makes sophisticated sludge handling techniques economically prohibitive. More than 60% of the sludge is disposed of in landfills. Composting would be an alternative to incineration to solve the sludge and garbage problems in small communities. Since composting is relatively untested in northern Europe, a test plant was built at Laxa, Sweden to be operated over a three year period by the National Environmental Protection Board. The plant will perform physical, chemical, and bacteriological analyses of nondigested wastes, digested materials, and cured compost for organics, mercury and other heavy metals, pesticides, coli, salmonella, virus, and parasites. Health hazards for plant personnel will be surveyed. Composting processes and technology in relation to different sludges will be evaluated. A cost analysis of the operation will also be done. Groundwater contamination from compost will be investigated. Both greenhouse and outdoor experiments will be conducted to determine the enrichment of heavy metals in soil and plants. (Dean-FIRL)
W75-12339

**HOW WELL ARE WE HANDLING TOXIC WASTE.**
Surveyor, Vol 146, No 4326, p 19-24, May 2, 1975. 7 fig, 2 tab.

Descriptors: *Waste disposal, *Industrial wastes, *Municipal wastes, Landfills, Investigations, Toxicity, Leachate, *Recycling, Legislation, Oily wastes.
Identifiers: Toxic wastes, Refuse, England, Metal hydroxide sludge, Cyanide heat treatment wastes.

Pitsea, Essex County, England, became a site for industry to deposit waste materials due to the Deposit of Poisonous Waste Act of 1972. Following the Act the amount of waste arriving jumped from 11 million gallons per year to 35 million. A greater regionalization in toxic waste disposal is needed to reduce the increased site management and transportation risks inherent in waste disposal areas that are few in number. In 1973 a research program was begun by the Institute of Geological Sciences, Water Research Center, and Hazardous Materials Service (Harwell) to study the behavior of hazardous wastes in landfill sites. Being investigated are the following: flow pattern in the unsaturated zone of rocks; refuse/hazardous waste/refuse sandwich interactions (Wastes being metal hydroxide sludge, cyanide heat treatment waste, and oily waste); and pulverized refuse. Also, a short course run at six-month intervals is being given. The Warren Spring waste exchange is being operated in an attempt to recycle. There have also been proposed revisions of geological formation classification for the purpose of landfill site and assessment. (Murphy-FIRL)
W75-12342

## 5F. Water Treatment and Quality Alteration

**CORROSION.**
For primary bibliographic entry see Field 8G.
W75-11888

**RECYCLABLE COAGULANTS LOOK PROMISING FOR DRINKING WATER TREATMENT,.**
Environmental Science and Technology, Vol 7, No 4, p 304-305, April, 1973. 1 fig.

Descriptors: *Potable water, *Water purification, *Coagulation, Dewatering, Recycling, Magnesium carbonate, Magnesium hydroxide, Calcium carbonate, Water softening, *Water treatment.
Identifiers: Lime slurry, Lime-alum treatment.

Drinking water purification methods which utilize alum or iron coagulation leave a sludge which is difficult to dewater due to its gelatinous properties. A new water treatment process uses magnesium carbonate which is recyclable as the coagulant. In this process, lime slurry is added to raw water which either naturally occurring magnesium bicarbonate or magnesium carbonate which as been added. The addition precipitates magnesium hydroxide and calcium carbonate. The magnesium hydroxide acts in a manner similar to the hydrolysis products of iron or aluminum salts and forms a floc which settles impurities out of the water. The treatment system is a combination softening and purification process. The cost of lime-alum treatment, without provision for sludge handling, is $8-10 per million gallons. The cost for magnesium carbonate treatment, with purchased CO2, high calcium lime, and purchased MgCO3, without recycling of lime is about $19 per million gallons. If dolomitic lime could be used and could serve as a magnesium source, the costs would decrease to about $12 /million gallons. (Sandoski-FIRL)
W75-11909

WATER SYSTEM OF NEWPORT, RHODE ISLAND AND ITS RECENT IMPROVEMENTS,
Newport City Engineers Office, R.I.
P. V. Janjigian.
Journal of the New England Water Works Association, Vol 87, No 1, p 41-46, March, 1973. 1 fig.

Descriptors: *Water quality, Water storage, Reservoirs, Storage tanks, Population, Surface water, Groundwater, *Rhode Island, Water supply, Water treatment.
Identifiers: *Newport(RI), Biological contamination.

The City of Newport, Rhode Island provides water service within the City limits and to areas in the Towns of Middletown and Portsmouth. Since 1956 there has been a substantial increase in water consumption and in 1963 the City was urged to take measures to safeguard water quality from biological contamination resulting from lack of cover over treated water storage reservoirs. Improvements since 1965 include: a new 3-mg welded steel storage tank to replace the open storage reservoir, a welded storage tank with 1.5 mg capacity near the Town lines where water consumption has increased rapidly, two intake and pumping stations, expansion of an existing treatment plant from 4 to 8 mgd average, and the rehabilitation, replacement, or installation of approximately 18 miles of mains. With the completion of construction three service areas now supply this region; yet, with unanticiapated population growth the available surface water and usable groundwater supplies are rapidly being depleted. (Sandoski-FIRL)
W75-11910

SOUTHERN NEVADA WATER PROJECT.
For primary bibliographic entry see Field 3B.
W75-11913

APPARATUS FOR CLEANING LOOSE FILTERING MATERIAL IN SLOW WATER FILLED WATER SUPPLY FILTERS,
B. F. Volokh.
United States Patent 3,732,983. Issued May 15, 1973. Official Gazette of the United States Patent Office, Vol 910, No 3, p 831-2, May 15, 1973.

Descriptors: *Filters, Cleaning, *Patents, *Water treatment, Potable water, Equipment, Filtration.
Identifiers: *Filtering material.

An apparatus for cleaning loose filtering material in slow water-filled water supply filters, comprises a washing chamber equipped with means for its movement relative to the surface of the loose filtering material being cleaned. Mounted inside the washing chamber are washing tubes to feed clean water into the layer of filtering material to be washed. The washing chamber connects with a suction pipe which passes the dirty water. The chamber is provided with means for regulating its pressure upon the filtering material controlling its degree of byouancy. (Sandoski-FIRL)
W75-11935

SCREEN RETAINER ASSEMBLY,
Robertshaw Controls Co. Richmond, Va.
For primary bibliographic entry see Field 8C.
W75-11942

THE RISK OF DEOXYGENATION OF WATER IN HERBICIDE APPLICATION FOR AQUATIC WEED CONTROL,
University of Wales Inst. of Science and Tech., Cardiff
For primary bibliographic entry see Field 5A.
W75-11996

THE BACTERIAL QUALITY OF BOTTLED WATER,
Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab.
E. E. Geldreich, H. D. Nash, D. J. Reasoner, and R. H. Taylor
News of Environmental Research in Cincinnati, May 23, 1975. 4 p, 1 fig, 4 tab, 6 ref.

Descriptors: *Bacteria, *Potable water, Pseudomonas, Coliforms, Enteric bacteria, Water quality, Standards, Public Health, Quality control, Sampling.
Identifiers: *Bottled water.

Ten per cent of freshly bottled water samples had plate counts above 500 bacteria/ml, 5% contained coliform bacteria, one fecal coliform bacteria, and another Pseudomonas aeruginosa. Forty-two per cent of samples of uncertain age contained above 500 bacteria/ml, 3 had total coliform counts above USPHS Drinking Water Standards, and 1 contained Pseudomonas aeruginosa. Plate counts varied between and within brands, and increased in 75% of samples stored 30 days. Bacterial population changes occurred in samples stored at room temperature for 63 days. Bacterial growth was reduced when water was refrigerated; peak bacterial density occurred after 26 days refrigeration and 11 days at room temperature. Bottled drinking water should be analyzed as frequently as required by USPHS standards and repeated when necessary. When bottled, water should contain less than 1 coliform/100 ml and have plate counts less than 500 bacteria/ml. Retailed water should have less than one coliform 100 ml and plate counts less than 1000 bacteria/ml. Plate count limits should be established. Consumers should be advised to refrigerate bottled water and labels should indicate bottling dates and numbers. (Buchanan-Davidson-Wisconsin).
W75-12011

THE ASSESSMENT OF WATER QUALITY,
Anacapa Sciences, Inc., Santa Barbara, Calif.
D. H. Harris.
Human Factors, Vol 17, No 2, p 139-148, April 1975. 8 fig, 1 tab, 10 ref. OWRT C-3064(No 3680)(2).

Descriptors: *Water quality, *Assessment, *Color, *Odor, *Turbidity, Measurement, Management, Treatment facilities, Variability, Data collections, California, Domestic water, Standards, Water sampling, Potable water, Water supply, *Attitudes, Social values.
Identifiers: *Public acceptance, Ratings.

Turbidity, color and odor have the greatest influence on public acceptance and day-to-day control of water quality. The assessment of water quality is likely to grow in importance as the availability of high-quality raw water becomes more limited. Existing guidelines for controlling water quality in terms of public acceptability are inadequate. Reported is a study in which the objectives were: (1) to determine the methods employed by water treatment facilities to measure turbidity, color, and odor in water; (2) to estimate the variability of measures obtained routinely by the most commonly employed methods; and (3) to relate combinations of measured turbidity, color, and odor values to public acceptability of drinking water. The main end-products of the study were a set of cumulative distributions of water quality measurements and a family of water quality acceptance curves for combinations of turbidity, color, and odor values throughout the full range of public acceptability. (Bell-Cornell)
W75-12054

PROCESS AND APPARATUS FOR RECOVERING CLEAN WATER AND SOLIDS FROM DILUTE, AQUEOUS, SOLIDS CONTAINING SOLUTIONS OR DISPERSIONS,
Hanover Research Corp., East Hanover, N.J. (assignee).
For primary bibliographic entry see Field 5D.
W75-12059

GENERAL ASPECTS OF WATER SUPPLY AND TREATMENT IN ONTARIO,
MacLaren (James F.) Ltd., Willowdale (Ontario).
T. W. Lumsden, and W. L. C. Knowles.
Canadian Journal of Civil Engineering, Vol. 2, No. 2, p 154-161, June, 1975. 2 fig, 3 tab, 8 ref.

Descriptors: *Reviews, *Water treatment, *Water supply, Great Lakes, Turbidity, Treatment facilities, Potable water, Rivers, Groundwater, Aeration, Pre-treatment, Urbanization, Canada, *Water sources.
Identifiers: *Ontario.

Water supply sources in Ontario, Canada, are described. Within the province, water sources to be treated include the Great Lakes, southern Ontario rivers and groundwater, and northern rivers and lakes. Each area has its own set of problems of acquisition and treatment of water. Differences include hardness, turbidity, color, chemical composition, and biological and bacteriological content. The effects of industrial expansion and urbanization are also discussed. Current trends in improvement of Great Lakes treatment facilities include pre-treatment with polymers, improving mixing and flocculation, adapting filters to high-rate service, and increasing hydraulic capacity of associated piping. River sources of potable water, particularly in southern Ontario, must be treated for turbidity, chlorides, hardness, dissolved solids, and for removal of algae and phenolic substances. Intensive treatment involves prechlorination; screening; superchlorination and dechlorination with ammonia and sulfur dioxide; taste and odor control with activated carbon; aeration; coagulation with alum and activated silica; pH control with calcium carbonate; sedimentation; filtration; postchlorination; postammoniation; and fluoridation. Groundwater obtained from aquifers in both northern and southern Ontario must be treated to remove entrained gases, which cause odor, taste, and corrosion problems. Aeration followed by filtration removes iron and manganese and the unwanted gases, while most well supplies are chlorinated. (Kramer-FIRL)
W75-12067

WATER-TREATMENT SLUDGE FILTRATION STUDIES,
Auburn Univ., Ala. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-12069

OPERATIONAL VARIABLES AND LIMITATIONS OF DIRECT FILTRATION,
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
W. R. Hutchison.
Research Report No. W54, January, 1975. 118 p, 14 fig, 35 tab, 42 ref, 29 append.

Descriptors: *Water treatment, *Filtration, *Suspended solids, Coals, Efficiencies, Separation techniques, Water quality control, Diatoms, Polymers, Polyelectrolytes, Algae, Pilot plants.
Identifiers: *Direct filtration, Alum, Ferric chloride, Filter breakthrough.

Some of the operating limitations of water treatment by direct filtration during periods of raw water turbidity greater than 20 Ftu or diatom levels of 500 Asu/ml are described and the results of a pilot plant study on the effect of various operating variables are presented. The lengths of filter runs vary inversely with the suspended solids loadings excluding algae. Alum was the dominant factor in determining the overall filter run length. Alum and ferric chloride produced similar quality effluent. Cationic polyelectrolytes lowered the alum requirements. If diatoms were absent, the best effective size of coal, with respect to effluent quali-

ength of filter runs, and floc distribution
the filter bed, was approximately 1.05 mm.
al media filters, effluent turbidity was not a
ion of the effective size of the coal within the
range from 0.9 to 1.55 mm. The optimum
oss distribution for maximizing filter runs
bout 75% for coal and 25% for sand. Diatom
as low as 200 Asu/ml changed the headloss
bution within the filter bed. Filter coal with
fective size of 1.5 mm operated with diatom
averaging 2500 Asu/ml produced filter runs
r than 12 hours at 4 Igpm/sq ft. The chance of
breakthrough was increased by increasing
ffective size of the coal or sand, the alum
e, the filtration rate, the flocculation
nt above 20/sec and the flocculation time to
than 10 minutes, or by decreasing the depth
dia. Polymers prevented breakthrough on all
sizes up to 1.55 mm under all conditions
. An increase in the pH resulted in a deteri-
n of the final effluent quality. (Orr-FIRL)
12127

ATMENT PLANT TO BE TESTED FOR
CINOGENS,
ern Kentucky Univ., Bowling Green. Dept.
gineering Technology.
Riney, and D. R. Rowe.
r and Sewage Works, Vol 122, No 5, p 110-
May, 1975. 2 fig, 2 tab.

riptors: *Water treatments, *Municipal
, *Water supply, Public health, Waste water
ment, *Pollutant identification, Wells, Water
y standards, Treatment facilities, Filtration,
ion, Chlorination, Kentucky.
ifiers: *Carcinogens, Well water supply.

plans to test eighty public water supplies in-
g Owensboro, Kentucky's water system for
resence of potentially carcinogenic organic
ounds. The city is located on the Ohio River
as a rapidly expanding population of over
0. Owensboro does not use the Ohio River as
w water supply source, but draws from twen-
wells that are about 150 feet deep and
rate an extensive aquifer that parallels the
Existing and proposed methods of treatment
e city's water treatment plant are discussed.
nt treatment involves aeration, coagulation,
entation, rapid sand filtration, and chlorina-
The chemical composition of the finished
supply meets Federal and Kentucky Drink-
Vater Standards. However, the system will be
oved with a ten mgd reactor-clarifier, which
combine flash mixing, flocculation, and pri-
sedimentation into one tank. Increased effi-
y has also been achieved by split treatment to
ve all of the magnesium and calcium hard-
which is particularly important for well
supplies such as these. Other additions to
wensboro treatment plant include new filtra-
units, a control building facility, and a
ated lime sludge waste system. (Kramer-
)
12130

TORS AFFECTING OXYGEN TRANSFER
NG BUBBLE AERATION UNDER
ORATORY SCALE CONDITIONS,
Univ., Iowa City.
rimary bibliographic entry see Field 5D.
12144

SUAL FEATURES IN PLANT DESIGN.
r and Sewage Works, Vol 122, No 6, p 80-81,
1975.

riptors: *Water treatment, *Treatment facili-
*Municipal water, Rivers, Water supply,
r purification, *Flocculation, Monitoring,
mation, Control system, Alabama, Water
y standards, Waste water treatment.
ifiers: Jackson(Ala).

The city of Jackson, Alabama, has designed a new water purification plant with a capacity of two mgd. The municipal water supply source is the Tombigbee River, along which industrial expansion is expected. The new industries--chemical and paper mills--will be expected to meet strict Alabama water pollution standards. The water treatment plant will have several unique features. Flocculators were designed for flexibility by building four units with vertical paddles, rather than the traditional two horizontal units. The LIGHTNIN model 34Q2 mixers with flocculating turbines also have variable speed control. River clarity changes often, and this variability is needed to keep solid particles properly suspended. Conical diffusers control the flocculating water as it enters the settling basin. Mud-laden water is trapped by these diffusers where the water loses velocity and dumps most of the mud at one end of the tank. Water conditions, from raw inflow to finished water, are automatically monitored from remote control panel.
W75-12146

**CONTROL SYSTEM FOR SHOWA WATER PURIFICATION PLANT, (IN JAPANESE),**
Y. Harashima, H. Watanabe, H. Komatsu, and Y. Terauchi.
Toshiba Review, Vol 30, No 6, p 499-503, June, 1975. 12 fig, 1 tab. (English summary).

Descriptors: *Treatment facilities, *Water treatment, *Computers, *Filtration, *Precipitation(Chemical), Urbanization, Water supply, Groundwater, Monitoring, Instrumentation.
Identifiers: Chemical treatment, *Japan.

The Showa Water Purification Plant, on the River Edo, Japan, is described. A facility with a water supply capacity of 350,000 cu m/day has been built in the Saitama Prefecture in order to meet an increase in water demand associated with urban growth and a decrease in goundwater resources from pumping. The treatment process involves precipitation, filtration, and sterilization. Computer control is implemented, for chemical injection and control of water flow. If the computer system is inoperable, a backup system of automatic analog control may be used. The facility has been in satisfactory operation for one year since its construction. (Kramer-FIRL)
W75-12147

**PRIMARY SOLIDS/LIQUID SEPARATION.**
For primary bibliographic entry see Field 5D.
W75-12153

**BEET SUGAR PROCESSING POINT SOURCE SUBCATEGORY--EFFLUENT GUIDELINES AND STANDARDS.**
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-12271

**THE $5 BILLION FLUSH.**
For primary bibliographic entry see Field 5D.
W75-12277

**INTRODUCTION OF S433 (BILL FOR SAFE DRINKING WATER).**
For primary bibliographic entry see Field 6E.
W75-12280

**PROCESS FOR RAW WATER CLARIFICATION,**
American Cyanamid, Stamford Conn. (assignee).
H. P. Panzer, and K. W. Dixon.
U.S. Patent No. 3,894,944, 6 p, 1 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 1007, July 15, 1975.

Descriptors: *Patents, *Water purification, *Water treatment, *Flocculation, *Water quality control, Suspended solids, Chemical reactions, Separation techniques.

This invention relates to an improved process for clarifying raw water or natural water derived from rain, snow, rivers, ponds, reservoirs, etc. The water may have suspended particles which affect the clarity of the water and render it undesirable for its intended use. The raw water is clarified when it is treated with an effective amount of a polyquaternary flocculant obtained from the reaction of an epoxy compound and a secondary amine until a solution viscosity of at least 100 centistokes at 25 deg. C. is obtained as a 37% solids solution, by weight, based on the cationic portion of the polyquaternary compounds. (Sinha-OEIS)
W75-12300

**WATER TREATMENT DEVICE,**
Water Technology Service, Inc., Cleveland, Ohio. (assignee).
H. S. Aber, D. D. Riggs, and J. Lamantia.
US Patent No 3,899,410, 5 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 937, No 2, p 628, August 12, 1975.

Descriptors: *Patents, *Water treatment, *Water softening, *Demineralization, Scaling, Screens, Cleaning, Electric currents, Electrical conductance.

An electrical liquid treatment apparatus is described which is used in eliminating the hardness effects of water. A cleaning device used with the apparatus removes undesirable mineral deposits from surfaces. Another object of the invention is to treat liquid to prevent scale and other mineral formation in liquid systems. The apparatus includes an enlarged fitting adapted for coupling in a flow line and a insultated screen supported in the fitting. An electric potential is applied between the screen and the fitting. A cleaning device having sharp edges is positioned in the fitting to clean mineral and other devices deposits from the screen. (Sinha-OEIS)
W75-12305

**SALT RECOVERY SYSTEM,**
For primary bibliographic entry see Field 5B.
W75-12306

**RECIRCULATING RESIN CLEANING CHEMICAL FEEDER SYSTEM FOR WATER SOFTENERS,**
For primary bibliographic entry see Field 3D.
W75-12307

**IRON AND MANGANESE REMOVAL WITH OZONE. PART II**
R. R. Furgason, and R. O. Day.
Water and Sewage Works, Vol 122, No 7, p 61-63, July, 1975. 5 tab, 8 ref.

Descriptors: *Ozone, *Municipal water, *Iron, *Manganese, Oxidation, Pilot plants, Water treatment, Potable water, Capital costs, Operating costs, Public Health, Idaho.
Identifiers: Public Health Drinking Water Standards, Moscow (Idaho).

Iron and manganese removal using ozone oxidation was demonstrated in a pilot study at the Moscow, Idaho, municipal water system. Iron and manganese were effectively oxidized to an insoluble form which could be filtered from water. Raw water with iron and manganese concentrations of 9.5 and 1.2 mg/liter, respectively, was treated with ozone at a dosage of 8.8 mg/liter. This removed all the Fe and Mn to below Public Health Drinking Water Standards. At an ozone dosage of 6.3 mg/liter, the iron was removed, but a 0.1 mg/liter residue of Mn remained. Complete oxidation of

both minerals involved a reaction time of 30 seconds. When compared to other methods, the capital investment costs of the ozone treatment were high, but the operating cost of $0.500/1000 gallons was competitively low. (Kramer-FIRL)
W75-12315

**ANALYSIS OF REVERSE OSMOSIS FACILITIES, GREENFIELD, IOWA,**
B. W. Knowles.
National Waste Supply Improvement Association Journal, Vol 2, No 2, p 29-34, July, 1975. 2 fig, 2 tab.

Descriptors: *Reverse osmosis, *Water treatment, Water supply, Wells, Pumps, Instrumentation, Water quality control, Maintenance, Waste discharge, Iowa, Waste water treatment.

The DuPont Permasep B-9 system for reverse osmosis treatment has been implemented in Greenfield, Iowa, since 1971 as an auxillary water supply from previously useless raw well water. This is the first reverse osmosis facility to have been built for municipal use. The system consists of three separately controlled units, each containing 24 parallel mounted permeators, a high pressure multistage centrifugal pump, and necessary instrumentation, hardware, and piping. Water quality for the three years of operation has been significantly better than the recommended 500 ppm TDS. Maintenance involves cleaning iron precipitate built up on the membranes, if and when pressure drop exceeds 50 psi. Brine disposal is achieved by discharge to a storm sewer. Operational costs are approximately $30.30 per 1000 gallons, excluding amortization. (Kramer-FIRL)
W75-12320

**CLEARWELL QUALITY DOESN'T LAST,**
Sioux Falls Water Dept., S. Dak.
L. J. Hash.
The American City, Vol 90, No 5, p 56-57, May, 1975. 2 fig.

Descriptors: *Distribution systems, *Bacteria, Water, Odor, Taste, Conduits, Iron, Pipes, Corrosion, Chlorination, Aeration, Adsorption, Activated carbon, Nitrogen, Phosphorus, *Water treatment.
Identifiers: Organic carbon, Bacterial growth, Ozonation, Potassium permanganate, Bacterial growth stimulators.

Problems in a water distribution system can be indicated by red water, cloudy water, and taste and odor complaints. These problems may be caused by bacterial action. The accumulation of flocculation of iron can be intensified by bacterial growth and can occasionally be dislodged during periods of high velocities in the mains. An undesirable taste similar to that of stagnant water can also be caused by an accumulation of bacterial growth. Depletion of oxygen or destruction of chlorine residuals can occur when certain species of bacteria are present. Accumulations of bacteria in unlined cast iron pipes can serve to inhibit or accelerate corrosion, depending on the extent and nature of the accumulation. Increases chlorination and lowered pH is an obvious answer to extensive bacterial growth. Organic carbon, nitrogen, and phosphorus are necessary for bacterial growth. Organic carbon appears to be the limiting nutrient in the distribution system. Aeration, ozonation, addition of potassium permanganate, or adsorption on activated carbon could accomplish the removal of a carbon source during treatment. Nitrogen and phosphorus sources should be added to water only after their assessment as potential bacterial growth stimulators. The same care should be taken prior to adding sulfuric acid as a pH control after softening to the finished water. (Dean-FIRL)
W75-12340

**PRESSURE CONTROL IN A MOUNTAIN AREA WATER SYSTEM.**
For primary bibliographic entry see Field 8C.
W75-12343

**WATER PLANT GOES AUTOMATIC,**
Iowa City Water Superintendent Office.
For primary bibliographic entry see Field 8C.
W75-12345

**AERATION UPGRADES RESERVOIR,**
Escondido Mutual Water Co., Calif.
R. S. Harper.
Water and Sewage Works, Vol 122, No 6, p 40-41, June, 1975.

Descriptors: *Reservoirs, *Aeration, *Dissolved oxygen, Hypolimnion, Reservoir operation, Reservoir evaporation, Turnovers, Upwelling, Odor, Taste, Water treatment, Mixing, Hydrogen sulfide, California.
Identifiers: *Lake Wohlford reservoir(Calif).

A compressor-operated aeration system has been decreasing the hydrogen sulfide concentration and increasing the dissolved oxygen content in the Lake Wohlford reservoir in California since the mid-1960s. The installation consists of a Schramm Model 210 Compressor connected by a 2 in galvanized pipe to a 1 1/2 PVC pipe that reaches 40 ft deep into the lake at the hypolimnion. This pipe ends with 20 ft sections, each perforated with 30 holes to release the compressed air. The aeration system is designed to operate at 22 psig, with a volume of 210 cfm. Air leaving the openings forms into bubbles which rise to the surface. Oxygen is dissolved at the interface of each air bubble and its surrounding water. The mass of rising bubbles creates a boiling effect on the surface. Water, no longer supported by the jet, flows outward 360 degrees around the boil pattern. The dissolved oxygen picked up at the water/atmosphere interface is about equal to the amount assimilated from the compressed air bubbles. The major factors which determine the overall mixing time are the expanse of the compressed air column and the duration of the compressor operation. The boil column at Lake Wohlford is about 0.7 acres after a 30 hr compressor run. The aeration system has reduced the chlorine dosage necessary to treat the water for drinking, has reduced evaporation resulting in a saving of 35 acre feet of water, and has increased the fish population due to the improved dissolved oxygen content. (Orr-FIRL)
W75-12346

**PROCEEDINGS OF THE ANNUAL CONFERENCE OF THE BRITISH COLUMBIA WATER AND WASTE ASSOCIATION.**
April 9-11, 1974. Conference held at Vancouver, B. C. 272 p.

Descriptors: *Waste water treatment, *Potable water, *Water supply, Water resources, Groundwater, Sewage, Irrigation, Disinfection, Pumps, Chlorination, Standards, Water quality, *Canada, Oil spills.
Identifiers: Horizontal groundwater collectors.

The 1974 annual conference of the British Columbia Water and Waste Association was held in Vancouver, British Columbia, during April 1974. Papers were delivered on the topics of: water resources; water rates; pump selection; water supply; role and responsibilities of the Environmental Protection Service (Canada); horizontal groundwater collectors; and oil spill technology. Actual treatment methods discussed included disinfection, alternatives to disinfection, package treatment plants, and spray irrigation of sewage. A panel discussion was held on the Canadian Drinking Water Standards and objectives with respect to the programs carried out by the provinces to insure that they are providing suitable drinking water to their residents. (See W75-12351 thru W75-12359) (Orr-FIRL)
W75-12350

**DISINFECTION TO PROTECT RECREATIONAL AREAS AND POTABLE WATER SUPPLIES,**
British Columbia Dept. of Health, Vancouver. Occupational Health Div.
For primary bibliographic entry see Field 5D.
W75-12351

**MUNICIPAL SEWAGE TREATMENT TO PROTECT SHELLFISH GROWING WATERS,**
Environmental Protection Service, Vancouver (British Columbia). Pacific Region.
For primary bibliographic entry see Field 5D.
W75-12352

**CANADIAN DRINKING WATER SURVEILLANCE PROGRAMS, PANEL DISCUSSION,**
Nova Scotia Dept. of Public Health, Halifax. Div of Public Health Engineering.
For primary bibliographic entry see Field 5G.
W75-12355

**CANADIAN DRINKING WATER STANDARDS REVIEW, ONTARIO'S PROGRAMS, PANEL DISCUSSION,**
Ontario Ministry of the Environment, Toronto. Contingency Planning Section.
For primary bibliographic entry see Field 5G.
W75-12356

**CANADIAN DRINKING WATER STANDARDS REVIEW, ALBERTA, SASKATCHEWAN AND MANITOBA, PANEL DISCUSSION,**
Department of the Environment, Edmonton (Alberta). Div. of Pollution Control.
For primary bibliographic entry see Field 5G.
W75-12357

**CANADIAN DRINKING WATER STANDARDS REVIEW, BRITISH COLUMBIA, PANEL DISCUSSION,**
British Columbia Dept. of Health, Vancouver. Environmental Engineering Div.
For primary bibliographic entry see Field 5G.
W75-12358

**CANADIAN DRINKING WATER STANDARDS REVIEW, NORTHWEST TERRITORIES AND YUKON TERRITORY, PANEL DISCUSSION,**
Environmental Protection Service, Edmonton (Alberta). Northwest Region.
For primary bibliographic entry see Field 5G.
W75-12359

**THE FLOATING COVER: BEST WAY TO COVER A FINISHED-WATER RESERVOIR,**
G. Dellaire.
Civil Engineering, ASCE, Vol 45, No 6, p 75-79, June, 1975. 4 fig.

Descriptors: *Reservoir storage, *Storage tanks, *Deterioration, *Air-water interfaces, Potable water, Municipal water, Water quality standards, Pollution, Reservoir operation, Water supply, Chlorination, Comparative costs.
Identifiers: *Reservoir covers, Floating reservoir covers.

Federal and state governments are increasing pressure on municipalities to protect the quality of treated water by covering their distribution reservoirs. Often contamination from bird and animal wastes, dust, airborne hydrocarbons, and odor causing algae is introduced into treated water in uncovered finished-water reservoirs. Many states require covers on all new reservoirs. Covering older reservoirs can be expensive, but costs are offset by a decreased need for treatment chem

d for reservoir cleaning and maintenance. columnrsupported concrete, wood, or steel nd aluminum geodesic domes are expensive struct and leave on air space above the Unless space is well ventilated escaping e gas may attack steel and concrete covers; vapor built up in the space can rot wooden Occasionally these heavy structures have escructive to older reservoirs not designed port the weight. A 45-mil floating plastic s less costly to purchase, install, and maind though this type of cover is relatively d untried, studies suggest that they should m 25 to 40 years. Since no air space exists the water, algae cannot grow there and e gas does not escape from the finished which allows a smaller chlorine dosage. The drawback of floating covers is the reservoir be drained, inspected and repaired since er rides down with the water and covers the . Scuba divers to do occasional inspecting, g and patching while water remains in ir are an expensive alternative. (Herr-Carolina)
2360

## Water Quality Control

**MINE DRAINAGE IN CANE CREEK , NEAR OAKMAN, WALKER COUNTY, AMA,**
gical Survey of Alabama, University.
Hyde.
gical Survey of Alabama, Circular 64, 1970, fig, 1 tab, 3 ref.

ptors: *Acid mine water, *Mine acids, c water, *Acid streams, Water pollution, drainage, Mine water, Waste water, Pollu-Coal, Strip mine wastes, Strip mines, Spoil *Alabama, Water pollution control.
iers: *Iron sulfides, *Sulfuric acid, Cane Ala), Walker County(Ala), Oakman(Ala).

drainage results from the passage of water nd through strata or spoil piles that are high fide minerals. The oxidation of sulfide ls in the presence of water forms sulfuric nd releases its products to nearby streams. on sulfide minerals are generally associated he rocks above and below the coal seam. Creek, throughout its length of 14 miles, ed from a neutral stream to a very acidic , to a less acidic stream, and then back to a l stream (pH ranged 8.0 to 3.0). Close cor-n between low stream stage and high pH of ter was found. Acidic water shortens the life inary metals and concrete used in construc-he water is not suitable for municipal or in-l use without extensive treatment, and is sfactory for recreational use. Tests were o determine the resistance of materials used d culverts to acidic waters. Control of acid ge is complex and often economically im-cal. No single method has been entirely relia-: several measures are presented.
1871

**TLE PROJECT CALLS FOR ROCK S.**
imary bibliographic entry see Field 4A.
1922

**MANAGEMENT OF WATER IN HERN IRELAND, WITH PARTICULAR RENCE TO WATER POLLUTION,**
nce, and M. G. W. Bell.
Pollution Control, Vol 72, No 1, p 10-19, fig, 4 tab, 11 ref.

ptors: *Water quality, *Water supply, pollution, Effluents, Surface waters, , Sampling, Public health, Data collections, tant identification.
iers: *Ireland, Coastal waters.

Water quality data relating to the surface and coastal waters of Northern Ireland are ar present very limited. However, the Department of Industrial and Forensic Science (DIFS), Ministry of Commerce, has since 1949 undertaken numerous water quality examinations over much of the province in relation to specific incidents or effluent disposal problems. The Fisheries Conservancy Board and Foyle Fisheries Commission also have developed considerable knowledge of pollution problems in Northern Ireland, as have the public health authorities. In order to obtain the necessary data, water quality sampling stations are being established throughout the country, which has been divided into seven hydrometric areas. The stations are situated on tributaries and at the mouths of major rivers and in relation to principal discharges or areas of special interest for amenity or other purposes. Each station is calibrated to ensure that any sample from it is representative of the river water quality in the emmediate vicinity. (Sandoski-FIRL)
W75-11939

**EXPERIMENTS WITH UNCONVENTIONAL STORM OVERFLOWS,**
Loughborough Univ. of Technology (England).
For primary bibliographic entry see Field 5D.
W75-11940

**WATER RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE NORTHERN GREAT PLAINS COAL REGION OF WYOMING, MONTANA, AND NORTH DAKOTA, 1975.**
Geological Survey, Denver, Colo. Water Resources Div.
For primary bibliographic entry see Field 5A.
W75-11961

**EFFICIENCY OF MEASURES FOR THE SANITARY PROTECTION OF SURFACE WATERS IN THE REGION OF CHEMICAL INDUSTRY ENTERPRISES, (IN RUSSIAN),**
Gorkovskii Meditsinskii Institut (USSR).
I. I. Belyaev, and M. P. Gracheva.
Gig Sanit, Vol 5, p 13-16, 1974.

Descriptors: Chemical wastes, *Industrial wastes, Effluents, Liquid wastes, *Water pollution control, Sanitary engineering, Streams, *Water pollution treatment, Waste water treatment.

Data from long-term observations on the composition of effluents and the sanitary state of a stream into which liquid wastes of several chemical industries were discharged are presented. A successful field experience in diminishing the amount of discharge wastes is reported. The sanitary measures that have been carried out for the last few years are discussed.--Copyright 1975, Biological Abstracts, Inc.
W75-11977

**OBSERVATIONS OF THE GUPPY, POECILIA RETICULATA PETERS, IN CULEX PIPIENS FATIGANS BREEDING SITES IN BANGKOK, RANGOON, AND TAIPEI,**
Maryland Univ., College Park. Dept. of Entomology.
E. C. Bay, and L. S. Self.
Bull W H O, Vol 46, No 3, p 407-416, 1972.

Descriptors: *Asia, Public health, Mosquitoes, *Human diseases, Organic wastes, Water pollution, Cities.
Identifiers: Bangkok, *Culex-Pipiens-Fatigans, Guppy, *Mosquito control, *Poecilia-Reticulata, Rangoon, Taipei, *Wuchereria-bancrofti.

The successful establishment of the guppy in a number of shallow, highly polluted ground pools beneath low income housing in Bangkok, Thailand was previously reported. Whether Bangkok guppies evolved a higher tolerance to organic pollution than P. reticulata that had never been exposed to these conditions was questioned; the possibilities of using these fish elsewhere to control C. pipiens fatigens (especially in Rangoon, Burma, and Taipei, Taiwan) where this mosquito is the vector of Wuchereria bancrofti which affects humans are discussed.--Copyright 1973, Biological Abstracts, Inc.
W75-11989

**SYSTEMS APPROACH TO HYDROLOGY.**
For primary bibliographic entry see Field 2A.
W75-12014

**THE ASSESSMENT OF WATER QUALITY,**
Anacapa Sciences, Inc., Santa Barbara, Calif.
For primary bibliographic entry see Field 5F.
W75-12054

**COAL MINE DRAINAGE POLLUTION--1973,**
Pennsylvania State Univ., University Park. Mine Drainage Research Section.
Harold L. Lovell.
Earth and Mineral Sciences, Vol. 42, No. 52, p. 54-55, 1973. 28 ref.

Descriptors: *Mine drainage, *Coal mines, *Water pollution control, *Water pollution treatment, Legislation, Research and development, Methodology, Acid mine water, *Pennsylvania.
Identifiers: Coal mine drainage.

The steps taken and the progress made through legislation, research, and action programs toward cleaning up streams polluted by mine drainage are summarized. Pennsylvania, other coal-producing states, and Congress have passed legislation which curtails stream debasement by mining. Quality specifications have been set for water discharge and acceptable mining procedures. Pennsylvania has instigated the design and operation of a mobile treatment pilot plant and construction of a full-scale Experimental Mine Drainage Treatment Facility, which utilized chemical neutralization procedures; distillation, ion exchange, reverse osmosis have also been studied in prototype installations. Corrective and preventive measures helpful in current strip mining operations include temporary water treatment using soda ash, drainage control, slope control, shortened land-disturbance intervals, and rapid revegation. Better coal refuse disposal now minimizes both water and air pollution. Several hundred facilities now treat drainage from active mines. The cost and process advantages of limestone when combined with biochemical iron oxidation have been demonstrated. The areas of current concern are control of drainage formation, correction of areas blighted by abandoned mines, improved treatment reliability and control with reduced labor requirements. The reverse osmosis process appears to be the most feasible for obtaining the higher purity levels but remains to be proven by time. (Auen-Wisconsin)
W75-12114

**SODIUM HYDROXIDE TREATMENT OF ACID MINE DRAINAGE,**
Environmental Protection Agency, Rivesville, W. Va. Croion Mine Drainage Control Field Site.
J. L. Kennedy.
EPA National Environmental Research Center, Cincinnati, Ohio. Office of Research and Monitoring, Report February 1973. 8 p, 1 fig, 4 tab, 3 ref.

Descriptors: *Mine drainage, *Alkalis(Bases), *Waste water treatment, *Sodium compounds, *West Virginia, Application methods, Water purification, Flocculation, Water quality, Sludge, Slurries, Comparative costs.
Identifiers: *Sodium hydroxide.

A sodium hydroxide solution was used to lower acidity and remove some of the chemicals in small mine-drainage flows in remote locations and its efficiency evaluated. The feeding device used was easily moved, required no electricity, needed very little maintenance, and was relatively simple to operate. The sodium hydroxide system maintained effluent pH between 6.6 and 7.6 and removed acid, iron, and aluminum regardless of the wide variance of water flow (from 13 gpm to 108 gpm). The cost for sodium hydroxide was considerably higher, however, than treatment by lime, limestone, or soda ash of similar water. But costs may be economically comparable as power and large storage hoppers are needed to reliably feed lime, limestone and soda ash, and these materials are difficult to keep in slurry. Baffles or similar arrangements are needed to ensure good mixing of the sodium hydroxide and the acid mine drainage after the effluent leaves the measuring flume. A settling pond to collect solids is recommended in all cases where the raw acid mine drainage contains more than 20 to 30 ppm of acidity because of the iron and aluminum precipates that would be formed. (Auen-Wisconsin)
W75-12116

**STRONG IMPACT OF TEXTILES BY U.S. WATER CONTROL ACT,**
L. C. Woodall, and T. A. Alspaugh.
Modern Textiles, Vol 54, No 2, p 12-13, 20-21, 1973.

Descriptors: *Pollution abatement, *Water pollution control, *Textiles, Industries, Economic impact, Regulation, Standards, Waste treatment, Costs, Federal Water Pollution Control Act, Optimization, Legislation, Air pollution, Waste disposal, Environment, Incineration.
Identifiers: *Textile industry, Zero discharges, Noise limitation.

The chairmen of the panel on Textile Manufacturers at the First International Pollution Engineering Conference held at Cleveland on December 4-7, 1972 summarize the highlights of the contributing papers. The provisions of the Federal Water Pollution Control Act Amendments of 1972 were considered too stringent in their objective of zero discharges as based on a cost/benefit analysis; specifically the cost for eliminating the remaining pollutants above 85-90% may be as high as the first 85-90%. It was emphasized that the costs of resources--energy, steel, coal, aluminum, etc.,--to remove 95-99% pollutants would be outbalanced by the benefits of total pollution control. The costs of waste treatment by municipal or joint municipal-industry operations, plus plant pretreatment costs, seem to favor total treatment by each individual plant. Other subjects discussed were noise control, environmental control programs, air pollution from drying and curing ranges, discharge of toxic substances, employee health and safety and solid waste disposal; and the problems of new plant designs to meet acceptable environmental standards, which deplorably are not static. (Auen-Wisconsin)
W75-12117

**POLLUTION OF GROUNDWATER DUE TO MUNICIPAL DUMPS,**
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 5B.
W75-12119

**HYDROGEOLOGICAL ASPECTS OF SOLID WASTE DISPOSAL,**
Wisconsin Univ., Madison. Water Resources Management Program.
For primary bibliographic entry see Field 5E.
W75-12121

**GROUND-WATER AND ENGINEERING GEOLOGY IN SITING OF SANITARY LANDFILLS,**
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 5E.
W75-12122

**REGULATORY ASPECTS OF SLUDGE UTILIZATION ON LAND,**
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
G. M. Wood.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2 September 18-19, 1974, Toronto, Ontario, Canada, p 110-119, (1974) 2 tab.

Descriptors: *Regulation, *Treatment facilities, Sites, Management, Organic wastes, Monitoring, Rates of application, Heavy metals, Nutrients, Damages, Compensation, Land, Soil analysis, Canada.
Identifiers: Environmental Protection Act(Canada), Guidelines, Crop analysis, Spreading equipment, Haulers.

Regulation 824 of the Environmental Protection Act, in Canada, has been amended to designate and define organic waste processing and establish guidelines for construction and operation of organic waste sites. Haulers will need a Certificate of Approval for hauling and spreading equipment and for the number of sites needed for each sewage treatment plant. Guidelines have been set up for the sites covering location, land characteristics, management, and application rates of processed organic waste. The sites must be monitored for buildup of heavy metals and nutrients by the sampling of soils and crops. It is hoped that these guidelines with built-in safety factors will prevent permanent damage or degradation by the use of sludge on farmland. If damage does occur, due to hauler negligence or to plant errors in processing organic waste quality, the legal responsibility and compensation to the individual will need to be determined. (See also W75-11715) (Dean-FIRL)
W75-12134

**FLOATING AQUATIC PLANTS REMOVE CHEMICALS FROM POLLUTED WATERS.**
Water and Pollution Control, Vol 113, No 6, p 23, 25, June, 1975. 2 fig.

Descriptors: *Aquatic plants, *Pollution abatement, *Metals, Waste water treatment, Nutrient removal, Absorption, Fermentation, Sewage, *Water hyacinths, Costs, Phenols, Insecticides, Water pollution control.
Identifiers: Chemical pollutants, Toxic metals.

NASA's National Space Technology Laboratories (NSTL) in Bay St. Louis, Mississippi has been experimenting with water hyacinths to determine the plant's ability to absorb and concentrate toxic metals, and metabolize other chemical pollutants - phenols, creosols, insecticides, nitrates, and phosphates. In early 1975 large quantities of water hyacinths were planted in a portion of the 60-acre lagoon that serves as the city's total sewage disposal outlet. The planting begins a complex process that results in the total recycling of enormous quantities of water hyacinths. One month after initial stocking, plant harvesting begins; by this time the plants will have reproduced enough to appreciably reduce pollution levels. The harvested crop is subjected to procedures to determine impurity assimilation. Two methods under study by NSTL involve continual processing of the water hyacinths. Anaerobic fermentation converts shredded water hyacinths into bio-gas, similar to natural gas. The potential yield is expected to be 28,500 cubic meters of gas per acre of plants. Pyrolytic decomposition produces a mixed hydrocarbon fuel similar to bio-gas. Plants grown in domestic sewage effluent (low in toxic metal content) will be evaluated as an animal food source. Residues from these processes will yie high grade fertilizer. The advantages of the i tegrated aquatic plant disposal method are dur bility and low installation and maintenance cost An obvious drawback is that it is limited to tropic and subtropical climate zones. (Murphy-FIRL)
W75-12145

**MINE DRAINAGE ABSTRACTS, A BIBLIO RAPHY. 1972 SUPPLEMENT.**
Bituminous Coal Research, Inc., Monroeville, Pa
For primary bibliographic entry see Field 5B.
W75-12158

**REPORT TO THE CONGRESS ON OCEA DUMPING RESEARCH, JANUARY THROUG DECEMBER 1974 PUBLIC LAW 92-532, TITL II, SECTION 201.**
National Oceanic and Atmospheric Administr tion, Washington, D.C.
For primary bibliographic entry see Field 5B.
W75-12173

**INPUT-OUTPUT ANALYSIS AND THE E VIRONMENT,**
University Coll. of Wales, Aberystwyth. Dept. Economics.
For primary bibliographic entry see Field 6G.
W75-12177

**INTERNATIONAL ECONOMICS AND E VIRONMENT CONTROL,**
Southampton Univ. (England). Dept. Economics.
For primary bibliographic entry see Field 6G.
W75-12178

**FILTERING AND DEBRIS REMOVING A PARATUS FOR CLEANING A SEA WATE STREAM,**
H. M. Zuccolotto.
U.S. Patent No 3,896,005, 6 p, 5 fig, 9 ref; Offici Gazette of the United States Patent Office, V 936, No 4, p 1378, July 22, 1975.

Descriptors: *Patents, *Water pollution treatmen *Water quality control, *Filtration, *Separatio techniques, Flotsam, Jetsam, Sea water, Cooli water, Equipment.

A filtering and debris removing apparatus described for cleaning a fluid intended for circul tion through the tube bundles of heat exchange and like equipment in order to completely and ef ciently remove the debris without the need complete stoppage of the plant operation. The a paratus provides in addition to a backflushi operation for cleaining the filtering media an ef cient scrubbing operation of the surface of the f tering media by the action of the feed fluid. The f tering apparatus has a chamber containing a filt which divides the chamber into upstream a downstream compartments. The debris containi fluid entrance is connected to the upstream co partment adjacent one end of the filter and has valve. The service fluid outlet is connected to t downstream compartment. A blowdown pipe connected to the upstream compartment adjace the other end of the filter and contains a seco valve. (Sinha-OEIS)
W75-12183

**OCEAN DUMPING OVERSIGHT.**
Hearings--Subcomm. on Fisheries and Wildli Conservation and the Environment and Subcom on Oceanography, Comm. on Merchant Mari and Fisheries, U. S. House of Representative 93d Cong, 2d Sess, May 1974. 287 p, multiple ta fig, ref.

Descriptors: *Legislation, *Oceans, *Protectio *Waste dumps, *Administrative agencies, A

ration, Waste disposal, Environmental en-
ing, Sanitary engineering, Wastes, Federal
nment, Legal aspects, Water law, Conserva-
Control, Preservation, Research and
opment, Dredging, Spoil banks, Water, En-
nental effects, Water injury, Water pollu-
Water pollution control, water pollution
es.
fiers: *Congressional hearings, *Marine pro-
n, *Marine Protection Research and Sanc-
s Act of 1972, Coastal waters, Environmen-
icy, Hazardous substances(Pollution), Inter-
al agreements, Territorial waters.

hearings were held in order to review the ac-
s of the various federal agencies charged
esponsibility for carrying out the Marine
tion, Research, and Sanctuaries Act of
also known as the Ocean Dumping Act. The
se of the Act is to impose strict controls
the dumping of waste materials into the
s and seas of the world. Basic responsibility
nforcement of the act is vested in the En-
nental Protection Agency, which has the ul-
power to review and control all dumping ac-
s over which the United States has jurisdic-
Research responsibilities and the power to
ish marine sanctuaries is delegated to the
tment of Commerce, through the National
ic and Atmospheric Administration. The
of Engineers is responsible for dredge and
tivities, and the Coast Guard is responsible
onitoring and supervision of dumping activi-
Representatives of all these agencies were
t and discussed their progress under the
Additional testimony was received from
witnesses such as the National Wildlife
ation. (Fernandez-Florida)
2194

CYPRESS NATIONAL PRESERVE (PART

rimary bibliographic entry see Field 6G.
2195

WATER PORT ACT OF 1974.
Report--Comms. on Commerce, Interior and
r Affairs, and Public Works, U. S. Senate
t No 93-1217, October 2, 1974. 106 p.

iptors: *Harbors, *Legislation, *Offshore
rms, *Oil industry, *International waters,
pollution sources, Deep water, Oil, Oil pol-
, Water pollution, Oil spills, Oil wastes, En-
ment, Environmental effects, Transporta-
Federal Government, Ships, Public health,
tures, Regulation.
ifiers: *Hazardous substances (Pollution),
nses, Class action suits, Environmental pol-

s a joint report on the Deepwater Port Act of
by the Committees on Commerce, Interior
nsular Affairs, and Public Works. The pur-
of the Act is to establish a licensing and regu-
program governing offshore deepwater port
opment beyond the territorial limits and off
coast of the United States. Such facilities
d be used to transfer oil and natural gas sup-
transported by tanker to and from the United
s. Economic and environmental advantages
iated with super tankers and deepwater ports
be utilized by means of this federal legisla-
The construction and operation of deepwater
off the coast of the United States promises
duce oil pollution damage to the marine en-
ment by reducing tanker traffic in congested
rs and ports. Enactment of the Deepwater
Act of 1974 is recommended by the Commit-
n grounds that the Nation's interests will be
served by the construction and operation of
ports. Generally, the report contains the pur-
and description, background and need, major
s, legislative history, general recommenda-
, section analysis, cost considerations and ad-
al views regarding the Act. (Fernandez-
da)

W75-12198

**FEDERAL OCEAN PROGRAMS REVIEW.**
For primary bibliographic entry see Field 6E.
W75-12200

**HIGH SEAS OIL PORT ACT.**
Hearings and Report--Comm. on Merchant Marine and Fisheries, U. S. House of Representatives, 93d Cong, 2d Sess, May 15, 1974. 40 p.

Descriptors: *Legislation, *Offshore platforms, *Foreign trade, *Oil industry, *Environmental effects, Oceans, Coastal structures, Coasts, Marine fisheries, Import, Economics, Ecology, Oil, Oil pollution, Legal aspects, Permits, Regulation, Water law, Administrative agencies, Transportation, Federal Government.
Identifiers: *Congressional hearings, *Licenses, *High Seas Oil Ports Act, Administrative regulations, Coastal waters, Coastal zone management, Environmental policy, Hazardous substances(Pollution).

After consideration of bill H. R. 11951, as amended, the House Committee on Merchant Marine and Fisheries reported favorably and recommended enactment. The purpose of the legislation is to authorize the issuance of licenses to eligible applicants for the construction and operation of high seas oil ports in the offshore coastal waters of the United States, as a means for the unloading and further handling of petroleum and petroleum products for transshipment to the United States. The bill outlines mandatory procedures to minimize adverse impacts on the marine environment, and to protect national, and state, and local interests which would be affected. This legislation seeks to facilitate oil importation in the manner most economically and environmentally desirable. Title I authorizes the Secretary of the Interior to issue licenses for construction of high seas oil ports if the Secretary, after consultation with other appropriate federal agencies and departments, determines that the applicant is, in all respects entitled to a license under the various provisions of the Act. Title II deals with the operation of the ports and places responsibility for oversight of operations in the Secretary of the department in which the Coast Guard is operating, and grants authority to promulgate and enforce reasonable rules and regulations. (Fernandez-Florida)
W75-12201

**1973 IMCO CONFERENCE ON MARINE POLLUTION FROM SHIPS.**
Hearings--Comm. on Commerce, U. S. Senate, 93d Cong, 1st Sess, November 14, 1973. 177 p, 5 append.

Descriptors: *Waste disposal, *Solid wastes, *Leakage, *Treaties, *International law, Water pollution, Water pollution control, Oil spills, Abatement, Sewage, Legislation, Legal aspects, Jurisdiction, Law enforcement, Water resources, Public health, International commissions, International waters, Law of the sea, Oil, Oil pollution, Oily water, Ships.
Identifiers: *Intergovernmental Maritime Consultative Organization, *International Convention for the Prevention of Pollution from Ships, Marine pollution.

A report on the 1973 Intergovernmental Maritime Consultative Organization (IMCO) Conference on Marine Pollution from ships was made before the U. S. Senate Commerce Committee. Its purpose was to present to the Committee for approval the new International Convention for the Prevention of Pollution from Ships. The treaty is an extension of a resolution by the IMCO Assembly to completely eliminate the willful and intentional pollution of the sea by oil and other noxious substances and to minimize accidental spills. The treaty governs five types of discharge from ships: oil, noxious liquid substances, harmful packaged goods, sewage and garbage. Some of the specific articles adopted include the imposition of more stringent regulations on the discharge of refined oil products; the adoption of segregated ballast requirements; and, the prohibition of oil discharge within 50 miles of land and within designated special areas, i. e., Baltic, Black, Red and Mediterranean Seas. IMCO evaluated and now regulates almost all of the major liquid substances carried in bulk on the oceans. It indicates the relative hazard to marine resources, human health, and amenities. The treaty is not self executing and will require the enactment of domestic legislation. The treaty provides for international enforcement by the individual adopting countries. (Altuve-Florida)
W75-12202

**THE FIFTH ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY.**
Council on Environmental Quality, Washington, D. C.
For primary bibliographic entry see Field 6G.
W75-12203

**USES OF SCIENTIFIC INFORMATION IN ENVIRONMENTAL DECISION-MAKING,**
Indiana Univ., Bloomington, School of Law.
For primary bibliographic entry see Field 6G.
W75-12204

**THE DOCTRINE OF PRIMARY JURISDICTION MISCONCEIVED: END TO COMMON LAW ENVIRONMENTAL PROTECTION,**
Florida Attorney General's Office, Tallahassee.
For primary bibliographic entry see Field 6G.
W75-12206

**THE FLORIDA ENVIRONMENTAL PROTECTION ACT OF 1971: THE CITIZEN'S ROLE IN ENVIRONMENTAL MANAGEMENT,**
For primary bibliographic entry see Field 6G.
W75-12207

**POLLUTION CONTROL UNDER THE PENNSYLVANIA CLEAN STREAMS LAW,**
A. Charlson.
University of Pittsburgh Law Review, Vol XXXIV, No 1, p 115-129, 1972. 15 p, 51 ref.

Descriptors: *Mine drainage, *Mining, *Mine water, *Mine wastes, *Pennsylvania, *Judicial decisions, Waste water disposal, Industrial wastes, Water treatment, Water quality, Water pollution, Penalties (Legal), Legislation.
Identifiers: *Due process.

The impact of two recent court cases on the Pennsylvania Clean Streams Law is analyzed in this article. The cases involved interpretation of section 315 of that statue which requires operators of mines to treat polluted water which it pumps from its mines. Mine operators contended that they were only required to treat polluted water discharges from active mines. One case involved water which was pumped from an adjacent mine for the purpose of protecting an active mine. The other case involved water from an inactive mine which commingled with other water and was discharged together with water originating in an active mine. In both cases the Commonwealth Court held that mine operators were not required to treat water which did not originate in an active mine. The article analyzes the Court's interpretation of various statutory language, such as mine, mine drainage, and source. The article also explored the problems of proof and fault and their relation to the constitutional requirements of due process. (Hoffman-Florida)
W75-12209

**A RIVER RESTORED: OREGON'S WILLAMETTE,**
National Geographic Society, Washington, D. C.
E. A. Starbird.
National Geographic, Vol 141, No 6, p 816-834, June 1972. 12 p, 1 map, 6 photo.

Descriptors: *Oregon, *Industrial wastes, *Pulp wastes, *Pollution abatement, *Fish ladder, *River regulation, Water pollution, Water pollution sources, Water quality, Spawning, Chemical wastes, Pulp and paper industry, Permits, State Government, Regulation, Water pollution effects, Water pollution treatment.
Identifiers: Willamette River (Ore), Permit systems, Spawning grounds.

Oregon's Willamette River was one of the most polluted waterways in the nation less than a decade ago. The river had become clogged with agricultural, industrial, and human wastes. Finally the public took steps to clean up the river, despite claims from the polluters that the cost of corrective steps would be prohibitive. Astate permit system was passed, without the waivers and variances that have underminded similar efforts, setting quality standards for all liquid discharges and requiring frequent testing of outflows. Pulp and papermakers, once the worst polluters, were required to start installing chemical recovery and secondary waste treatment facilities. Because of these and other pollution controls, waste discharges have been reduced by 90 percent. Overall water quality has been raised; water-contact sports are again safe; and the number of game fish has increased dramatically. Because the fish can once again survive in the Willamette, a 3.7 million dollar fish ladder was constructed to help fish climb the face of a cliff to reach spawning grounds. A program has been set up to keep a constant watch for potential violators.
W75-12210

**WASTING A RIVER,**
California Univ., Berkeley, Coll. of Natural Resources.
For primary bibliographic entry see Field 6G.
W75-12211

**LITIGATION UNDER THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1974,**
Environmental Law Inst., Washington, D.C.
K. L. Hall.
Environmental Law Reporter, Vol IV, p 50109-50122, 1974. 12 p, 139 ref.

Descriptors: *Federal Water Pollution Act, *Judicial decisions, *Jurisdiction, *Pollution abatement, Water pollution, Water quality act, Water pollution treatment, Water law, Waste water treatment, Legislation.
Identifiers: Federal Water Pollution Control Act Amendments of 1972, *National Environmental Policy Act, Injunctive relief, Navigability tests.

Recent litigation arising under the Federal Water Pollution Act (FWPCA) Amendments of 1972 is classified and analyzed. The FWPCA is said to have had three goals: (1) to furnish financial aid for the planning and construction of waste treatment facilities; (2) to regulate the discharge of pollutants into American waterways; and (3) to encourage planning for waste treatment management. Cases to date have involved only the first two goals, with the bulk of litigation centering on regulation of pollutant discharge. Courts are in agreement that the 1972 Amendments did not repeal prior federal law relating to water pollution control. However, other ambiguities arising under these amendments are not fully resolved. The author includes the controversy over presidential impoundment of appropriated funds among these problems, although she recognizes that the trend in these matters is clearly against the asserted presidential authority. Although most courts have ruled that navigability is no longer a jurisdictional requirement in the federal control of water pollution, that issue is not entirely resolved. The question of the notice requirement for citizen suits is still in doubt, as is the issue of whether the citizen suit provision is the exclusive remedy under the Act. A further problem, and one which arises in a variety of contexts, is the degree of discretion enjoyed by the Administrator under the Act. The author concludes that, from an environmentalist's point of view, the decisions today are quite favorable, although with so many issues unresolved, no final analysis of the court's role is possible. (Gerlach-Florida)
W75-12212

**DRAFT PROPOSAL FOR LEGISLATION TO CONTROL WATER POLLUTION FROM AGRICULTURAL SOURCES,**
R. Piampiano.
Cornell Law Review, Vol 59, p 1097-1125 (1974). 29 p, 161 ref.

Descriptors: *Agricultural runoff, *Agricultural chemicals, *Water pollution, *Water pollution control, *Water pollution effects, Water pollution sources, Agriculture, New York, Pollutant identification, Pollution abatement, Pollutants, Water, Water quality, Water quality control, Toxicity, Nitrogen, Phosphorous, Pesticides, Pesticide toxicity, Plant growth, Soils, Crops, Groundwater, Eutrophication, Wastes, Animal wastes(Wildlife), Fertilizers.
Identifiers: Hazardous substances(Pollution), Non-point sources(Pollution), NEPA, Refuse Act of 1899.

Because a great deal of agricultural water pollution comes from so-called 'non-point' sources which are difficult to identify, quantify, and discern, agricultural pollution is less visible to public scrutiny and concern. However, the volume of agricultural pollution suggests that legislative efforts must enter a new phase of development--increased control of specific sources of agricultural pollution. Of the many substances used in agricultural operations which are potential pollutants, three are of primary concern to water quality management: nitrogen, phosphorus, and toxic chemical pesticide residues. When compounds with high concentrations of nitrogen and phosphorus are applied in proper amounts with proper techniques, the result is beneficial to plant growth and soil development. The chemicals become potential pollutants only when the amount applied exceeds the amount which can be used by plants, crops and the soils, because the excess is then available to leach or run off into surface and ground water, resulting in contamination and eutrophication. It is clear that present methods of pollution control fail to take account of the special difficulties involved in regulating the disposal of animal wastes and the use of fertilizers and pesticides. Greater public and legislative awareness of these special problems is required to arrive at an effective plan and appropriate methods of control. (Gagliardi-Florida)
W75-12213

**THE INTEGRATIVE POTENTIAL OF THE PROPOSED INTERNATIONAL REGIME FOR THE SEABED.**
For primary bibliographic entry see Field 6E.
W75-12215

**WYANDOTTE AND ITS PROGENCY: THE QUEST FOR ENVIRONMENTAL PROTECTION THROUGH THE ORIGINAL JURISDICTION OF THE SUPREME COURT,**
Pepper, Hamilton and Schultz, Philadelphia, Pa.
B. W. Ficken.
Dickenson Law Review, Vol 78, p 429-459 (1974). 31 p, 153 ref.

Descriptors: *Jurisdiction, *Judicial decisions, *Mercury, *Ohio, *Federal-state water rights conflicts, Constitutional law, Governmental interrelations, Interstate, Common law, Federal jurisdiction, State jurisdiction, Water rights, Legal aspects, Water law, Water pollution sources, Water pollution, Environmental effects, Environment.
Identifiers: *Hazardous substances(Pollution), *Injunctive relief, *Mercury pollution, Nuisance(Legal aspects).

In Ohio v. Wyandotte Chemicals Corporation the State of Ohio sought to invoke the original jurisdiction of the United States Supreme Court to enjoin Wyandotte from dumping mercury into streams whose course ultimately reached Lake Erie. Although the Court acknowledged its jurisdiction, it declined to exercise it. This comment analyzes the Court's approach to the exercise of its original jurisdiction in light of Wyandotte and three subsequent cases. Particular consideration is given to clarifying those factors which influence the exercise of original jurisdiction. The comment outlines a course of action and arguments for the environmentally aggrieved state seeking to invoke the original jurisdiction of the Supreme Court. The author concludes that unless the action can be properly characterized as a suit between two or more states, an attempt to invoke the original jurisdiction of the Court will probably be unavailing. (Fernandex-Florida)
W75-12218

**FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,**
D. N. Stern, and E. M. Mazze.
American Business Law Journal, Vol 12, p 81-86 (1974). 7 p, 22 ref.

Descriptors: *Federal Water Pollution Control Act, *Legislation, *Legal aspects, *Pollution abatement, *Navigable waters, Governmental interrelations, Non-structural alternatives, Administration, Industries, Environmental control, Water pollution control, Research and development, Grants, Monitoring.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Enforcement procedures, *Notice, Monitoring procedures.

Governmental regulation of water pollution has been recognized as a legitimate activity. The apparatus for executing this function developed in a series of legislative acts beginning in 1948 with the creation of the Federal Water Control Advisory Board. The Water Quality Act of 1970 transferred control of water pollution from the Deparment of Health, Education and Welfare to the Environmental Protection Agency (EPA). In 1972, amendments to the Federal Water Pollution Control Act strengthened federal control in several major areas. Extension of federal jurisdiction to all navigable waters including territorial seas involves a possible violation of the Commerce Clause which has not yet been determined by the Supreme Court. Research programs have been revised. The EPA must now coordinate research efforts with HEW, and the Coast Guard has jurisdiction over research of marine pollution. Grants for construction of public waste treatment have been established. Manufacturers are now required to monitor discharges at point sources of pollution and the records must be made available to the EPA. Specific and immediate enforcement procedures enable the EPA to proceed against a violator when the state where the violation occurs fails to take appropriate action within 30 days of the alleged violation. (Jenkins-Florida)
W75-12221

**THE RUSH FOR OFFSHORE OIL AND GAS: WHERE THINGS STAND ON THE OUTER CONTINENTAL SHELF.**
Environmental Law Reporter, Vol V, No 2, p 10026-10029, February 1975. 4 p, 15 ref.

ptors: *Coastal structures, *Drilling, ore platforms, *Continental shelf, Adminis- decisions, Zoning, Seashores, Project ng, Alaska, Maine, Cost-benefit analysis, gical surveys, Oil spills, On-site tests, Path utants, Ocean currents, Submerged Lands ontinental margin.
iers: *National Environmental Policy Act, al Zone Management Act, *Environmental statement.

g of Outer Continental Shelf acreage for oil s exploration while to be encourage, con- vith the Council of Environmental Quality's ecommendation that site development be al- only if environmental risks are outweighed efits to be obtained. Onshore processing of and gas presents the major data gaps ham- assessment of onshore environmental im- State participation in safeguarding the en- ient is encouraged by possible federal fund- d National Oceanic and Atmospheric Ad- ration approval of state coastal programs. uter Continental Shelf Lands Act also pro- for environmental impact statements, which be aided by proposed Interior Department equirements and bidding procedures. The Administration favors immediate develop- of offshore resources, even without a com- sive national policy. The Energy Supply f 1974, which was not enacted, provided opment guidelines which might have aided dministration in this area of development. ke-Florida)
2222

**E FIGHTING OIL POLLUTION WITH LES, BELTS AND BEADS,**
d.
e Digest, Vol 69, p 34-39, March 1971. 6 p, 4

iptors: *Oil spills, *Oily water, *Oil pollu- *Separation techniques, *Oil-water inter- Organic wastes, Water pollution treatment, Oil wastes, Waste water disposal.
fiers: *Oil tagging systems, *Oil herding ds, *Microbial degradation.

us techniques for combating and controlling lls are explored in this article. In addition, a survey of the history of oil spill cleanups is The article describes the various clean-up ns, such as natural detergents, chemical oil rs, and oil and water separation systems, n use. These systems, however, are generally able only in calm waters. Two experimental cts are currently under analysis in an attempt ve the open water problem. One of the pro- nvolves systems designed solely for installa- ear a final well which would capture leaking ne other involves the application of microbial dation. The idea of a chemical 'recipe' is also bed, whereby the oil in a ship's tank can be orarily turned into a gelatin so that is cannot Finally, since the solution in oil spills seems way, the article describes a new tagging n. Unlike the current fingerprint method now e, this method will be able to detect the ic ship responsible for the spill. (Hoffman- la)
12225

**ORICAL GUIDE TO FEDERAL WATER LUTION CONTROL LAWS AFFECTING D PROCESSING,**
omic Research Service, Washington, D.C.
Emerson.
able from Superintendent of Documents, Gov't Printing Office, Wash, DC, as 1:543, ERS-543. February 1974. 10 p, 8 ref, 1

riptors: *Governmental interrelations, eral jurisdiction, *Penalties(Legal), *Food ssing industry, Water pollution control, Water quality standards, Regulation, Water quality, Water utilization, State jurisdiction, History, Economics, Federal Water Pollution Control Act, Permits, Water resources development, Rivers and Harbors Act, Law enforcement, Water permits, Local governments.
Identifiers: *Environmental impact statement, History of federal regulation.

The role of the federal government in controlling water pollution originally emphasized financial support of state programs. Increasing federal concern led to the Federal Water Pollution Control Amendments of 1972, and use of effluent limitations and discharge permits. Deadlines for best practicable and best available standards were set of 1977 and 1983 respectively. Plants discharging to municipal facilities will be required to satisfy pretreatment standards and pay part of municipal capital and operating costs. The broad goals of current federal statutes are primarily concerned with area-wide management planning and continued assistance of municipal treatment plants. (Knocke-Florida)
W75-12226

**THE DEEPWATER PORTS ACT OF 1974; HALF SPEED AHEAD,**
R. Meltz.
Environmental Law Reporter, Vol 5, No 3, p 50043-50048, 1975. 6 p, 34 ref.

Descriptors: *Offshore platforms, *Harbors, *Legislation, *Oil industry, *International waters, Water pollution sources, Deep water, Oil, Oil pollution, Water pollution, Oil spills, Oil wastes, Environment, Environmental effects, Transportation, Federal government, Ships, Public health, Structures, Regulation.
Identifiers: *Hazardous substances(Pollution), Class action suits, Environmental policy, Licenses.

The immediate effect of the Deepwater Ports Act of 1974 is to extend federal jurisdiction to facilities beyond the territorial waters of the United States, thus filling the regulatory void which has deterred deepwater port development. This article considers the background, purposes, provisions, strengths, and weaknesses of the Act. Proponents of the Act argue that deepwater ports will aid the importation of oil and provide an economically and environmentally sound way of transporting large amounts of oil over long distances. The environmental provisions of the Deepwater Ports Act are discussed in relation to the specific environmental threats posed by superports and supertankers. Regulatory schemes set forth in the Act include preconstruction testing of potential port sites, licensing of ports by the Secretary of Transportation, and some supervision by the Environmental Protection Agency. The article discusses a wide spectrum of issues such as oil spillage, cleanup side-effects, land-based development, oceanographic effects, and human health and welfare. In conclusion the author states that the Deepwater Ports Act seems a reasonable legislative response to a complex problem. (Fernandez-Florida)
W75-12229

**TOXIC WATERS (DISCUSSION OF RECENT FEDERAL ACTION AGAINST WATER POLLUTION).**
Resources for the Future, Inc., Washington, D.C.
In: Resources, No 48, p 14-15, January 1975. 2 p, 1 illus.

Descriptors: *Judicial decisions, *Water pollution, *Public health, *Lake Superior, *Mining, Pollutants, Waste water(Pollution), Waste water treatment, Wastes, Water, Water pollution effects, Great Lakes, Lakes, Federal government, Legal aspects, Water law, Water Quality Act, Federal Water Pollution Control Act, Mine wastes, Water pollution sources.
Identifiers: *Hazardous substances(Pollution), Federal Water Pollution Control Act Amendments of 1972, Nuisance(Legal aspects).

Of particular interest in this issue of Resources is a discussion of the water pollution problems in Lake Superior caused by the Reserve Mining Company. Discussion focuses on the dumping of 67,000 tons of taconite tailings into the lake. As citizen concern mounted over the murkiness of the water, the federal government sued Reserve for violation of the Federal Water Pollution Control Act and the Refuse Act. Later, a substantial amount of a submicroscopic fiber was detected. Evidence exists that these fibers in the water supply might be a cause of gastrointestinal cancer. In response, the suit was amended to include the public health issue and several states and environmental groups have joined in the suit. The article further discusses the history of the case through the courts. It is not yet concluded and Reserve Mining has been allowed to continue operations pending final decision in the Circuit Court. Central to the controversy is the question whether there is sufficient evidence to conclude that the fibers are cancer-causing. Another crucial consideration is the extent of economic harm that will be caused if immediate shutdown is ordered. (Fernandez-Florida)
W75-12230

**SAVING OUR WATER RESOURCES,**
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 6G.
W75-12232

**THE ECONOMICS OF CLEAN WATER.**
Environmental Protection Agency, Washington, D. C.
Available from Superintendent of Documents, GPO, Washington, D.C., as EP 2.14:973. December 1973, 120 p, 60 tab.

Descriptors: *Economic feasibility, *Economic prediction, *Cost-benefit analysis, *Pollution abatement, Water pollution, Water pollution control, Water pollution treatment, Inflation(Economic), Industrial wastes, Cost analysis, Cost-benefit theory, Government finance, Industrial production.
Identifiers: *Non-point sources(Pollution), Hazardous substances.

This is the 1973 edition of a report prepared annually by the Environmental Protection Agency (EPA). After a survey of the nature of water pollution and of recent advances in understanding the subject, this document analyzes in detail the current pollution level status of 22 major rivers, ranking them in groups from 'cleanest' to 'dirtiest'. The focus then shifts to the cost of water pollution control; EPA estimates the total cost of constructing municipal treatment and collection facilities eligible for federal funding under the 1972 Federal Water Pollution Control Act (FWPCA) Amendments to by $60.1 billion. Of this sum about 35.9 billion is for treatment plants and new interceptor sewers. As for industrial plants (not including power plants), the highest estimate is that is will be necessary to invest an $11.9 billion (1972 dollars) by 1977 to meet the pollution abatement standards set for that year. In 1972, industry invested only about one billion dollars in water pollution control facilities. Various approaches to the problem of non-point source pollution are then discussed. After an analysis of the types of benefits which are derived from water quality enhancement, the different fiscal and other constraints on the achievement of desired improvements are enumerated and discussed. The study concludes with various arguments suggesting the continued feasibility of meeting the higher standards of pollution control set forth by the FWPCA Amendments of 1972 and asks but does not answer a 'fundamental question': At what point do the additional costs of controlling all sources of pollutants exceed the ad-

ditional benefits of improved water quality. (Gerlach-Florida)
W75-12233

**TOWARD A CLEANER AQUATIC ENVIRONMENT,**
Environmental Protection Agency, Washington, D. C. Office of Air and Water Programs.
K. M. Mackenthun.
Available from Superintendent of Documents, U. S. Govt Printing Office, Washington, D.C., as No 5501-00573, for $2.05. 1973, 273 p, 62 plate, 20 fig, 2 tab, 1 append, 102 ref.

Descriptors: *Pollution abatement, *Environment, *Environmental control, *Aquatic life, Water qualify, Environmental effects, Industries, Industrial wastes, Pollutants, Pollutant identification, Urbanization, Technology, Fish, Wastes, Oil, Slime, Rivers and Harbors Act, Water Quality Act, Water quality control, Lakes, Ponds, Streams.
Identifiers: Hazardous substances(Pollution), National Environmental Policy Act.

Positive action to ensure the attainment of protection from pollution and the enhancement of this country's environmental resources must be accelerated to compensate for continued pressures of population and industrial growth, urbanization, and technological changes. The key to success is dependent upon our ability to define and understand the quality and behavior of the aquatic environment. The author commences his study by examining the characteristics of the aquatic environment and environmental damage of recent years (e.g., dead fish, wastes, oil, slimes, etc.). Legal controls are then considered (e.g., the Rivers and Harbors Act of 1899, the National Environmental Policy Act of 1969, and the Water Quality Improvement Act of 1970). Consideration is also given to investigation of aquatic problems, the reporting of results, biological nuisances, health-related aquatic problems and government abatement and control programs. Investigative techniques are also described in detail for the pond, stream and lake environments. Additionally, methods of correcting the causes of slime, plant, and animal nuisances are considered. (Gagliardi-Florida)
W75-12234

**LIABILITY FOR OIL POLLUTION DISASTERS: INTERNATIONAL LAW AND THE DELIMITATION OF COMPETENCES IN A FEDERAL POLICY,**
Syracuse Univ., N. Y. Coll. of Law.
L. F. E. Goldie.
Journal of Maritime Law and Commerce, Vol 6, No 3, p 303-329, (1975). 27 p, 121 ref.

Descriptors: *Oil spills, *Water pollution control, *International law, Ships, Navigable waters, State governments, State jurisdiction, Supervisory control(Power), Federal government, Administration, Regulation, Jurisdiction, Coordination, Pollutant identification, Oil wastes, Nuclear wastes, Oily water, Legal aspects, Adoption and practices, International waters, Law of the sea, Treaties, Foreign countries.
Identifiers: *Absolute liability, Intergovernmental Maritime Consultative Organization(IMCO), Liability Convention(IMCO), Fund Convention(IMCO), Indemnification, Hazardous substances(Pollution), Oil Pollution Act, Territorial seas(Jurisdiction), FWPCA Amendments of 1972.

If the United States ratifies the Intergovernmental Maritime Consultative Organization's (IMCO's) Liability and Fund Conventions, the current relationship between the federal government and the states in the area of liability for oil spills will be altered. IMCO's Conventions represent a move towards absolute liability for harms caused by extrahazardous activities, and towards the establishment of an international fund providing compensation to the victims of maritime oil pollution accidents who are not otherwise protected by the Liability Convention. Adoption of these measures would make possible a uniform liability law, basis for damages, and process for recovery. The Oil Pollution Compensation Bill would make the provisions of the Liability and Fund Conventions part of the domestic law of the United States. If enacted, it would complement the Water Pollution Act Amendments of 1972 by defining and effectuating the claims of individuals and local and state government. Conflicts with pre-existing liability and indemnification laws of the various states, such as the Florida Act, would have to be worked out. However, the creation of a uniform basis of recovery, on a national level, would eliminate many inconsistencies arising from the resolution of claims under various policies and jurisdiction of the several states. (Parrish-Florida)
W75-12235

**LAND USE CONTROLS UNDER THE FEDERAL WATER POLLUTION CONTROL ACT: A CITIZEN'S GUIDE,**
National Resources Defense Council, Washington, D. C.
D. Donley, E. Moss, R. Outen, and G. Speth.
Environmental Law Reporter, Vol 5, p 50092-50101, May 1975. 10 p, 57 ref.

Descriptors: *Federal Water Pollution Control Act, *Land use, *Land management, Legislation, Water quality, Comprehensive planning, Land classification, Land development, Zoning, Pollutants, Water quality control, Abatement, Municipal wastes, Inter-agency cooperation, Water Quality Act, Water pollution, Water pollution control, Water pollution sources, Waste disposal, Waste treatment, Waste water(Pollution), Wastes.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Non-degradation policy, Municipal sewage treatment, Effluent limitations, Hazardous substances(Pollution), Non-point sources(Pollution).

The Federal Water Pollution Control Act Amendments in 1972 recognized that if water quality is to be protected, effective regulation of existing sources of water pollution must be coupled with land use planning and regulation of the location of new sources. Six provisions of the 1972 Amendments are concerned with planning. Section 208, the most important, provides a basis for regulating non-point sources of pollution, such as general runoff from agricultural or mining operations. Section 208 also strengthens statutory control over point source pollution by requiring establishment of regulations governing the location, modification, and construction of all facilities which may discharge pollutants. Other aspects of section 208 and a critical analysis of the Environmental Protection Agency's implementation of the section are presented in detail. Further, the 1972 Amendments mandate a non-degradation policy to prevent water bodies, whose actual water quality is better than that required by law, from being 'legally' downgraded to the standards. In addition, the Amendments provide construction standards for municipal sewage treatment plants. (Hoffman-Florida)
W75-12237

**1974 ANNUAL REPORT, GREAT LAKES BASIN COMMISSION.**
Great Lakes Basin Commission, Ann Arbor, Mich.
June 30, 1974. 20 p, 8 photo, 1 map, 1 tab.

Descriptors: *Lake basins, *Shores, *Great Lakes, *Comprehensive planning, *Management, Lakes, Long-term planning, Regional development, Multi-purpose projects, Economics, Water policy, Basins, Watersheds(Basins), Great Lakes Region, Planning, Coordination, Research and development, Water resources development, Future planning(Projected), Water management(Applied).
Identifiers: *Coastal zone management, Lake basin development, State policy.

A summary of the Great Lakes Basin Commission's coordinating activities is presented. Major activities include coastal zone management, shoreland damage reduction, survey of planning programs, international coordination and research, assessment of water and related land resources, public participation, and the Lake Erie Wastewater Management Demonstration Project. The Basin Commission is legally required to prepare a comprehensive plan for development of water and related land resources. This plan must include an inventory of basin resources, and an evaluation of the extent that those resources are being used, with projections for potential future use. The current status of this plan is presented, together with an analysis of other special studies carried on by the Commission. Further included, is a synopsis of the Great Lakes states' activities in water and related land resources planning fiscal year 1974. Finally, the financial statement of the Great Lakes Basin Commission is reported. (Hoffman-Florida)
W75-12238

**OREGON SURVEYS ITS HAZARDOUS WASTES,**
Oregon State Dept. of Environmental Quality, Portland.
P. H. Wicks, and M. Synak.
Environmental Science and Technology, Vol 8, No 13, p 1080-1084, December 1974. 5 p, 3 photo, 1 tab.

Descriptors: *Oregon, *Waste disposal, *Water quality standards, *Surveys, Industrial wastes, Sewage disposal, Legislation, Water pollution, Municipal wastes, Data collections, Evaluation, Penalties(Legal), Industries, Electric power industry, Disposal, Waste water disposal, Environmental sanitation, Water pollution control, Water pollution sources.
Identifiers: Disposal sites, Enforcement programs, Administrative regulations, Effluent limitations, Hazardous substances(Pollution).

The need for improved hazardous waste disposal practices, adequate planning, and enforcement resulted in the enactment of a waste disposal law by the Oregon Legislature. The Oregon Department of Environment Quality was given regulatory responsibility for the law. Major provisions of the law require the licensing of disposal sites, state ownership of disposal site property, and the designation of pesticide and low-level radioactive wastes as hazardous substances. To fully implement the goals of the law, surveys were undertaken to gather and evaluate information concerning all facets of hazardous waste disposal. The types of industries surveyed were selected on the basis of materials, chemicals, processes, or other factors which might result in the production of hazardous waste. The data obtained from these surveys are presented. Industries surveyed included electric utilities, metal manufacturers, paper manufacturers, and oil terminals. Utilizing the survey results, projections about future waste-related problems are given. (Hoffman-Florida)
W75-12239

**THOSE ELUSIVE 1985 WATER QUALITY GOALS.**
Professional Engineer, Vol 44, No 3, p 30-31, March 1975. 2 p, 3 photo.

Descriptors: *Research and development, *Comprehensive planning, *Federal Water Pollution Control Act, *Water demand, Water quality, Water management, Water supply, Water conservation, Water allocation(Policy), Pollutants, Municipal wastes, Economics, Dependable supply, Water quality control, Water policy, Technology.
Identifiers: Research and development funding, Control technology.

port of the U.S. General Accounting Office in-
es that it is doubtful that the Federal govern-
will meet the 1985 goal set by Congress to
nate the discharge of pollutants into the na-
s rivers. Current funding levels for water pol-
n research and development are the central
rs behind this grim forecast. The report in-
es that increased funding is necessary to
improvements in several vital areas.
arch is needed to determine how pollutants
nto the water, what happens to them, and their
t. Technology is needed to control pollution
industrial and non-point sources and to
mize the cost of treating municipal sewerage.
n an administrative viewpoint, there is need
a national plan to improve coordination of
r pollution research and development. Up to
present, much of the nation's water pollution
ts have been fragmented and diverse. A
al focal point is needed to coordinate the dis-
nation of research information so that
arch and development programs can be made
responsive to Environmental Protection
ncy operating programs, and the duplication of
arch efforts can be eliminated. (Hoffman-
ida)
-12242

**GH SOLID-WASTE LAWS BREWING ON TOL HILL.**
mical Engineering, Vol 82, No 2, p 56, 58,
ary 20, 1975. 2 p, 1 tab.

criptors: *Solid wastes, *Ultimate disposal,
ineration, *Landfills, Legislation, Chemical
es, Standards, Administration, Waste
osal, Waste dumps, Regulation, Permits,
ycling.
tifiers: Packaging waste, Hazardous wastes,
mical treatment, Solid-waste treatment
niques.

e stringent national legislation concerning
l waste handling is apparently in the offing.
proposed legislation focuses in two main
ctions: cutting down on packaging wastes, and
ping careful watch over hazardous wastes. All
mittees in the Senate are in agreement that
niques are needed to cope with the growing
me of packaging activity. There is a difference
pinion, however, as to the role the Environ-
tal Protection Agency (EPA) should play. The
mmerce Committee's version requires the EPA
et enforceable standards for the manufacture
packaging materials, while the Public Works
mittee only calls on the EPA to issue advisory
delines. The legislation concerning the
ardous wastes involves the establishment of a
ulatory framework that approximates current
and water legislation. The EPA would set stan-
ds and issue permits for disposal. Currently,
EPA is studying three basic technical options
hazardous waste management - incineration,
mical treatment, and special landfill. The
delines developed by these three studies will
ve to set the standards and regulations if the
posed legislation is passed. (Hoffman-Florida)
5-12243

**NEPA SETTLEMENT: CONSERVATION UNCIL OF NORTH CAROLINA V. OEHLKE,**
rthwestern Univ., Evanston, Ill. School of
v.
primary bibliographic entry see Field 6E.
5-12244

**E WATER POLLUTION PERMITTING STEM,**
ion Bank and Trust Co., Montgomery, Ala.
A. Leslie.
e Alabama Lawyer, Vol 35, No 2, p 192-201
74). 10 p.

Descriptors: *Alabama, *Permits, *State governments, *Water pollution control, Water pollution treatment, Water quality control, Governmental interrelations, Federal government, Federal Water Pollution Control Act, State jurisdiction, Water quality standards, Regulation, Law enforcement.

The Alabama Water Improvment Commission has adopted water quality standards and regulations. Enforcement mechanisms include permits which must be obtained by persons discharging pollutants, in order to avoid civil and criminal Penalties. Plans are submitted describing the facility, which may lead to a Commission study. Following public hearings, a permit is issued which specifies effluent limitations. Further controls include Attorney General prosecution following failure to appeal a Commission order. Appeal via public hearings before the Commission allows immediate enforcement by the Attorney General if the order is reaffirmed at the hearing. State permits are issued following construction, using Federal Environmental Protection Agency guidelines, and run for an indefinite period. The Commission also certifies federal permits to ensure that local sources meet the performance standards of the Environmental Protection Agency. (Knocke-Florida)
W75-12245

**ENFORCING INTERNATIONAL LAW: U.S. AGENCIES AND THE REGULATION OF OIL POLLUTION IN AMERICAN WATERS,**
Maryland Univ., College Park. Dept. of Political Science.
D. E. Milsten.
Journal of Maritime Law and Commerce, Vol 6, No 2, p 273-285 (1975). 13 p, 33 ref.

Descriptors: *Federal Water Pollution Control Act, *Coast Guard regulations, *Oil spills, *Federal jurisdiction, International law, International waters, Oil pollution, Law of the sea, Administrative agencies, Administrative decisions.
Identifiers: *Enforcement(International).

The 1970 Federal Water Pollution Control Act (FWPCA) prohibits discharge of oil within the twelve mile contiguous zone. Any 'visible sheen' of oil on the water subjects oil spillers to civil and criminal penalties, but the act stresses cleanup and prevention. Presidential authority and Coast Guard decisions to prosecute indicate that the United States has an option to expand and enforce international standards through simple spill definitions. The author examines the conflict between a preventive or clean-up program versus the consequences of stiff enforcement, which is inherently limited beyond waters immediately adjacent to the United States coastline. (Knocke-Florida)
W75-12246

**ADMIRALTY'S POWER IN RE OIL POLLUTION (STATES ABLE TO SET MORE STRINGENT PENALTIES),**
J. H. Scherr.
Natural Resources Lawyer, Vol 7, No 4, p 635-653 (1974). 19 p, 133 ref.

Descriptors: *Florida, *Oil spills, *Water Quality Act, *State jurisdiction, Federal jurisdiction, Federal-state water rights conflicts, Governmental interrelations, Reservation doctrine, Constitutional law, Pollution taxes(Charges).
Identifiers: *Strict liability.

Florida's Oil Spill Prevention and Pollution Control Act is not an unconstitutional intrusion into the federal maritime domain, nor is it preempted by the Federal Water Quality Improvement Act, although Florida's strict liability for spills from any vessel imposes standards more stringent than federal legislation. Special definition of the additional or supplemental police power and the twilight zone between state and federal powers have allowed escape from strict uniformity requirements. However, existing case law provides only a first step towards full recognition of state power to enact a law more stringent than the Federal Water Quality Improvement Act. (Knocke-Florida)
W75-12248

**RECOGNITION OF SUBSTANTIVE RIGHTS UNDER NEPA,**
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 6E.
W75-12250

**A SOLUTION TO THE PROBLEM OF PRIVATE COMPENSATION IN OIL DISCHARGE SITUATIONS,**
T. R. Post.
University of Miami Law Review, Vol 28, No 3, p 524-550 (1974). 25 p, 138 ref.

Descriptors: *Penalties(Legal), *Oil pollution, *Oil spills, *Navigable waters, *Legal aspects, Law of the sea, Judicial decisions, Negligence, Trespass, Water pollution, Water pollution sources, Oily water, Oil, Oil wastes, Disasters, Waste water(Pollution), Oil industry, Riparian rights, Water law, Common law, International law, Water rights, Legislation, Non-structural alternatives, Federal Water Pollution Control Act.
Identifiers: *Liability(Legal aspects), Environmental policy, Federal Water Pollution Control Act Amendments of 1972, International torts, International agreements, Non-print sources(Pollution), Nuisance(Legal aspects), Territorial waters.

Discharges of oil from vessels on the navigable waters of the United States and the resultant injury to the environment and population is the topic of this article. This paper examines the question of whether those who are damaged by such discharges can adequately obtain compensation for their injuries. First the author discusses the choice of a forum for relief, that is, whether a plaintiff should institute his suit in a federal or state court. Traditional concepts of tort liability, such as trespass, negligence, and nuisance, are considered with regard to their adequacy as a basis for compensation. It is suggested that an examination of the common law concepts of tort liability from the claimant's standpoint reveals numerous inadequacies in the relief available for damage suffered as a result of a vessel's discharge of oil on navigable waters. Compensation based on maritime concepts of liability is considered. The article points out that there is no present provision for relief under any International Conventions nor under the Federal Water Pollution Control Act. Related state statues are discussed. In conclusion, the author suggests, that in order to enhance the availability of effective compensation for victims of a vessel's discharge of oil on the navigable waters of the United States, the federal government should establish a fund to provide compensation. (Fernandez-Florida)
W75-12254

**DIKED DISPOSAL AREA SITE NO 12, CLEVELAND HARBOR, CUYAHOGA COUNTY, OHIO.**
Army Engineer District, Buffalo, N. Y.
For primary bibliographic entry see Field 5E.
W75-12255

**WATER QUALITY MANAGEMENT BASIN PLANS--POLICIES AND PROCEDURES.**
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 39, No 107, Part II, p 19631-19644, June 3, 1974. 14 p.

Descriptors: *Administrative agencies, *Regulation, *Water quality control, *Research

and development, *River basin development, Water basins, Federal government, Federal Water Pollution Control Act, Permits, Comprehensive planning, Future planning(Projected), Long-term planning, Project planning, Non-structural alternatives, Management, Water management(Applied), Water resources development, State governments, Governmental interrelations, Water conservation.
Identifiers: *Administrative regulations, *Federal Water Pollution Control Act Amendments of 1972, Environmental Protection Agency, Environmental policy, Hazardous substances(Pollution), Non-point sources(Pollution), National Pollutant Discharge Elimination System, State policy.

The purpose of this Environmental Protection Agency notice is to amend 40 CFR to add a new Part 130--Policies and Procedures for State Continuing Planning Process. Section 303(e) of the Federal Water Pollution Control Act requires each state to submit a continuing planning process which is consistent with the Act. These final regulations, which describe the necessary elements of a state's continuing planning process, provide policies and procedures for review, revision, and approval. In addition the regulations provide a mechanism for states to satisfy their responsibilities with respect to critical waters and total maximum daily loads, reports on water quality and related information, clean lakes, estimates of construction needs for publicly-owned treatment works, and federal reports on water quality. Further, 40 CFR is amended to add a new Part 131--Preparation of Water Quality Management Basin Plans. The regulations describe the requirements for preparation of basin plans and the procedures governing basin plan adoption, submission, revision, and approval. (Fernandez-Florida)
W75-12260

**IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS.**
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 39, No 126, Part II, p 24114-24147, June 28, 1974. 34 p.

Descriptors: *Administrative agencies, *Regulation, *Effluents, *Iron, *Steel, Metals, Iron alloys, Alloys, Wastes, Water pollution sources, Federal government, Sewage effluents, Air pollution, Discharge(Water), Industrial wastes, Liquid wastes, Sanitary engineering, Waste water(Pollution), Waste water disposal, Water pollution.
Identifiers: *Administrative regulations, *Effluent limitations, *Pretreatment standards(Effluent), Environmental policy, Federal Water Pollution Control Act Amendments of 1972, National Pollutant Discharge Elimination System, Environmental Protection Agency.

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the iron and steel manufacturing category of point sources, by amending 40 CFR, Chapter 1, Subchapter N, to add a new Part 420. Guidelines are established for the following subcategories: by-product coke, beehive coke, sintering, blast-furnace (iron), blast-furnace (ferromanganese), basic oxygen furnace (semiwet air pollution control methods), basic oxygen furnace (wet air pollution control methods), open hearth furnace, electric arc furnace (semiwet air pollution control methods), electric arc furnace (wet air pollution control methods), vacuum degassing, and continuous casting. The Environmental Protection Agency simultaneously proposes a separate provision stating the application of the limitations and standards set forth below to users of publicly owned treatment works. Notice is also given of proposed regulations setting forth the application of effluent limitations guidelines for existing sources to pretreatment standards for incompatible pollutants. (Fernandez-Florida)
W75-12264

**CANNED AND PRESERVED SEAFOOD PROCESSING POINT SOURCE CATEGORY--EFFLUENT LIMITATIONS GUIDELINES.**
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 39, No 124, Part II, p 23134-23156, June 26, 1974. 23 p.

Descriptors: *Food processing industry, *Foods, *Administrative agencies, *Regulation, *Effluents, Crabs, Wastes, Water pollution sources, Federal government, Sewage effluents, Air pollution, Discharge(Water), Shellfish, Industrial wastes, Liquid wastes, Sanitary engineering, Waste water(Pollution), Waste water disposal, Shrimp, Water pollution, Industries, Pollutants, Canneries, Fish.
Identifiers: *Administrative regulations, *Effluent limitations, *Pretreatment standards(Effluent), Environmental policy, Federal Water Pollution Control Act Amendments of 1972, National Pollutant Discharge Elimination System, Environmental Protection Agency.

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the Canned and Preserved Seafood Processing category of point sources by amending 40 CFR Chapter 1, Subchapter N, to add a new Part 408. Subcategories of processing regulated include: farm-raised catfish, conventional blue crab, mechanized blue crab, Alaskan crab, dungeness and tanner crab, Alaskan shrimp, northern shrimp, southern shrimp, and tuna. The Environmental Protection Agency simultaneously proposes a separate section stating the applicaton of the limitations and standards to users of publicly owned treatment works which are subject to pretreatment standards under the Federal Water Pollution Control Act. Notice is also given of proposed regulations concerning the application of effluent limitations guidelines for existing sources to pretreatment standards for incompatible pollutants. (Fernandez-Florida)
W75-12265

**FERTILIZER MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS AND PROPOSED LIMITATIONS.**
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 39, No 68, Part III, p 12832-12844, April 8, 1974. 13 p.

Descriptors: *Administrative agencies, *Regulation, *Effluents, *Fertilizers, Ammonium compounds, Nitrates, Nitrogen compounds, Phosphates, Treatment, Waste water disposal, Water pollution treatment, Treatment facilities, Administration, Federal government, Wastes, Sewage effluents, Water pollution sources, Discharge(Water), Industrial wastes, Waste water(Pollution), Water pollution, Ureas.
Identifiers: *Administrative regulations, *Effluent limitations, *Pretreatment standards(Effluent), Federal Water Pollution Control Act Amendments of 1972, Hazardous substances(Pollution).

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the fertilizer manufacturing category of point sources, by amending 40 CFR Chapter 1, Subchapter N, to add a new part 418. Subcategories regulated include: phosphate, ammonia, urea, ammonium nitrate, and nitric acid. Limitations guidelines are established representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available and economically achievable. Additionally, the Environmental Protection Agency simultaneously proposes a separate provision stating the application of the limitations and standards to users of publicly-owned treatment works which are subject to pretreatment standards under the Federal Water Pollution Control Act. Notice is given of proposed regulations concerning the application of effluent limitations guidelines for existing sources to pretreatment standards for incompatible pollutants. (Fernandez-Florida)
W75-12266

**TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS.**
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 76, Part II, p 13942-13954, April 18, 1974. 13 p.

Descriptors: *Administrative agencies, *Regulation, *Effluents, *Lumber, *Standards, Industrial wastes, Bark, Hardwood, Federal Water Pollution Control Act, Waste water(Pollution), Water pollution, Chemical wastes, Water Quality Act, Treatment, Administration, Federal government, Trees, Permits, Legal aspects, Legislation, Water policy, Wastes, Water pollution sources, Sewage, Effluents, Discharge(Water).
Identifiers: *Administrative regulations, *Effluent limitations, *FWPCA Amendments of 1972, *Pretreatment standards(Effluent), Environmental policy, Hazardous substances(Pollution), National Pollutant Discharge Elimination System.

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the timber products processing category of point sources, by amending 40 CFR Chapter 1, Subchapter N, to add a new Part 429. This final rulemaking is promulgated pursuant to the Federal Water Pollution Control Act. Guidelines are established for the following subcategories: barking, veneer, plywood, hardboard-dry process, hardboard-wet process, wood preserving, wood preserving-steam, and wood-preserving-boultonizing. Additionally, the Environmental Protection Agency simultaneously proposes a separate provision stating the application of the limitations and standards to users of publicly owned treatment works. Notice is given of proposed regulations concerning the application of effluent limitations guidelines for existing sources to pretreatment standards for incompatible pollutants. (Fernandez-Florida)
W75-12267

**ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS AND PROPOSED APPLICATION TO PRETREATMENT STANDARDS.**
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 81, Part II, p 14676-14685, April 25, 1974. 10 p.

Descriptors: *Administrative agencies, *Regulation, *Effluents, *Organic wastes, *Chemical wastes, Chemicals, Standards, Industrial wastes, Organic compounds, Federal Water Pollution Control Act, Waste water(Pollution), Water pollution, Water Quality Act, Treatment, Administration, Federal government, Permits, Legal aspects, Legislation, Water pollution sources.
Identifiers: *Administrative regulations, *Effluent limitations, *FWPCA Amendments of 1972, *Pretreatment standards(Effluent), Environmental policy, Hazardous substances(Pollution), National Pollutant Discharge Elimination System.

The purpose of this notice is to establish final effluent limitations guidelines for existing sources

ndards of performance and pretreatment
ls for new sources in the organic chemicals
cturing category of point sources, by
g 40 CFR Chapter 1, Subchapter N, to add
Part 416. This final rulemaking is promul-
ursuant to the Federal Water Pollution
Act. Subcategories regulated include:
ous processes, processes with water con-
steam diluent or absorbent, and aqueous
hase reaction systems. Additionally, the
mental Protection Agency simultaneously
s a separate provision stating the applica-
the limitations and standards set forth
users of publicly-owned treatment works
re subject to pretreatment standards.
s also given of proposed regulations con-
the application of effluent limitations
es for existing sources to pretreatment
s for incompatible pollutants. (Fernandez-

68

ND DETERGENT MANUFACTURING
SOURCE CATEGORY--EFFLUENT
TIONS GUIDELINES.
nental Protection Agency, Washington,

Register, Vol 39, No 72, Part II, p 13370-
pril 12, 1974. 28 p.

ors: *Administrative agencies,
ion, *Effluents, *Detergents, *Soaps,
es, Federal Water Pollution Control Act,
ater(Pollution), Water pollution, Chemi-
es, Chemicals, Water Quality Act, Treat-
dministration, Federal government, Per-
gal aspects, Legislation, Water policy,
Water pollution sources, Sewage ef-
Discharge(Water), Industrial wastes.
rs: *Administrative regulations, *Effluent
ns, *Federal Water Pollution Control Act
ents of 1972, *Pretreatment stan-
fluent), Environmental policy,
us substances(Pollution), National Pollu-
harge Elimination System.

ose of this notice is to establish final ef-
nitations guidelines for existing sources
dards of performance and pretreatment
s for new sources in the soap and deter-
ufacturing category of point sources, by
g 40 CFR Chapter 1, Subchapter N, to add
art 417. This final rulemaking is promul-
rsuant to the Federal Water Pollution
Act, as amended Subcategories regulated
soap manufacturing by batch kettle, fatty
ufacturing by fat splitting, soap manufac-
fatty acid neutralization, glycerine con-
n, glycerine distillation, manufacture of
kes and powders, manufacture of bar
anufacture of liquid soaps, oleum sul-
and sulfation, air-SO3 sulfation and sul-
SO3 solvent and vacuum sulfonation,
acid sulfation, chlorosulfonic acid sulfa-
tralization of sulfuric acid esters and sul-
ds, and the manufacture of various deter-
ditionally, the Environmental Protection
imultaneously proposes a separate provi-
ng the application of the limitations and
to users of publicly owned treatment
ernandez-Florida)
9

PRODUCTS--PROPOSED EFFLUENT
NES AND PERFORMANCES AND
ATMENT STANDARDS FOR NEW
S.
ental Protection Agency, Washington,

egister, Vol 39, No 2, Part III, p 938-949,
, 1974. 12 p.

rs: *Wood wastes, *Federal Water Pol-
ntrol Act, *Lumber, *Water quality stan-
ater pollution control, Industrial plants,
posal, Industrial wastes, Water pollution

sources, Pulp wastes, Lumbering, Pulp and paper industry, Construction materials.
Identifiers: *Plywood, *Veneer, Timber products processing.

Subcategories under the timber products processing category of the Federal Water Pollution Control Act are regulated as eight subcategories, according to their effluent characteristics, and classed as new point sources under this proposed regulation. Subcategories of barking, veneer, plywood, hardboard-dry process, hardboard-wet process, wood preserving, wood preserving-steam, and wood preserving boultonizing are each considered according to waste categorization, treatment and control technology, daily maximum effluent limitations, non-water quality aspects of pollution control, economic impact analysis. A summary of public participation and comment is provided. (Hoffman-Florida)
W75-12270

**BEET SUGAR PROCESSING POINT SOURCE SUBCATEGORY--EFFLUENT GUIDELINES AND STANDARDS.**
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 22, Part II, p 4034-4040, January 31, 1974. 7 p.

Descriptors: *Sugar beets, *State governments, *Odor, State jurisdiction, Condensation, Fog, Water pollution, Discharge(Water), Sugar crops, Air pollution effects, Agriculture, Energy conversion, Energy dissipation.
Identifiers: *Beet sugar.

The beet sugar subcategory within the point source category of sugar processing, under the Federal Water Pollution Control Act, establishes final effluent limitation guidelines on performance and pretreatment standards for new sources in the subcategory. The Environmental Protection Agency also applies these standards to users of publically-owned treatment works, but only those subject to pretreatment standards under the Act. Final regulations differ from those proposed, in regulation of plants by 1983 effluent guidelines and monolithic subcategorization of the industry. Energy requirements, fogging from condenser water, odor from increased land disposal, definition of effluent load and effect on state water rights are also specifically covered by the final regulation. (Hoffman-Florida)
W75-12271

**FERTILIZER MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT LIMITATIONS AND GUIDELINES.**
Environmental Protection Agency, Washington D.C.
Federal Register, Vol 39, No 195, Part II, p 36094-36099, October 7, 1974. 6 p.

Descriptors: *Fertilizers, *Water pollution sources, *Federal Water Pollution Control Act, *Ammonium compounds, Chemicals, Agricultural chemicals, Water pollution, Energy, Fertilization, Administrative agencies, Data collections, Data transmission, Pretreatment(Water).
Identifiers: *Mixed and blend fertilizers.

Proposed effluent limitations and guidelines for new sources within the fertilizers category add subcategories of ammonium sulfate and mixed and blend, under the Federal Water Pollution Control Act and its administration by the Environmental Protection Agency. Point source effluents are to meet the best practicable and best available standards by 1977 and 1983 respectively, and new categories data and standards are to be periodically developed according to the unique requirements and technologies of pretreatment standards. Ammonium sulfate produces waste in water as ammonium, while mixed and blend fertilizers produce no direct liquid waste. Specific treatment and control technology, costs, energy requirements, and public and administrative reaction to the proposals are considered. (Hoffman-Florida)
W75-12272

**MEAT PRODUCTS POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS.**
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 41, Part II, p 7894-7908, February 28, 1974. 15 p.

Descriptors: *Effluents, *Industrial wastes, *Water quality standards, *Regulation, *Waste treatment, Wastes, Water pollution sources, Discharge(Water), Water pollution standards, Control, Performance, Administrative agencies, Federal government, Treatment, Waste water treatment, Cleaning, Environmental effects.
Identifiers: *Administrative regulations, *Effluent limitations, *Federal Water Pollution Control Act Amendments of 1972, *Pretreatment standards(Effluent), *Environmental Protection Agency, Environmental policy, Hazardous substances(Pollution).

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the meat products category of point sources, by amending 40 CFR Chapter 1, Subchapter N, to add a new Part 432. Guidelines are promulgated for new sources within the simple slaughterhouse, complex slaughterhouse, low-processing packinghouse, and high-processing packinghouse subcategories. Further delineated are effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available, as well as the best available technology economically achievable. In addition, the Environmental Protection Agency proposes a separate provision which states the application of the limitations and standards to users of publicly owned treatment works which are subject to pretreatment standards under Federal Water Pollution Control Act. Notice is also given, pursuant to the Act, of proposed regulations concerning the application of effluent limitations guidelines for incompatible pollutants. (Fernandez-Florida)
W75-12273

**GRAIN MILLS POINT SOURCE CATEGORY--EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS.**
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 55, Part II, p 10512-10520, March 20, 1974. 9 p.

Descriptors: *Administrative agencies, *Regulation, *Effluents, *Mills, *Grains(Crops), Wheat, Rice, Corn(Field), Standards, Water pollution, Treatment, Water treatment, Waste treatment, Federal government, Wastes, Water pollution sources, Sewage effluents, Discharge(Water), Industrial wastes, Waste water(Pollution), Waste water disposal.
Identifiers: *Administrative regulations, *Effluent limitations, *Pretreatment standards(Effluent), Federal Water Pollution Control Act Amendments of 1972, Hazardous substances(Pollution), Environmental Protection Agency.

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the grain mills category of point sources by amending 40 CFR Chapter 1, Subchapter N, to add a new Part 406. Subcategories regulated include: corn wet milling, corn dry milling, normal wheat flour milling, bulgur wheat flour milling, normal rice milling, and parboiled rice processing. These regulations

govern the discharge of pollutants into navigable waters. Additionally, the Environmental Protection Agency hereby gives notice of proposed regulations concerning the application of effluent limitations guidelines for existing sources to pretreatment standards for incompatible pollutants. Further, rules are proposed to regulate users of publicly owned treatment works which are subject to pretreatment standards. (Fernandez-Florida)
W75-12274

**PLASTICS AND SYNTHETIC POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS.**
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 67, Part 11, p 12502-12525, April 5, 1974. 24 p.

Descriptors: *Administrative agencies, *Regulation, *Effluents, *Plastics, *Treatment, Water pollution treatment, Water treatment, Resins, Standards, Treatment facilities, Administration, Federal government, Wastes, Sewage effluents Water pollution sources, Discharge(Water), Industrial wastes, Waste water(Pollution), Water pollution, Waste water disposal.
Identifiers: *Administrative regulations, *Effluent limitations, *Pretreatment standards(Effluent), Federal Water Pollution Control Act Amendments of 1972, Hazardous substances(Pollution).

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the plastics and synthetics category of point sources by amending 40 CFR Chapter 1, Subchapter N, to add a new Part 416. Subcategories regulated include: polyvinyl chloride, polyvinyl acetate, polystyrene, polypropylene, polyethylene, cellophane, rayon, acrylonitrile-butadienestyrene (ABS) and styrene-acrylonitrille (SAN) resin copolymers, polyster, nylon 66, nylon 6, cellulose acetate and acrylics. Additionally, the Environmental Protection Agency simultaneously proposes rules stating the application of the limitations and standards to users of publicly owned treatment works subject to pretreatment standards under the Federal Water Pollution Control Act. Further, notice is hereby given of proposed rules concerning the application of effluent limitations guidelines for existing sources to pretreatment standards for incompatible pollutants. (Fernandez-Florida)
W75-12275

**NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS AND PROPOSED LIMITATIONS.**
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 68, Part II, p 12822-12830, April 8, 1974. 9 p.

Descriptors: *Administrative agencies, *Regulation, *Effluents, *Standards, *Metals, Aluminum, Treatment, Waste water disposal, Water pollution treatment, Water treatment, Treatment facilities, Administration, Federal government, Wastes, Sewage effluents, Water pollution sources, Discharge(Water), Industrial wastes, Waste water(Pollution), Water pollution.
Identifiers: *Administrative regulations, *Effluent limitations, *Pretreatment standards(Effluent), Federal Water Pollution Control Act Amendments of 1972, Hazardous substances(Pollution).

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the nonferrous metals manufacturing category of point sources by amending 40 CFR Chapter 1, Subchapter N, to add a new Part 421. Guidelines are established for the following subcategories: bauxite refining, primary aluminum smelting, and secondary aluminum smelting. Limitations are established representing the degree of effluent reduction attainable by the application of the best practical control technology currently available and economically achievable. In addition, the Environmental Protection Agency simultaneously proposes rules regarding the application of the limitations and standards to users of publicly owned treatment works which are subject to pretreatment standards under the Federal Water Pollution Control Act. Notice is given regarding the application of effluent limitations guidelines for existing sources to pretreatment standards for incompatible pollutants. (Fernandez-Florida)
W75-12276

**INTRODUCTION OF S433 (BILL FOR SAFE DRINKING WATER).**
For primary bibliographic entry see Field 6E.
W75-12280

**UNITED STATES V. DEXTER CORP. (APPEAL BY SANITARY DISTRICT FROM CONVICTION FOR DISCHARGE OF MANUFACTURING REFUSE INTO NAVIGABLE WATERS).**
For primary bibliographic entry see Field 6E.
W75-12283

**TRAIN V. CITY OF NEW YORK (CLASS ACTION BY CITY TO COMPEL EPA TO ALLOT FUNDS AUTHORIZED BY THE 1972 FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS).**
For primary bibliographic entry see Field 6E.
W75-12284

**TRAIN V. CAMPAIGN CLEAN WATER, INC. (ACTION BY ENVIRONMENTAL GROUP TO REQUIRE EPA TO RELEASE FUNDS AUTHORIZED FOR FEDERAL GRANTS TO MUNICIPALITIES FOR WATER POLLUTION CONTROL.**
For primary bibliographic entry see Field 6E.
W75-12285

**WETZEL V. A. DUDA AND SONS (ACTION BY RIPARIAN PROPERTY OWNERS TO ENJOIN WATER POLLUTION TO LAKE FROM FARMING OPERATIONS).**
For primary bibliographic entry see Field 6E.
W75-12286

**COLORADO PUBLIC INTEREST RESEARCH GROUP, INC. V. TRAIN (CITIZEN SUIT TO COMPEL THE ENVIRONMENTAL PROTECTION AGENCY TO CONTROL DISCHARGE OR RADIOACTIVE MATERIALS INTO NAVIGABLE WATERS).**
For primary bibliographic entry see Field 6E.
W75-12287

**GULF SHORE SEAFOOD AND COMPANY V. CITIES SERVICE CO. (ACTION FOR DAMAGES ARISING FROM DAM BREAK OF PHOSPHATE COMPANY'S DAM PERMITTING PHOSPHATE SLIME POLLUTION OF RIVER).**
For primary bibliographic entry see Field 6E.
W75-12291

**VALIDITY, UNDER FEDERAL CONSTITUTION, OF STATE STATUTE OR LOCAL ORDINANCE REGULATING PHOSPHATE CONTENT OF DETERGENTS,**
For primary bibliographic entry see Field 6E.
W75-12293

**UNITED STATES V. ASHLAND OIL AND TRANSPORTATION CO. (APPEAL FROM FINDING THAT DEFENDANT HAD VIOLATED FWPCA AMENDMENTS OF 1972 BY DISCHARGING OIL INTO NAVIGABLE STREAM).**
For primary bibliographic entry see Field 6E.
W75-12294

**PROCESS FOR RAW WATER CLARIFICATION,**
American Cyanamid, Stamford Conn. (assignee).
For primary bibliographic entry see Field 5F.
W75-12300

**WATER CONSERVATION IN SWEDEN: IL POLLUTION CONTROL,**
National Swedish Environment Protection Board, Stockholm.
A. Liedberg, and I. Olsson.
Journal Water Pollution Control Federation, Vol 47, No 4, p 669-672, April, 1975.

Descriptors: *Legislation, *Waste water treatment, *Pollution abatement, Urbanization, Population, Detergents, Eutrophication, Bodies of water, Environmental effects, Treatment facilities, Municipal wastes, Sludge treatment, Sludge disposal.
Identifiers: *Sweden, Environmental Protection Act.

During the last century there has been a definite redistribution of population in Sweden from almost 90% rural to over 80% urban. At the same time the population has doubled. Heavy pollution in lakes, rivers, and coastal waters occurred as a result of the urbanization, population growth, and municipal waste regulations. Eutrophication was increased by the use of synthetic detergents. In the 1960's the Swedish government instituted action programs and policy goals to prevent further deterioration of the environment. The Environmental Protection Act became effective in 1969 to regulate the use of land and supervision of activities hazardous to the environment. Prior to the enactment of the Environmental Protection Act only 50% of the urban households were connected to biological treatment plants, 25% to primary treatment plants, and 25% no treatment plants. Presently 50.6% are connected to chemical and biological/chemical treatment, 40.6% biological treatment, 7.8% sedimentation and 1% no treatment. Technological progress and governement grants as well as legislation and political goals resulted in this rapid progress. Guidelines for the treatment and disposal of sludge are in preparation. Positive effects of these programs have been the restoration of heavily polluted areas, decrease in algal growth, and a recolonization by fish. (Dean-FIRL)
W75-12317

**ARE CHEMICALS USED ALGAE CONTRO BIODEGRADABLE.**
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5C.
W75-12325

**HOW TO EVALUATE WATER MAIN CAPAC TIES, PART I,**
For primary bibliographic entry see Field 8B.
W75-12329

**ENVIRONMENTAL WATER QUALITY PR GRAM,**
Chicago Dept. of Aviation, Ill.
M. F. Obrecht, W. E. Downes, and R. W. Valiqu
Heating, Piping, Air Conditioning, Vol 47, No 6 47-53, June, 1975. 10 ref.

Descriptors: *Airports, *Water pollution contr *Water quality, Administration, Oil spills, Ind

wastes, Sewage, Fuels, Illinois, *Monitoring,
utant identification.
ifiers: Chicago(Ill).

istory of the O'Hare Water Quality Section
Department of Aviation, City of Chicago, Il-
, is discussed from its beginning in October
to the present. The ultimate objective of the
am is to allow the airport to maintain strict
liance with existing and future regulations
gh continuous monitoring and testing. The
re International Airport has the typical
tions of most major airports including: air-
fueling and maintenance; vehicle servicing;
ft lavatory servicing; continuous construc-
and remodeling; land fill; and, grading. A
r Quality Control Program has been
oped. An emergency oil spill plan is part of
aster program. Communication equipment,
ble booms, sorbent material, pump-out and
ning equipment, shovels, sledgehammers,
, lines, boots, lifejackets, available holding
and earth moving equipment are some of
uipment necessary for an efficient oil con-
ent and removal program. The Technical
ittee for Present and Future Water Control
cts was formed to be representative of all the
s of the airport. The committee will discuss
ons and common problems, pass resolu-
and field test proposed solutions. The
ishment of a Master Water Quality Control
am is believed to be necessary for the com-
e with present and future water quality stan-
at any airport. The program instituted at
e may also be applied to tank farms, railroad
als, and industrial complexes. (Orr-FIRL)
2331

**H WEST: A DIRTY INHERITANCE.**
, No 3, p 19-22, April, 1975. 3 fig.

ptors: *Water sources, *Water pollution,
supply, Administration, Planning, Recrea-
acilities, Investment, Rivers, Estuaries,
ies.
iers: England, River management, Coastal
.

orth West Water Authority covers the area
northwest England including Liverpool,
ester, and the Lake District with a popula-
f approximately seven million. For many
the water supply for both Manchester and
ool has come from the Lake District and
Wales. As a result little concern was shown
the discharge of effluents into the rivers
g pollution. Some of the tasks facing the
West Water Authority are improving water
ution in rural areas, sewerage in the rural
and the pollution in the Mersey Belt and
arts of the region. Future industrial and re-
al development of the area is an important
in the North West Water Authority's capital
g along with cooperation with the local
ties. The future organization of the
ity will include seven divisions, five of
will be in the heavily populated southern
the area. There will be a single division for
nanagement. Water recreation needs are
r of the Authority's concerns. The Lake
t is a well known recreational area as well as
stal resorts. Some of the coastal waters are
table for boating or other water sports. The
ty hopes to expand recreation on the waters
its jurisdiction nearer population centers.
evelopment of fisheries and recreational
s as well as the clean up of coastal waters,
and estuaries will require major invest-
(Dean=FIRL)
336

**RICAL AND LEGAL ASPECTS OF**

nary bibliographic entry see Field 6G.
337

**HOW WELL ARE WE HANDLING TOXIC WASTE.**
For primary bibliographic entry see Field 5E.
W75-12342

**AERATION UPGRADES RESERVOIR,**
Escondido Mutual Water Co., Calif.
For primary bibliographic entry see Field 5F.
W75-12346

**PROCEEDINGS OF THE ANNUAL CONFERENCE OF THE BRITISH COLUMBIA WATER AND WASTE ASSOCIATION.**
For primary bibliographic entry see Field 5F.
W75-12350

**WATER QUALITY MANAGEMENT IN A METROPOLITAN AREA,**
British Columbia Univ., Vancouver. Westwater Research Centre.
A. H. J. Dorcey, and K. J. Hall.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 195-217. 4 fig, 11 tab, 8 ref.

Descriptors: *Municipal wastes, *Water pollution sources, *Water pollution control, *Water quality control, Biochemical oxygen demand, Indicator organisms, Coliforms, Pesticides, Chlorinated hydrocarbons, Heavy metals, Rivers, Nutrients, Nitrogen, Phosphorus, Phenols, Organic pollutants, Canada, Foreign research.
Identifiers: Lower Fraser River, Vancouver(B.C.).

The information required for water quality management in a metropolitan area, specifically the Lower Fraser Estuary of metropolitan Vancouver, British Columbia, Canada, is discussed. The parameters to be considered in water quality management include dissolved oxygen, BOD, pollution indicator microorganisms (total coliforms, fecal coliforms, and fecal streptococci), nutrients (mainly nitrogen and phosphorus), trace metals, pesticides, and other toxic substances, such as hydrocarbons, phenols, and other organic compounds. The data collected show that pathogenic microorganisms, trace metals, and pesticides resulting from the metropolitan Vancouver area all present potential pollution problems. Information must be generated to determine the sources of these pollutants if the quality of the water environment in the Lower Fraser is to be managed. The information presently available is inadequate for determining the sources and for developing management plans. Data from the California Bight and New York City are illustrated to show the importance of pollution source information in determining whether the implementation of a particular management plan will be effective in producing the desired improvement in water quality. Current studies are being performed to provide a better understanding of the significant sources of these pollutants and the opportunities for their most cost-effective control. (See also W75-12350) (Orr-FIRL)
W75-12354

**CANADIAN DRINKING WATER SURVEILLANCE PROGRAMS, PANEL DISCUSSION,**
Nova Scotia Dept. of Public Health, Halifax. Div. of Public Health Engineering.
C. E. Tupper.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 243-245.

Descriptors: *Potable water, *Water supply, Water quality, *Canada, Standards, Water treatment, Chlorination, Filtration, Corrosion control, *Water quality standards.
Identifiers: *Canadian Drinking Water Standards and Objectives.

The Canadian Water Standards and Objectives are currently used by each of the Atlantic provinces of Canada as either a legal requirement or as a reference guideline for evaluating and assessing municipal water supplied. All of the public systems in Prince Edward Island meet the Standards mainly because the public supplies there are all groundwater. In Nova Scotia, New Brunswick, and Newfoundland, the majority of public water supplies are surface water sources; many of these public systems cannot meet the requirements of the Standards during the winter. Upgrading of the public systems has included the installation of pH adjustment, filtration plants, and appropriate chemical feed systems for chlorination. Although there is a general soft water corrosiveness of the water, chemical quality is not a major problem in the Atlantic Provinces. The Canadian Standards can be achieved in the long run in these provinces without any difficulty. However, a period of several years will be needed to bring all systems to the desired quality level. The Canadian Drinking Water Standards and Objectives have been an important aid in establishing better drinking water surveillance programs in the Atlantic Provinces, and in encouraging an improvement in overall quality of the public water supplies. (See also W75-12350) (Orr-FIRL)
W75-12355

**CANADIAN DRINKING WATER STANDARDS REVIEW, ONTARIO'S PROGRAMS, PANEL DISCUSSION,**
Ontario Ministry of the Environment, Toronto. Contingency Planning Section.
G. H. Kay.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 247-252.

Descriptors: *Water treatment, *Potable water, Standards, Canada, Treatment facilities, Filtration, Disinfection, Pathogenic bacteria, Groundwater, Surface waters, *Water quality standards.
Identifiers: *Canadian Drinking Water Standards and Objectives.

A review is presented of the Canadian Water Standards with respect to the actions necessary to achieve these goals. The implementation of drinking water standards or objectives is highly desirable and permits a technical assessment to be made of the product being provided. The Ontario Ministry of the Environment is starting the E.D.P. storage and retrieval of water analysis results to accelerate the assessment of water quality. The Province of Ontario is initiating a program of training, leading to the mandatory certification of water treatment plant operators. Miniaturization of the sampling units would aid in organic chemical determinations. The Ministry is trying to protect the natural waters since the quality of the water source affects the quality of the drinking water. Legislation since 1957 has encouraged advanced treatment of waste flows and drinking waters. The presence-absence test, a simple modification of the most probable number method, is used in addition to the multifilter technique to provide a sensitive test of the presence of pathogenic microorganisms. Other steps taken to ensure the best possible drinking water include: detection of asbestos fibers in drinking water by electron microscopy; monitoring organic chemicals; filtration as well as disinfection treatment is required of all surface water supplies; water reservoirs must be covered; automatic continuous recording analyzers for turbidity and chlorine residuals are required at filtration plants; and, regionalization is encouraged to discourage the growth of small plants. (See also W75-12350) (Orr-FIRL)
W75-12356

**CANADIAN DRINKING WATER STANDARDS REVIEW, ALBERTA, SASKATCHEWAN AND MANITOBA, PANEL DISCUSSION,**
Department of the Environment, Edmonton (Alberta). Div. of Pollution Control.

R. N. Briggs.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 253-256.

Descriptors: *Potable water, *Water supply, Standards, Water quality, Canada, Ground water, Surface waters, *Water quality standards.
Identifiers: *Canadian Drinking Water Standards and Objectives.

The Prairie Provinces of Canada, Alberta, Saskatchewan, and Manitoba, have accepted the Canadian Drinking Water Standards but due to physical limitations the Standards are used more like guidelines. The surface water and groundwater qaulity decreases from Alberta through Saskatchewan to Manitoba. The Province of Manitoba has adopted the Canadian Drinking Water Standard with the modification that their optimum fluoride level is 1.0 mg/liter, with an operating range from 0.8 to 1.2 mg/liter. Of the 199 water works systems in Manitoba, only 4 use water that meets the Water Quality Objectives, 24 use acceptable water, and the remaining 72% use water outside of the Standards. The Province of Sadkatchewan uses the values corresponding to the Maximum permissible limit in the Drinking Water Objectives. The Objective Values have been modified: sodium limit = 300 mg/liter; sulfate limite = 500 mg/liter; T.D.S. = 1500 mg/liter; hardness = 800 mg/liter; alkalinity = 500 mg/liter; and, phenolics = 0.001 mg/liter. The Province of Alberta has adopted the Canadian Drinking Water Standards, with the exceptions as determined by the Director of Standards and Approvals. (See also W75-12350) (Orr-FIRL)
W75-12357

**CANADIAN DRINKING WATER STANDARDS REVIEW, BRITISH COLUMBIA, PANEL DISCUSSION,**
British Columbia Dept. of Health, Vancouver. Environmental Engineering Div.
W. Bailey.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 257-261.

Descriptors: *Potable water, *Water supply, *Water quality standards, Standards, Canada.
Identifiers: *Canadian Drinking Water Standards and Objectives.

The quality of the potable water supplies in British Columbia, Canada, and measures taken to protect the drinking water are discussed. The B.C. Health Branch has published 'Recommended Water Quality Standards', however, this document has no legal standing. The part of the standards dealing with potable water supplies is similar to the Canadian Drinking Water Standards. Very few of the water works systems in B.C. have full water treatment. Data processing storage and retrieval of waterworks information is just beginning to be implemented. An annual Water and Waste School is held at the University of British Columbia to produce well trained, competent operators for the waterworks systems. Open reservoirs on waterworks distribution systems must be covered or abandoned. The following programs must be initiated with supporting legislation and staff: controlled multiple use of watersheds to protect raw water quality; establishment of minimum drinking water quality standards for bacteriological, chemical and physical characteristics; prevention of contamination of water in the distribution system by cross-connection control programs, increasing water pressure, prohibiting open reservoirs, and promoting proper maintenance programs; consolidation of small water systems into larger, better managed systems; and promotion of waterworks operator training and certification. (See also W75-12350) (Orr-FIRL)
W75-12358

**CANADIAN DRINKING WATER STANDARDS REVIEW, NORTHWEST TERRITORIES AND YUKON TERRITORY, PANEL DISCUSSION,**
Environmental Protection Service, Edmonton (Alberta). Northwest Region.
J. W. Grainge.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 261-263.

Descriptors: *Water supply, *Potable water, *Water quality standards, Standards, Canada, Sewers.
Identifiers: *Canadian Drinking Water Standards and Objectives.

The control of water supplies in the two northern territories of Canada is discussed. The Canadian Drinking Water Standards are used as a guide for water quality. Half of the people in the two territories use water which meets, or nearly meets, the Standards. Most of the rest of the people have access to good quality water although the water is subject to contamination during haulage and storage. Bacterial contamination, color, and turbidity are the parameters which are not met in the substandard water. Water wells are fairly productive in the Yukon Territory but are not used in the Northwest Territories because of the high mineralization of the water. Administrative control of water quality in most communities is performed by self-governing councils which accept advice from the local offices of the Department of National Health and Welfare and the area MHO's and EHO's. The local health officer should supervise the water sampling for bacteriological control and the testing for chlorine. The greatest need in the northern Canadian territories is for community planning so that water mains and sewers can be constructed. (See also W75-12350) (Orr-FIRL)
W75-12359

**THE FLOATING COVER: BEST WAY TO COVER A FINISHED-WATER RESERVOIR,**
For primary bibliographic entry see Field 5F.
W75-12360

**GROUND WATER AND GROUND-WATER CONTROL,**
For primary bibliographic entry see Field 4B.
W75-12386

**SPECIALIZED UNDERGROUND EXTRACTION SYSTEMS.**
For primary bibliographic entry see Field 8B.
W75-12388

# 6. WATER RESOURCES PLANNING

## 6A. Techniques Of Planning

**SYSTEMS APPROACH TO HYDROLOGY.**
For primary bibliographic entry see Field 2A.
W75-12014

**THE STRUCTURE OF INPUTS AND OUTPUTS OF HYDROLOGIC SYSTEMS,**
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12017

**A STUDY OF LONG RANGE RUNOFF SYSTEM RESPONSE BASED ON INFORMATION THEORY,**
Kyoto Univ., (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12018

**EFFICIENCY OF PARAMETER AND STATE ESTIMATION METHODS IN RELATION TO MODELS OF LUMPED AND DISTRIBUTED HYDROLOGIC SYSTEMS,**
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2A.
W75-12025

**A BAYESIAN FRAMEWORK FOR THE USE OF REGIONAL INFORMATION IN HYDROLOGY,**
Resource Analysis, Inc., Cambridge, Mass.
G. J. Vicens, I. Rodriguez-Iturbe, and J. C. Schaake, Jr.
Water Resources Research, Vol 11, No 3, p 405-414, June 1975. 12 fig, 4 tab, 18 ref. OWRT C-4118(9021)(9).

Descriptors: *Decision making, *Risks, *Streamflow, *Regional analysis, Hydrology, Statistical methods, Analytical techniques, Stochastic processes, Regression analysis, Hydrologic data, Streamflow.
Identifiers: *Bayesian methodology, *Model uncertainties, Synthetic generation, Prior probability distribution function, Maximum likelihood estimates.

Water resource designs are perfrect examples of decision making under uncertainty. In fact, three types of uncertainties may exist in any design problem: natural, parameter, and model uncertainties. The last two may be considered as informational uncertainties that are due to the lack of perfect information about the streamflow processes. The use of regional information has been suggested as a technique for reducing parameter uncertainties. The use of Bayesian methodology provides a framework for combining regional information with at-site historical records. Moreover, Bayesian methods allow the hydrologist to consider the parameter uncertainties as well as the natural uncertainties within the decision-making process. Because of these two advantages the Bayesian approach is a more complete and realistic approach to problems of uncertainty in hydrology and water resource planning than presently used methodologies. (Singh-ISWS)
W75-12048

**INPUT-OUTPUT ANALYSIS AND THE ENVIRONMENT,**
University Coll. of Wales, Aberystwyth. Dept. of Economics.
For primary bibliographic entry see Field 6G.
W75-12177

## 6B. Evaluation Process

**PLANNING MODELS FOR WATER SYSTEM DEVELOPMENT IN MISSISSIPPI COMMUNITIES,**
Mississippi Univ., University. Dept. of Economics and Finance.
For primary bibliographic entry see Field 6D.
W75-11851

**LIFE HISTORY, ECOLOGY, AND MANAGEMENT OF THE CARP, CYPRINUS CARPIO LINNAEUS, IN ELEPHANT BUTTE LAKE.**
New Mexico Agricultural Experiment Station University Park.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-10821, $4.75 in paper copy, $2.25 in microfiche Research Report 273, January 1974. 80 p, 24 fig, 3 tab, 79 ref. NOAA CFRD 6-11-R.

Descriptors: *Life history studies, *Fish management, *Carp, Growth rates, Competition, Carp sucker, Fish behavior, Reservoirs, New Mexico Rio Grande River, Spawning, Fish reproduction Fecundity, Commercial fish, Chlorophyta

ophyta, Copepods, Market value, aceans, Gill nets, Distribution, Buffalo fish, diets, Fish diseases, Baits, Systematics, fish, Fish harvest.
fiers: *Elephant Butte Lake(New Mexico).

lassification, range, and local distribution of Cyprinus carpio) are described in connection tudies of fishery resources in Elephant Butte New Mexico. The truism that carp and other ' fishes are limiting factors on game fish ations and that they contribute much less eir potential to human food supplies is con-. Investigated were the carp life history, its y, population dynamics and interactions in ant Butte Lake. Commercial fishes, includ-rp, comprised 20.9% of the relative density. general declines in relative density and ss of smallmouth buffalo, accompanied by ons in the parameters of carp, river carp-, game and forage fish populations suggest effects of selective commercial harvest of on interactions within and between groups. atus of carp as a 'rough' and 'commercial' s commercial value, and the need of simul-s exploitation of buffalo, carpsucker, and achieve a concurrent enhancement of sport and utilization of 'rough fish' is discussed. sions are that carpsucker and carp are con-le by commercial harvest and must be har-along with buffalo. Four, five and 6-inch nets, in medium brown color, are the most nt for selection of 'rough' fish in a marketa-e. (Auen-Wisconsin)
1972

SSESSMENT OF WATER QUALITY,
a Sciences, Inc., Santa Barbara, Calif.
mary bibliographic entry see Field 5F.
2054

RNALITIES AND PUBLIC GOODS. A OGRAPHY,
k Univ., Coventry (England). Dept. of nics.
oreland.
mpton University, Department of nics, Environmental Economics Study Bibliography Series 2, June 1973. 10 p, 199

tors: *Bibliographies, *Real property, re(Economics), Social aspects, Legal , Political aspects, Taxes, Pollution abate-Resource allocation, Government finance, ce, Optimization, Evaluation, Social

ers: *Externalities, *Public goods, ty rights.

liography contains 119 references to topics rnalities and optimality, economics of pro-ghts, demand and supply of public goods, l economics and diseconomies, public nd public policy, and theory of public ex-re. The articles were published between ber 1931 and February 1973. (Becker-sin)
179

ATION ANALYSIS. A BIBLIOGRAPHY,
ham Univ. (England). Dept. of Transporta-Environmental Planning.
son.
mpton University, Department of nics, Environmental Economics Study Bibliography Series 4, July 1973. 243 ref.

tors: *Bibliographies, *Recreation de-*Economic impact, *Recreation, Fishing, tudies, Use rates, Forecasting, Tourism, waterways, Pricing, Sport fishing, Social Estimated benefits, Boating, Planning, Recreation facilities, Cost-benefit analy-nic highways, Property values, Social value, Forests, Motivation, United States, Zoning, Rivers, Reservoirs, Financing, National parks, Land use, Welfare(Economics), Evaluation, Swimming.
Identifiers: United Kingdom, Ireland, England, Wales, Scotland, City planning, Motoring.

Over two hundred references related to the economics of recreation research are included in this bibliography. Two gaps in the bibliography are noted: references to tourism, and supply and policy studies of regional sports councils. The major topic included are: (1) British waterways-related recreation, (2) methods of estimating benefits from recreation, (3) methods of estimating the demand for recreation, (4) the valuation of fishery-related recreation, (5) urban vs. nonurban recreation and (6) the modeling of recreation demand. Other references are cited to various topics related to recreation. (Becker-Wisconsin)
W75-12180

**ECONOMIC GROWTH VS. THE ENVIRONMENT. A BIBLIOGRAPHY,**
Bristol Univ. (England). Dept. of Economics.
For primary bibliographic entry see Field 6G.
W75-12182

**THE ECONOMICS OF CLEAN WATER.**
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W75-12233

**THOSE ELUSIVE 1985 WATER QUALITY GOALS.**
For primary bibliographic entry see Field 5G.
W75-12242

**LIAISON WITH PLANNING AUTHORITIES-A VITAL LINK,**
For primary bibliographic entry see Field 6E.
W75-12335

## 6C. Cost Allocation, Cost Sharing, Pricing/Repayment

**NEED WAYS TO REDUCE DRILLING COSTS,**
For primary bibliographic entry see Field 8C.
W75-11884

**SEWER SYSTEM EVALUATION AND REHABILITATION COST ESTIMATES,**
H. Farmer.
Water and Sewage Works, Reference number, p 8-9, April 30, 1975.

Descriptors: *Sewers, *Construction costs, Cost allocation, Infiltration, Inflow, Waste water treatment.
Identifiers: Sewer inspection, Sewer rehabilitation.

A method is outlined for developing sewer system evaluation and rehabilitation cost estimates for infiltration/inflow analyses. This cost estimation method is based on calculating rehabilitation costs for eliminating both excessive infiltration and inflow in a sewer system. Rehabilitation costs for infiltration were determined to equal the sum of costs for each infiltration source and each manhole reach to be grouted. A total inflow rehabilitation cost can be computed by adding the costs for individual inflow sources (such as from leakage or holes in manhole covers, foundation drains, catch basins, ditch or storm sewers, or area drains). A complete sewer system evaluation survey consists of five phases: physical survey, rainfall simulation, preparatory cleaning, internal inspection, and survey report. An estimated cost of the complete survey is $0.65 to $0.95 per foot for the total length of the sewer system. A cost-effective evaluative survey is one where results of the physical survey and rainfall simulation are used to determine the actual sewer segments which require cleaning and internal inspection. It is recommended that actual costs of the evaluation be established by a cost plus a fixed fee, a fixed price, per diem, salary multiplier, or by a closed end contract. (Kramer-FIRL)
W75-11951

**WATER RESOURCES PROGRAMS IN THE SOUTHEASTERN REGION.**
Geological Survey, Atlanta, Ga. Water Resources Div.
For primary bibliographic entry see Field 9D.
W75-11960

**SOLAR SEA THERMAL ENERGY.**
For primary bibliographic entry see Field 3E.
W75-12196

**THE ECONOMICS OF CLEAN WATER.**
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W75-12233

## 6D. Water Demand

**PLANNING MODELS FOR WATER SYSTEM DEVELOPMENT IN MISSISSIPPI COMMUNITIES,**
Mississippi Univ., University. Dept. of Economics and Finance.
E. W. Wood, and S. C. Shull.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 260, $3.75 in paper copy, $2.25 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Completion Report, 1975. 32 p, 23 tab, 1 fig. OWRT A-082-MISS (1).

Descriptors: *Mississippi, Data collections, *Water utilization, Mathematical Models, Planning, Water Supply, *Water demand, *Consumptive use, *Long-term planning, *Projections, Model studies.

The purpose was to develop a practical model whereby local government officials can project future water demand to facilitate economical long range planning. Water consumption data gathered from individual cities in Mississippi were compared by statistical techniques with other readily available data about the communities (population, income estimates, rainfall, temperature and so on) to determine what combination of factors can be used to project water consumption most accurately. Only readily available statistical comparisons were used because the models are to be used by local officials who will have limited sophistication in statistical techniques and limited time and funds to spend preparing the projections. (Orr-FIRL)
W75-11851

**WATER CONSUMPTION TRENDS WITHIN THE CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT,**
Central and Southern Florida Flood Control District, West Palm Beach. Resources Planning Dept.
A. Kreitman, R. H. Walker, and J. A. Beck.
Technical Publication 74-3, May 1974. 32 p, 12 fig, 2 tab, 14 ref.

Descriptors: *Water utilization, *Consumptive use, *Water demand, *Florida, Use rates, Water supply, Aquifers, Groundwater, Hydrology, Climatology, Water requirements, Water sources, Water management(Applied).

The use (consumption) of potable water in southeastern Florida is of primary interest to planners, engineers, and the regulatory agency responsible for effective and efficient management of available water resources. The unique climatologic position southeastern Florida occupies was recognized, and the changes and range of per capita use of potable water supplies due in part to this uniqueness were examined. Per capita use of potable water in Florida, the South Atlantic Gulf Region, and the nation was compared with the per capita use in southeastern Florida. These studies indicated that per capita potable water use within the Central and Southern Florida Flood Control District has a rather broad range and centers about a significantly higher per capita use than is found in other parts of the state and nation. (Sims-ISWS)
W75-12085

**SUPPLEMENTAL WATER USE IN THE EVERGLADES AGRICULTURAL AREA,**
Central and Southern Florida Flood Control District, West Palm Beach. Resources Planning Dept.
For primary bibliographic entry see Field 3F.
W75-12086

**DESIGN AND OPERATING CRITERIA FOR RURAL WATER SYSTEMS,**
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
G. L. Goodwin.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 572, $4.75 in paper copy, $2.25 in microfiche. M.S. Thesis, May, 1975. 68 p, 27 fig, 4 tab, 16 ref. OWRT B-028-OKLA (1).

Descriptors: *Water distribution(Applied), *Rural areas, Water delivery, *Water demand, *Water users, *Water utilization, Domestic water, Dairy industry, *Design criteria, Pumping, *Water supply, Oklahoma.

An analysis was made of the water usage in the Rural Water District No. 3 Payne County, Oklahoma. Customers were categorized on the apparent economic value of their residence and were classified as Class A, Class B, or dairies. The monthly usages of each of these groups were analyzed to obtain patterns of usage. The patterns of usage were then used to determine the values of daily demand and peak demand expected for type of user. There was a significant difference in the usage pattern for the three classes of customers. The average monthly usage per tap was 8768-19,138 gal for dairies, 4357-11,983 gal for Class A taps, and 2537-4160 gal for Class B taps. The average monthly usage per person ranged from 1424 to 2821 gal for Class A taps and from 989 to 1664 gal for Class B taps. Optimal design values for daily demand were 200 gal per Class B tap, 350 gal per Class A tap, 600 gal per Dairy tap, 12 gal per dairy cow milked, 90 gal per person for a Class B tap, and, 150 gal per person for a Class A tap. The optimal design values for peak demand were 1.3-1.8 gal per minute per Class A tap, and 0.6-0.9 gal per minute per Class B tap. The optimal period off-peak pumping time was from 10 p.m. to 7 a.m. (Orr-FIRL)
W75-12126

**RECREATION ANALYSIS. A BIBLIOGRAPHY,**
Birmingham Univ. (England). Dept. of Transportation and Environmental Planning.
For primary bibliographic entry see Field 6B.
W75-12180

**THOSE ELUSIVE 1985 WATER QUALITY GOALS.**
For primary bibliographic entry see Field 5G.
W75-12242

## 6E. Water Law and Institutions

**SUPPLEMENTAL WATER USE IN THE EVERGLADES AGRICULTURAL AREA,**
Central and Southern Florida Flood Control District, West Palm Beach. Resources Planning Dept.
For primary bibliographic entry see Field 3F.
W75-12086

**THE EFFECT OF LEGISLATION OF THE FUTURE USE OF WATER IN THE LEATHER INDUSTRY,**
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5D.
W75-12112

**COAL MINE DRAINAGE POLLUTION--1973,**
Pennsylvania State Univ., University Park. Mine Drainage Research Section.
For primary bibliographic entry see Field 5G.
W75-12114

**STRONG IMPACT OF TEXTILES BY U.S. WATER CONTROL ACT,**
For primary bibliographic entry see Field 5G.
W75-12117

**REGULATORY ASPECTS OF SLUDGE UTILIZATION ON LAND,**
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
For primary bibliographic entry see Field 5G.
W75-12134

**INTERNATIONAL ECONOMICS AND ENVIRONMENT CONTROL,**
Southampton Univ. (England). Dept. of Economics.
For primary bibliographic entry see Field 6G.
W75-12178

**EXTERNALITIES AND PUBLIC GOODS. A BIBLIOGRAPHY,**
Warwick Univ., Coventry (England). Dept. of Economics.
For primary bibliographic entry see Field 6B.
W75-12179

**FISHERIES ECONOMICS. A BIBLIOGRAPHY,**
Manchester Univ. (England). Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3E.
W75-12181

**OCEAN DUMPING OVERSIGHT.**
For primary bibliographic entry see Field 5G.
W75-12194

**BIG CYPRESS NATIONAL PRESERVE (PART 1).**
For primary bibliographic entry see Field 6G.
W75-12195

**SOLAR SEA THERMAL ENERGY.**
For primary bibliographic entry see Field 3E.
W75-12196

**DIVERSION AND WITHDRAWAL OF ADDITIONAL WATER FROM LAKE MICHIGAN INTO THE ILLINOIS WATERWAY.**
For primary bibliographic entry see Field 4A.
W75-12197

**DEEPWATER PORT ACT OF 1974.**
For primary bibliographic entry see Field 5G.
W75-12198

**THE POTENTIAL FOR ENERGY PRODUCTION FROM GEOTHERMAL RESOURCES.**
For primary bibliographic entry see Field 4B.
W75-12199

**FEDERAL OCEAN PROGRAMS REVIEW.**
Hearings--Subcomm. on Oceanography, Comm. on Merchant Marine and Fisheries, U. S. House of Representatives, 93d Cong, 2d Sess, March 26, 29, April 11, 1974. 343 p.

Descriptors: *Oceanography, *Oceans, *Project post-evaluation, *Atmosphere, *Administrative agencies, Coordination, Legal aspects, Legislation, Management, Federal Government, Administration, Comprehensive planning, Bodies of water, Surface waters, Law of the sea, Marine biology, Marine fisheries, Sea water, Air environment, Air pollution, Project planning, Projects, Environment, Aquatic environment.
Identifiers: *Congressional hearings, *Environmental policy, Energy crisis, International agreements.

Hearings were held by the House Subcommittee on Oceanography to consider the various aspects of the Federal Ocean Programs and the interagency coordination of ocean activities. Extensive testimony was received from the National Advisory Committee on Oceans and Atmosphere, which is required to undertake a continuing review of the progress of the marine and atmospheric science and service programs of the United States, and to submit a comprehensive annual report setting forth an overall assessment of the status of the Nation's marine and atmospheric activities. Particular attention was given to the Advisory Committee's second annual report. The subcommittee addressed itself in detail to all aspects of marine science activities and to the relationships of the various departments and agencies which have not received careful legislative review in the past few years. Since January 1969, several pieces of legislation and several administrative iniatives have occurred. The central question sought to be answered by the subcommittee was whether there has been adequate advancement on ocean problems as a result of these legislative and administrative initiatives. (Fernandez-Florida)
W75-12200

**1973 IMCO CONFERENCE ON MARINE POLLUTION FROM SHIPS.**
For primary bibliographic entry see Field 5G.
W75-12202

**THE FIFTH ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY.**
Council on Environmental Quality, Washington D. C.
For primary bibliographic entry see Field 6G.
W75-12203

**USES OF SCIENTIFIC INFORMATION IN ENVIRONMENTAL DECISION-MAKING,**
Indiana Univ., Bloomington, School of Law.
For primary bibliographic entry see Field 6G.
W75-12204

**THE FEDERAL COMMON LAW OF ACCRETION: A NEW ELEMENT IN PROPERTY LAW**
J. J. Walsh.
Louisiana Law Review, Vol 35, No 1, p 178-1 (1974). 14 p, 104 ref.

Descriptors: *Accretion (Legal aspect *Boundaries (Property), *Common law, *Feder state water rights conflicts, *Judicial decisio Legal aspects, Bank erosion, Reliction, Avulsio Boundary disputes, High water mark, Low wat

Ownership of beds, Shores, Constitutional Jurisdiction, Federal jurisdiction, State jution, Land tenure, public rights, Riparian , Reservation doctrine, Riparian land, Water

fiers: *Reliction, Public trust doctrine, State .

governing real property and the question of rship of accreted lands, traditionally has considered the exclusive province of state However, federal in-roads have been made e traditional common law rules of accretion veral recent United States Supreme Court ons. This article focuses on the Court's ap to the question of ownership of accreted in relation to the potential effect on land tiDiscussion begins with a history of common ghts in water bottoms from the origins in English law to the present Constitutional ions granting control over navgatine the l government, and reservation of the shores igable waters and the underlying soils. The on law doctrines of accretion, reliction, and on are explained. Universal to the common as the rule that accretion belongs to the of the land to which it attaches. Generally, deral courts have acknowledged the state ecently, the United States Supreme Court plied a federal common law in certain in to determine the rights of riparian lanrs under the equal footing doctrine. The concludes that this new approach involves cing of interests and is a laudable and flexiroach to the problem of ownership accreted long navigable waters. (Fernandez-Florida) 2205

OCTRINE OF PRIMARY JURISDICTION NCEIVED: END TO COMMON LAW ENMENTAL PROTECTION,
Attorney General's Office, Tallahassee.
mary bibliographic entry see Field 6G.
206

LORIDA ENVIRONMENTAL PROTECACT OF 1971: THE CITIZEN'S ROLE IN ONMENTAL MANAGEMENT,
nary bibliographic entry see Field 6G.
207

TION CONTROL UNDER THE YLVANIA CLEAN STREAMS LAW,
nary bibliographic entry see Field 5G.
209

VER RESTORED: OREGON'S WILTTE,
l Geographic Society, Washington, D. C.
nary bibliographic entry see Field 5G.
210

NG A RIVER,
ia Univ., Berkeley, Coll. of Natural es.
nary bibliographic entry see Field 6G.
211

TION UNDER THE FEDERAL WATER TION CONTROL ACT AMENDMENTS ,
mental Law Inst., Washington, D.C.
nary bibliographic entry see Field 5G.
212

PROPOSAL FOR LEGISLATION TO OL WATER POLLUTION FROM ULTURAL SOURCES,
ary bibliographic entry see Field 5G.
213

**INTERNATIONAL LAW, U.S. SEABEDS POLICY AND OCEAN RESOURCE DEVELOPMENT,**
Virginia Univ., Charlottsville.
K. Clarkson.
The Journal of Law and Economics, Vol 17, p 117-142 (1974). 26 p, 58 ref.

Descriptors: *Law of the sea, *International commissions, *Resource allocation, *Resources development, *United Nations, *United States, International waters, Water pollution control, Jurisdiction, Legal aspects.
Identifiers: *Coastal waters, *Territorial seas, *Non-navigational uses, Comparative law, International agreements, U.N. Convention on the International Seabed Area, Truman Proclamation, Seabed.

Existing international agreements and institutions governing use of the ocean's resources are unsatisfactory. The allocative consequences of proposals under study need to be examined. Since certain ocean industries such as oil extraction and fishing conflict with each other, ownership of the seas is a crucial issue. This development renders the historical doctrine of 'freedom of the seas' obsolete. Since the early nineteenth century regulation of international fishing rights has mainly been accomplished by bilateral agreement. Inherent in most proposals is the idea that the net returns from the seas should be as high as possible. The requirement of conflicting industries make this objective impractical. One proposal which attempts to resolve the problem is the U.S. draft articles to the U.N. on the Rights and Duties of States in the Coastal Seabed Economic Area (CSEA). The proposal grants to coastal states exclusive rights to nonnavigational use of the seabed. (Jenkins-Florida)
W75-12214

**THE INTEGRATIVE POTENTIAL OF THE PROPOSED INTERNATIONAL REGIME FOR THE SEABED.**
Iowa Law Review, Vol 60, p 148-173, 1974. 26 p, 251 ref.

Descriptors: *Oceans, *International waters, *International law, *Jurisdiction, Water law, Water, Environment, Sea water, Water policy, Continential shelf, Economics, Exploitation, Mineralogy, Ecology, Ecological distribution, Economics, Prices, Resources, Environmental control, Environmental(Effects), Regime.
Identifiers: International agreements, Territorial seas(Jurisdiction), Territorial waters.

Whether an international regime for the seabed develops a significant capability to make authoritative decisions for the international community depends to a great extent on how a number of major policy issues concerning the establishment of such a regime are resolved. Important issues which demand consideration are the limits of national jurisdiction, the powers of an international regime, the structure and voting of such a regime, and the enforcement of its decisions. There are three main categories of claims to national jurisdiction over the oceans: claims to territorial waters, claims to the continental shelf, and claims to economic resource zones. The resolution of issues concerning the powers of an internationl regime involves consideration of the exploitation of mineral resources, ecological powers, price controls, and distributors of economic aid. The utility of a seabed regime is manifested by the possibility of providing an orderly means for the exploitation and minimization of the possibility of conflict over ocean resources. Such a regime could promote international cooperation and also play a major role in promulgating rules for environmental protection. Additionally, the concept that seabed resources are 'the common heritage of mankind' to be exploited only through an international regime may provide practical experience in joint decision-making which, if successful, will encourage future efforts in other areas. (Gagliardi-Florida)
W75-12215

**THE LAW OF THE SEA: A SELECTIVE BIBLIOGRAPHY OF ARTICLES, DOCUMENTS AND MONOGRAPHS,**
Columbia Univ., New York. School of Law.
J. T. Vambery.
Columbia Journal of Transnational Law, Vol 13, p 173-186, 1974. 14 p, 181 ref.

Descriptors: *Sea water, *Oceans, *International law, *International waters, Resources, Exploration, Exploitation, Water, Water law, Water policy, Water resources, Water resources development, Water rights, Water users.
Identifiers: Coastal waters, International agreements, Territorial waters.

While the prospects for a universally binding law of the sea are uncertain, there is already a pressing need to begin long-term ocean resource exploration and expolitation. Several countries have unilaterally engaged in practices violative of existing international law. Other nations have been prompted to make unilateral regulations of some ocean uses in anticipation of generally acceptable future international regime of the seas. The American Society of International Law has recognized the urgent need to find a temporary, but immediate, solution to the problems raised by ocean resource exploration and exploitation pending the adoption of a permanent international regime. The 1974 annual Philip C. Jessup International Moot Court Competition presented a legal problem similar to that which will be faced by the United States Congress in enacting its current unilateral regulation bill, and by the international community in connection with its attempted enforcement. (Gagliardi-Florida)
W75-12217

**WYANDOTTE AND ITS PROGENCY: THE QUEST FOR ENVIRONMENTAL PROTECTION THROUGH THE ORIGINAL JURISDICTION OF THE SUPREME COURT,**
Pepper, Hamilton and Schultz, Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W75-12218

**THE ALLOCATION OF WATERS OF INTERNATIONAL RIVERS.**
Georgetown Univ., Washington, D.C. Law Center.
Natural Resources Lawyer, Vol 7, p 45-66 (1974). 22 p, 105 ref.

Descriptors: *International waters, *International law, *Riparian rights, *River basin development, *River basins, *Rivers, *International commissions, Water users, Technology, Water supply, Regulation.
Identifiers: *Helsinki Rules, Limited territorial sovereignty, International Law Association, Equitable utilization(Doctrine), Territorial waters, Sovereignty, Third World.

Changing national boundaries and improved technology require a study of the law regarding international rivers. The prevailing position today is that nations must consider the effect of their river development on their riparian neighbors and compensate them for any resulting injury. The extent of these rights is governed by the doctrine of equitable utilization set forth by the International Law Association in the Helsinki Rules. Under this doctrine, each river basin state is entitled to a reasonable and equitable share in the beneficial use of waters of an international drainage basin. The term beneficial does not require that the most beneficial use be made of the waters, thus allowing states with differing technologies to share equally in the waters. The Rules also provide for apportioning water among competing interests based on

prescribed factors. One problem yet to be resolved in reservation of water rights for future use. The Helsinki Rules do not recognize such a right. Developing riparian states have no guarantee that a minimum level of hydroelectric power will be available to operate plants under construction. Treaties present a possible solution to this problem because they deal with specific situations. (Jenkins-Florida)
W75-12219

**THE DEVELOPMENT OF EUROPEAN REGIONAL LAW OF THE SEA,**
Naval Postgraduate School, Monterey, Calif.
M. W. Janis.
Ocean Development and International Law Journal, Vol 1, p 275-289 (1973). 15 p, 1 tab, 34 ref.

Descriptors: *Sea water, *Oceans, *International law, International waters, International commissions, Fisheries, Fishing, Fish, Treaties, Continental shelf, Water, *Europe, Regime.
Identifiers: Coastal waters, International agreements, Territorial waters.

The development of regional law of the sea may be more practical than a new global order for the oceans and may be preferable to the extension of national maritime jurisdictions. The Common Market has taken two important steps toward creating a European system of maritime law--the European Economic Community (EEC) Common Fisheries Policy and the EEC Commission's decision applying the Treaty of Roue and EEC regulations to the continental shelf. The former opened national territorial waters within the EEC to all Community fishermen and provided the foundation for the generation of Common Market fishing policy. The latter brought the exploration and exploitation of hydrocarbons on the shelf within EEC regulations and supervision. Other European organizations (the Bow Group, the Council of Europe, and the Western European Union) have proposed various non-EEC regimes for maritime legislation and cooperation, but no non-EEC proposal seems likely to be implemented. The future of European law of the sea lies with the Common Market which can make an important contribution to European maritime order. If a European solution to maritime problems is not the global solution, it is still a model of regional cooperation for other areas of the globe. (Gagliardi-Florida)
W75-12220

**FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,**
For primary bibliographic entry see Field 5G.
W75-12221

**THE RUSH FOR OFFSHORE OIL AND GAS: WHERE THINGS STAND ON THE OUTER CONTINENTAL SHELF.**
For primary bibliographic entry see Field 5G.
W75-12222

**UNDERSTANDING THE OCEAN SCIENCE DEBATE,**
Woods Hole Oceanographic Institution, Mass.
H. T. Franssen.
Ocean Development and International Law, Vol 2, p 187-202 (1974). 16 p, 41 ref.

Descriptors: *Oceans, Technology, *Research and development, *Resources development, *Water resources, Research priorities, Water, Coasts, Water law, Water policy, Water rights, Resources.
Identifiers: Coastal waters, Coastal zone management, International agreements, State policy.

Several spokesmen for the American ocean science community have indicated their approval of providing technical assistance in the marine sciences to developing countries in return for uncontrolled access to coastal waters beyond narrow territorial limits for scientific research. The author doubts whether technical assistance will work as a quid pro quo for obtaining unrestricted access to the proposed resource since developing countries, which have expressed a strong desire to control foreign-conducted research in the proposed resource zone are not likely to relinquish sovereign rights over parts of their claimed 'national territory' for a vague promise of technical assistance. Additionally, nations move through various stages of scientific and technological development from complete dependence on foreign science and technology to the development of an independent scientific tradition. There is historical evidence to suggest that when nations are progressing in the direction of an indigenous scientific capability they tend to restrict access to their national territory. When the transition towards an independent scientific capability has been completed, restrictions on foreign conducted science tend to subside. Because most developing countries are now somewhere between the stage of complete dependence on foreign science and the final independent state, restrictions on foreign conducted oceanic research are likely to grow within their national territories. The offer of technical assistance in the marine sciences is not likely to change their positions. (Gagliardi-Florida)
W75-12223

**ARE WE ANY NEARER TO AN INTERNATIONAL AGREEMENT ON USE OF THE SEAS,**
Rhode Island Univ., Kingston. Graduate School of Oceanography.
J. A. Knauss.
Maritimes, Vol 18, No 4, p 4-7, November 1974. 4 p, 1 map.

Descriptors: *Conferences, *Treaties, *International law, United States, Coasts, Fish, Fish management, Fisheries, Fishing, Oil, Deep water, International waters.
Identifiers: International agreements, Coastal waters, Territorial seas(Jurisdiction), Territorial waters.

Although the recent Law of the Sea Conference in Caracas failed to produce a single paragraph of the proposed international treaty, great progress may nevertheless have been made in the ten weeks of negotiations. Because of the complexity of the issues and the wide range of interests, most nations are unprepared to formally agree on issues before receiving reasonable assurance of the nature of the agreement on all other related issues. There is nearly universal agreement on a 12-mile territorial sea. Both the U.S. and the U.S.S.R. announced in Caracas their readiness to accept, a 200-mile zone in which the coastal nation would control its economic resources, including fish and oil. At issue are the so-called residual rights, those not explicitly considered, which might become significant in the next half-century. All nations are agreed on international control, but the degree of control is at issue. If agreement is to be attained, no nation will be able to emerge from the negotiations without making substantial compromises. It is suggested that if agreement is not reached in 1975, it will be increasingly difficult to do so in succeeding years, because a number of countries, including the U.S., will move unilaterally in such areas as fishing, deep-sea mining and vessel pollution control. (Gagliardi-Florida)
W75-12224

**WE'RE FIGHTING OIL POLLUTION WITH BUBBLES, BELTS AND BEADS,**
For primary bibliographic entry see Field 5G.
W75-12225

**HISTORICAL GUIDE TO FEDERAL WATER POLLUTION CONTROL LAWS AFFECTING FOOD PROCESSING,**
Economic Research Service, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-12226

**FLOOD INSURANCE AND FLOOD PLAIN ZONING AS COMPATIBLE COMPONENTS,**
Clark Univ., Worcester, Mass. Dept. of Geography.
For primary bibliographic entry see Field 6F.
W75-12227

**OVERLAND FLOW: ANSWER TO WATER CLEANUP CHALLENGE.**
Louisiana State Univ., Baton Rouge. Office of Sea Grant Development.
For primary bibliographic entry see Field 5D.
W75-12228

**THE DEEPWATER PORTS ACT OF 1974; HALF SPEED AHEAD,**
For primary bibliographic entry see Field 5G.
W75-12229

**TOXIC WATERS (DISCUSSION OF RECENT FEDERAL ACTION AGAINST WATER POLLUTION).**
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-12230

**TOWARD A CLEANER AQUATIC ENVIRONMENT,**
Environmental Protection Agency, Washington, D. C. Office of Air and Water Programs.
For primary bibliographic entry see Field 5G.
W75-12234

**LIABILITY FOR OIL POLLUTION DISASTERS: INTERNATIONAL LAW AND THE DELIMITATION OF COMPETENCES IN A FEDERAL POLICY,**
Syracuse Univ., N. Y. Coll. of Law.
For primary bibliographic entry see Field 5G.
W75-12235

**LAND USE CONTROLS UNDER THE FEDERAL WATER POLLUTION CONTROL ACT: A CITIZEN'S GUIDE,**
National Resources Defense Council, Washington, D. C.
For primary bibliographic entry see Field 5G.
W75-12237

**1974 ANNUAL REPORT, GREAT LAKES BASIN COMMISSION.**
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 5G.
W75-12238

**OREGON SURVEYS ITS HAZARDOUS WASTES,**
Oregon State Dept. of Environmental Quality, Portland.
For primary bibliographic entry see Field 5G.
W75-12239

**CORPS' GUIDELINES FOR DAM SAFETY INSPECTION NEED REVAMPING,**
Tennessee Valley Authority, Knoxville. Flood Control Branch.
For primary bibliographic entry see Field 8A.
W75-12241

**TOUGH SOLID-WASTE LAWS BREWING ON CAPITOL HILL.**
For primary bibliographic entry see Field 5G.
W75-12243

NEPA SETTLEMENT: CONSERVATION
OUNCIL OF NORTH CAROLINA V.
OEHLKE,
rthwestern Univ., Evanston, Ill. School of
w.
P. Davis.
vironmental Law Reporter, Vol 5, p 50079-
087 (1975). 9 p, 55 ref.

scriptors: *North Carolina, *Water control,
ams, *Dam construction, *Reservoirs,
ooding, *Judicial decisions, Administrative
ncies, Administration, Water quality, Water
servation, Environmental effects, Damsites,
trophication, Federal government, Water
ources development, Federal project policy,
droelectric power.
ntifiers: Environmental impact statements, Na-
al Environmental Policy Act, Consent judge-
nt, Administrative regulations.

intiff filed a motion in federal district court for
nctive and declaratory relief against the con-
ction by New Hope (now B. Everett Jordan)
n by the Corps of Engineers, on the ground
the defendants violated the procedural and
stantive requirements of the National Environ-
ntal Policy Act of 1969. Plaintiffs argued that
benefits of the project were outweighed by the
truction of wildlife, pollution, and eutrophica-
of the reservoir that would result from the
ding. Defendants admitted these problems in
nvironmental impact statement, but concluded
additional treatment facilities would remedy
problems. The district court denied plaintiffs
ion for an injunction because defendant had
plied with the procedural requirements of the
On appeal, the Fourth Circuit remanded for a
sideration of whether the substantive require-
nts of a good faith consideration of environ-
ntal factors had also been met. Due to the
tracted litigation, a consent settlement was
hed which permitted completion of the dam
halted construction of a permanent conserva-
pool. A supplemental environmental impact
y of the reservoir water quality aspects of the
ect was to be filed in two years. A final deci-
on the reservoir would be made at that time.
type of consent judgment is unique in en-
nmental litigation. (Jenkins-Florida)
-12244

WATER POLLUTION PERMITTING
TEM,
on Bank and Trust Co., Montgomery, Ala.
primary bibliographic entry see Field 5G.
-12245

ORCING INTERNATIONAL LAW: U.S.
NCIES AND THE REGULATION OF OIL
LUTION IN AMERICAN WATERS,
yland Univ., College Park. Dept. of Political
nce.
primary bibliographic entry see Field 5G.
-12246

PERTY (WETLANDS REGULATION),
etchum, and D. W. Schmitz.
ual Survey of American Law, 1973/74 Vol, p
318 (Winter 1974). 7 p, 53 ref.

riptors: *Wetlands, *Coastal marshes,
shwater marshes, *State jurisdiction, Ad-
strative agencies, Governmental interrela-
, Federal jurisdiction, Reservation doctrine,
ent domain, Judicial decisions, Compensa-
Cost repayment, Condemnation value.
ifiers: *Police power.

ervation of coastal wetlands, lying between
nd permanently submerged lands, is being im-
ented through limits on dredging, filling and
truction in these marshy areas. Regulations
oying the value of the property have been
trued as takings of property without compen-
sation, frustrating in many instances state regulatory programs. Recent cases, however, have sustained state legislative programs as protective of a valid domestic interest, constituting a valid exercise of the state's police power. Two courts that have decided the issue based their holdings on entirely different rationale. The Maryland Court of Appeals formulated a three-pronged test based upon protection of the public generally, in a reasonably necessary manner, but not unduly oppressive. The Supreme Court of Wisconsin upheld the questioned legislation on the ground that it constituted a restraint imposed to prevent public harm, and thus a noncompensable regulation. (Knocke-Florida)
W75-12247

**ADMIRALTY'S POWER IN RE OIL POLLUTION (STATES ABLE TO SET MORE STRINGENT PENALTIES),**
For primary bibliographic entry see Field 5G.
W75-12248

**A PROPOSAL FOR THE QUANTIFICATION OF RESERVED INDIAN WATER RIGHTS,**
S. M. Campbell.
Columbia Law Review, Vol 74, No 7, p 1299-1321 (1974). 23 p, 115 ref.

Descriptors: *Indian reservations, *Water rights, *Water law, *Appropriation, *Treaties, *Water allocation(Policy), Legal aspects, Water resources development, Federal-state water rights conflicts, Water measurement, Water policy, Pueblo water rights, Water supply, Water users, Reservation doctrine, Federal jurisdiction.
Identifiers: *Water quantification, *State policy, *Indian water rights, Western states, Water scarcity.

The indefinite nature of Indian reserved rights has made state water resource planning difficult. While courts have recognized that Indian reservations have reserved water rights paramount to even non-Indian prior appropriations, there has been no attempt to quantify those rights. The leading case recognizing Indian rights referred to sufficient future requirements. The federal government has proved to be an unsatisfactory if not arbitrary, advocate of Indian interests. Fixing Indian water rights at present requirement levels with periodic review of changing needs is the best solution. The basis for allocation should be beneficial use rather than only agricultural use. The sale or lease of Indian water rights is practicable when water cannot be put to use on reservation land. The most difficult part of a quantification plan is dealing with changes in the place and nature of water use. Restricted, reasonable changes in the nature of use should be permitted when there is no unduly adverse effect on the rights of non-Indian appropriators. A periodic review of Indian needs and predictable uses can accomplish this objective. Inventory and quantification of Indian water rights should be conducted by a neutral federal body divorced from the Justice Department and the Department of the Interior. (Jenkins-Florida)
W75-12249

**RECOGNITION OF SUBSTANTIVE RIGHTS UNDER NEPA,**
California State Water Resources Control Board, Sacramento.
R. B. Robie.
Natural Resources Lawyer, Vol 7, No 3, p 387-437 (1974). 51 p, 249 ref.

Descriptors: *Public rights, *Water policy, *Water resources development, Federal jurisdiction, Federal government, Constitutional law, Administrative decisions, Institutional constraints, Environmental effects, Administrative agencies, Remedies.
Identifiers: *NEPA, *Private substantive rights, Standing, Burden of proof.

The most important contribution of the National Environmental Policy Act may be the encouragement of review of governmental actions, through recognition of judicially enforceable substantive rights held by the public. Section 101 of the Act, on policy, section 102 on implementation and the Council on Environmental Quality promote recognition of these rights, which arguably attain constitutional scope through the Fifth, Ninth and Fourteenth Amendments. Specifically, the right to prevent environmentally harmful federation actions may be limited by definition of the nature of the environmental right, standing, burdens of proof and difficult questions of fact. The author reviews recent case law and administrative decisions relating to possible substantive rights under the Act. (Knocke-Florida)
W75-12250

**MANAGEMENT OF INTERSTATE GROUND WATER,**
Fischer and Beatty, Fort Collins, Colo.
For primary bibliographic entry see Field 4B.
W75-12251

**INFORMATION REPORT ON THE LAW OF THE SEA: UNDERSTANDING THE DEBATE OF THE LAW OF THE OCEAN SPACE.**
The International Lawyer, Vol 8, No 4, p 688-723 (1974). 34 p, 6 ref.

Descriptors: *International waters, *Commercial fishing, *Foreign trade, *International law, Fish management, International commissions, Mineral industry, Navigation, Military aspects, Reasonable use, Continental shelf, Law of the sea.
Identifiers: *International regulatory, *International licensing.

The law of ocean space recognizes a wide variety of geopolitical and international interests and priorities. The territorial sea as an economic resource is only the beginning of a broad economic zone of interest. Support is growing for a limit of 12 miles, conditioned on free right of transit over the zone. Innocent passage, not prejudicial to peace or security of the coastal state, excludes some vessels as well as overflight rights, and an emerging concept of free transit has been proposed by the United States. High seas fishery management presently involves open access governed by regional fishery conventions and ad hoc reactions to such crises as territorial water conflicts. The United States has proposed species regulation and environmental definitions of national interests in this area. Seabed rights might best be managed by use of economic zones, international revenue sharing, pollution control, compulsory dispute settlement, and assurance of investment monies, although precise definition of Continental Shelf lands is difficult. With respect to international waters, the United States supports group international licensing, versus international agencies or regulations. Pollution control of land runoff, airborne chemicals and ocean activities is susceptible to essentially the same range of regulatory alternatives, including possible economic zone definition followed by international regulation. (Knocke-Florida)
W75-12252

**BASIC PRINCIPLES RELATING TO THE INTERNATIONAL REGIME OF THE OCEANS AT THE CARACAS SESSION OF THE U. N. LAW OF THE SEA CONFERENCE,**
International Bank for Reconstruction and Development, Washington, D.C.
C. F. Amerashinghe.
Journal of Maritime Law and Commerce, Vol 6, No 2, p 213-247, 1975. 35 p, 77 ref.

Descriptors: *Conferences, *Regime, *Law of the sea, *United Nations, *Beds under water, Beds, Regulation, Productivity, Technology, International law, Foreign trade, Foreign waters, Govern-

ments, International waters, International commissions, Research and development, Treaties, Channel morphology, Flow, Flow profiles, Regimen.
Identifiers: *International agreements.

This article reviews the work done in Committee I of the Third United Nations Conference on the Law of the Sea held in Caracas in the summer of 1974. Generally, the theme of Committee efforts was the international regime and machinery for the international seabed area. This review critically analyzes the proposals presented to the Committee and the texts which it drafted. Existing differences between states on various issues which came before the Committee are identified and examined. Approaches to compromise solutions and the use of negotiators are considered. The procedure and proceedings of the Committee are outlined. Basic problems discussed include: delimitation of the international seabed area, regulation of production in the international seabed area, transfer of technology, and protection of the marine environment. The author states that there are more areas in dispute than in agreement concerning the international regime of the international seabed. He concludes that there must be more flexibility and less insistence on extreme positions at the Conference table if agreement is to be reached. (Fernandez-Florida)
W75-12253

**A SOLUTION TO THE PROBLEM OF PRIVATE COMPENSATION IN OIL DISCHARGE SITUATIONS,**
For primary bibliographic entry see Field 5G.
W75-12254

**WATER BANK PROGRAM.**
Soil Conservation Service, Washington, D. C.
Federal Register, Vol 37, No 216, p 23729, November 8, 1972. 1 p.

Descriptors: *Farms, *Agricultural watersheds, *Legislation, *Drainage, *Land management, Water conservation, Soil conservation, Water policy, Controlled drainage, Regulation.
Identifiers: *Water bank program.

This notice of proposed Water Bank Program amendments was published to afford interested persons an opportunity to convey their views concerning the proposed changes. The amendments redefine the Program's geographical applicability and the eligibility requirements for a farm to participate in the program. The amendments also place certain restrictions on land designated eligible for the program. All comments and suggestions regarding the proposals were to be received by the Director of the Land Use Division within thirty days after publication of the notice. (Hoffman-Florida)
W75-12259

**WATER QUALITY MANAGEMENT BASIN PLANS--POLICIES AND PROCEDURES.**
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W75-12260

**MARINE SANCTUARIES.**
National Oceanic and Atmospheric Administration, Washington, D. C.
Federal Register, Vol 39, No 125, p 23254-23257, June 27, 1974. 4 p.

Descriptors: *Administrative agencies, *Coasts, *Regulation, *Preservation, *Aquatic life, Marine animals, Marine fish, Oceans, Marine plants, Administration, Federal government, State governments, Education, Legal aspects, Management, Conservation, Control, Protection, Water law, Water management(Applied), Water policy, Water resources, Recreation, Ecology, Aesthetics.
Identifiers: *Marine sanctuaries, *Administrative regulations, *Environmental policy, *Coastal zone management, National Oceanic and Atmospheric Administration, Hazardous substances(Pollution), Territorial waters.

The National Oceanic and Atmospheric Administration hereby establishes guidelines, pursuant to Title III of the Marine Protection and Research Act of 1972, setting forth the procedure by which areas may be nominated as marine sanctuaries. These guidelines set forth the concepts, policies, and procedures for the processing of nominations and the selection, designation and operation of a marine sanctuary. Sanctuaries may be designated to preserve, restore, or enchance areas for their conservational, recreational, ecological, research, or esthetic values in coastal waters. Multiple use is provided for in each category to the extend compatible with the primary use of the sanctuary. Nomination of sanctuaries is to be effected through federal, state, or local studies. Enforcement of this regulation will be carried out by the imposition of civil penalties. Marine sanctuaries will be established to preserve, protect, and manage essential habitats, and esthetic and unique areas; to conserve certain species; or to promote scientific research, education, and recreation. (Fernandez-Florida)
W75-12261

**ESTUARINE SANCTUARY GRANTS--APPLICATION AND SELECTION CRITERIA PROCEDURES.**
National Oceanic and Atmospheric Administration, Rockville, Md.
Federal Register, Vol 39, No 46, p 8924-8927, March 7, 1974. 4 p.

Descriptors: *Administrative agencies, *Estuaries, *Estuarine environment, *Grants, *Coasts, Federal government, Regulation, State governments, Education, Research facilities, Aquatic habitats, Bays, Estuarine fisheries, Inlets(Waterways), Intertidal areas, Environment, Aquatic environment, Projects, Research and development, Government finance, On-site laboratories, Laboratories.
Identifiers: *Administrative regulations, *Coastal zone management, Coastal waters.

The National Oceanic and Atmospheric Administration hereby gives notice of proposed guidelines to establish policy and procedures for the nomination, selection, and management of estuarine sanctuaries as authorized under sections 312 and 314 of the Coastal Zone Management Act of 1972. These guidelines establish a program which '... provides grants to states on a matching basis to acquire, develop, and operate natural areas as estuarine sanctuaries...', for the purpose of scientific examination of ecological relationships. The primary use of estuarine sanctuaries will be to provide information essential to coastal zone management. Natural field laboratories are to be established to gather data and make studies of the natural and human processes occuring within the estuaries of the coastal zone. Zoogeographic classification will reflect differentiation and a variety of ecosystems to include all significant variations. Each individual program must interact with the overall coastal zone management program. The manner of application, criteria for selection, and method of use of the grants are delineated. (Fernandez-Florida)
W75-12262

**PERMITS FOR ACTIVITIES IN NAVIGABLE WATERS OR OCEAN WATERS.**
Corps of Engineers, Washington, D. C.
Federal Register, Vol 39, No 65, p 12115-12137, April 3, 1974. 23 p, 7 append.

Descriptors: *Administrative agencies, *Regulation, *Permits, *Structures, *Navigable waters, Navigable rivers, Dams, Dikes, Bridges, Bodies of water, Navigation, Legal aspects, Water law, Water permits, Water rights, Canals, Oceans, Legislation, River and Harbors Act, Federal government.
Identifiers: *Administrative regulations, *Navigational obstructions, Corps of Engineers.

The Department of the Army, acting through the Corps of Engineers, is publishing final regulations which prescribe the policies, practice, and procedures to be followed in the processing of applications for permits authorizing structures and work in or affecting navigable waters of the United States, the discharge of dredged or fill materials into navigable waters, and the transportation of dredged material for the purpose of dumping it into ocean waters. These regulations are issued pursuant to the authority of the Rivers and Harbors Act which prohibits the construction of any dams or dikes across any navigable waters in absence of approval by the Chief of Engineers and the Secretary of the Army. Activities requiring authorization are all structures of work in navigable waters except for bridges and causeways, the placement of aids to navigation by the Coast Guard, and structures constructed in artificial canals within principally residential developments. The decision whether to issue a permit will be based on an evaluation of the probable impact of the proposed structure or work and its intended use on the public interests. (Fernandez-Florida)
W75-12263

**IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS.**
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W75-12264

**CANNED AND PRESERVED SEAFOOD PROCESSING POINT SOURCE CATEGORY--EFFLUENT LIMITATIONS GUIDELINES.**
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W75-12265

**FERTILIZER MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS AND PROPOSED LIMITATIONS.**
Environmental Protection Agency, Washington D. C.
For primary bibliographic entry see Field 5G.
W75-12266

**TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS.**
Environmental Protection Agency, Washington D.C.
For primary bibliographic entry see Field 5G.
W75-12267

**ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS AND PROPOSED APPLICATION TO PRETREATMENT STANDARDS.**
Environmental Protection Agency, Washington D.C.
For primary bibliographic entry see Field 5G.
W75-12268

**SOAP AND DETERGENT MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT LIMITATIONS GUIDELINES.**
Environmental Protection Agency, Washington D.C.
For primary bibliographic entry see Field 5G.
W75-12269

ER PRODUCTS--PROPOSED EFFLUENT
ELINES AND PERFORMANCES AND
REATMENT STANDARDS FOR NEW
CES.
onmental Protection Agency, Washington,

imary bibliographic entry see Field 5G.
2270

ILIZER MANUFACTURING POINT
CE CATEGORY--EFFLUENT LIMITA-
S AND GUIDELINES.
onmental Protection Agency, Washington

imary bibliographic entry see Field 5G.
2272

PRODUCTS POINT SOURCE CATEGO-
FFLUENT GUIDELINES AND STAN-
S.
onmental Protection Agency, Washington,

imary bibliographic entry see Field 5G.
2273

N MILLS POINT SOURCE CATEGORY--
UENT LIMITATIONS GUIDELINES AND
DARDS.
onmental Protection Agency, Washington,

imary bibliographic entry see Field 5G.
2274

TICS AND SYNTHETIC POINT SOURCE
GORY--EFFLUENT GUIDELINES AND
DARDS.
onmental Protection Agency, Washington,

imary bibliographic entry see Field 5G.
2275

ERROUS METALS MANUFACTURING
SOURCE CATEGORY--EFFLUENT
ELINES AND STANDARDS AND
OSED LIMITATIONS.
nmental Protection Agency, Washington,

mary bibliographic entry see Field 5G.
2276

DUCTION OF BILLS TO AUTHORIZE
REPLACEMENT OF THE AMERICAN
DAM IN IDAHO.
essional Record, Vol 199, No 56, p 56910-
daily edition, April 10, 1973). 2 p.

ptors: *Idaho, *Dams, *Dam construction,
foundations, *Concrete structures, Water
e, Flood control, Dam failure, Engineering
y, Safety factors, Legislation, Federal
ment.
iers: American Falls Dam, Federal water

ills were introduced providing alternative
als for construction of a repalcement dam
existing American Falls Dam in Idaho.
e of chemical reactions within the struc-
e dam has deteriorated to the extent that it
ger meets current safety standards. Con-
ly, service restrictions have been placed
storage level of the reservoir, putting the
pendent basin in a precarious situation.
st bill would authorize the Secretary of the
to construct and operate a replacement
nder the reclamation program. Its major
ck is the time delay associated with govern-
appropriations. The second bill would
e water users to finance and construct the
thout federal assistance, with the Secretary
nterior taking title to the dam upon comple-
his bill would greatly reduce the vital time factor, although it would deprive the water users of the benefit of federal financial assistance. (Hoffman-Florida)
W75-12278

**INTRODUCTION OF SHORE EROSION CONTROL LEGISLATION.**
Congressional Record, Vol 119, No 9, p H307-H308 (daily ed. January 18, 1973). 2 p.

Descriptors: *Beach erosion, *Shore protection, *Soil erosion, *Great Lakes, Legislation, Washouts, Bank erosion, Recreation facilities, Government finance, Coastal engineering, Tidal effects, Waves(Water).
Identifiers: Beachfront, Welland canal.

The purpose of the proposed legislation is to provide federal assistance to protect privately-owned shore property from erosion. The bill's sponsor noted that current high water levels in the Great Lakes area, together with Canada's closing of the Welland Canal for repairs has critically aggravated this situation in his own district. He also introduce data from a report estimating the financial impact of future shore erosion on a four-mile strip with respect to private property owners and state tax revenues. The report also stated that the cost of providing necessary protection to the shorelines would be prohibitive for private owners. This legislation would provide the necessary federal financing for such a project., hopefully preventing the future loss of real property, the depletion of tax resources, and the loss of recreational areas and scenic beauty. (Hoffman-Florida)
W75-12279

**INTRODUCTION OF S433 (BILL FOR SAFE DRINKING WATER).**
Congressional Record, Vol 119, No 9, p S860-S864 (daily ed. January 18, 1973). 5 p.

Descriptors: *Potable water, *Water purification, *Water quality, *Public health, Domestic water, Standards, Water policy, Legislation, Grants, Governmental interrelations, State governments, Water supply, Federal government, Freshwater, Public health, Environmental sanitation.
Identifiers: *Safe Drinking Water Act, *Rural water surveys, *Water supply occupations.

This legislation was introduced to help assure high quality drinking water. The bill's sponsor noted that a recent Environmental Protection Agnecy (EPA) report showed that over 8 million people are served water which fails to meet mandatory requirements set by the federal government with respect to interestate carrier systems. The proposed bill would authorize the EPA to establish minimum federal drinking water standards prevailing maximum limits for contaminants as well as standards for the operation and maintenance of drinking water system. These standards would be enforced by the individual states, which would receive federal grants to aid in enforcement. In addition, a National Drinking Water Council would be established to give advice on scientific and engineering matters. The bill would also authorize several projects, such as the promotion of water supply occupations, the conducting of a rural water survey, and a grant program to study new water supply technology. Finally the bill would authorize citizen suits against violators of drinking water standards and against the Administrator for failing to perform mandatory duties. (Hoffman-FLorida)
W75-12280

**UNITED STATES V. CAPPAERT (ACTION FOR DECLARATION OF RIGHTS OF UNITED STATES TO UNDERGROUND WATERS APPURTENANT TO DEVIL'S HOLE, DEATH VALLY NATIONAL MONUMENT).**
508 F.2d 313-322 (9th Cir. 1974). 10 p.

Descriptors: *Judicial decisions, *Overlaying proprietor, *Groundwater, *Water rights, *Reservation doctrine, Water, Water allocation(Policy), Water conservation, Land tenure, Legal review, Legal aspects, Public rights, Water law, Riparian rights, Competing uses, Water loss, Water holes, Water levels, Water supply, United States, Federal government.
Identifiers: *Implied reservation, Presidential proclamation.

An action was brought by the United States for a declaratory judgment regarding underground waters appurtenant to Devil's Hole, Death Valley National Monument. Pupfish, which have been declared a unique and endangered species, live in Devil's Hole. The district court limited the amount of water which the owners of nearby cattle ranches may withdraw. Devil's Hole was made part of a national monument by Presidential Proclamation. The government contended that the Proclamation, with its express preservation of Devil's Hole pool and the surrounding land from the public domain, contains an implied reservation of enough groundwater to assure preservation of the pupfish in that pool. The ranchers, argued that the doctrine of implied reservation of water does not apply to groundwater, but only to surface water. The court held that the doctrine of implied reservation applies to groundwater, and that the presidentail proclamation withdrawing the area from the public domain impliedly reserved rights in the groundwater sufficient to maintain the pool. (Fernandez-Florida)
W75-12281

**CONSERVATION SOC'Y. OF SOUTHERN VERMONT, INC. V. SECRETARY OF TRANSPORTATION (REVIEW OF MOTION FOR EQUITABLE INJUNCTION AGAINST STREAM CHANNELIZATION PROJECT).**
508 F. 2d 927-939 (2d Cir. 1974). 13 p.

Descriptors: *Highways effects, *Judicial decisions, *Administrative agencies, *Federal government, *Project feasibility, Feasibility, Project planning, Planning, Financing, Government finance, State governments, Environmental effects, Environment, Ecology, Highways, Effects legal aspects, Equity, Federal jurisdiction, Water law, Legislation, Administration, *Vermont.
Identifiers: *Environmental Impact Statment, *Injunctive relief, *National Environmental Policy Act, Environmental policy.

Environmental groups objecting to proposed Vermont highway construction sought injunctive relief against state and federal highway officials, for alleged violations of the National Environmental Policy Act (NEPA). Plaintiffs alleged procedural and usbstantive violations of NEPA, in that, the draft and final environmental impact statement (EIS) were prepared by the state agency rather than by the federal agency. On appeal the Second Circuit held that an EIS must be prepared by the responsible federal agency, and that the Federal Highway Administration must formulate and prepare its own impact statement to assess environmental effects of proposed federally-funded highway projects. The court, however, affirmed the lower court's refusal to grant an injunction based upon its discretionary power. (Fernandez-Florida)
W75-12282

**UNITED STATES V. DEXTER CORP. (APPEAL BY SANITARY DISTRICT FROM CONVICTION FOR DISCHARGE OF MANUFACTURING REFUSE INTO NAVIGABLE WATERS).**
507 F. 2d 1038-1041 (7th Cir. 1974).

Descriptors: *Industrial wastes, *Rivers and Harbors Act, *Judicial decisions, *Law enforcement, *Municipal wastes, Wastes, Sewage, Waste disposal, Waste water treatment, Water pollution, Water pollution sources, Legislation, Legal

aspects, Water law, Federal government, cities, Federal jurisdiction, Penalties(Legal), Adjudication procedure, Local governments, Lake Michigan.
Identifiers: *Information(Prosecution), *Navigation obstructions, Hazardous substances(Pollution).

An information was filed against a manufacturer and a municipal corporation for violations of Section 407 and 411 of the Rivers and Harbors Act. The Act makes it a misdemeanor to deposit'... any refuse matter of any kind or description whatever other than that flowing from streets and sewers and passing therefrom in a liquid state, into any navigable water....' The defendant discharged liquid phenolic resin from its manufacturing plant, through the sanitary district's sewer system and into Lake Michigan. The court held that the liquid phenolic resin came within the statutory prohibition, but reversed the convictions on grounds that the activity complained of came within the specific statutory exclusion of any refuse matter 'flowing from streets and sewers and passing therefrom in a liquid state.' (Fernandez-Florida)
W75-12283

**TRAIN V. CITY OF NEW YORK (CLASS ACTION BY CITY TO COMPEL EPA TO ALLOT FUNDS AUTHORIZED BY THE 1972 FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS).**
95 S. Ct. 839-847 (1975).

Descriptors: *Judicial decisions, *Administrative agencies, *Allotments, *Treatment facilities, *Cities, Waste treatment, Grants, Water pollution, Water treatment, Treatment, Administration, Federal government, Cost sharing, Legal aspects, Legislation, Economics, Government finance, Financing, Water Quality Act, Federal Water Pollution Control Act, New York.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Injunctive relief, Hazardous substances(Pollution), Environmental policy, Class action suits.

A class action was brought by the City of New York against the Administrator of the Environmental Protection Agency (EPA) to compel allotment of funds which were appropriated under the authority of the 1972 Amendments of the Federal Water Pollution Control Act. Title II of these Amendments makes available federal financial assistance for municipal sewers and sewage treatment works. Section 207 authorizes the appropriation of 'not to exceed' specified amounts for each of three fiscal years, and section 205(a) provides that the 'sums authorized to be appropriated pursuant to section 207... shall be alloted by the Administrator' of the Environmental Protection Agency. In compliance with a Presidential Directive, the Administrator refused to allot the maximum allowable amounts. The issue was whether the 1972 Act permits the Administrator to allot to the States under section 205 less than the entire amounts authorized to be appropriated by section 207. The Supreme Court held that the Act required the allotment of all sums authorized to be appropriated, and that the administrator was not authorized to allot lesser sums in his discretion. (Fernandez-Florida)
W75-12284

**TRAIN V. CAMPAIGN CLEAN WATER, INC. (ACTION BY ENVIRONMENTAL GROUP TO REQUIRE EPA TO RELEASE FUNDS AUTHORIZED FOR FEDERAL GRANTS TO MUNICIPALITIES FOR WATER POLLUTION CONTROL.**
95 S. Ct. 847-848 (2975).

Descriptors: *Judicial decisions, *Administrative agencies, *Grants, *Treatment facilities, *Cities, Waste treatment, Water pollution, Water treatment, Treatment, Administration, Federal government, State government, Cost sharing, Legal aspects, Legislation, Economics, Government finance, Financing, Water Quality Act, Federal Water Pollution Control Act, Allotments.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Hazardous substances(Pollution), *Injunctive relief, Administrative regulations, Environmental policy.

An environmental group brought an action against the Administrator of the Environmental Protection Agency challenging the Administrator's action in withholding from the states 55 per cent of a fund authorized by Congress under the Federal Water Pollution Control Act (FWPCA), for federal grants to municipalities for construction of publicly-owned waste treatment works. The Supreme Court held that the Administrator did not have discretion to allot to the states less than all sums authorized to be appropriated under the FWPCA Amendments of 1972. (Fernandez-Florida)
W75-12285

**WETZEL V. A. DUDA AND SONS (ACTION BY RIPARIAN PROPERTY OWNERS TO ENJOIN WATER POLLUTION TO LAKE FROM FARMING OPERATIONS).**
306 So. 2d 533-534 (4th D.C.A. Fla. 1975).

Descriptors: *Trespass, *Judicial decisions, *Water pollution, *Lakes, *Farm wastes, Common law, Legal aspects, Riparian rights, Equity, Land tenure, Water law, Water pollution sources, Florida, Riparian land, Wastes, Farms, Chemical wastes, Agricultural chemicals, Chemicals.
Identifiers: *Injunctive relief, *Intentional torts, *Nuisance(Legal aspects), Hazardous substances(Pollution), Non-point sources(Pollution).

Plaintiffs, riparian property owners on a lake, brought an action against a nearby farming operation for an injunction to abate water pollution and for damages. Defendants were polluting the lake by discharging noxious chemical and other substances from a nearby farming operation. Plaintiffs alleged that their riparian rights were injured by the defendant's creation of a nuisance, that defendents breached their duty to conduct their farming operation in such a manner as not to injure plaintiffs, that the defendants were engaging in a continuing trespass, and that the actions of the defendants were willful and malicious. The trail court dismissed the action for failure to exhaust their administrative remedies under the Environmental Protection Act. The Fourth District Court of Appeal of Florida reversed and remanded holding that the action was predicated on the right to abate nuisance, continuing trespass, and continuing breach of duty; therefore, the property owners were not required to exhaust administrative remedies before seeking injunctive relief. (Fernandez-Florida)
W75-12286

**COLORADO PUBLIC INTEREST RESEARCH GROUP, INC. V. TRAIN (CITIZEN SUIT TO COMPEL THE ENVIRONMENTAL PROTECTION AGENCY TO CONTROL DISCHARGE OR RADIOACTIVE MATERIALS INTO NAVIGABLE WATERS).**
507 F. 2d 743-749 (10th Cir. 1974).

Descriptors: *Radioactive wastes, *Colorado, *Water pollution control, *Federal Water Pollution Control Act, Regulation, Permits, Water pollution sources, Pollutant identification, Impaired water quality, Federal project policy, Federal jurisdiction, Administrative agencies, Navigable waters.
Identifiers: *Administrative accountability.

Plaintiff, a nonprofit Colorado Corporation, sought to compel the Administrator of the United States Environmental Protection Agency to control discharges of radioactive materials into navigable waters. The Administrator claimed that by-products were not radioactive pollutants under law, and refused to regulate discharges into Colorado waters. Relying on the principle that a clear and reasonably certain statute requires no additional rule of construction, and noting that the Federal Water Pollution Control Act requires the Administrator to control pollutants, including radioactive materials, the United States Court of Appeals, Tenth Circuit, reversed and remanded the summary judgment in favor of defendants rendered by the District Court. (Knocke-Florida)
W75-12287

**SUBMERGED LANDS (STATE TITLE TO CERTAIN SUBMERGED LANDS).**
Illinois Stat. Ann. Ch 19, secs. 150 thru 151 (Smith-Hurd 1972). 1 p.

Descriptors: *Illinois, *Land reclamation, *Ownership of beds, *Beds under water, *Penalties(Legal), Regulation, Legislation, Public lands.
Identifiers: *Submerged lands, *Reclaimed land.

Under sections 150 and 151 the State of Illinois asserts the right to reclaim title to land in the state now submerged, and land that was formerly submerged, but which has since been illegally filled in, reclaimed and occupied. To enforce the State's claim, the Attorney General is authorized to bring suit to recover the lands, or to protect such lands from illegal occupation. (Hoffman-Florida)
W75-12288

**BORGMANN V. FLORISSANT DEVELOPMENT CO (ACTION TO ENJOIN ADJOINING PROPERTY OWNERS FROM COLLECTING AND DISCHARGING SURFACE WATER ONTO PLAINTIFFS' LAND).**
515 S. W. 2d 189-197 (Mo. Ct. App. 1974).

Descriptors: *Riparian land, *Riparian rights, *Natural flow doctrine, *Adjacent landowners, *Judicial decisions, Legal aspects, Common law, Equity, Land tenure, Negligence, Water law, Water rights, Relative rights, Competing uses, Water transfer, Natural flow, Channel flow, Flow, Streamflow, Regulated flow, Alteration of flow, Diversion, Obstruction to flow.
Identifiers: *Common enemy rule, *Injunctive relief, Nuisance(Legal aspects).

Plaintiff, landowners sued to enjoin adjoining property owners from collecting and discharging surface water onto plaintiffs' land. The issue presented was whether a landowner may develop a tract of land by building an apartment complex and collect surface water into a weir located on his property and permit the overflow to be discharged onto the adjoining tract of land. Plaintiffs contended that defendants constructed the system of storm sewers in a manner changing the flow of surface waters from the natural water course' and have discharge large quantities of surface water onto plaintiffs' lands where no natural water course existed prior to the construction. The court held that if the conformation of the land gives the surface water flowing from one tract to the other a fixed and determining course, so as to uniformly discharge it upon the servient tract at a fixed and definite point, the course thus uniformly followed by the water in its flow is a 'watercourse'. In denying the injunction, the court further held that defendant's discharge of water onto plaintiffs' land was through a 'natural surface water drainway or channel' and thus permissible under the common enemy doctrine. (Fernandez-Florida)
W75-12289

**GUMZ V. BEJES (ACTION BY ADJOINING LANDOWNERS FOR INJUNCTION AGAINST FLOODING FROM DRAINAGE AND IRRIGATION DITCH).**
321 N.E 2d 851-858 (Ct. App. Ill. 3d Dist. 1975).

riptors: *Flooding, *Adjacent land owners, od routing, *Watercourses(Legal aspects), ls, Abatement, Check structures, Dams, s, Drainage systems, Flood damage, Over- Flow control, Pumps, Water circulation, Ar- l watercourses, Developed waters.

iffs, adjoining landowners to defendant, t an injunction and damages for causing their to flood. Defandant counterclaimed for in- ve relief and damages for plaintiffs alleged uction to water flow. A flood control gate rected and maintained by all parties since at 1956. After erecting a private system of dikes own land, defendant demanded contribution plaintiffs for keeping their lands from flood- When no money was paid, defendant modified kes to protect his own lands which caused ng on plaintiff's land. Judgment was for iff. The Third District Court of Appeals of ia affirmed on the grounds that water which ecome part of a watercourse may not be ed by an owner onto his neighbor's land ut liability. (Knocke-FLorida)
12290

**' SHORE SEAFOOD AND COMPANY V. ES SERVICE CO. (ACTION FOR AGES ARISING FROM DAM BREAK OF PHATE COMPANY'S DAM PERMITTING PHATE SLIME POLLUTION OF RIVER).**
2d 957 (5th Cir 1974).

iptors: *Floods, *Phosphates, *Adjacent owners, *Flood damage, Flood control, protection, Watercourses(Legal aspects), s, Banks, Dams, Dam failure.

iff brought a diversity action in tort against dant phosphate company for compensatory nitive damages resulting from a dam break g phosphate slime to pollute the Peace River o plaintiff's land. While plaintiff graphically ed the extent of pollution damage, he failed uce substantial evidence of willful and wan- sconduct by defendant which would support ve damages. The United States District directed a verdict denying punitive damages warding compensatory damages. The fifth t Court of Appeals affirmed. (Knocke- a)
2291

**WOOD ESTATES OF BRAINTREE, INC. SMITH (ACTION TO DETERMINE CRIPTIVE RIGHTS OF USE IN DEFEN- 'S POND).**
E. 2d 781 (Mass App 1975).

ptors: *Adjacent land owners, *Ponds, riptive rights, Legal aspects, Equity, Water Judicial decisions.

ffs sought rights of precription in defen- pond. Because of a failure by plaintiffs to e pond uninterruptedly for over 20 years, the ls Court of Norfolk County, Massachusetts ed the trial court's judgment for defendant. ke-Florida)
2292

**DITY, UNDER FEDERAL CONSTITU- OF STATE STATUTE OR LOCAL OR- NCE REGULATING PHOSPHATE CON- OF DETERMENTS,**
Myers.
R Fed. 365-375 (1974). 11 p, 6 ref.

ptors: *Local governments, *Phosphates, r pollution sources, *Constitutional law, ial decisions, Water quality control, hication, Florida, Illinois, Chicago, Indus- Environmental control, Legislation.
iers: State policy, Hazardous sub- s(Pollution), Phosphate, Regulation, Com- merce clause, Chicago ordinance, Ordinances, Statutes.

The annotation deals with constitutional challenges to state and local statutes regulating the phosphate content of detergents. Most of the litigation involves suits by the Soap and Detergent Association for a preliminary injunction against enforcement of a statute. The courts are divided on the issue of whether the statute or ordinance constitutes an undue burden on commerce. Employing a balancing test, more courts have upheld such laws where the only burden on interstate commerce is increased cost to the businessman. A Chicago ordinance making it a criminal offense to sell detergent containing phosphates was held to constitute an undue burden on commerce because the product was not sufficiently harmful to justify disruption of the flow of interstate commerce. Challenges based on substantive due process and equal protection grounds have not succeeded thus far in the federal district courts. (Jenkins-Florida)
W75-12293

**UNITED STATES V. ASHLAND OIL AND TRANSPORTATION CO. (APPEAL FROM FINDING THAT DEFENDANT HAD VIOLATED FWPCA AMENDMENTS OF 1972 BY DISCHARGING OIL INTO NAVIGABLE STREAM).**
504 F.2d 1317-1330 (6th Cir. 1974).

Descriptors: *Federal Water Pollution Control Act, *Water pollution, *Water pollution control, *Water pollution sources, *Oil pollution, *Oil spills, Water, Water quality, Water quality control, Pollutants, Pollutant identification, Oil, Streams, Navigable waters, Tributaries, Rivers, Navigable rivers.
Identifiers: Evidence, Hazardous substances(Pollution).

Corporate defendant was charged under the Federal Water Pollution Control Act of 1972 with failing to immediately notify an appropriate federal agency after ascertaining that it had discharged oil into a non-navigable stream. The United States District Court for the Western District of Kentucky entered a guilty verdict from which defendants appealed. The Sixth Circuit affirmed and held that the Act was intended to control both discharges of pollutants directly into navigable waters and discharges of pollutants into non-navigable tributaries which flow into navigable waters. The court also found that Congress has the constitutional authority under its interstate commerce powers to prohibit the discharge of pollutants into non-navigable tributaries of navigable streams. The court noted that the government is not required to bear the burden of proof to establish that pollutants were not only discharged into a non-navigable tributary of a navigable river, but also that reached and polluted the navigable river. (Gagliardi-Florida)
W75-12294

**AQUATIC WEED CONTROL - STATE REVENUE LAWS.**
Fla. Stat. sec. 213.11 (1971), as amended, act 217, sec. 1 (1973) Fla. Laws.

Descriptors: *Florida, *Aquatic weed control, *Aquatic weeds, *Taxes, *Water hyacinth, Cultural control, Watershed management, Antifouling materials, Aquatic algae, Legislation, Aquatic life, Aquatic plants.
Identifiers: *Aquatic vegetation.

Under this statute, two percent of all revenues collected under the first gasoline tax will be transfered from the Department of Revenue to the agency in charge of controlling aquatic weeds. This revenue, limited to two million eight hundred thousand dollars, will be used only for the eradication, control, and research of water hyacinths and noxious aquatic vegetation. (Hoffman-Florida)
W75-12295

**TARSHIS V. LAHAINA INVESTMENT CORP. (RESPONSIBILITY OF OWNER OF BEACH FRONT PROPERTY TO WARN OF SURGING WAVE).**
400 F.2d 1019-1021 (9th Cir. 1973).

Descriptors: *Judicial decisions, *Hawaii, *Waves, *Turbulence, *Surf, *Negligence, Ocean waves, Rip currents, Third party effects, Local aspects, Penalties(Legal).
Identifiers: *Tort liability, *Beach front hotels.

Plaintiff brought a tort action against an ocean-front hotel for personal injuries suffered as a result of being thrown on the beach by a wave. The plaintiff alleged negligence by the hotel in not warning its guests of the existence of the powerful, surging surf. An appeal was taken following a summary judgment of dismissal. In reversing the trial court, the Court of Appeals found that whether the ocean would have appeared dangerous to an ordinarily intelligent person was question of fact inappropriate for summary adjudication. The case was remanded to allow the plaintiff to present her theory that the surf represented an unapparent, dangerous condition of which the hotel operator negligently failed to warn its guests. (Hoffman-Florida)
W75-12296

**WATER SUPPLY.**
New York Session Laws, Ch. 664, sec. 15-1501 through 1529 (McKinnley 1972).

Descriptors: *Well regulations, *New York, *Reservoirs, *Reservoir construction, *Reservoir sites, *Water supply, *Dependable supply, Reservoir operation, Water management, Water utilization, Legislation, Pipelines.
Identifiers: *Forest preserve reservoirs, *Water supply construction, *Legal damages.

The statute contains regulations concerning the installation of new sources of water supply. All maps and plans for new or additional sources of water supply or for public forest preserve reservoir projects are to be submitted for approval to the appropriate state department. The information required on the application is set forth in detail. Restrictions are placed on the transportation of freshwater from New York to neighboring states. Guidelines for the approval of reservoir projects are set forth. Also designated is supervision of construction, responsibility for future repairs, and holder of title to the reservoir. The statute also establishes requirements for obtaining permission to drill wells in Long Island, and provides for the payment of damages to any third person injured by the execution of any water supply project carried on by the City of Rochester. (Hoffman-Florida)
W75-12297

**CITY OF LAKE CHARLES; RECLAMATION AND DEVELOPMENT OF LAKE FRONT.**
Louisiana Constitution, Article 14, sec. 39 (Supp. 1973).

Descriptors: *Louisiana, *Land reclamation, *Land development, *Land management, *Levees, Public lands, Legislation, Land tenure, Economics, Breakwaters, Retaining walls, Eminent domain, Cities, Local governments, State governments.
Identifiers: *Lakefront development, *Beach development.

The Louisiana Constitution authorizes the City of Lake Charles to have full and exclusive right and power to provide various works, of a non-commercial non-profit nature, necessary for the reclamation and development of the lake front. The section describes the particular area of Lake Charles and the adjoining property over which the City will have control. The City of Lake Charles is also authorized to acquire any private property along the shore of the lake, within the defined

limits necessary for the reclamation project. To help defray costs, the State grants title to the city of all public property necessary to further the goals of the project. The State is prohibited from authorizing any governmental subdivision, private entity or person to reclaim the bed of the lake or constructing any works within the limits described. Finally, the City of Lake Charles is authorized to issue bonds and incur additional debt of up to $3 million to finance the public improvements authorized. (Hoffman-Florida)
W75-12298

**UNITED STATES V. 187.40 ACRES OF LAND, HUNTINGDON COUNTY, PA. (ACTION TO CONDEMN LAND FOR USE IN CONSTRUCTING FLOOD CONTROL PROJECT).**
381 F. Supp. 54 (M.D. Pa. 1974).

Descriptors: *Condemnation, *Flood control, *Reservoir construction, Pennsylvania, Rivers, Flood protection, Condemnation value, Flooding, Floods, Reservoir sites, Reservoirs, Eminent domain.
Identifiers: Presumptions(Legal).

This case arises from condemnation proceedings instituted by the Secretary of the Army for the construction of a flood control reservoir on the Juniata River, Huntingdon County, Pennsylvania. The United States moved to strike the landowners' defense that the Secretary of the Army lacked statutory authority to take the land and that their land was not necessary to the success of the project. The United States District Court for the Middle District of Pennsylvania held that the Secretary had authority to take the property even though the property was not listed in the plan submitted to Congress. The court found that the judicial role in reviewing condemnation cases does not encompass the power to determine whether the land taken is actually necessary for the successful operation of the project, but only extends to deciding the propriety of the public purpose of such acquisitions and the requisite statutory authority. (Gagliardi-Florida)
W75-12299

**WATER CONSERVATION IN SWEDEN: II. POLLUTION CONTROL,**
National Swedish Environment Protection Board, Stockholm.
For primary bibliographic entry see Field 5G.
W75-12317

**ENVIRONMENTAL WATER QUALITY PROGRAM,**
Chicago Dept. of Aviation, Ill.
For primary bibliographic entry see Field 5G.
W75-12331

**LIAISON WITH PLANNING AUTHORITIES-A VITAL LINK,**
R. Satchell.
Water, No 3, p 9-11, April, 1975. 1 fig.

Descriptors: *Water policy, *Water supply, *Legislation, *Administration, Comprehensive planning, Decision making.
Identifiers: Water authorities, Great Britain.

The need for cooperation between water authorities and local planning agencies is essential to providing proper water services. This need was recognized by Section 24(8) of the Water Act 1973 making it necessary for water authorities to take development plans, local plans, and structure plans into account and consult with local authorities. The Severn Trent Water Authority arranges a meeting about once a year with the county officials, regional economic planning councils, managers of new towns, and the central and regional Department of Environment. Planning applications are part of the on-going responsibilities of the water authority which are passed on to the proper division to get their opinions on the appropriate water reclamation and supply. The water authority must keep the counties and districts informed of the intent and content of their short and medium term programs. Although the water authority should contribute to the planning process it is not their purpose to usurp the function of local planners. (Dean-FIRL)
W75-12335

**NORTH WEST: A DIRTY INHERITANCE.**
For primary bibliographic entry see Field 5G.
W75-12336

**HISTORICAL AND LEGAL ASPECTS OF NEPA,**
For primary bibliographic entry see Field 6G.
W75-12337

**HOW WELL ARE WE HANDLING TOXIC WASTE.**
For primary bibliographic entry see Field 5E.
W75-12342

**CANADIAN DRINKING WATER SURVEILLANCE PROGRAMS, PANEL DISCUSSION,**
Nova Scotia Dept. of Public Health, Halifax. Div. of Public Health Engineering.
For primary bibliographic entry see Field 5G.
W75-12355

## 6F. Nonstructural Alternatives

**FLOOD INSURANCE AND FLOOD PLAIN ZONING AS COMPATIBLE COMPONENTS,**
Clark Univ., Worcester, Mass. Dept. of Geography.
A. L. Marcus, and G. H. Abrams.
Natural Resources Lawyer, Vol 7, No 4, p 481-619 (1974). 29 p, 112 ref, 4 fig.

Descriptors: *Flood plain insurance, *Flood plain zoning, *Flood damage, *Flood protection, *Flood plains, Nonstructural alternatives, Legal aspects, Water zoning, Zoning, Flood routing, Economics, Insurance, Floodways, Overflow, Flood control, Floods, Flood data, Flood flow, Flood forecasting, Flash floods, Multiple-purpose projects, Alternative planning.
Identifiers: *Flood damage reduction, Compatible component approach.

An examination is made of the utilization of flood insurance as an element in a multiple alternative planning objective for flood plain regulation. Physical, human, and legal aspects of the problem are explained in relation to decision-making policies. Initially, the article describes the physical setting which leads to the occurrence of floods. An explanation of the interplay between river hydrology and numerous meteorological stimuli is presented. Further, the authors consider human encroachment on flood plains as one of the primary causes of flood losses. Two factors are emphasized as significantly contributing to flooding: large developed areas which have caused an increase in initial runoff, and the rise in elevation of flood waters as a result of man-made obstructions. The article presents the ramifications of flood insurance in great detail, describing its benefits in effecting a comprehensive flood protection program. Constitutional issues of due process, equal protection, and taking of property without compensation are discussed. The authors conclude that flood insurace is a viable component for a program to help relieve flood-induced tragedy. (Fernandez-Florida)
W75-12227

**FLOOD PLAIN INFORMATION: ELLICOTT CREEK IN THE TOWNS OF LANCASTER AND ALDEN AND THE VILLAGE OF ALDEN, ERIE COUNTY, NEW YORK.**
Army Engineer District, Buffalo, N.Y.
Prepared for New York State Department of Environmental Conservation, Division of Water Resources, October, 1972. 56 p, 24 fig, 9 plates, 10 tab.

Descriptors: *Floods, *Flooding, *Flood plains, *Flood protection, *Flood damage, *Flood plain zoning, Maximum probable flood, Obstructions to flow, *New York.
Identifiers: Lancaster(NY), Alden(NY), Erie County(NY), *Ellicott Creek(NY), Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

The reach of Ellicott Creek covered in this report lies within the Town of Lancaster and the Town and Village of Alden, New York, a total length of 13.8 miles. Flood records are incomplete but research showed the greatest flood was in 1936 (estimated 50-year frequency). Other major floods occurred in 1916, 1929, 1937, 1959 and 1963. Melting snow coincident with moderate amounts of precipitation has often caused major damaging floods in late winter or early spring although large floods occur at all times of the year. Development in the flood plain has been substantial and will continue to increase due to increased suburbanization in the Buffalo area; population in the basin has increased from 19,000 in 1920 to 153,000 in 1970. Floods of any major proportion could cause substantial damage due to residential and commercial development in the flood plain, high channel velocities, and obstructions in the channel of vegetation. The Alden sewage disposal plant would be damaged, creating health problems. At stoney Road Bridge an Intermediate Regional Flood would have a peak discharge of 6,350 cfs and the Standard Project Flood discharge would be 23,800 cfs. No specific regulations for land use with respect to flood risk are in effect in these towns. Channel improvements, levees and a reservoir are included in possible flood control measures under consideration. Suggestions for flood plain management include encroachment lines, zoning, subdivision regulations, building codes, and flood plain regulations. (Park-North Carolina)
W75-12365

**FLOOD PLAIN INFORMATION: MOORES CREEK, ALBEMARLE COUNTY AND CHARLOTTESVILLE, VIRGINIA.**
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-12366

**FLOOD PLAIN INFORMATION--COASTAL FLOODING: TOWN OF POQUOSON, VIRGINIA.**
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-12367

**FLOOD PLAIN INFORMATION: MEHERRIN RIVER, EMPORIA, VIRGINIA.**
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-12368

**FLOOD PLAIN INFORMATION, WILLAMETTE RIVER, JOHNSON, KELLOGG AND MT. SCOTT CREEKS, MILWAUKIE-OAK GROVE-LAKE OSWEGO, OREGON.**
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 4A.
W75-12369

D PLAIN INFORMATION: SPRING AND
OW CREEKS, HOUSTON
OPOLITAN AREA, TEXAS.
Engineer District, Galveston, Tex.
mary bibliographic entry see Field 4 .
2371

D PLAIN INFORMATION: ONION
K, AUSTIN, TEXAS.
, Collie and Braden, Inc., Houston, Tex.;
ny Engineer District, Galveston, Tex.
mary bibliographic entry see Field 4A.
374

D PLAIN INFORMATION: JAMES
, HOWARDSVILLE TO SCOTTSVILLE,
MARLE COUNTY, VIRGINIA.
Engineer District, Norfolk, Va.
nary bibliographic entry see Field 4A.
375

D PLAIN INFORMATION: SOUTH SAN-
RIVER, LEBANON, OREGON.
Engineer District, Portland, Oreg.
nary bibliographic entry see Field 4A.
376

AL FLOOD HAZARD INFORMATION:
UAH AND TIBBETTS CREEKS, IS-
H AND VICINITY, WASHINGTON.
Engineer District, Seattle Wash.
nary bibliographic entry see Field 4A.
377

AL FLOOD HAZARD INFORMATION:
DISE CREEK, PULLMAN AND VICINI-
ASHINGTON.
Engineer District, Walla Walla, Wash.
nary bibliographic entry see Field 4A.
378

D PLAIN INFORMATION: HACKBERRY
K AND COTTONWOOD BRANCH, DAL-
OUNTY, TEXAS.
ngineer District, Fort Worth, Tex.
nary bibliographic entry see Field 4A.
379

## Ecologic Impact Of
## ater Development

LE PROJECT CALLS FOR ROCK

nary bibliographic entry see Field 4A.
922

IOURAL RESPONSES OF WHITEFISH
RAINBOW TROUT TO DRILLING
,
s and Marine Service, Winnipeg
ba).
nary bibliographic entry see Field 5C.
952

OUTPUT ANALYSIS AND THE EN-
MENT,
ity Coll. of Wales, Aberystwyth. Dept. of
ics.
athur.
npton University, Department of
ics, Environmental Economics Study
Bibliography Series 14, 1973. 6 p, 18 ref.

tors: *Economic impact, *Bibliographies,
output analysis, *Mathematical models,
on abatement, Social impact, Industrial
ion, Leontief models.
ers: *Isgard models.

Input-output analysis, as a tool for the study of pollution abatement, is presented with an introduction to its mathematics and an annotated bibliography. The mathematics of input-output analysis can be described in terms of (1) a partitioned matrix with component matrices of coefficients of input-output, pollution generation, goods required for eliminating pollutants, and pollution production and of total factor costs of both economic activities and pollution control activities; and (2) output, cost, and price vectors. Included in the bibliography are the 3 books and 15 articles published from 1966 to 1974. The topics range from a simple introduction to a summary of previous theoretical work to an application of input-output analysis to Canadian industry. Empirical results as well as theoretical results are presented in the articles covering the effect of pollution control in U.K. prices, the Leontief models, the Isgard model, and other applications of input-out analysis. (Becker-Wisconsin)
W75-12177

**INTERNATIONAL ECONOMICS AND ENVIRONMENT CONTROL,**
Southampton Univ. (England). Dept. of Economics.
E. Pearce.
Environmental Economics Study Group Bibliography Series 11, December 1973. 7 p, 38 ref.

Descriptors: *Pollution abatement, *Bibliographies, *Environmental control, *Industrial production, Economic impact, Foreign trade, Standards, Political aspects, Competition, Social aspects.
Identifiers: *Externalities, *Spillover effects, *International economics, International cooperation, International boundaries.

This bibliography contains 38 references to books and journal articles pertaining to the area of international economics and environmental control. It includes the topics of trade and environmental quality, economic development and environmental quality, pollution control and international trade, and international transmission of pollution. Of the 38 references, 9 were contributed by I. Walter and 5 by R.C. d'Arge. The bibliography covers articles published in the period from September 1970-September 1973. (Becker-Wisconsin)
W75-12178

**ECONOMIC GROWTH VS. THE ENVIRONMENT. A BIBLIOGRAPHY,**
Bristol Univ. (England). Dept. of Economics.
R. Lecomber.
Southampton University, Department of Economics, Environmental Economics Study Group Bibliography Series 6, August 1973. 13 p, 159 ref.

Descriptors: *Environmental effects, *Industrial production, *Bibliographies, *Optimization, *Decision making, Natural resources, Welfare(Economics), Foreign countries, Model studies, Measurement, Discount rates, Ecology, Political aspects, Forecasting, Ethics, Planning, Social values, Social aspects, Foreign trade, Human population, Water pollution, Legal aspects, Psychological aspects, Legislation, Pollution abatement.
Identifiers: *Externalities, *Uncertainty, *Welfare distribution.

This bibliography includes 159 references to a wide range of topics. To facilitate use of the bibliography, an index with sections encompassing various areas and controversies associated with economic growth and the environment is included. Index headings are: general surveys, models, etc., (1) growth and externalities, (2) irrationality, ignorance and failure in the assumption of exogenous tastes; (3) future generations; (4) welfare distribution; (5) growth and environment in an international setting; (6) developing countries; (7) the role of uncertainty; (8) growth and other sources of environmental deteriorations; (9) prophesies of doom; (10) technicalities of measuring growth, welfare, etc., (11) discussion of discount rate; (12) multi-period optimization models; (13) policies for the environment; (14) a short reading list. All articles are listed under at least one index subheading. (Becker-Wisconsin)
W75-12182

**BIG CYPRESS NATIONAL PRESERVE (PART 1).**
Hearings--Subcomm. on Parks and Recreation--Comm. on Interior and Insular Affairs, U. S. Senate, 93d Cong, 2d Sess, March 21 and 22, 1974. 369 p, 1 map, multiple photo, multiple illus.

Descriptors: *Florida, *Swamps, Parks, Recreation, Ecology, Water, Ecosystems, Land, Slopes, Sheet flow, Water levels, Rainfall, Watershed management, Drainage, Drainage effects, Drainage patterns (Geologic).
Identifiers: Congressional hearings.

The Senate Subcommittee on Parks and Recreation convened on March 21, 1974 to consider S.334, S.783, S.920 and H. R. 10088. All four measures involve protection for the Everglades-Big Cypress ecology. The bills differ in the methods of acquisition and slightly different acreage in the acquisition and establishment plans. A vital factor in the Big Cypress ecosystem is the slope of the land, which results in exceedingly slow drainage which extends the wet months beyond the period of actual rainfall. The underneath flatness causes sheet flows, the result of which is water level changes of only a few inches which can affect thousands of acres. Much of those acres stand under water for as long as four months after the rainfall ceases. This is a natural watershed storage area and supplements the manmade areas. Although acquisition will be expensive, a monumental commitment in terms of funds for environment protection may be necessary since future action will probably be even more expensive. (Gagliardi-Florida)
W75-12195

**HIGH SEAS OIL PORT ACT.**
For primary bibliographic entry see Field 5G.
W75-12201

**THE FIFTH ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY.**
Council on Environmental Quality, Washington, D. C.
For sale by the Superintendent of Documents, Government Printing Office, Washington, DC, for $5.20. 1974, 636 p, 57 fig, 1 illus, 76 photo, 86 tab, 12 append.

Descriptors: *Administrative agencies, *Environmental effects, *Environmental control, *Environmental engineering, Air pollution, Water pollution, Land use, Land development, Land management, Land resources, Programs, Administration, Federal Government, Regulation, Comprehensive planning, Legal aspects, Planning, Social aspects, Water resources development, Statistics, Legislation, United Nations.
Identifiers: *Environmental policy, *National Environmental Policy Act, Energy crisis, Hazardous substances (Pollution), Non-print sources (Pollution).

This Fifth Annual Report of the Council on Environmental Quality was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), which requires the Council to report at least once a year on the state of the environment and efforts to improve it. An overview of current knowledge about a number of land use issues is presented. Topics include: the environmental, economic, and social impacts of land development; the various stimulants which affect develop-

ment; and the different tools available to control the pace and character of development. Major developments during the past year in government programs to protect the environment are considered. Information about the condition of the enviroment, important trends in environmental quality, and basic environmental statistical data is provided in the Report. One chapter reviews the evolution of the National Environmental Policy Act over its first five years, including the adoption of environmental impact statement requirements by the states and foreign countries. The report describes the development of the United Nations Environmental Program, and, in the framework of its Action Plan, the broad range of international environmental efforts now underway around the globe. The final chapter provides brief descriptions of some of the Council's analytical work over the past year. (Fernandez-Florida)
W75-12203

**USES OF SCIENTIFIC INFORMATION IN ENVIRONMENTAL DECISION-MAKING,**
Indiana Univ., Bloomington, School of Law.
M. R. Gelpe, and A. D. Tarlock.
Southern California Law Review, Vol 48, No 2, p 371-427, 1974. 57 p, 145 ref.

Descriptors: *Legal aspects, *Public rights, *Water law, *Competing uses, *Cost-benefit analysis, Costs, Economics, Benefits, Environmental effects, Common law, Constitutional law, Equity, Judicial decisions, Regulation, Third party effects, Social aspects, Water rights, *Adjudication procedure, Legislation, Public health, Environment, Cost-benefit theory, Technology, Natural resources, Risks.
Identifiers: *Proximate causation, *Environmental policy, *Hazardous substances (Pollution), Injuctive relief, Standing(Legal).

The response of the legal system to the uncertainty inherent in scientific analysis of environmental impacts is explored. The authors argue that existing concepts of cause-in-fact, the foundation of legal liability, place potentially severe constraints on the ability of the legal system to respond to the need to minimize the risks of future environmental injury. Both the legal and scientific concepts of cause are explained and distinguished. The article points out the concern of science to describe physical relationships and draw inferences from observed to unobserved behavior, while the law treats an event as having happened or likely to occur regardless of what did in fact happen or may occur. In addition, the article discusses the less of what did in fact happen or may occur. In addition, the article discusses the decision-making process with respect to how much of an activity should be allowed or if a project should be prohibited or modified as one aspect of the broader problem of technology assessment. The relationship between the problems studied by the science of ecology and the difficult problems of value choice faced by decisionmakers forced to choose between alternative uses of natural resources is explored. In conclusion, the article proposes a refinement of the concepts of cause and injury, to conform them to real threats to the environment, by means of risk-benefit analysis consistent with principles of fairness. (Fernandez-Florida)
W75-12204

**THE DOCTRINE OF PRIMARY JURISDICTION MISCONCEIVED: END TO COMMON LAW ENVIRONMENTAL PROTECTION,**
Florida Attorney General's Office, Tallahassee.
K. F. Hoffman.
Florida State University Law Review, Vol 2, No 3, p 491-510, 1974, 20 p, 110 ref.

Descriptors: *Administrative agencies, *Administrative decisions, *Jurisdiction, *Judicial decisions, *Pollution abatement, Common law, Equity, Public health, Public rights, State governments, Administration, Water law, Legal aspects, Adjudication procedure, Administration, Federal government, Legal review, Water pollution, Abatement, Control, Water pollution control, Water pollution sources.
Identifiers: *Hazardous substances (Pollution), *Injunctive relief, *Nuisance (Legal aspects).

The doctrine of 'primary jurisdiction' was articulated by the United States Supreme Court in 1907. The doctrine bars access to the courts where a dispute should be heard first in an administrative tribunal, for purposes of uniformity or to make use of particular administrative expertise. This article examines the effect of the primary jurisdiction doctrine on common law actions to abate pollution-caused nuisances. Both the history and limitations of the doctrine are reviewed. Historically, government possessed the authority and duty to seek abatement of nuisances that threatened public health and welfare; and courts of equity have had concurrent jurisdiction. This article illustrates how the doctrine of primary jurisdiction destroys that traditional authority and replaces it with administrative control. Most commentators agree, states the author, that these agencies are very unsatisfactory substitutes because they are unresponsibe to public needs. The article concludes that the creation of the doctrine was an improper judicial attempt to legislate which has resulted in irreparable injury to the public health and welfare by delaying access to the courts until it is too late to remedy the effects of uncontrolled pollution. (Fernandez-Florida)
W75-12206

**THE FLORIDA ENVIRONMENTAL PROTECTION ACT OF 1971: THE CITIZEN'S ROLE IN ENVIRONMENTAL MANAGEMENT,**
P. A. Renovitch.
Florida State University Law Review, Vol 2, No 4, p 736-765, 1974. 30 p, 181 ref.

Descriptors: *Legal aspects, *Judicial decisions, *Public rights, *Legislation, *Environmental effects, Public health, Administrative agencies, Common law, Equity, Regulation, Water law, Administration, Adjudication procedure, State Governments, Administrative decisions, Environment, Environmental control, Environmental engineering, Management, Florida.
Identifiers: *Administrative regulations, *Class action suits, *Liability (Legal aspects), *Nuisance (Legal aspects), *Standing (Legal), Environmental policy, Hazardous substances (Pollution), Injunctive relief.

In response to increased public awareness of visible environmental decay, the Florida Legislature has enacted legislation designed to forestall environmental deterioration. The reluctance of administrative agencies to enforce the law, however, has impaired the ability of concerned citizens to protect the environment. This note discusses the inadequacies of the common law nuisance remedy in environmental litigation. The author discusses the strict standing requirements of the 'special injury' rule which inhibits the institution of public nuisance actions by private citizens. Particular emphasis is given to the granting of standing by Florida's Environmental Protection Act, and to its potential effecacy as a means of providing access to the courts, which frequently have been foreclosed by traditional public nuisance doctrine. The author criticizes the traditional practice of placing the enforcement of environmental laws in the hands of administrative agencies, and strongly endorses the Environmental Protection Act as affording citizens a voice in environmental management. In conclusion, the author suggests that judicial intervention in the environmental regulatory scheme should insure effective and efficient enforcement of environmental laws. (Fernandez-Florida)
W75-12207

**A RIVER RESTORED: OREGON'S WILLAMETTE,**
National Geographic Society, Washington, D. C.
For primary bibliographic entry see Field 5G.
W75-12210

**WASTING A RIVER,**
California Univ., Berkeley, Coll. of Natural Resources.
B. T. Parry, and R. B. Norgaard.
Environment, Vol 17, No 1, p 17-20, 25-27, (1975). 7 p, 1 fig, 4 photo, 1 tab, 9 ref.

Descriptors: *Dams, *Cost allocation, *Cost analysis, *Cost-benefit analysis, *Cost-benefit ratio, *Cost-benefit theory, Costs, Economics, Economic justification, Economic impact, Economic prediction, Inflation(Economic), Environment, Environmental control, Water, *California, Flood control, Irrigation, Recreation, Fish, Wildlife, Environmental effects.
Identifiers: Administrative regulations, New Melones Dam(Calif).

The degree to which economic factors are arranged in a light favorable to environmental projects has become a concern to the General Accounting Office (GAO). The New Melones Dam in California has been singled out to determine how economic assessments fall short of the objectivity which by law they are required to display. Calculations of the authors show vast exaggeration of the benefit-to-cost ratio resulting from the evaluation techniques used by the Corps of Engineers. The following project benefits were found to have been overstated: flood control, irrigation, power, recreation, fish and wildlife, and water quality control. Some of the errors pointed out are substantial, some in themselves enough to make the project uneconomical. Others are not as substantial but, in combination have the same effect. In addition, the Corps utilized a project life of 100 years rather than the more recognized 50 year life. Further, it did not use the correct interest rate or consider many environmental costs. In light of these errors, it was recommended the construction of the New Melones Dam be forestalled until a re-evaluation of the benefit-cost analysis be done. (Gagliardi-Florida)
W75-12211

**CRITICAL CHOICES SAVE SHORELINE,**
J. Carroll.
In: Our Natural Resources: The Choices Ahead, Department of Interior Conservation Yearbook Series, No 10, p 58-61, 1974. 4 p, 2 photo.

Descriptors: *National seashore, *Scenery, *Shore protection, Environment, Frail lands, Seashores, Public lands, Recreation facilities, Conservation, Shores, Beaches, Aquatic environment.
Identifiers: Historical values.

Congressional action has resulted in the establishment of 12 national seashores and lakeshores which are administered by the National Park Service. This action was taken to help preserve the scenic treasures, recreational opportunities, and historical values of these vital, but threatened areas of our country. The effects of various national Park Service decisions on the environment of particular protected areas are scrutinized. The areas involved include the Cape Cod National Seashore, Apostle Islands of Lake Superior, Point Reyes in California, Roanoke Island of North Carolina, Padre Island along the Texas Gulf Coast, Gulf Islands National Seashore in Florida, Cumberland Island National Seashore off the Georgia Coast, and the Sleeping Bear Dunes National Lakeshore of Michigan. (Hoffman-Florida)
W75-12231

**SAVING OUR WATER RESOURCES,**
Office of Water Resources Research, Washington D.C.

L. Leedy.
Our Natural Resources: The Choices Ahead, partment of Interior Conservation Yearbook ries No 10, p 76-78, 1974. 3 p, 3 photo.

scriptors: *Office of Water Resources search(OWRR), *Training, *Water manage-nt(Applied), *Methodology, Occupations, aste treatment, Pollutants, Estuaries, Decision king, Comprehensive planning, Resources velopment, Planning, River forecasting, Water ources development.
ntifiers: Water related occupations, Research jects, Chowan River.

e Office of Water Resources Research (OWRR) ministers a nation-wide cooperative water ources research and training program. One usand or more research projects are sponsored ually by OWRR in which over 2,000 university dents participate as research assistants and eive valuable training for water-related posi-ns. Three studies are described showing how OWRR program aids in water and related ources planning and management. One of these dies involves the Spokan River in Oregon. The earch team is developing information on the rces and fate of pollutants, and what is needed return the river to a high quality level and main-n it at this level in the face of increasing velopment. In another study, a Scenic Rivers dy Unit was organized in Idaho to develop thodology for decision making and planning in selection, use, and management of rivers ing under the 1968 Wild and Scenic Rivers Act. e third study explored involved a program ablished to find the causal relationships tween waste inputs and its effects on water ality of the Chowan River estuary in the Al-marle region of North Carolina. (Hoffman-rida)
5-12232

WARD A CLEANER AQUATIC ENVIRON-NT,
vironmental Protection Agency, Washington, C. Office of Air and Water Programs.
r primary bibliographic entry see Field 5G.
5-12234

NEPA SETTLEMENT: CONSERVATION UNCIL OF NORTH CAROLINA V. OEHLKE,
rthwestern Univ., Evanston, Ill. School of w.
r primary bibliographic entry see Field 6E.
5-12244

COGNITION OF SUBSTANTIVE RIGHTS DER NEPA,
ifornia State Water Resources Control Board, cramento.
r primary bibliographic entry see Field 6E.
5-12250

KED DISPOSAL AREA SITE NO 12, CLEVE-ND HARBOR, CUYAHOGA COUNTY, OHIO.
ny Engineer District, Buffalo, N. Y.
r primary bibliographic entry see Field 5E.
5-12255

RITIME ADMINISTRATION PROPOSED ORE FACILITY FOR TREATMENT AND SPOSAL OF SHIP GENERATED OILY TER WASTES.
ritime Administration, Washington, D. C.
r primary bibliographic entry see Field 5D.
5-12256

MALA BAY WASTEWATER TREATMENT D DISPOSAL SYSTEM, OAHU, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, San Francisco, Calif. Region IX.
For primary bibliographic entry see Field 5D.
W75-12257

RIVER CROSSING PERMITS FOR BUCKEYE PIPE LINE CO. PROPOSED PETROLEUM PRODUCTS PIPELINE SYSTEM BETWEEN LINDEN, NEW JERSEY AND MACUNGIE, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 8A.
W75-12258

MARINE SANCTUARIES.
National Oceanic and Atmospheric Administration, Washington, D. C.
For primary bibliographic entry see Field 6E.
W75-12261

ESTUARINE SANCTUARY GRANTS--APPLICATION AND SELECTION CRITERIA PROCEDURES.
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 6E.
W75-12262

CONSERVATION SOC'Y. OF SOUTHERN VERMONT, INC. V. SECRETARY OF TRANSPORTATION (REVIEW OF MOTION FOR EQUITABLE INJUNCTION AGAINST STREAM CHANNELIZATION PROJECT).
For primary bibliographic entry see Field 6E.
W75-12282

HISTORICAL AND LEGAL ASPECTS OF NEPA,
G. Noble.
Water and Sewage Works, Vol 122, No 5, p 86-88, May, 1975. 8 ref.

Descriptors: *Legislation, *Water pollution control, Legal aspects, Environmental effects.
Identifiers: *National Environmental Policy Act(NEPA), Environmental impact statements.

The National Environmental Policy Act (NEPA) was signed into law on January 1, 1970. The historical and legal aspects of NEPA are discussed. Although the original act was really only a statement of good intention, its action forcing provisions stated that: a systematic interdisciplinary approach will be used by the agencies to insure integrated use of the natural and social sciences and the environmental design arts; and, methods will be developed to give appropriate consideration in decision making to presently unquantified environmental amenities. The main feature of the Act is the provision that requires each Federal agency to submit a statement of environmental impact in advance of each major action, recommendation or report on legislation that may significantly affect the quality of the human environment. Areas of uncertainty, such as what projects are "significant" enough to require an impact statement and what degree of latitude should exist between agency interpretations, exist under NEPA. The results of several court cases which have helped to clarify the interpretation of NEPA are presented. (Orr-FIRL)
W75-12337

# 7. RESOURCES DATA

## 7A. Network Design

ERRORS AND FLUCTUATIONS OF RAIN-GAUGE ESTIMATES OF AREAL RAINFALL,
McGill Univ., Montreal (Quebec).
I. I. Zawadzki.
Journal of Hydrology, Vol 18, No 3-4, p 243-255, March, 1973. 3 fig, 5 ref.

Descriptors: *Rain gages, *Rainfall, Distribution patterns, Equations, Analytical techniques, Estimating, Areal.
Identifiers: Errors.

Analytical expressions for the error in the area-averaged rainfall as estimated by a network of rain gages and the fluctuations in the estimate have been derived. The actual variance of the area-averaged rainfall in terms of the mean, the mean square, and the space autocorrelation function of the areal distribution of rainfall also has been examined. The error equation is evaluated for an exponential autocorrelation function and a simple approximate expression is obtained. (Sandoski-FIRL)
W75-11933

EFFECT OF AN ERROR IN DISCHARGE MEASUREMENTS ON THE DETECTION PROCESS IN RUNOFF SYSTEMS ANALYSIS,
Hokkaido Univ., Sapporo (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12020

EFFICIENCY OF PARAMETER AND STATE ESTIMATION METHODS IN RELATION TO MODELS OF LUMPED AND DISTRIBUTED HYDROLOGIC SYSTEMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2A.
W75-12025

## 7B. Data Acquisition

A COMPARISON OF THE METHODS USED TO CALCULATE FIRST ORDER BOD EQUATION CONSTANTS,
Rutgers - the State Univ., New Brunswick, N. J. Dept. of Environmental Science.
For primary bibliographic entry see Field 5B.
W75-11855

DECIPHERING OF GROUND WATER FROM AERIAL PHOTOGRAPHS,
For primary bibliographic entry see Field 4B.
W75-11882

MEASUREMENT OF EXTREMELY SMALL PRESSURE DIFFERENCES IN WATER,
Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics.
D. Weihs, and M. Sumer.
Journal of Physics E: Scientific Instruments, Vol. 6, No. 1, p 77-78, January, 1973. 3 fig, 3 ref.

Descriptors: *Measurement, *Manometers, Pressure, *Pressure measuring instruments.
Identifiers: Water velocities.

A technique for measuring small pressure differences in water, corresponding to water velocities of down to 0.04 meters per second has been developed. The system is a modification of Preston's twin reservoir techinque, using an inclined U tube manometer. Results accurate within one percent were achieved by this system,

which has a slightly faster response time than former techniques, in addition to being simpler in construction. (Sandoski-FIRL)
W75-11915

**ERRORS AND FLUCTUATIONS OF RAIN-GAUGE ESTIMATES OF AREAL RAINFALL,**
McGill Univ., Montreal (Quebec).
For primary bibliographic entry see Field 7A.
W75-11933

**A MOBILE SPRINKLER IRRIGATION FACILITY FOR MEASUREMENT OF SURFACE RUNOFF AND SOIL EROSION (EINE TRANSPORTABLE BEREGNUNGSANLAGE FUER DIE MESSUNG VON OBERFLAECHENABFLUSS UND BODENABTRAG),**
J. Karl, and H. Toldrian.
Wasser und Boden, No 3, p 63-65, 1973. 2 fig, 8 ref.

Descriptors: *Analytical techniques, *Rainfall-runoff relationships, *Soil erosion, *Infiltration, Rain gages, Measurement.
Identifiers: Ground infiltration.

A mobile irrigation unit, designed for measurement of rainfall-runoff, soil erosion, and ground infiltration, can be used almost anywhere. The unit, carried on a Volkswagen bus with trailer, has 22 nozzles emitting water at a maximum of 99 mm/h. Water can be pumped from a source nearby, or transported in the bus. The precipitation is measured with 15 Hillmann rain gages on the ground and the volume of water used is checked with a water meter installed between the pump and the nozzles. The area sprinkled, 0.25 meters, is bordered off by metal sheets dug into the ground or by ditches stabilized with a holding preparation. The collecting system consists of inclined metal sheets adjoining large metal funnels with trap spaces for eroded soil and an outlet for water. Water is collected into calibrated fiber metal tubes and seepage is measured with two weight-gage cylinders staked in the ground. The work includes determinations of the ground profile and features, and soil analysis. (Holz-FIRL)
W75-11948

**PHOTOGRAPHIC QUANTIFICATION OF WATER QUALITY IN MIXING ZONES,**
Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5A.
W75-11970

**A COMPUTER PROGRAM USED TO ESTIMATE PRIMARY PRODUCTIVITY FROM PH AND CARBON DIOXIDE DATA EMPLOYING THE UPSTREAM-DOWNSTREAM METHOD,**
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5C.
W75-11971

**LIDAR VS. PHOTOMETER, A ONE MONTH COMPARISON,**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W75-12036

**VARIATIONS OF THE TURBULENT FLUXES OF MOMENTUM, HEAT AND MOISTURE OVER LAKE ONTARIO,**
Atmospheric Environment Service, Toronto (Ontario).
For primary bibliographic entry see Field 2H.
W75-12078

**THE SPATIAL AND TEMPORAL VARIATIONS OF THE TURBULENT FLUXES OF HEAT, MOMENTUM AND WATER VAPOR OVER LAKE ONTARIO,**
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 2D.
W75-12079

**USE OF ENVIRONMENTAL ISOTOPE METHODS AS A RECONNAISSANCE TOOL IN GROUNDWATER EXPLORATION NEAR SAN ANTONIO DE PICHINCHA, ECUADOR,**
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Radiohydrometrie.
For primary bibliographic entry see Field 2F.
W75-12080

**SOIL WATER MEASUREMENT WITH AN INEXPENSIVE SPECTROPHOTOMETER,**
Agricultural Research Service, Durant, Okla. Water Quality Management.
For primary bibliographic entry see Field 2G.
W75-12081

**TESTING OF CLOUD SEEDING MATERIALS AT THE CLOUD SIMULATION AND AERSOL LABORATORY, 1971-1973,**
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W75-12099

**ON THE EFFECT OF NATURAL RAINFALL VARIABILITY AND MEASUREMENT ERRORS IN THE DETECTION OF SEEDING EFFECT,**
Battelle-Northwest, Richland, Wash.
For primary bibliographic entry see Field 3B.
W75-12103

**THE NATURE OF WINTER CLOUDS AND PRECIPITATION IN THE CASCADE MOUNTAINS AND THEIR MODIFICATION BY ARTIFICIAL SEEDING. PART II: TECHNIQUES FOR THE PHYSICAL EVALUATION OF SEEDING,**
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-12108

**THE NATURE OF WINTER CLOUDS AND PRECIPITATION IN THE CASCADE MOUNTAINS AND THEIR MODIFICATION BY ARTIFICIAL SEEDING. PART III: CASE STUDIES OF THE EFFECTS OF SEEDING,**
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-12109

**AN INFRA-RED PSYCHROMETER FOR DETECING CHANGES IN THE HUMIDITY OF LEAF BOUNDARY LAYERS,**
Adelaide Univ. (Australia). Dept. of Botany.
For primary bibliographic entry see Field 2I.
W75-12131

**MAJOR LATE-WINTER FEATURES OF ICE IN NORTHERN BERING AND CHUKCHI SEAS AS DETERMINED FROM SATELLITE IMAGERY,**
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W75-12168

**RAPID SOIL MOISTURE DETERMINATION BY IMMERSION METHOD, (IN KOREAN),**
Institute of Plant Environment, Suwon (Republic of Korea).
For primary bibliographic entry see Field 2G.
W75-12240

**FLOW QUANTITIES IN RESIDENTIAL WEEPING TILE SYSTEMS--A CALCULATIONAL METHOD,**
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
For primary bibliographic entry see Field 4A.
W75-12328

## 7C. Evaluation, Processing and Publication

**NEW COMPUTER SYSTEM MONITORS BATON ROUGE SEWERS.**
Water and Sewage Works, Vol. 120, No. 4, p 57, April, 1973.

Descriptors: *Computers, *Monitoring, *Sewerage, Maintenance costs, Pumping plants, Maintenance, Data collections, Data transmissions, *Pollutant identification, Waste water treatment, Louisiana, Remote reusing.
Identifiers: Baton Rouge (La), Sensors, Remote Contact Monitor Program.

A new computer system that is helping Baton Rouge, Louisiana, monitor the condition of its sewer system on a 24-hour basis is cutting maintenance costs by more than $20,000 a year. Using an automatic telephone dialing units, the IBM system/7 computer places calls to telephone unit which relay tone patterns generated by sensors attached to 120 unmanned sewerage pumping stations throughout the city. If the tone pattern indicates that a malfunction has occurred, the computer identifies the irregular response and the type of malfunction and prints a message to an operator telling him precisely what is wrong at which station. This 'Remote Contact Monitor Program' enables the computer to monitor the status of up to six contact-point sensors at any location with the proper telephone signaling equipment. (Sandoski-FIRL)
W75-11927

**COMPUTER'S MASTER PLAN SIGNALS SEWER PROBLEMS BEFORE THEY START,**
Thousand Oaks Utilities Dept., Calif.
O. H. Blume, and P. B. Kline.
The American City, Vol. 88, No. 5, p 96, 144, May, 1973.

Descriptors: *Computers, *Sewerage, *Model studies, Sewers, Flood forecasting, Interceptor sewers, Peak discharge, Design, Construction, Costs, California, *Pollutant identification.
Identifiers: Arcadia(Calif).

Engineering Science, Inc. (E-S) of Arcadia, California, has prepared a computerized sewerage system master plan to predict sewer overloading and flooding, thus enabling the city to take preventive action. In developing the master plan, E-S and city personnel first determined the capacity of the existing sewerage system. They superimposed on this system patterns of anticipated growth. The computer calculated, sized, and prepared estimated costs of new or supplemental collection and interceptor sewers. The growth patterns included presently approved development, two other logical phases of growth, and the predicted ultimate growth patterns. The program consists of a design model and a cost model. Each can be manipulated easily to simulate any condition of development. Program output includes calculated peak flows and velocity, capacity of existing sewers, size, length, and cover, and invert elevations of recommended new sewers if required. After helping

n the sewers, the cost model estimates con-
ion costs. The master plan program can
ze up to 800 separate reaches of sewer. It is
n in FORTRAN extended language. The pro-
is flexible and can be modified at nominal
It takes about 30 seconds to run the entire
am and costs less than $40. (Sandoski-FIRL)
11928

**OD EVENT DATA COLLATION,**
ute of Hydrology, Wallingford (England).
Lowing, and M. D. Newson.
r and Water Engineering, Vol 77, No 925, p
, March, 1973. 3 fig, 3 ref.

riptors: *Hydrologic aspects, *Floods, Rain-
unoff relationships, Hydrographs.
ifiers: Statistical studies.

67 a report from the Institution of Civil En-
rs drew attention to the need to updates a
publication on reservoir flooding in light of
quent improvements of techniques in flood
ology. A team of hydrologists started a three-
investigation, due for completion in 1973, to
ine various aspects of the mag-
e/frequency problem associated with flood
ology using two approaches. One is a statisti-
tudy of instantaneous peak flows and the
is concerned with catchment response and is
ore a study of particular rainfall-runoff
s. This second approach has required the col-
n and processing of a considerable quantity
od event data. Antecedent condition, storm
ll, and flow hydrograph data have been as-
led for over 1500 events from 151
ments. (Sandoski-FIRL)
11943

**OD PROFILES IN THE UMPQUA RIVER
N, OREGON: PART 3, UMPQUA RIVER
OW SCOTTBURG, SCHOLFIELD, COW
EK ABOVE GLENDALE,**
ogical Survey, Portland, Oreg.
rimary bibliographic entry see Field 4A.
11959

**ER RESOURCES DATA FOR CALIFOR-
1973: PART 2. WATER QUALITY
ORDS.**
ogical Survey, Menlo Park, Calif.
Report, 1975. 654 p, 2 fig, 6 tab, 23 ref.

riptors: *Water quality, *Surface waters,
undwater, *California, *Basic data collec-
, Streamflow, Physical properties, Sediment
port, Particle size, Water temperature,
ical analysis, Inorganic compounds, Biologi-
roperties, Sampling, Sites, River basins, Data
ctions.

basic-data report for the 1973 water year
1, 1972-Sept. 30, 1973) for California in-
s records of chemical, physical, and biologi-
haracteristics of surface and groundwater.
e data were collected from designated sam-
sites at predetermined intervals such as once
, weekly, monthly, or less frequently, and at
sites data were recorded on punched paper
at 15-, 30-, or 60- minute intervals. Chemical
y includes concentrations of individual dis-
d constituents and certain properties or
cteristics such as hardness, sodium adsorp-
ratio, specific conductance, and pH. The
gical information includes qualitative and
titative analyses of plankton, bottom organ-
and particulate inorganic and amorphous
r present. Microbiological information in-
s quantitative identification of certain bac-
logical, indicator organisms. Water-tempera-
data represent once-daily observations except
stations where a continuous temperature
rder furnishes information from which daily
nums and maximums are obtained. Fluvial-
nent information is given for suspended-sedi-
ment discharges and concentrations for particle-size distribution of suspended sediment and bed material. (Woodard-USGS)
W75-11962

**GROUND-WATER BASIC DATA FOR EMMONS COUNTY, NORTH DAKOTA,**
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 4B.
W75-11963

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 6. MISSOURI RIVER BASIN.**
Geological Survey, Reston, Va.
Available from Supt. of Documents, GPO, Washington, D.C. 20402, price $4.70. Water-Supply Paper 2155, 1975. 554 p, 1 fig, 41 ref.

Descriptors: *Water quality, *Surface waters, *Sediment transport, *Hydrologic data, Missiouri River, River basins, Iowa, Kansas, Missouri, Montana, Nebraska, North Dakota, South Dakota, Wyoming, Water temperature, Physical properties, Particle size, Chemical analysis, Inorganic compounds, Biological properties, Streamflow, Gaging stations, Sampling, Sites.
Identifiers: *Missouri River basin.

During the water year ending September 30, 1970, the Geological Survey maintained 258 stations on 123 streams in the Missouri River basin for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 226 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 35 and daily at 67 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical or sediment content. So far as practicable, the water temperatures were taken at about the same time ach day. Quantities of suspended sediment are reported for 38 stations during the year ending September 30, 1970. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 41 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W75-11964

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 8. WESTERN GULF OF MEXICO BASINS.**
Geological Survey, Reston, Va.
Availble from Supt. of Documents, GPO, Washington, D.C. 20402, price $4.50. Water-Supply Paper 2157, 1975. 532 p, 1 fig, 41 ref.

Descriptors: *Waterquality, *Surface waters, *Sediment transport, *Water temperature, *Basic data collections, Colorado, Louisiana, New Mexico, Texas, River basins, Physical properties, Particle size, Chemical analysis, Inorganic compounds, Biological properties, Streamflow, Sampling, Sites.
Identifiers: *Gulf of Mexico basins(Western).

During the water year ending September 30, 1970, the Geological Survey maintained 246 stations on 144 streams in the western Gulf of Mexico basins for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 241 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 2 and daily at 104 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 27 stations during the year ending September 30, 1970. Sediment samples were collected one or more times daily at most station, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of the sediments were determined at 25 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W75-11965

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 8. WESTERN GULF OF MEXICO BASIN.**
Geological Survey, Reston, Va.
Available from Supt. of Documents, GPO, Washington, D.C. 20402, $4.00. Water-Supply Paper 2147, 1974. 567 p, 1 fig, 40 ref.

Descriptors: *Water quality, *Surface waters, *Sediment transport, *Water temperature, Gulf of Mexico, *River basins, *Basic data collections, Colorado, Louisiana, New Mexico, Texas, Physical properties, Particle size, Chemical analysis, Inorganic compounds, Biological properties, Streamflow, Sampling, Sites.
Identifiers: *Gulf of Mexico river basins(Western).

During the water year ending September 30, 1969, the Geological Survey maintained 219 stations on 15 streams in the western Gulf of Mexico basin for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 214 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 1 and daily at 110 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 38 stations during the year ending September 30, 1969. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 34 stations, and particle-size distribution of bed material at 4 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W75-11966

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS - VOLUME 3. BASINS FROM APALACHICOLA RIVER TO PEARL RIVER.**
Geological Survey, Reston, Va.
Availble from Supt. of Documents, GPO, Washington, D.C. 20402, price $6.15. Water-Supply Paper 2106, 1975. 764 p, 1 fig.

Descriptors: *Basic data collections, *Surface waters, *Streamflow, *Flow rates, *Southeast U.S., River basins, Atlantic Ocean, Gulf of Mexico, Alabama, Florida, Georgia, Louisiana, Mis-

sissippi, Tennessee, Runoff, Discharge(Water), Gaging station, Flow measurement, Average flow, Lakes, Reservoirs, Hydrologic data.
Identifiers: Maximum discharges, Minimum discharges.

This report is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the South Atlantic Slope and eastern Gulf of Mexico basins from Apalachicola River to Pearl River. This is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by montly and yearly summaries of total, average, maximum, and minimum discharge. (Woodard-USGS)
W75-11967

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 6. MISSOURI RIVER BASIN--VOLUME 1. MISSOURI RIVER BASIN ABOVE WILLISTON, NORTH DAKOTA.**
Geological Survey, Reston, Va.
Available from Supt. of Documents, GPO, Washington, D.C. 20402, price $5.60. Water-Supply Paper 2116, 1974. 835 p, 1 fig.

Descriptors: *Basic data collections, *Streamflow, *Flow rates, Missouri River, Montania, North Dakota, Wyoming, Runoff, Discharge(Water), Gaging stations, Flow measurement, Average flow.
Identifiers: *Missouri River basin, Maximum discharges, Minimum discharges.

This report is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Missouri River basin above Williston, North Dakota. This is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W75-11968

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 7. LOWER MISSISSIPPI RIVER--VOLUME 2. ARKANSAS RIVER BASIN.**
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, D.C. 20402, price $6.15. Water-Supply Paper 2121, 1974. 931 p, 1 fig.

Descriptors: *Basic data collections, *Streamflow, *Flow rates, *River basins, Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, Texas, Runoff, Discharge(Water), Gaging stations, Flow measurement, Average flow.
Identifiers: *Arkansas River basin, Maximum discharges, Minimum discharges.

This report is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Arkansas River basin. This is one of the second series of water-supply papers to be published on a 5-year basis. The first sereies covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W75-11969

**SYSTEMS APPROACH TO HYDROLOGY.**
For primary bibliographic entry see Field 2A.
W75-12014

**THE STRUCTURE OF INPUTS AND OUTPUTS OF HYDROLOGIC SYSTEMS,**
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12017

**A STUDY OF LONG RANGE RUNOFF SYSTEM RESPONSE BASED ON INFORMATION THEORY,**
Kyoto Univ., (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12018

**KERNELS OF STOCHASTIC LINEAR HYDROLOGIC SYSTEMS,**
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12021

**NUMERICAL SIMULATION OF WATERSHED HYDROLOGY,**
Texas Univ., at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12027

**ENVIRONMENTAL RESEARCH LABORATORIES, 1973 ANNUAL REPORT.**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W75-12033

**APPLICATION OF A SIMPLE DISPERSION MODEL TO A RURAL INDUSTRIAL REGION,**
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W75-12037

**1974 WATER RESOURCES DATA FOR OREGON, SURFACE WATER RECORDS, PRECIPITATION RECORDS,**
Oregon State Engineers Office, Salem. Water Resources Dept.
C. L. Wheeler.
1974, 264 p, 4 fig.

Descriptors: *Oregon, *Data collections, *Streamflow, *Precipitation(Atmospheric), Rivers, Streams, Water resources, Surface waters, Surface runoff, Stream gages, Gaging stations, Rainfall, Rain gages, Hydrologic data, Meteorological data, Climatic data, Meteorology, Hydrology.

The surface water records for the 1974 water year (October 1, 1973 through September 30, 1974) for gaging stations and miscellaneous sites within Oregon were presented. The base data collected at gaging stations consisted of records of stage and measurements of discharge. Observations of factors affecting the stage-discharge relation, weather records, and other information were used to supplement base data in determining daily flow. The records of stage were primarily obtained from water-stage records that gave a continuous record of fluctuations. A few records of stage were obtained from direct readings on nonrecording gages. Measurements of discharge were made with a current meter by the general methods outlined in standard textbooks on the measurement of stream discharge. Daily discharge was tabulated for each gaging station, and supporting information about the gaging stations was included. Daily precipitation data from storage precipitation stations operated by the U.S. Forest Service were also given. (Robinson-ISWS)
W75-12087

**HAIL SUPPRESSION DATA FROM WESTERN NORTH DAKOTA, 1969-1972,**
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-12094

**ANALYSIS OF RADAR OBSERVATIONS OF A RANDOMIZED CLOUD SEEDING EXPERIMENT,**
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-12101

**COMPARISON OF GAGE AND RADAR METHODS OF CONVECTIVE RAIN MEASUREMENT,**
National Oceanic and Atmospheric Administration, Coral Gables, Fla. Experimental Meteorology Lab.
For primary bibliographic entry see Field 2B.
W75-12102

**THE EFFECT OF PERSISTENCE OF AGI ON RANDOMIZED WEATHER MODIFICATION EXPERIMENTS,**
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 3B.
W75-12104

**ON THE DESIGN AND EVALUATION OF CUMULUS MODIFICATION EXPERIMENTS,**
Virginia Univ., Charlottesville. Dept. of Environmental Sciences; and Virginia Univ., Charlottesville. Center for Advanced Studies.
For primary bibliographic entry see Field 3B.
W75-12105

**EVALUATION BY MONTE CARLO TESTS OF EFFECTS OF CLOUD SEEDING ON GROWING SEASON RAINFALL IN NORTH DAKOTA,**
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-12106

**BAYESIAN AND CLASSICAL STATISTICAL METHODS APPLIED TO RANDOMIZED WEATHER MODIFICATION EXPERIMENTS,**
Battelle-Northwest, Richland, Wash.
For primary bibliographic entry see Field 3B.
W75-12107

**POTENTIAL OF PRECIPITATION MODIFICATION IN MODERATE TO SEVERE DROUGHTS,**
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W75-12110

**OCEANOGRAPHIC OBSERVATIONS IN THE GEORGIA BIGHT: DATA REPORT FOR R.V.**

WARD CRUISES E-13-73 (4-11 SEP-ER) AND E-19-73 (8-9 DECEMBER 1973),
way Inst. of Oceanography, Savannah, Ga.
imary bibliographic entry see Field 2L.
2169

PUTER CONTROLLED WASTEWATER AMATION PLANT,
l Contra Costa Sanitary District, Walnut Calif.
imary bibliographic entry see Field 5D.
2361

D PLAIN INFORMATION: ELLICOTT K IN THE TOWNS OF LANCASTER AND N AND THE VILLAGE OF ALDEN, ERIE TY, NEW YORK.
Engineer District, Buffalo, N.Y.
imary bibliographic entry see Field 6F.
2365

D PLAIN INFORMATION: MOORES K, ALBEMARLE COUNTY AND CHAR-ESVILLE, VIRGINIA.
Engineer District, Norfolk, Va.
imary bibliographic entry see Field 4A.
2366

D PLAIN INFORMATION--COASTAL DING: TOWN OF POQUOSON, VIR-.
Engineer District, Norfolk, Va.
imary bibliographic entry see Field 4A.
2367

D PLAIN INFORMATION: MEHERRIN R, EMPORIA, VIRGINIA.
Engineer District, Norfolk, Va.
imary bibliographic entry see Field 4A.
2368

D PLAIN INFORMATION, WIL-TTE RIVER, JOHNSON, KELLOGG AND SCOTT CREEKS, MILWAUKIE-OAK E-LAKE OSWEGO, OREGON.
Engineer District, Portland, Oreg.
imary bibliographic entry see Field 4A.
2369

D PLAIN INFORMATION: HASSAYAM-IVER, VICINITY OF WICKENBURG, ONA.
Engineer District, Los Angeles, Calif.
imary bibliographic entry see Field 4A.
2370

D PLAIN INFORMATION: SPRING AND OW CREEKS, HOUSTON OPOLITAN AREA, TEXAS.
Engineer District, Galveston, Tex.
imary bibliographic entry see Field 4 .
2371

D PLAIN INFORMATION: ONION K, AUSTIN, TEXAS.
, Collie and Braden, Inc., Houston, Tex.;
my Engineer District, Galveston, Tex.
imary bibliographic entry see Field 4A.
2374

D PLAIN INFORMATION: JAMES R, HOWARDSVILLE TO SCOTTSVILLE, MARLE COUNTY, VIRGINIA.
Engineer District, Norfolk, Va.
imary bibliographic entry see Field 4A.
2375

**FLOOD PLAIN INFORMATION: SOUTH SANTIAM RIVER, LEBANON, OREGON.**
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 4A.
W75-12376

**SPECIAL FLOOD HAZARD INFORMATION: ISSAQUAH AND TIBBETTS CREEKS, ISSAQUAH AND VICINITY, WASHINGTON.**
Army Engineer District, Seattle Wash.
For primary bibliographic entry see Field 4A.
W75-12377

**SPECIAL FLOOD HAZARD INFORMATION: PARADISE CREEK, PULLMAN AND VICINITY, WASHINGTON.**
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 4A.
W75-12378

**FLOOD PLAIN INFORMATION: HACKBERRY CREEK AND COTTONWOOD BRANCH, DALLAS COUNTY, TEXAS.**
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 4A.
W75-12379

**HYDROGEOLOGIC DATA FOR THE LOWER CONNECTICUT RIVER BASIN, CONNECTICUT,**
Geological Survey, Hartford, Conn.
J. W. Bingham, F. D. Paine, and L. A. Weiss.
Connecticut Department of Environmental Protection, Hartford, Water Resources Bulletin No 30, 1975. 59 p, 1 fig, 1 plate, 7 tab, 10 ref.

Descriptors: *Hydrogeology, *Hydrologic data, *Connecticut River, *Basic data collections, Test wells, Drillers logs, Aquifer characteristics, Well data, Unconsolidated sediments, Particle size, Water levels, Water quality, Chemical analysis, Streams, Streamflow, Publications, Information retrieval.
Identifiers: *Lower Connecticut River basin.

Geologic, groundwater, and quality of surface water data are presented for the lower Connecticut River basin, Connecticut. For this report, the basin has an area of 639 square miles in south-central Connecticut drained principally by the main stem of the Connecticut River, by its tributaries south of Wilcox Island, and by several smaller streams which drain directly to Long Island Sound. Information collected for this investigation from July 1970 to August 1972 was supplemented by that collected in previous investigations. The primary criteria for selection were records of wells having greater than 2-hour pumping test, depths of stratified drift or till penetrated greater than 20 or 30 feet, respectively, and a location map adequate to field locate the well. The logs of 50 test holes and sieve analyses of the samples collected from them are included. Also included are chemical analyses of surface-water samples collected from 1956-1963. Data on streamflow, quality-of-water, and groundwater levels are published in many U.S. Geological Survey and State of Connecticut reports. These reports, type of data contained, and year of collection are listed. (Woodard-USGS)
W75-19954

**WATER-QUALITY DATA, 1948-73, ANCHORAGE AND VICINITY, ALASKA,**
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 5A.
W75-19955

# 8. ENGINEERING WORKS

## 8A. Structures

**INNOVATIVE WORKOVER FOR WASSON WATER WELLS,**
For primary bibliographic entry see Field 3B.
W75-11890

**EUROPEAN DEWATERING SYSTEM AIDS QUEBEC PROJECT,**
For primary bibliographic entry see Field 5D.
W75-11918

**TOUGH DIGGING, TIGHT QUARTERS HAMPER HULL COLLECTOR SEWER JOB,**
For primary bibliographic entry see Field 5D.
W75-11919

**SANITARY SEWER SUSPENDED WITHIN STORM SEWER,**
For primary bibliographic entry see Field 5D.
W75-11920

**STEEL, CONCRETE FORM SEWER SUPPORT SYSTEM.**
For primary bibliographic entry see Field 5D.
W75-11921

**FLOODS PROTECTION (SCHUTZ VOR UEBERSCHWEMMUNGEN).**
For primary bibliographic entry see Field 4A.
W75-11946

**LAYING A MAIN SEWER IN THE RESERVATION AREA OF THE ST. POELTEN WATERWORKS (VERLEGUNG EINES ABWASSERSAMMLERS IM SCHUTZ- UND SCHOENGEBLET DES WASSERWERKES ST. POELTEN).,**
For primary bibliographic entry see Field 5D.
W75-11947

**APPLICATION OF PVC BELL-AND-SPIGOT PRESSURE PIPES IN CONSTRUCTION OF WATER SUPPLY LINES (DIE ANWENDUNG VON PVC-MUFFENDRUCKROHREN BEIM BAU VON WASSERVERSORGUNGSNETZEN),**
K. Friedrich.
Wasserwirtschaft-Wassertechnik, Vol 23, No 1, p 32-34, 1973. 6 fig.

Descriptors: *Plastic pipes, *Construction materials, Corrosion Control, Flow, Water supply.
Identifiers: Germany, Polyvinyl chloride.

In West Germany, pipes from polyvinyl chloride (PVC) will replace between 80 and 90 percent of all pipe materials in new pipelines to be built by 1975. Advantages of PVC pipes include: Complete resistance to corrosion both inside and outside; a high insulating capacity, thus no corrosion due to stray ground electrical currents; a high aging resistance; no interior incrustation; and, higher flow-passing capacity due to surface smoothness. Also simple and inexpensive joints which are easy to insert into the pipe end by hand can be used. The joint, together with rubber sealing, allows for all possible expansion and contraction of the pipelines. Generally a work team of 3 to 4 can lay 400 meters of pipeline in an 8-hour shift. (Holz-FIRL)
W75-11949

**SEWER SYSTEM EVALUATION AND REHABILITATION COST ESTIMATES,**
For primary bibliographic entry see Field 6C.
W75-11951

**A MINI-PROJECT FOR AVON HARBOR, NORTH CAROLINA,**
North Carolina State Univ., Raleigh. Center for Marine Coastal Studies.
J. L. Machemehl, and J. C. Bumgarner.
Shore and Beach, Vol 42, No 1, p 3-10, April 1974. 7 fig, 2 tab.

Descriptors: *Waves(Water), *Erosion control, *Harbors, *Channels, *North Carolina, Groins(Structures), Jetties, Channel erosion, Shore protection.
Identifiers: *Avon Harbor(NC).

A detailed analysis of the various methods utilized in stabilizing the entrance of the Avon Harbor, North Carolina, was presented. The harbor was originally constructed in 1946 by the federal government. The entrance channel was repeatedly dredged until 1964; however, wave erosion made the entrance channel almost unusable. To protect it against such erosion,nylon bag groins, timber groins, and nylon bag jetties were constructed. These remedial measures were effective in maintaining the entrance channel and the harbor against storms and wave erosion. (Bhowmik-ISWS)
W75-12045

**SMALL GROINS ON THE SHORES OF LONG ISLAND SOUND,**
New York Ocean Science Lab., Montauk.
T. Omholt.
Shore and Beach, Vol 42, No 1, p 11-13, April 1974. 3 fig, 7 ref.

Descriptors: *Shores, *Groins(Structures), *Erosion, *Beaches, *New York, *Littoral drift, Waves(Water), Stability, Beach erosion, Shore protection, Hydraulic structures, Sands.
Identifiers: *Long Island Sound, *Shoreline recession.

The main results of a groin study on the north shore of Suffolk County, New York, were summarized. A total of 51 groins constructed in 14 areas were surveyed. Over 50% of these groins were 100 feet or less in length and 90% were less than 200 feet. They were mostly constructed of rocks or pre-cast interlocking concrete blocks. Extensive use of aerial photographs was made to study the long-term changes of the shoreline due to groin construction. A trend of shoreline erosion was confirmed. The order of change was generally 30 to 50 feet over the period from 1940 to 1970. In some instances groins helped to decrease the net erosion on the order of 10 to 30 feet. Hoever, groins also had some adverse effects; 30 to 40% of the cases, increased erosion occurred downdrift of the last groin. (Bhowmik-ISWS)
W75-12046

**CORPS' GUIDELINES FOR DAM SAFETY INSPECTION NEED REVAMPING,**
Tennessee Valley Authority, Knoxville. Flood Control Branch.
B. Buehler.
Civil Engineering, Vol 45, No 1, p 74-75 (January 1975). 2 p, 1 photo.

Descriptors: *Dams, *Spillways, *Dam design, *Economic justification, *Dam construction, Safety, Economics, Safety factors, Structural stability, Structural design, Dam foundation, Damsites, Check structures, Engineering geology, Retaining walls, Economic efficiency, Inspection, Dam failure, Structural engineering, Structures, Engineering structures, Economics.
Identifiers: *Dam safety, *National Dam Safety Act of 1972, Administrative regulations, Dam effects.

The Corps of Engineers, as a first step in implementing the 1972 National Dam Safety Act, recently proposed guidelines for safety inspections of existing dams. This author argues that the Corps' safety criteria are too conservative, and will waste millions of dollars needlessly upgrading many dams. Spillway capacity is a prominent aspect of dam safety in the guidelines. Yet, the aspect is criticized for ignoring techniques suggested by the American Society of Civil Engineers task committee for pinpointing the level of spillway safety that best promotes economic efficiency. The structural stability guidelines are also criticized for hinging on conventional safety factors while disregarding hazard categories. In this sense, present guideline stability criteria are inconsistent with spillway criteria. Therefore, the author suggests that modern, practical, and consistent spillway criteria are needed in order to deal effectively with low and high hazards. Several proposals are presented that the author feels would greatly increase the effectiveness of the guidelines, while at the same time releasing millions of dollars which could be used on other programs affecting human welfare. (Hoffman-Florida)
W75-12241

**RIVER CROSSING PERMITS FOR BUCKEYE PIPE LINE CO. PROPOSED PETROLEUM PRODUCTS PIPELINE SYSTEM BETWEEN LINDEN, NEW JERSEY AND MACUNGIE, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**
Army Engineer Div. North Atlantic, New York.
National Technical Information Service, Springfield, Va 22161, USDC as EIS-NJ-73-1917-F, $11.25 in paper copy, $2.25 in microfiche. December 11, 1973. 447 p, 27 fig, 25 tab.

Descriptors: *Environmental effects, *Pipelines, *Oil, *Permits, *Northeast US, New Jersey, Connecticut, Transportation, Rivers, Regulation, Federal government, Administrative agencies, Environmental control, Aesthetics, Oil pollution, Pressure conduits, Engineering structures, Conveyance structures, Pipes, Water pollution sources, Water quality control.
Identifiers: *Environmental impact statements, Linden(NJ), *Macungie(Pa), Hazardous substances(Pollution).

River crossing permits are sought for construction of a subterranean petroleum pipeline to run from Linden, New Jersey to Macungie, Pennsylvania. The area is not ecologically 'unique', since it is highly modified by human activity and has been affected by an existing pipeline. Environmental impacts of the project include disruption of aquatic and terrestrial biota, soil erosion, sedimentation, and increased turbidity during construction in waterways. Permanent constraints will be imposed on the planting of trees along the corridor. Adverse environmental effects include: habitat disruption, flora and fauna displacement, erosion, sedimentation, increased stream turbidity, the possibility of pipeline ruptures, and esthetic impacts. Although the proposed project was the most feasible action, the following alternatives were proposed: (1) an alternate route, (2) alternate methods of transportation, and (3) no action. Construction and operation of the new pipeline will promote flexible use of the area and will not affect long-term productivity. Other than time, energy, and material there are no irreversible and irretrievable commitments of resources involved in the proposed action. Comment received indicated concern over environmental effects, but was not considered significant enough to warrant hearings. (Fernandez-Florida)
W75-12258

**BACTERIAL PROCESSES FOR IMPROVED OIL RECOVERY.**
Tulsa Univ., Okla.
For primary bibliographic entry see Field 2F.
W75-12391

## 8B. Hydraulics

**HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING, PART 1,**
Continental Oil Co., Ponca City, Okla.
For primary bibliographic entry see Field 8C.
W75-11865

**DISPLACEMENT STABILITY OF WATER DRIVES IN WATER-WET CONNATE-WATER-BEARING RESERVOIRS,**
Koninklijke-Shell Exploratie en. Produktie Laboratorium, Rijswijk (Netherlands).
For primary bibliographic entry see Field 4B.
W75-11870

**A NEW APPROACH TO PERMEABILITY REDUCTION,**
Marathon Oil Co., Littleton, Colo.
For primary bibliographic entry see Field 8G.
W75-11872

**HOLE-TO-HOLE GEOPHYSICAL MEASUREMENT RESEARCH FOR MINERAL EXPLORATION,**
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 8G.
W75-11873

**GRAPHIC SOLUTIONS TO TUBING MOVEMENT IN DEEP WELLS,**
Baker Oil Tools, Inc., Oklahoma City, Okla.
N. F. Moseley.
Petroleum Engineer, Vol 45, No 3, p 59-66, March, 1973. 5 fig, 1 tab.

Descriptors: *Casings, Movement, *Buckling, *Deep wells, *Graphical analysis, Graphical methods, Analytical techniques, Pressure, Temperature, Wells, Water wells, Well casings, Pipes, *Tubes.
Identifiers: *Tubing movement.

Tubing movement can be divided into four classes according to the force acting on the tubings. They are: (1) movement due to piston force; (2) buckling movement due to differential pressure; (3) movement due to a ballooning force; and (4) movement due to temperature force. These forces, with the exception of number 2, are straight line functions of pressure and temperature differential. Therefore plots may be made of the movement versus the pressure or temperature to obtain a useful graph. The formulas for each of these graphs are derived and an example using actual data illustrates the derivation and use of these graphs. (Bradbeer-NWWA)
W75-11875

**GRAPHIC SOLUTION TO FRACTURE TREATMENT DESIGN,**
Amoco Production Co., Tulsa, Okla.
C. R. Fast.
Petroleum Engineering, Vol 45, No 11, p 39-46, October, 1973. 12 fig.

Descriptors: *Secondary recovery(Oil), *Hydraulic fracturing, *Graphic analysis, *Design criteria, Oil, Gas, Permeability, Porosity, Viscosity, Leakage, Reservoir leakage, Sandstone, Shale, Injection, Groundwater.
Identifiers: *Fracture length, Fracturing fluid efficiency.

Results of numerous hydraulic fracturing treatment design calculations are summarized in graph form. The effects of formation properties, fracturing fluid properties, injection rates, and treatment volumes are all considered in the equations that describe the graphs. The design also accounts for fluid spurt loss effects and for changes in fluid properties due to proppants. The design criteria

cified and are more or less typical of condi-
ncountered in thick, deep, low permeability
ervoirs. (Bradbeer-NWWA)
1876

**/ LOOK AT SANDSTONE ACIDIZING,**
Production Research Co., Houston, Tex.
mary bibliographic entry see Field 4B.
1878

**EFFECT OF SURFACE KINETICS IN TURE ACIDIZING,**
rton Services, Duncan, Okla.
oberts, and J. A. Guin.
/ of Petroleum Engineers Journal, Vol 14,
385-395, August, 1974. 9 fig, 3 tab, 17 ref.

ptors: *Fractures(Geologic), *Permeability,
, *Mathematical models, Finite element
s, Kinetics, Mixing, Laboratory tests,
dary recovery(Oil), Chemical reactions,
dwater, Flow augmentation.
iers: *Acid fracturing, Finite-difference
s.

hematical model is developed that yields the
ce to which live acid may penetrate into a
e under conditions in which the overall
n rate is influenced by finite surface reac-
netics. The model is solved by an explicit
difference method, and the results are
ted in graphical form. An example design
tion is given for HCl reaction in a dolomite
e. Experimental data are presented for acid
in limestone and dolomite laboratory-
ed fracture systems 4.1 to 9.7 feet long, at
0, and 290 degrees F. From these experi-
was determined a parameter appearing in
athematical model -- termed the effective
coefficient. The mixing coefficient has a
um in the low Reynolds number region, in-
g that rectilinear laminar flow is approached
closely just before the flow becomes turbu-
he mixing coefficient also appears to be de-
nt upon temperature in the laminar flow re-
The mathematical solutions given are ap-
e to situations in which the overall rate of
eaction is not determined solely by mass
er. (Bradbeer-NWWA)
1887

**MODYNAMIC AND KINETIC ASPECTS RGILLACEOUS SANDSTONE ACIDIZING,**
t Francais du Petrole, Rueil-Malmaison
e).
imary bibliographic entry see Field 4B.
1891

**BORATORY STUDY OF THE EFFECTS ONFINING PRESSURE ON FRACTURE / AND STORAGE CAPACITY IN CAR-TE ROCKS,**
o Production Co., Tulsa, Okla.
imary bibliographic entry see Field 4B.
1892

**SECTION AND PERMEABILITY STU-CALL FOR SMALLER GRAVELS IN EL PACKING,**
Gulati, and G. P. Maly.
l of Petroleum Technology, Vol 27, p 107-
anuary, 1975. 13 fig, 1 tab, 9 ref.

iptors: *Gravels, *Sandstones, *Sand
rs, *Clogging, *Wells, Pumping,
eability, Grain size, Sands, Unconsolidated
rs, Screens, Well screens, Size, Filters, Col-

fiers: *Gravel pack, *Snad bridging,
el-to-sand ratio, Caving.

bridging is an extensively used form of sand
l in gas and oil wells and can be accom-
plished by the use of screens, gravel packs or plastic-coated gravel. Results are discussed of an experimental investigation designed to find the most effective gravel-to-sand size ratio for an effective gravel pack. A ratio of less than 6, preferably 4, will give a stable pack. Angular gravel and uniform formation sand promote the highest pack stability. Results were confirmed by the examination of this sections. (Bradbeer-NWWA)
W75-11893

**RESERVOIR PROPERTIES AFFECTING MATRIX ACID STIMULATION OF SANDSTONES,**
Chevron Oil Field Research Co., La Habre, Calif.
For primary bibliographic entry see Field 4B.
W75-11894

**GRAPHICAL METHOD SPEEDS DEVIATED WELL CASING DESIGN,**
Champlin Petroleum Co., Wilmington, Calif.
For primary bibliographic entry see Field 8G.
W75-11896

**TRACERS AID PLACEMENT OF STIMULATION FLUIDS,**
Getty Oil Co., Andrews, Tex.
For primary bibliographic entry see Field 8G.
W75-11898

**A MATHEMATICAL MODEL FOR HEAD-DISCHARGE RELATIONSHIPS FOR VARIOUS FERRULE-HOUSE SERVICE PIPE COMBINATIONS,**
Don Bosco Polytechnic, Calcutta (India).
D. N. Ghose, and N. Chaudhuri.
Journal of the Institution of Engineers, India, Vol 53, Part PH1, p 14-20, October, 1972. 10 fig, 6 tab, 2 ref.

Descriptors: *Mathematical models, *Pipes, Conduits, Discharge measurement, Model studies.
Identifiers: Calcutta, India, Ferrules.

A mathematical model, based on the principles of hydraulics, has been developed to describe the head-discharged relationships for various combinations of ferrules and house service pipes commonly used in Calcutta. From the experimental results it was possible to derive the relationship Q sub x = A sub s to the nth power x (base length/length of house service pipe) to the nth power, a modification of the well established head-discharge relationship Q = KH to the nth power. In this expression, A = Kl sub l to the nth power, l sub l is the base length, K the constant for a parбicular ferrule-service pipe combination, n = 0.54 for all combinations, and s = H/l sub x, where H is the dynamic water head in street water main and l sub x the length of a house service pipe. The values of A for all combinations of ferrules and pipes were experimentally determined. Using the values of A, discharge from a given length of pipe under a given dynamic head may be computed. A set of graphs relating Q and s has been provided for all combinations of ferrules and house service pipes for quick estimation of probable dishcarges. (Sandoski-FIRL)
W75-11906

**PIPE FLOW MEASUREMENTS BY THE PULSE VELOCITY METHOD WITH RADIOACTIVE ISOTOPES,**
For primary bibliographic entry see Field 8G.
W75-11916

**APPARATUS, FOR AND METHOD OF CONTROLLING FLOW OF FLUIDS IN A PIPELINE,**
Talbot (F. W.) Co. Ltd., Winchester (England). (Assignee).
E. G. B. Gledhill.
United States Patent 3, 722,520. Issued March 27, 1973. Official Gazette of the United States Patent Office, Vol 908, No 4, p 926, March 27, 1973.

Descriptors: *Pipes, *Flow control, Valves, Pipelines, Water conservation, Patents.
Identifiers: Stopcocks.

A method and apparatus for controlling the flow of fluid in a supply pipe to a premises such as a water supply pipe or a gas supply pipe are described. A small bore high pressure tubing is provided preferably alongside the standard supply pipe and communicates between a main stopcock arranged to control the flow of fluid from a supply into the premises' supply pipe and the various valves in the premises. The main stopcock and the control valves have an apertured diaphragm providing the only means of communication between the small bore tubing and the supply pipe. When one of the control valves is opened, pressure is released in the small bore tubing to lift the diaphragm off the seat of the main stopcock to permit flow of fluid through the main stopcock into the supply pipe and vice versa. Instead of relying upon pressure signals to open and close the main stopcock, electrical signals can be used. By fitting such apparatus into a domestic water or gas supply, water or gas will only flow into the domestic system through the main stopcock when required. Thus, wastage of water or gas in the event of a leak in the pipeline between the main stopcock and the premises will be prevented. (Sandoski-FIRL)
W75-11932

**SWIRLING LAMINAR PIPE FLOW OF SUSPENSIONS,**
Illinois Univ., Urbana. Dept. of Mechanical and Industrial Engineering.
S. K. Tung, and S. L. Soo.
Journal of Applied Mechanics, Vol 95E, No 2, p 331-336, June, 1973. 5 fig, 22 ref.

Descriptors: *Mathematical studies, *Pipe flow, Velocity, Hydraulics, Hydraulic models, Reynolds number.
Identifiers: Flow of suspensions, Navier-Stokes equations.

Vortex pipe flow of suspensions with laminar motion in the fluid phase has been examined. The pipe consists of two smoothly joined sections, one stationary and the other rotating with a constant angular velocity. The flow properties of the fluid phase are determined by solving the complete Navier-Stokes equations numerically with governing parameters being the flow Reynolds number and swirl ratio. Subsequent numerical solution to the momentum equations governing the particulate phase provides for both particle velocity and concentration distributions. The method can be applied to many other fluid flow or two-phase flow problems. It also provides an easy check on the results obtained by using some other approximated methods. (Sandoski-FIRL)
W75-11938

**SYSTEMS SIMULATION OF STREAMFLOWS,**
Kyoto Univ., (Japan), Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-12024

**SIMULATION OF THE SHORT-TIME SCOUR-FILL PROCESS IN ERODIBLE STREAMS WITH STOCHASTIC SEDIMENT TRANSFER AT THE STREAM BED,**
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2J.
W75-12029

**VERTICAL TEMPERATURE PROFILES IN OPEN-CHANNEL FLOW,**
Dar es Salaam Univ. (Tanzania).
For primary bibliographic entry see Field 5B.
W75-12047

**FLOW QUANTITIES IN RESIDENTIAL WEEPING TILE SYSTEMS--A CALCULATIONAL METHOD,**
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
For primary bibliographic entry see Field 4A.
W75-12328

**HOW TO EVALUATE WATER MAIN CAPACITIES, PART I,**
M. D. Curry, and R. R. Wright.
Water and Sewage Works, Vol 122, No 5, p 98-101, May, 1975. 2 fig, 3 tab.

Descriptors: *Water distribution(Applied), *Pipelines, *Roughness coefficient, *Head loss, Hazen-Williams equation, Roughness(Hydraulic), Pipe flow, Water conveyance.

Periodic evaluations of water distribution systems should be performed to protect the monetary investment in constructing this portion of the water supply system. Generalized procedures are available that permit field flow tests and express the system performance in quantitative terms. The importance of the roughness value (C factor) in distribution main analyses is stressed. The C factor is used in the Hazen-Williams formula for hydraulic calculations and represents the resistance to flow or roughness coefficient. Determination of C factors of arterial mains allow the main capacity to be expressed in quantitative terms for comparison with expected performance. The C factor represents quantitatively the head loss in a pipe. Variation in resistance to flow affects the friction loss in a water main and the flow capacity. The C factor is affected by inside pipe diameter and by pipe roughness. Visual observation of sections of a water main may not show the actual roughness present throughout the pipe. Typical C factors for various pipes are given. Four case studies representing C factors determined in the field are presented. Actual values to be expected in any particular community are dependent upon such parameters as the type of water treatment used, control of the treatment processes, soil conditions, and velocities. Measures are mentioned that will aid in the prevention of loss of main capacity. (Orr-FIRL)
W75-12329

**WATERFLOODING OF OILFIELDS IN WYOMING TO 1968,**
Bureau of Mines, Laramie, Wyo. Mineral Resources Field Office.
P. Biggs, and C. A. Koch.
Report of Investigations 7469, December, 1970. 147 p, 32 fig, 4 tab, 7 ref.

Descriptors: *Flooding(Oil recovery), *Groundwater, Wells, *Oil industry, Permeability, Aquifer characteristics, *Wyoming.
Identifiers: Waterflood projects, Reservoir data, Oil-in-place, Oil production, Madison Formation(Wisc).

Information is provided on 138 waterflood projects in Wyoming. Injection was in 25 producing zones and 65 fields. Specific data presented include field location, discovery and development, water supply and injection, oil and water production, estimates of oil in place, and oil recoveries by primary and secondary methods. The 138 projects studied will, if successful, recover about 800 million barrels of secondary oil. Almost all of the injection water is from deep water wells. Estimated water requirements total 1,225,000 acre-feet. The equivalent of 237,000 acre-feet had been injected by January, 1968. The Elk Basin-Madison and Salt Creek-Second Wall Creek projects each expect to recover more than 100 million barrels of oil by waterflooding. Totaling all projects, the daily production in December, 1967, was 195,600 barrels of oil and 501,500 barrels of water. Most of the injection water is from the Madison Formation and is unfit for domestic or agricultural use. Usually a closed water system is used, and occasionally filtering and chemical additives are necessary. (Campbell-NWWA)
W75-12380

**FLUID FLOW IN CHANNELS, CAPILLARIES, AND POROUS MEDIA UNDER THE INFLUENCE OF AN ELECTRIC FIELD,**
Bureau of Mines, Morgantown, W. Va. Petroleum Research Lab.
For primary bibliographic entry see Field 2F.
W75-12381

**PREDICTION OF PENETRATION RATE FOR PERCUSSIVE DRILLING,**
For primary bibliographic entry see Field 8E.
W75-12382

**PERCUSSIVE DRILLING: WITH INDEPENDENT ROTATION,**
Bureau of Mines, Twin Cities, Minn. Twin Cities Mining Research Center.
For primary bibliographic entry see Field 8E.
W75-12383

**DRILLABILITY STUDIES: PERCUSSIVE DRILLING IN THE FIELD,**
Bureau of Mines, Twin Cities, Minn. Twin Cities Mining Research Center.
For primary bibliographic entry see Field 8E.
W75-12384

**GROUND WATER AND GROUND-WATER CONTROL,**
For primary bibliographic entry see Field 4B.
W75-12386

**SPECIALIZED UNDERGROUND EXTRACTION SYSTEMS.**
SPE Mining Engineering Handbook, Vol 2, Section 21, p 21-2 to 21-78, 1973. 48 fig, 7 tab.

Descriptors: *Mining, Aquifer characteristics, Cementing, Cements, Nuclear logging, Resistivity logging, Borehole geophysics, Casing.
Identifiers: *Solution mining techniques, In situ mining, Potash, Halite, *Brine disposal, Leaching, Well completion, Hydraulic fracture, Multiple well systems, Well costs, Sulphur, Microbial activity.

Solution mining techniques present a means of extracting soluble ores, particularly such materials as salt and potash, from horizons which are not accessible by conventional mining. In the process of dissolving materials, it is evident that solution may be complete or partial. In general, the solution mining operations are described and relate to complete solution of the desired compound. Even though the solution of material is complete, there may be instances in which insoluble material is present to a large extent either as granular separated particles or as insoluble layers. The process required for obtaining the desired product involves access wells to reach the deposits, sufficient water supply to yield the production goals, and the development of an underground cavity. The process of solution mining, therefore, depends to a great extent on three factors: availability of a relatively pure strata or formation of salt or potash to be mined, access well or wells, and adequate control of the solutioning process so that enlargement of underground cavities can be fairly well delineated. (Campbell-NWWA)
W75-12388

**WELL STORAGE,**
J. Waddell.
Water Well Journal, Vol 29, No 8, p 22-23, August, 1975.

Descriptors: *Water wells, Groundwate *Aquifer testing, Drawdown, Aquifer chara teristics, Safe yield, Aquifers, *Wells, Casing.
Identifiers: *Well storage, Well recovery, Lo range production, Well design, Pump costs, Pow costs, Low capacity wells.

Marketing factors other than initial well cost a discussed in terms of long range production, pum unit life, power costs, and well storage. We storage is most important in areas where t aquifer is of limited thickness or if the formation tight and wells have a rapid drawdown and lo capacity with slow recovery. Well casing size discussed in terms of pump starting periods. A si inch casing offers a greater storage than a 4 in casing and requires fewer pump starts per hou lower power costs and greater recoveries in ca of energy requirements. Pressure tank size is al discussed in terms of available storage. A com prehensive chart is presented that shows optimu requirements of casing size, drawdown and ann lar volume. (Campbell-NWWA)
W75-12390

**RECENT APPLICATION OF GEOPHYSICA METHODS IN COAL MINING,**
National Coal Board, London (England).
E. C. Laughton.
In: Ninth Commonwealth Mining and Metallurg cal Congress 1969, Mining and Petroleum Geolo Section, Paper 23, 19 p, 7 fig, 3 tab, 7 ref, 1 a pend.

Descriptors: *Borehole geophysics, Surfa geophysics, Resistivity, *Mining, *Wells, Coal *Well logging.
Identifiers: Density logging, Coal propertie Thermal conductivity, Gamma logging, Neutr logging, Surface gravity, Surveying, Continuo seismic marine profiling, Refraction profiling.

Land and marine geophysical methods applied coal mining are reviewed and their limitations a discussed by the use of examples drawn from typ cal surface surveys, mainly where a knowledge the fault trends would have reduced mining risk Underground methods are described and exampl are given to illustrate favourable site condition Present limitations of these methods are assesse and possible lines of development are indicated. is suggested that the most promising approach d pends on the development of underground seism methods using the marked density contrast of t coal seam as the main parameter. Mining risks a being reduced by the use of geophysic techniques, using the marked physical properti of the coal seam. The development of an aid usi the coal seam as a waveguide offers the be chance of success and the greatest possibilities an increased range. Surface methods will contin to be used to assist in mine planning. (Campbe NWWA)
W75-12396

**TURBO-DRILLING AS APPLIED TO POTAS DEVELOPMENTS IN THE SASKATCHEWA FIELD,**
Cementation Mining, Ltd., London (England).
J. N. Adamson, and J. H. Storey.
In: Ninth Commonwealth Mining and Metallurg cal Congress, 1969, Mining and Petroelum Geol gy Section, Paper 19, 14 p, 5 fig, 2 tab.

Descriptors: *Rotary drilling, *Wells, Cost anal sis, Drilling equipment, Cementing, Drillin *Mining, *Canada.
Identifiers: *Turbo-drilling, *Potash, Boreho deviation control, Wedging, Blairmore formatio *In situ mining, Lost circulation.

Control of borehole deviation in drilling the ring holes (4-5 ft apart and 2000 ft deep) required shaft-sinking in the Saskatchewan potash field the freezing method is discussed. A system turbo-drilling with directional 'kick-sub', inste

ing, was adopted to correct deviations in y-drilled freezing holes around Esterhazy, , Duval, and Patience Lake shafts. The igs and equipment used are outlined, and ce layout adopted for simultaneous multi- ng with minimum transfer time between described. Problems encountered during ng of the glacial till and the Blairmore For- are referred to, and the cementing re employed is described. The experience se of turbo-drilling in freeze-hole drilling n very satisfactory since its first use at zy. The precision in the hole patterns d over these 6 shafts has demonstrated the bility of this technique and justified the concept of applying turbo-drilling for ole application. From the point of view of ng engineer, the precision locations of the oles enabled the construction of the rela- ick and uniform ice walls to withstand the drostatic pressures at these depths to be ut safely. The speed of operation was pre- —an essential factor in the critical path s for these very expensive projects. ell-NWWA)
397

ATION OF WELL LOGGING IQUES TO MING EXPLORATION OLES,
Petroleum Co. Ltd., Sunbury-on-Thames d). Research Centre.
nary bibliographic entry see Field 8G.
398

WATER STRATA OF MISSISSIPPI AS LED BY ELECTRICAL LOG STUDIES,
Coll., Jackson, Miss.
nary bibliographic entry see Field 4B.
399

## lydraulic Machinery

DOWNHOLE TEMPERATURES, PRES- AFFECT DRILLING, PART 1,
ntal Oil Co., Ponca City, Okla.
ertl, and D. J. Timko.
Oil, Vol. 174, No. 7, p 67-70, June, 1972. 4

tors: *Pressure, *Hydrostatic pressure, g, *High pressure, Wells, Water wells, Oil eep wells, Pressure head, Groundwater.
ers: *Pressure gradient, *Formation pres-

rst article in a 10 part series covering all of determining and evaluating formation es discusses basic subsurface pressure ts. It defines hydrostatic pressure, overbur- ssure and formation pressure. Subnormal es are shown in example and some ex- ns are given. Abnormally high pressures iewed and sixteen possible causes of high es are presented. (See W75-11866 thru 869) (Campbell-NWWA)
865

DOWNHOLE TEMPERATURES, PRES- AFFECT DRILLING, PART 2, DETECT- ND EVALUATING FORMATION PRES- ,
ntal Oil Co., Ponca City, Okla.
Fertl, and D. J. Timko.
Oil, Vol 175, No. 1, p 45-50, July, 1972. 3 b, 27 ref.

tors: *Drilling, *Temperature, *Pressure, pressure, *Measurement, Geophysics, mud, Techniques, Evaluation, Oil, lwater.
ers: Abnormal pressure, Formation pres- rill cuttings.

The methods of detection of formation pressures and an evaluation of these methods as to their effectiveness, are presented. About 35 detection methods are described. These are divided into 6 categories in relation to the source of data. The categories are: (1) geophysical methods, (2) drilling parameters, (3) drilling mud, (4) drill cuttings, (5) well logging, and (6) direct pressure measuring devices. (See also W75-11865) (Bradbeer-NWWA)
W75-11866

**HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING, PART 3, OVERPRESSURE DETECTION FROM WIRELINE METHODS,**
Continental Oil Co., Ponca City, Okla.
W. H. Fertl, and D. J. Timko.
World Oil, Vol. 175, No. 2, p 36-39, August, 1972. 7 fig.

Descriptors: *Drilling, *Temperature, *High pressure, *Acoustics, Electrical well logging, Borehole geophysics, Bulk density, Techniques, Evaluation, Gravimetric analysis, Geophysics, Oil, Groundwater.
Identifiers: *Wireline techniques, *Overpressure, Shale formation factor.

Information on overpressured intervals in a borehole is important in well planning. The response of various wireline logging devices to overpressures are described. A comparison of results is made with other methods used to locate transition zones from normal to high pressures. (See also W75-11865) (Bradbeer-NWWA)
W75-11867

**HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING, PART 9, NAVEL WAYS TO DETECT ABNORMAL PRESSURE,**
Continental Oil., Ponca City, Okla.
W. H. Fertl, and D. J. Timko.
World Oil, Vol. 176, No. 2, p 47-50, February 1, 1973. 5 fig, 21 ref.

Descriptors: *Drilling, *High pressure, *Borehole geophysics, Bicarbonate concentration, Hydrogen ion concentration, Chemistry, Well data, Deep wells, Groundwater.
Identifiers: *Shale slurry, *Drill cuttings.

Recent field and lab work indicate new methods soon may be available for predicting pressure of abnormally high pressured formations. Five unusual parameters that may be affected by high pressure including bicarbonate concentration in formation brines and shale water, reduction-oxidation optential and pH of shale slurry filtrates are discussed. (See also W75-11865) (Bradbeer-NWWA)
W75-11868

**HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING, PART 10, MISCELLANEOUS WAYS TO DETECT ABNORMAL PRESSURE,**
Continental Oil Co., Houston, Tex.
D. J. Timko, and W. H. Fertl.
World Oil, Vol. 176, No. 4, p 63-65, March, 1973. 5 fig, 5 ref.

Descriptors: *Drilling, *High pressure, *Temperature, *Prediction, Borehole geophysics, Oil, Deep wells, Groundwater, Resistivity, Filtration rate.
Identifiers: Shale cuttings.

Some unusual methods for detecting the presence of abnormal pressures ahead of the bit are being investigated. Resistivity, filtration rate and moisture index of shale cuttings, slurry, and the product of shale bulk density and moisture index are correlated with downhole pressure environments. (See also W75-11865) (Bradbeer-NWWA)
W75-11869

**TESTS SHOW JET DRILLING HAS PROMISE,**
Koninklijke-Shell Exploratie en Produktie Laboratorium, Rijswijk (Netherlands).
R. Feenstra, A. C. Pols, and J. van Steveninck.
Oil and Gas Journal, Vol 72, No 26, p 45-57, July 1, 1974. 12 fig, 6 tab, 23 ref.

Descriptors: *Jets, *Drilling, *Deep wells, *Drilling equipment, Flow, Nozzle, Drilling fluids, Hydraulics, Laboratory tests, On-site investigations, Shale, Wells, Oil wells, Water wells.
Identifiers: *Jet drilling, Groningen gas field, Shell oil.

An investigation was made with the aid of three laboratory-type drilling machines which permit tests on both microbits (1.5 in) and full-scale bits (6.5 - 9.628 in). In view of the application of jets to deep wells, care was taken to simulate hydrostatic pressures as they exist in the field on the hole bottom. These have a major effect on bit-penetration rate. The extensive experiments performed are listed and their procedure recorded. The results of the laboratory tests are presented. Field tests in tertiary shales below 1700 ft at the Groningen gas field show that 9.628 in holes could be jetted in weak formations at satisfactory rates using 5000 psi equipment. (Bradbeer-NWWA)
W75-11880

**NEED WAYS TO REDUCE DRILLING COSTS,**
C. C. Daly.
Oilweek, Vol 23, No 52, p 12-13, February 12, 1973. 2 fig.

Descriptors: *Drilling, *Costs, *Cost-benefit analysis, *Economic efficiency, Oil wells, Water wells.
Identifiers: Penetration rate, *Drilling rate.

Several methods of reducing drilling costs were tested in problem boreholes such as those that penetrated Mississippian shales that have a tendency toward a sloughing after being water-wet for a number of days. Non-wetting lubricants were used, such as Drispac Soltex, a polyanionic cellulosic polymer and a sodium asphalt sulfonate. They substantially increased penetration rates. (Bradbeer-NWWA)
W75-11884

**WANTED: FEWER BIT, CASING SIZES, REWARD: MANY BENEFITS FOR INDUSTRY,**
Armco Steel Corp., Middletown, Ohio.
R. L. Vingoe, and J. H. Cook.
Drilling, Vol 36, No 7, p 33-39, May, 1975. 1 fig, 6 tab.

Descriptors: *Drilling equipment, *Water wells, *Oil wells, *Casings, *Drill bits, Size, Weight, Statistical analysis, Economics, Standards.

A substantial reduction in the number of sizes of rock bits and the number of sizes and weights of casing furnished industry would result in many benefits, including delivery of the products, all in critical supply, beneficial elimination of little-used items, and standardization of a more streamlined product line. A group of Armco and Hughs personnel was formed to standardize on an optimum number of sizes and weights of bits and casing which would satisfy the industry's requirements. A study was made to determine the existing demand for various product sizes and the data are presented. (Bradbeer-NWWA)
W75-11885

**BIT DESIGN IS KEY TO DEEP DRILLING WITH TURBINES,**
Shell Oil Co., New Orleans, La.
J. E. Fontenot.
Oil and Gas Journal, Vol 73, No 23, p 39-43, June 9, 1975. 11 fig, 4 ref.

Descriptors: *Design criteria, *Drilling equipment, *Turbines, *Rotary drilling, Electric motors, Drilling, Wells, Deep wells, Ground water, Oil, Performance, Efficiencies.
Identifiers: *Diamond bit design, Torque, Downhole motor, Drill bit, Drill string.

The use of a downhole mud motor in place of a rotary drill could increase the ability to put power down the borehole efficiently. There is an increase in the specific horsepower per square inch available at the bottom of the hole with the turbine mud motor. This increased available power allows deep drilling with less torque on the drill pipe than a rotary drill, thus keeping expenses on drill pipe maintenance to a minimum. Rock bits have performed poorly, however, on the turbine, and the results using diamond bits have been inconsistent. The diamond bit should be studied and redesigned to feature low torque, good cleaning at low bit-pressure drop, high penetration rate at low weights on bit and long life (50-100 hr). (Bradbeer-NWWA)
W75-11889

**DRILLING IMPEDANCE OF MUD SOLIDS,**
M. D. Nelson.
World Oil, Vol 180, No 2, p 55-60, February 1, 1975. 5 fig, 5 ref.

Descriptors: *Drilling, *Penetration, *Drilling fluids, Boreholes, Clays, Brines, Emulsions, Mud, Slurries.
Identifiers: *Specific drilling impedance, Mud solids, Drilling rate.

Solids in drilling fluids adversely affect drilling rates, and relative comparisons of different types of solids have been made in the past. However, new information is presented that includes a method of determining the quantitative effect a particular solid has on drilling. Specific drilling impedance is a measure of the amount solids reduce penetration rates, under a given set of conditions. (Bradbeer-NWWA)
W75-11897

**INFLATABLE PLUG CUTS MESS, CLEANUP ON SEWERLINE BYPASS,**
Robbinsdale Water and Sewer Superintendent's Office, Minn.
G. Austin.
The American City, Vol 88, No 4, p 22, April, 1973. 1 fig.

Descriptors: *Sewers, *Repairing, *Bypasses, Floods, Castings, Aluminum, Construction materials, Equipment, Waste water treatment.
Identifiers: Inflatable plugs, Sewer repair.

A specially designed inflatable plub, used for bypassing when sewer repairs are required, eliminates flooding and the ensuing cleanup problems. The plugs, known as Muni-Balls, are manufactured by Cherne Industrial, Incorporated, of Edina, Minnesota and come in sizes from 6 to 53 inches in diameter. Made of an elastic compound and molded on high tensile strength aluminum castings, they include a removable plug in the center ranging from 1 to 4 inches in diameter. (Sandoski-FIRL)
W75-11908

**SEATTLE PROJECT CALLS FOR ROCK WEIRS.**
For primary bibliographic entry see Field 4A.
W75-11922

**SUPERPOSITION OF TWO PIPES IN A COMMON, MIXED SEWER SYSTEM (RECOURS A LA SUPERPOSITION DE DEUX CONDUITES DANS UN RESEAU D'ASSAINISSEMENT UNITAIRE).**
For primary bibliographic entry see Field 5D.
W75-11923

**FLEXIBLE JOINT FOR SEWER PIPE,**
For primary bibliographic entry see Field 5D.
W75-11931

**A PRACTICAL PROPORTIONAL WEIR,**
Sri Venkateswara Univ., Tirupati (India). Dept. of Civil Engineering.
P. Venkataraman, and K. Subramanya.
Water Power, Vol 25, No 5, p 189-190, May, 1973. 3 fig, 5 ref.

Descriptors: *Mathematical studies, *Weirs, Flow rates, Flow measurement, Outlets, Sampling, Waste water treatment.
Identifiers: Sediment chambers, Analytical profiles, Linear proportional weirs.

Linear proportional weirs are those weirs for which the rate of flow is proportional to the linear power of the head measured above the datum. Because of this characteristic these weirs find their use as flow measuring devices, outlets for sediment chambers, and controls for float-regulated dosing and chemical sampling. In the Keshavamurthy and Seshagiri generalized theory of proportional notches, the shapes of the weir profile designed to maintain the linear relationship between the head and discharge are complex while being analytically sound. To simplify the profile for purposes of practical application while maintaining the essential linear proportional quality, an experimental investigation was conducted utilizing a weir formed by two quadrants of a circle. The quadrant plate notch can thus be used to obtain a linear proportionality between the head and discharge This device has the advantage of simplicity of profile and is thus easy to construct, and in addition it does not have the restrictions imposed on some of the exact analytical profiles. (Sandoski-FIRL)
W75-11937

**SCREEN RETAINER ASSEMBLY,**
Robertshaw Controls Co, Richmond, Va.
D. K. Murrell.
United States Patent 3,732,985. Issued May 15, 1973. Official Gazette of the United States Patent Office, Vol 910, No 3, p 832, May 15, 1973.

Descriptors: *Screens, *Conduits, *Patents, Equipment, Installation.
Identifiers: *Screen retainer assembly.

A screen retainer assembly for use in a conduit is described. The method includes the steps of draping the screen across a convoluted band of ductile material, positioning the screen-draped band within the conduit in general alignment with a continuous groove provided in the interior surface of the conduit, and expanding the convoluted band so that the band fits snugly in the groove thus to hold the screen firmly in place with its periphery pinched between the band and the groove. The resultant screen retainer assembly has the advantages that the screen retaining means does not impede the flow of fluid through the conduit and that the expanded band cannot become displaced or accidentially removed. (Sandoski-FIRL)
W75-11942

**POWER CONVERSION APPARATUS FOR UTILIZING THE FORCE OF WAVES,**
For primary bibliographic entry see Field 3E.
W75-12062

**DIGESTER GAS: VALUABLE PLANT FUEL,**
South Burlington Waste Treatment Plant, N. C.
A. D. Everett.
Water and Sewage Works, Vol 122, No 5, p 60-61, May, 1975. 4 fig.

Descriptors: *Methane, *Instrumentation, Natural gas, Fuels, Equipment, North Carolina, *Gases, *Treatment facilities, Recycling.
Identifiers: *Digester gas.

The South Burlington waste treatment plant, Burlington, North Carolina, uses digester gas (Essentially methane) to power three 150-hp engines at a rate of 1200 scfh to drive the centrifugal blowers for the aeration tanks. Approximately $4,000 per year in fuel costs are saved by using digester gas instead of natural gas. American Meter rotating-vane type positive displacement meters have been installed in place of the conventional diaphragm meters commonly used for a check on digester gas consumption. Two meters are used in the system, one measures digester gas to the three air blower engines and the other measures excess digester gas that must be consumed in a waste burner. Greater than 95% of the digester gas produced is normally used. Periodic readings of the two meter totalizers show the total gas usage. An interchangeable measuring cartridge contained on the CVMP-S meter simplifies maintenance and maintains the meter's accuracy. Dirt, pipe scale, and corrosive vapors are prevented from reaching the gears by a magnetic drive on the meter which enables the gear box to be isolated from the flowing digester gas. Pre-lubricated bearings are sealed so that they are not exposed to the degreasing effect of digester gas condensates. The meters may be installed horizontally in three-inch pipe loops or mounted in vertical lines. (Orr-FIRL)
W75-12332

**RESORT COMMUNITY PUTS ALL UTILITIES UNDERGROUND.**
For primary bibliographic entry see Field 8G.
W75-12338

**RECENT DEVELOPMENTS OF INSTRUMENTATION, CONTROL AND AUTOMATION SYSTEMS FOR WASTEWATER TREATMENT SYSTEMS,**
Tokyo (Japan). Sewerage Bureau.
For primary bibliographic entry see Field 5D.
W75-12341

**PRESSURE CONTROL IN A MOUNTAIN AREA WATER SYSTEM.**
Public Works, Vol 106, No 5, p 100-101, May, 1975. 1 fig.

Descriptors: *Water pressure, *Mountains, California, Valves, Hydrants, Design, Energy dissipation, *Water distribution(Applied), Water delivery.

The Crestline-Lake Arrowhead Water Agency, located northeast of Los Angeles in the San Bernardino mountains, draws water from the Feather River Aqueduct. It wholesales this water to 27 outlets servicing 10,000 customers, and also acts as a fire service. During design of the system, it became apparent that to maintain a practical distance between hydrants, many hydrants would be placed in areas where the pressure (850 psi) would exceed the capabilities of the fire fighting equipment. Therefore, the agency built a test facility costing $27,000 to evaluate the capability of control valves needed to reduce pressures. Cavitation was observed below the valve rather than within it-10 to 15 diameters downstream of the valve. A temporary energy dissipator was devised consisting of river rocks (3/4 to 1-inch) stuffed into a 4 1/2-foot long section of a 6-inch water main, with 1/4 by 1-inch steel bars welded across the end of the piece. With cavitation taking place in the dissipator, the rocks appeared to have been split in half. The rocks and bars were evaluated, and a permanent dissipator was designed and patented. The configuration of the energy dissipator can be changed to meet flow demand conditions. The tube-like device has been made in lengths of 18 inches to 4 1/2 feet, and is filled with steel balls furnace-welded together. (Murphy-FIRL)
W75-12343

ER PLANT GOES AUTOMATIC,
City Water Superintendent Office.
on.
and Wastes Engineering, Vol 12, No 5, p 59-
ay, 1975. 2 fig.

iptors: *Treatment facilities, *Automation,
, Deep wells, Pumps, Flow rates, Intakes,
quality control, Water treatment, Iowa.
fiers: Iowa City(Iowa), Iowa River.

owa City, Iowa, Municipal Water Treatment
nas become completely automated as a result
recent moderinization program. The decision
mputerize the entire facility was due to
y changing water conditions with widely
g seasonal conditions typical of mid-western
, presenting special treatment problems prior
tribution. To supply its 50,000 customers,
City gets only 5% of its water from a deep
which requires only chlorination and settling
e distribution. The remaining 95% is pumped
the Iowa River. A digital computer will con-
he following areas: high service pumps
ng and stopping the pumps in relation to
n demand); rate of flow, by monitoring the
well level and by calculating the rate of flow
intain the clear well level; and operation of
s at the river intake structure, to supply
ate water for maintaining the desired plant
ate. Part of the computer program also con-
the filter effluent valves. Chemical feed,
ning gates, backwash, and sludge blowoff are
olled by determining the quality of the raw
. (Dean-FIRL)
12345

## Rock Mechanics and eology

PHIC SOLUTION TO FRACTURE TREAT-
T DESIGN,
co Production Co., Tulsa, Okla.
rimary bibliographic entry see Field 8B.
11876

DICTION OF PENETRATION RATE FOR
CUSSIVE DRILLING,
Selim, and W. E. Bruce.
rt of Investigations 7396, June, 1970. 21 p, 13
0 ref, append.

riptors: *Drilling, Drilling equipment, Min-
Rock mechanics, *Wells, Ground water, Core
g.
ifiers: *Percussive drilling, Penetration rate,
collinearity, Compressive strength, Tensile
gth, Young's modulus, Coefficient of rock
gth.

feasibility of predicting percussive drilling
by equations derived from statistical regres-
analysis is described. The least squares
tical method was used and the analysis was
rmed both by direct and by stepwise linear
ssion analysis. The predicted penetration rate
function of the drill power and the physical
erties of the rocks penetrated. The results
promise that the technique may be of value
oviding a mathematical model by which per-
ve drill manufactures and users can predict
performance of a given drill. Experimental
involved two mining type percussive drills.
tration data for these drills were determined
nine rocks drilled in the laboratory. Drill
rates (power) were determined in a separate
s of experiments. Rock physical properties
measured from diamond-drill core samples
from the same blocks used for percussive
ng. (Campbell-NWWA)
12382

PERCUSSIVE DRILLING: WITH INDEPENDENT ROTATION,
Bureau of Mines, Twin Cities, Minn. Twin Cities Mining Research Center.
H. F. Unger, and R. R. Fumanti.
Report of Investigations 7692, 1972. 21 p, 16 fig, 4 tab, 8 ref.

Descriptors: *Drilling, *Drilling equipment, Mining, Rock strength, *Wells, Core drilling, Rock mechanics, Sampling, Bits.
Identifiers: *Percussive drilling, Rock properties, Rotational speed, Drilling thrust, Penetration rate, Surface-set diamond bits, Impregnated diamond bits, Diamond drilling data, Laboratory drilling tests, Field drilling tests, Energy requirements.

The Bureau of Mines conducted drilling experiments in the laboratory with a commercially available percussive drill that has an independent rotational system. Eight rock types with a wide range of physical properties were drilled under several combinations of rotational speed, drilling thrust, and operating pressure. Penetration rates and energy per unit volume correlated well with the coefficient of rock strength as shown graphically. Size-distribution analyses of some of the drill cuttings show how particle size varies with rotation speed and rock hardness. In general, changing the rotational speed has a greater influence on the penetration rate in softer rocks, with penetration rate increasing with increasing rotational speed. Although the physical properties of the rocks are an indication of their drillability characteristics, no single property correlates perfectly with the results of percussive drilling. The coefficient of rock strength number, determined by fracturing a sample in a manner similar to that of percussive drilling, correlates well with penetration rates and energy per unit volume for the independently rotated percussive drill.
W75-12383

DRILLABILITY STUDIES: PERCUSSIVE DRILLING IN THE FIELD,
Bureau of Mines, Twin Cities, Minn. Twin Cities Mining Research Center.
R. L. Schmidt.
Report of Investigations 7684, 31 p, 1972. 11 fig, 10 tab, 11 ref.

Descriptors: *Drilling, *Drill holes, Drilling equipment, Mining, On-site investigations, Construction equipment.
Identifiers: *Rock drillability, *Percussive drilling, Laboratory drilling data, Mobile drill units, Tensile strength, Compressive strength, Young's modulus, Poisson's ratio, Penetration rate, Thrust, Speicfic energy, Button bits, Operating pressure.

One of a series published by the Bureau of Mines covering research investigations in rock drillability, this report of field drilling results extends earlier laboratory findings and provides a relatively simple procedure for predicting percussive drilling rates with reasonable accuracy. Two percussive drills mounted on a truck were used to drill a total of 25 rock types, and the results were used to develop a prediction equation. The equation was tested on a set of unrelated laboratory percussive drilling data, and the comparison between predicted and actual rates is shown in tabular form. Of the physical properties investigated, compressive strength gave the best correlation with percussive drillability. No physical property by itself is considered a good predictor of drillability. A step that considers the energy output of the drill must be included in the procedure. The simplest procedure for predicting penetration rates is to determine the coefficient of rock strength of the rock to be drilled and use this value to determine the apparent specific energy of the rock. Substituting the apparent specific energy in the equation developed yields a reasonably accurate drillability prediction. (Campbell-NWWA)
W75-12384

FRAGMENTATION.
SME Mining Engineering Handbook, Vol 1, Section 11, p 11-1 to 11-60, 1973. 54 fig, 19 tab.

Descriptors: *Drilling, Rock mechanics, Bits, Rotary drilling, Oil industry, *Drillability, Drilling equipment, *Mining.
Identifiers: *Fragmentation, Fracture energy, Plasticity, Penetration rate, Rock strength, Percussion drilling, Blasthole drilling, Down-the-hole hammer, Thermal drilling.

Energy must be supplied to rock by direct or indirect means to fragment that rock. The amount is dependent upon the properties of the rock and the type of loading system. Fragmentation energy is consumed by three main mechanisms: (1) creation of new surface area (fracture energy), (2) friction (plasticity) and (3) elastic wave energy dispersion. The state of the art in property testing permits only relative measure of the ease with which rock breaks. Such measures have not been rigorously linked to excavation or comminution costs or rates. Laboratory tests for quantifying energy input requirements to cause fragmentation under various controlled degrees of confinement and loading rate will be increasingly important in aiding the understanding and analysis of rock fragmentation systems. (Campbell-NWWA)
W75-12387

CHEMICAL FRAGMENTATION,
W. H. Engelmann.
SME Mining Engineering Handbook, Vol 1, Section 11, p 11-112 to 11-123, 1973. 152 ref.

Descriptors: *Drilling, Rock Mechanics, *Rotary drilling, Oil industry, *Drilling fluids, Bits, Bibliographies.
Identifiers: *Chemical fragmentation, Penetration rate, Drilling variables, Diamond bits, Inorganic additives, Organic additives, Bit life.

The term chemical fragmentation is defined as the breakage, fracture or comminution of rock or mineral materials by mechanical forces, aided by the presence of chemical solutions. The latter usually are in the form of the aqueous pulp of a ball-mill grinding circuit, or the flushing and cooling fluids pumped down the hollow drill stem to the drill bit. Grinding and drilling are, therefore, the two most important processes benefiting by chemicals in solutions. Although these processes are emphasized, other chemically induced changes in rock toughness, as determined by special laboratory tests are also noted. Any reduction in direct-energy requirements, even by a few percentage points, can offer a cost benefit considerably greater than the cost of the chemical additives. While energy per unit volume using additives is higher than for water, the overall cost: benefit is very low. Other chemical enhancement of drilling variable is considered, such as penetration rates. Recent field drilling tests run by the Bureau of Mines, using anionic, cationic and nonionic surfactant solutions as flushing fluids for surface-set diamond bits have shown that penetration rates can be increased as much as 50% over that with water alone. These examples have demonstrated that chemical additives play an important role in conserving diamond bits and energy in rock fragmentation and removal processes. (Campbell-NWWA)
W75-12389

WATER-LEVEL FLUCTUATIONS AND EARTHQUAKES ON THE SAN ANDREAS FAULT ZONE,
Stanford Univ., Calif. Dept. of Geophysics.
For primary bibliographic entry see Field 4B.
W75-12392

STUDIES IN THE SYSTEM CACO:-FECO3: 1. PHASE RELATIONS; 2. A METHOD FOR MAJOR-ELEMENT SPECTROCHEMICAL

ANALYSIS; 3. COMPOSITIONS OF SOME FERROAN DOLOMITES,
Chicago Univ., Dept. of Geophysical Sciences.
For primary bibliographic entry see Field 2F.
W75-12400

## 8F. Concrete

HOW TO USE THIXOTROPIC SLURRIES TO SOLVE CEMENTING PROBLEMS,
Dow Chemical Co., Tulsa, Okla. Dowell Div.
B. Bradford.
Drilling, Vol 34, No 9, p 26, June, 1973. 1 fig, 2 tab.

Descriptors: *Cement, *Slurries, *Concrete mixes, Linings, Groutings, Concrete control, Wells, Leakage, Repairing, Construction, Drilling, Maintenance, Permeability, Seepage control.
Identifiers: *Thixotropic cement, *Crystalline-gel structure(Cement).

Thixotropic slurries have a crystalline-gel structure capable of being self-supporting before set. The slurry is thin during mixing and pumping, quickly becoming rigid when pumping is stopped, and again becoming fluid when enough force is applied to move it. It contains tri-calcium-aluminate, gypsum and calcium chloride. The properties are described and the advantages of thixotropic slurries are listed. (Cambell-NWWA)
W75-11886

RUNNING AND CEMENTING DEEP WELL LINERS,
MWL Tool and Supply Co., Midland, Tex.
H. E. Lindsey.
World Oil, Vol 180, No 1, p 103-110, January, 1975. 2 fig.

Descriptors: *Wells, *Lingings, *Sealants, *Deep wells, *Cleaning, Treatment, Oil wells, Water wells, Joints(Connections).
Identifiers: *Cementing.

Liner tie-back cementing operations plus post cementing procedures are explained. It is important that recommended production liner clean-out procedures be closely followed since they usually are performed under low clearance conditions with lower strength work strings and with a higher incidence of fishing jobs. A list of useful formulas for liner cementing problems is given. (Bradbeer-NWWA)
W75-11895

CEMENTING OFF, PLUGGING, AND REDRILLING,
Dow Chemical Co., Tulsa, Okla. Dowell Div.
J. E. McGinty, and D. G. Calvert.
Water Well Journal, Vol 29, No 7, p 43-46, July, 1975.

Descriptors: *Cementing material, *Wells, *Groundwater, Drilling, Water wells, Aquifer characteristics, Subsurface waters, Casing.
Identifiers: Lost circulation, Well abandonment, Casing seats, Sanitary seal, Undesirable fluids, Recompletions, Gypsum cement, Neat cement, Concrete, Placement techniques.

In recent months interest has been shown by local, state, and federal control boards in the cementing off and plugging of water wells. The following article discusses these points of interest as well as redrilling techniques. There are many reasons for setting cement plugs. Many times plugs are set during the drilling operations, upon completion of the drilling operations and for zone or well abandonment. The following are some of the specific reasons for cement plugs: (1) whipstock or kick-off, (2) shut off undersirable formation fluids, (3) lost circulating during drilling, (4) recompletion, (5) casing seats, (6) zone abandonment, (7) well abandonment. The effect of mix water and cement temperature is a factor that must be considered when designing systems for plug cementing. There are many cement systems that may be designed for use in plugging wells. The following are some of the most commonly used: (1) Gypsum cement (Gypseal, Calseal), (2) Neat cement, (3) Concrete, (4) Reduced water cements, (5) Regulated fill-up cement. Placement techniques are also discussed. (Campbell-NWWA)
W75-12394

## 8G. Materials

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING, PART 1,
Continental Oil Co., Ponca City, Okla.
For primary bibliographic entry see Field 8C.
W75-11865

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING, PART 2, DETECTING AND EVALUATING FORMATION PRESSURES,
Continental Oil Co., Ponca City, Okla.
For primary bibliographic entry see Field 8C.
W75-11866

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING, PART 3, OVERPRESSURE DETECTION FROM WIRELINE METHODS,
Continental Oil Co., Ponca City, Okla.
For primary bibliographic entry see Field 8C.
W75-11867

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING, PART 9, NAVEL WAYS TO DETECT ABNORMAL PRESSURE,
Continental Oil., Ponca City, Okla.
For primary bibliographic entry see Field 8C.
W75-11868

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING, PART 10, MISCELLANEOUS WAYS TO DETECT ABNORMAL PRESSURE,
Continental Oil Co., Houston, Tex.
For primary bibliographic entry see Field 8C.
W75-11869

A NEW APPROACH TO PERMEABILITY REDUCTION,
Marathon Oil Co., Littleton, Colo.
C. T. Presley, P. A. Argabright, R. E. Smith, and B. L. Phillips.
Journal of Petroleum Technology, Vol 27, p 592-594, May, 1975. 2 fig, 2 tab, 12 ref.

Descriptors: *Permeability, *Oil reservoir, *Colloids, *Clogging, *Control, *Well filters, Groundwater, Aquifer, Flow augmentation, Wells, Seepage, Gravels, Coarse aggregates, Storage.
Identifiers: *Sand bridging.

A new class of polyelectrolytes, polyisocyanurate salts, was evaluated as a permeability reducing agent. The permeability reduction involves plugging interpore flow channels with colloidal particles that are generated in situ. This process is operative up to about 150F. This method has many advantages including the flexibility to designate the final permeability as almost any desired fraction of the initial permeability. (Bradbeer-NWWA)
W75-11872

HOLE-TO-HOLE GEOPHYSICAL MEASUREMENT RESEARCH FOR MINERAL EXPLORATION,
Geological Survey, Denver, Colo.
J. H. Scott, J. J. Danils, W. P. Hasbrouck, and J. Y. Guu.
In: Society of Professional Well Log Analysts Sixteenth Annual Logging Symposium, June 4-7, 1975, 14 p. 6 fig, 21 ref.

Descriptors: *Borehole geophysics, *Electric well logging, *Exploration, Mineral industry, *Cross-sections, Coal, Seismic studies, Radioactivity, Resistivity, Mining, Locating, Subsurface investigations, Mapping, Metals.
Identifiers: Uranium ore.

A major deficiency exists in state-of-the-art borehole geophysical measurements available to the mineral industry -- the inability of conventional well-logging techniques to 'see' more than a few meters from a borehole. Hole-to-hole and hole-to-surface geophysical measurements offer the possibility of extending the range of investigation to 3-300 m. A review of previous research indicates that a few extended-range borehole geophysical techniques have been developed for specialized problems in petroleum and mineral exploration. Two new applications show special promise: hole-to-hole electrical measurements for uranium exploration and hole-to-hole seismic measurements for coal-seam testing. Results of recent field tests and computer model studies indicate that these techniques can improve exploration efficiency by reducing the number of drill holes needed for finding uranium orebodies and by certifying the continuity of coal seams. (Bradbeer-NWWA)
W75-11873

GRAPHIC SOLUTIONS TO TUBING MOVEMENT IN DEEP WELLS,
Baker Oil Tools, Inc., Oklahoma City, Okla.
For primary bibliographic entry see Field 8B.
W75-11875

SEISMIC EXPLORATION: ITS NATURE AND EFFECT ON FISH,
Fisheries and Marine Service, Winnipeg (Manitoba).
M. R. Falk, and M. J. Lawrence.
Technical Report Series No CEN-T-73-9, 1973, 51 p. 12 fig, 4 tab, 21 ref.

Descriptors: *Seismic exploration, *Fish, Explosives, *Environmental effects, Seismic waves, Fish management, Marine fish, Aquatic animals, *Fishkill, Canada.
Identifiers: Sparker, Aquapulse, Hydrosonde, Airgun, Seismic profile.

The nature of seismic exploration in offshore and inland waterbodies of the Northwest Territories, as well as the effects on fish are described. Literature pertaining to the nature and effect of explosive and non-explosive seismic energy sources is presented. A study is described of the effects that seismic energy sources commonly used in the Northwest Territories have on fish. Caged Arctic cisco (Coregonus autumnalis) and other small Coregonids were subjected to the energy sources to determine their lethal characteristics. Aquaflex (a linear high explosive) detonated in 165 foot lengths on the bottom in 10 ft of water, killed fish over an area of 36,200 square foot. A 10 pound charge of 60% Geogel (a point high explosive) detonated 10 ft below the surface in 15 feet of water, killed fish over an area of 25,540 square feet. In contrast, a 300 cubic inch Par Air Gun caused no direct fish mortalities. (Cambell-NWWA)
W75-11877

CAREFUL SAMPLE TAKING IS KEY TO SUCCESSFUL WELLS,
Universal Oil Products, St. Paul, Minn. Johnson Div.
J. R. Carr.
Johnson Drillers Journal, p 4-7, March-April, 1975. 2 fig.

ptors: *Drilling, *Sampling, *Drilling sam-
Drillers logs, Drill holes, Exploration, Sub-
e mapping, Wells, Rotary drilling, Quality
, Reliability, Heaving.
iers: Borehole description, Depth descrip-

ng should be as frequent as necessary, that
least one sample for each geologic unit
ated and as many as possible within the unit
quately describe the aquifer characteristics.
ifferent uphole velocities of the various
fluids necessitate different sampling inter-
or example, the normal uphole velocity in
air drilling is 3,000 feet per minute. This
te makes it necessary to sample continually
eriodically stop the drilling and continue cir-
n to obtain a clean sample. Shavings
ed by driving the casing are a true sample of
ll if a careful depth description is kept. The
enced driller may also aid the description
h his knowledge of the formation obtained
h the rate of penetration by the drill bit.
eer-NWWA)
1881

OSION.
Well Journal, Vol 29, No 6, p 46-48, June,

ptors: *Corrosion, *Corrosion control,
ngs, Chemical degradation, Deterioration,
ion, Water softening, Control, Films, Car-
oxide, Dissolved oxygen, Tennessee.
iers: *Galvanic cells.

sion is a natural chemical process with a rate
ed by acidity of the water, electrical con-
ity, oxygen concentration, and temperature.
n dioxide in rain water, unless buffered by
one, combines with the water to form car-
acid. Galvanic cells created by the juxtaposi-
f two dissimilar metals aid in corrosion of a
system. Available oxygen will combine with
dissolving the pipe molecule by molecule.
he more available the oxygen, the faster the
ion. Since corrosion is a chemical reaction,
te of corrosion increases with increasing
rature. Control involves reduction of acidity
ffering either in the water or as a filter in the
n itself and reduction of dissolved oxygen.
hosphate compounds, which lay down a thin
n interior metal surfaces of hydraulic equip-
minimizing the water metal contact,
ize corrosion. (Bradbeer-NWWA)
1888

PHICAL METHOD SPEEDS DEVIATED
L CASING DESIGN,
plin Petroleum Co., Wilmington, Calif.
odlan, and G. E. Powell.
l Oil, Vol 180, No 2, p 40-43, February 1,
6 fig, 1 tab, 6 ref.

iptors: *Well casings, *Drilling, *Design,
odology, Weight, Length, Pressure, Buoyan-
ension, Collapse, Water wells, Oil wells,

fiers: *Bending load, Directional drilling.

n major factors are considered in the graphi-
sing design method for directionally drilled
including: (1) byoyancy, (2) bending load,
ension, (4) collapse, (5) correction, (6)
ted hole support, and (7) burst. To minimize
ations and trial and error methods, all per-
equations have been put in graph form for
ion casing goods. Adequate safety factors
ncluded. An example calculation is made.
beer-NWWA)
11896

CERS AID PLACEMENT OF STIMULA-
FLUIDS,
Oil Co., Andrews, Tex.
Lilley.
Oil and Gas Journal, Vol 72, No 24, p 62-64, June 17, 1974. 6 fig, 1 tab.

Descriptors: *Tracers, *Secondary recovery(Oil), *Radioactivity techniques, Tracking techniques, Injection, Hydrofracturing. Leakage, Plugging, Testing procedures, Groundwater movement, *Texas.
Identifiers: Cochran County(Tex), Ward County(Tex).

A new procedure using radioactive tracers is useful in placing well-stimulation and fracture fluids, isolating theif zones in injection wells for proper placement of plugging agents, and in controlling water flow from a permeable zone in the middle of an oil pay. The method of emplacement is described and related problems discussed. This method has been utilized in the North Ward Estes field, Ward County, Texas and in the Slaughter Field, Cochran County at depths of approximately 2500 ft and 5000 ft respecitively. The results are tabulated. (Campbell-NWWA)
W75-11898

**USE OF PLASTIC PIPE FOR SEWERS,**
Otay Municipal Water District, Spring Valley, Calif.
G. M. Reiter, and L. Hirsch.
Public Works, Vol 104, No 4, p 88-91, April. 1973. 4 fig, 1 tab.

Descriptors: *Sewers, *Plastic pipes, Construction, California, Pipelines, Costs, Laboratory tests, Waste water treatment.
Identifiers: Otay Municipal Water District(Calif).

Plastic pipes are beeing used in the construction of sanitary sewers for a California area having a steep hillside terrain with rock outcroppings. After much construction bidding and rebidding for the 70,000 feet of pipeline, the Otay Municipal Water District permitted the use of plastic pipes. These pipes have demonstrated the following advantages: low material cost; long, lightweight pipe lengths, permitting easy handling, storage, and laying; pipe flexibility allowing maximum curvatures; fast, positive air pressure testing; narrow trench digging; and, simpler manhole construction with longer spacing and compatibility with plastic laterals and saddles. Prior to use of such pipes, specific laboratory tests were performed. Tests consisted of subjecting pipe specimens to extreme conditions - far exceeding normal anticipated operating conditions for periods up to 18 days. The tests corroborated results reported from major research and testing programs. (Sandoski-FIRL)
W75-11907

**PIPE FLOW MEASUREMENTS BY THE PULSE VELOCITY METHOD WITH RADIOACTIVE ISOTOPES,**
P. Wurzel.
The Civil Engineer in South Africa, Vol. 15, No. 2, p 33-38, February, 1973. 4 fig, 1 tab, 7 ref.

Descriptors: *Pipe flow, *Measurement, *Radioisotopes, Instrumentation.
Identifiers: Scintillation rate-meter.

A radioactive system for broad angly detection of pipe flow measurement using AERE 1413A scintillation rate-meter gives flatter wave forms with lower repeatability and requires relatively higher radiation mass dosages per injection as compared with a narrow angle detection device. However, using an automatic on/off light system set at a preselected radiation threshold level, this system gives excellent repeatability and requires low radiotracer concentrations per injection. The instrumentation is light and portable, and requires no expert supervision. The criteria for selection of the tracer method are speed and convenience rather than high accuracy and precision. However, an accuracy of plus or minus 5 percent can be achieved and the danger from radiation is negligible. (Sandoski-FIRL)
W75-11916

**SAFETY INSTALLATION FOR PREVENTING POLLUTION BY PIPELINES,**
G. F. Wittgenstein.
United States Patent 3,721,270. Issued March 20, 1973. Official Gazette of the United States Patent Office, Vol 908, No 3, p 605-606, March 20, 1973.

Descriptors: *Pipelines, *Safety, Plastics, Instrumentation, Monitoring, Patents, Water pollution control, Pollutant identification, Monitoring.
Identifiers: Detectors, Vessels.

A safety installation for preventing pollution by pipeline is provided with at least one sector equipped with a jacket of plastic material. The jacket surrounding the pipeline is sealed at its ends, with a annular gap formed between the pipeline and its jacket containing a fluid and inserts and spaces. At least one vessel is provided for collecting the evacuated flow and liquid presence detector which gives a warning and remotely controls operations. A fluid-tight hollow space contains a gas under a pressure different from atmospheric pressure and connects the interior of at least one vessel to a crack in the pipe wherever the crack occurs. Instruments permantely monitor the tightness of the space, which compreses at least one perforated gap. Near each vessel is a liquid presence detector and every horizontal run gap of the space is filled with water. The jacket is pierced by at least one perforation, and there is a chimney surrounding the perforation. A channel leads into the chimney above the level of water and to a vessel to form part of the space. Every inclined run gap of the space is perforated at a low point in its jacket, and the channel surrounding the perforation and leading to the vessel forms part of the space. (Sandoski-FIRL)
W75-11934

**HYDRAULIC SEWER PIPELINE CLEANER,**
O'Brien Mfg. Co., Inc., Chicago, Ill. (assignee).
For primary bibliographic entry see Field 5D.
W75-11944

**PIPE RELINING METHOD AND APPARATUS,**
R. M. Bremner.
Australian Patent 434,556. Issued April 19, 1973. Official Journal of Patents, Trade Marks and Designs, Vol 43, No 14, p 1373, April 19, 1973.

Descriptors: *Pipes, *Linings, Plastics, *Patents, Repairing, Rehabilitation.
Identifiers: Polyethylene liners.

A piping renovation method utilizes a polyethylene linear drawn through with an oscillating motion. An oscillating motion is set up by a cable attached to a pneumatic power unit, to which is secured the high density polyethylene lining tube, as they are drawn through the underground piping. Any residual friction inside the piping is overcome and damage to the lining prevented. The gap between the lining and the piping is filled with an embedding mortar to secure the lining in place. (Sandoski-FIRL)
W75-11945

**APPLICATION OF PVC BELL-AND-SPIGOT PRESSURE PIPES IN CONSTRUCTION OF WATER SUPPLY LINES (DIE ANWENDUNG VON PVC-MUFFENDRUCKROHREN BEIM BAU VON WASSERVERSORGUNGSNETZEN),**
For primary bibliographic entry see Field 8A.
W75-11949

**RESORT COMMUNITY PUTS ALL UTILITIES UNDERGROUND.**
Water and Sewage Works, Vol 122, No 5, p 94-95, May, 1975.

Descriptors: *Pipes, *Sewerage, Plastic pipes, Construction materials, Clay pipes, Joints(Connection), Infiltration, Costs, Virginia, Waste water treatment.
Identifiers: Armco Truss Pipe, Acrylonitrile-butadiene-styrene.

Kingsmill on the James is a 2900 acre resort and residential development is Virginia. Construction was begun in 1972 and is expected to continue 15 years. One of the earliest construction phases was the placing of electricity, water, sewer and telephone lines underground. Armco Truss Pipe is being installed for the sanitary sewers. The pipe is made by extruding ABS (Acrylonitrile-butadiene-styrene) resin into a truss shape to form an inner and outer wall supported by webs. The voids between the webs are filled with lightweight concrete. The pipe is about three times longer than vitrified clay pipe which allows for fewer joints and faster installation. The joints are solvent welded to reduce infiltration/exfiltration. Separate contracts were signed on four different residential sites in Kingsmill on the James. In each case, the successful contractor bid the Armco pipe substantially lower than the VCP. (Orr-FIRL)
W75-12338

**EPOXY RESIN APPLICATION AT SEWAGE WORKS.**
For primary bibliographic entry see Field 5D.
W75-12349

**CREW TRAINING,**
Exxon Co., Houston, Tex.
J. V. Langston.
Drilling, Vol 36, No 7, p 63-65, May, 1975. 4 fig.

Descriptors: *Drilling, *Training, *Labor, *Manpower, Personnel, Schools(Education).
Identifiers: *Driller training, Toolpusher, Derrick man, Rotary helper, Drilling rig crew.

The increasing complexity of drilling operations, a large increase in cost, and the critical shortage of trained people at a time of rapid expansion in the number of drilling rigs are the contributing factors to the greater importance placed on drilling crew training. The article stresses that the level of experience of the average crewman will decrease as a large number of untrained crews are employed in the extending drilling operations. The schools established at the present are good but unable to handle the anticipated volume of training. A plan is suggested that includes a standard test of ability before qualification for promotion. (Bradbeer-NWWA)
W75-12385

**SPECIALIZED UNDERGROUND EXTRACTION SYSTEMS.**
For primary bibliographic entry see Field 8B.
W75-12388

**CHEMICAL FRAGMENTATION,**
For primary bibliographic entry see Field 8E.
W75-12389

**WATER-LEVEL FLUCTUATIONS AND EARTHQUAKES ON THE SAN ANDREAS FAULT ZONE,**
Stanford Univ., Calif. Dept. of Geophysics.
For primary bibliographic entry see Field 4B.
W75-12392

**RECENT APPLICATION OF GEOPHYSICAL METHODS IN COAL MINING,**
National Coal Board, London (England).
For primary bibliographic entry see Field 8B.
W75-12396

**APPLICATION OF WELL LOGGING TECHNIQUES TO MINING EXPLORATION BOREHOLES,**
British Petroleum Co. Ltd., Sunbury-on-Thames (England). Research Centre.
P. Threadgold.
In: Ninth Commonwealth Mining and Metallurgical Congress 1969, Mining and Petroelum Geology Section, Paper 11, 17 p, 9 fig, 2 tab.

Descriptors: *Boreholes Geophysics, Electrical Logging, *Mining, *Well Logging, *Wells, Aquifer characteristics, Resistivity.
Identifiers: Hydrocarbons, Mining exploration, Sonic log, Formation density, Neutron log, Gamma log, Logging Program Design, Economics.

The development of well-logging in its applications to exploration for hydrocarbons is traced, and it is shown that the interpretation methods used for estimation of porosity in the presence of a multicomponent rock matrix can be used for any multi-component system. The routine logging tools used for porosity estimates are briefly described, and their responses are discussed. Methods of using these tools to resolve problems of mixed lithology are described and illustrated; these methods can be used when the constituents of the rock are known so that their relevant 'logging characteristics' can be defined. The application of other routine logging methods to mining exploration is considered more specifically from a diagnostic viewpoint; however, quantitative use of these measurements in specific areas is not discounted. The design of logging programmes to solve specific problems is described. Various practical problems which have arisen, largely because of the development of well-logging primarily for the petroleum industry, are considered. It is concluded that the technical problems which may well have been responsible for the relatively small use of well logs outside the petroleum industry are no longer insurmountable. A major problem of economics still remains. It is suggested, however, that modern trends in logging justify serious reappraisal of their possible applications to mining exploration. (Campbell-NWWA)
W75-12398

**FRESH WATER STRATA OF MISSISSIPPI AS REVEALED BY ELECTRICAL LOG STUDIES,**
Millsaps Coll., Jackson, Miss.
For primary bibliographic entry see Field 4B.
W75-12399

## 8H. Rapid Excavation

**MOLE DRIVES THROUGH CLAY-SHALE FACE.**
Engineering News Record, Vol. 190, No. 16, p 17, April 19, 1973. 1 fig.

Descriptors: *Tunneling machines, *Tunnels, Storm drains, Soils, Rocks, Ohio.
Identifiers: Euclid(Ohio).

A tunnel boring machine (TBM) recently holed through a 4180-foot storm drainage tunnel in Euclid, Ohio. The TBM, made by Jarva, Incorporated, of Solon, Ohio, has a rotating cutterhead that operates within a steel shield in soft ground, but can be extended forward of the shield when mining in hard rock. To cope with any shield rotation, the $780,000 TBM's cutterhead operates in either direction. The machine's best day of advance was 45 feet in a mixed face of shale and clay, functioning alternately as a hard rock boring machine and a soft ground shield-type. (Sandoski-FIRL)
W75-11911

## 8I. Fisheries Engineering

**SEISMIC EXPLORATION: ITS NATURE AND EFFECT ON FISH,**
Fisheries and Marine Service, Winnipeg (Manitoba).
For primary bibliographic entry see Field 8G.
W75-11877

**LIFE HISTORY, ECOLOGY, AND MANAGEMENT OF THE CARP, CYPRINUS CARPIO LINNAEUS, IN ELEPHANT BUTTE LAKE.**
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 6B.
W75-11972

**DISTRIBUTION AND BIOMASS OF MACROPHYTES IN LAKE DGAL MALY,**
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland).
B. Gerlaczynska.
Ekologia Polska, Vol 21, No 48, p 743-752, 1973. 1 fig, 5 tab, 9 ref.

Descriptors: *Distribution, *Lake fisheries, *Biomass, *Aquatic plants, Submerged plants, Floating plants, Chemical properties, Marsh plants, Aquatic weed control, Bulrushes, Cattails, Lakes, Europe, Fish reproduction.
Identifiers: *Lake Dgal Maly(Poland), *Poland, *Macrophytes, Hornwort, Burr-weed, Sedge, Water horsetail, Pondweeds, Schoenoplectus, Water moss, Water weed, Stratiotes aloides.

Macrophyte occurence, distribution, biomass, and their chemical composition in relation to habitat were studied in Lake Dgal Maly, Poland. Vascular flora occupied 4.09 hectares (28.8% of lake area); of this 1.34 hectares or 9.4% were emerged and 2.75 hectares or 19.4% submerged plants. Macrophyte biomass weighed 55.52 tons fresh weight or 12.209 tons dry weight. Fourteen species were found. Phragmites communis (21.6% of total area occupied by littoral plants) was dominant plus 2.4% Typha angustifolia, 3.7% T. latifolia, 2.4% Schoenoplectus sp., and 1.5% Carex sp. Submerged and floating plants consisted of 65.6% Ceratophyllum demersum, 0.8% Fontinalis antypyretica, and 0.5% Stratiotes aloides. C. demersum contained the largest amount of calcium (8.1% of dry mass) and least calcium contents were in Schoenoplectus Tabernaemontani (0.52%). C. demersum contained 0.39% phosphorus and Typha latifolia 0.11%. Typha angustifolia contained 1.84% nitrogen and C. demersum 0.84%. Development of marsh plants limits occurence of underwater meadows and causes deteriorating conditions for phytophilous fish reproduction. Mowing must be done every few years to limit helophyte development. (Buchanan-Davidson–Wisconsin)
W75-11993

**EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. XIV. THE RELATIONS BETWEEN THE FISH AND OTHER BIOCENOTIC COMPONENTS (SUMMING UP THE STUDIES),**
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
Z. Kajak, and J. Zawisza.
Ekologia Polska, Vol 21, No 41, p 632-642, 1973. 8 tab, 26 ref.

Descriptors: *Fish stocking, *Lakes, *Biological communities, *Fish diets, Aquatic plants, Carp, Pikes, Perches, Phytoplankton, Zooplankton, Nannoplankton, Productivity, Biomass, Herbivores, Fecundity, Juvenile fish, Fish parasites, Growth rates, Benthos, Europe.
Identifiers: *Lake Warniak(Poland), *Poland, Roach, Tench, Bream.

eview of previous research shows that in-uction of fish, primarily carp, into Lake War-, Poland from 1967-1969 caused phytoplank-biomass and production to decrease and or-c matter decomposition and nannoplankton ass to increase. Small zooplankton species in-sed, but biomass and productivity of large ies decreased. Dominant zooplankton species uced 2-10 times more eggs and body length in-sed up to 37%. Increasing fish pressure eased the benthos level without changing its mics. Where fish pressure was high, faunal ass associated with macrophytes and the age individual weight was smaller. Spatial dis-ution of pike, roach, perch, and most juvenile forms did not change. Young carp were used od by bigger pike, but carp did not gather on vning grounds of roach, tench, and crucian or feed on their spawn and larvae. Carp were cted by Trichodina, Dactylogyrus vastator, D. oratus, and Ergasilus sieboldi and an acute icaemia. Growth rates of fish decreased from to 1969, but increases in carp and bream body ght were generally high and their conditions factory due to better utilization of smaller unts of consumed food. Fish pressure corre-l with the decrease of benthos biomass. chanan-Davidson--Wisconsin)
5-11998

**PERIMENTALLY INCREASED FISH STOCK THE POND TYPE LAKE WARNIAK. XIII. TRIBUTION AND BIOMASS OF THE LEM-CEAE AND THE FAUNA ASSOCIATED TH THEM,**
rsaw Univ. (Poland). Zoological Inst.
M. Kobuszewska.
logia Polska, Vol 21, No 39, p 611-629, 1973. 5 5 tab, 25 ref.

criptors: *Fish farming, *Spatial distribution, uatic plants, *Aquatic animals, Biomass, In-s, Habitats, Periphyton, Invertebrates, Gas-ods, Oligochaetes, Amphipods, Submerged nts, Herbivores, Fish food organisms, ewings, Aquatic insects, Larvae, Mayflies, tera, Europe.
ntifiers: *Lake Warniak(Poland), *Duckweed, ra-fauna associations, Monophagous insects.

dies of Lemnaceae distribution and biomass the composition and abundance of associated ertebrate macrofauna were made in Lake War-, Poland, in 1969-1970 to determine the effect ncreased fish stock on lake biocenosis. Sub-ged Lemnaceae were represented by Lemna ulca; floating Lemnaceae by Spirodela polyrr-a plus Lemna minor. Floating Lemnaceae ied with water level fluctuations, wave motion, emergent vegetation. The biomass of floating nnaceae was highest at distances greater than meter from shore but lower than that of other crophyte species. Biomass of submerged Lem-eae was highest in June. Quantitative and litative studies were made of the fauna as-iated with the submerged and floating Lem-eae. Large Anisoptera and Neuroptera larvae re found on submerged Lemnaceae, with hemeroptera, Chironomidae, Oligochaeta, choptera, and Gastropoda dominant. On float-Lemnaceae, Collembola, Hemiptera, Gas-poda, and Hydrozoa were dominant. The nber of fauna associated with submerged Lem-eae averaged 1674 individuals/sq m of lake sur-e and with floating Lemnaceae averaged 155 in-iduals. Biomass fluctuations of Lemnaceae and nges in associated fauna were affected by fish zing on plants and the associated fauna. Unsta-rates of Lemnaceae development caused varia-ns in the amount of associated fauna. chanan-Davidson--Wisconsin)
5-12009

**ILY FALL ACTIVITY AND DIRECTION OF OVEMENTS OF FISH IN LAKE QUENOUILLE IN THE LAURENTIANS, (IN FRENCH),**
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 2H.
W75-12064

**PRAIRIE POTHOLE ECOLOGY AND THE FEASIBILITY OF GROWING RAINBOW TROUT (SALMO GAIRDNERI RICHARDSON) IN PRAIRIE POTHOLES,**
North Dakota State Univ., Fargo. Dept. of Zoology.
G. L. Myers.
MS thesis, May 1973. 98 p. 19 fig, 11 tab, 34 ref.

Descriptors: *Potholes, *North Dakota, *Fish farming, *Rainbow trout, *Fish food organisms, Mortality, Fish stocking, Salmonids, Oxygen sag, Lake morphology, Chemical properties, Phytoplankton, Zooplankton, Invertebrates, Growth rates, Water levels, Winterkilling, Benthic fauna, Salamanders, Mercury, Diptera, Amphipods, Water temperature, Alkalinity, Phosphates, Nitrogen compounds, Hardness(Water), Specific conductivity, Costs, Eutrophication, Copepods, Daphnia, Fish harvest, Water pollution effects, Rooted aquatic plants, Waterfowl, Competition.
Identifiers: *Prairie pothole lakes.

Commercial rainbow trout production is not feasible in four North Dakota pothole lakes studied, although trout growth did reach commercial size in one season. Mortality was due to a combination of factors: initial stocking mortality, diurnal dissolved oxygen fluctuations, water temperature, ammonia toxicity, and bird predation. Trout ate the same foods as salamanders but in different proportions. Trout consumed amphipods, Chaoborus, and chironomids. They selected Chaoborus when present, then relied on amphipods. Competition with waterfowl for food was not demonstrated. Nitrogen was the limiting nutrient in three lakes; the fourth lake had high nitrogen and ortho-phosphate levels due to a septic tank discharge. Density of rooted vegetation, Ceratophyllum demersum and Myriophyllum exalbescens, appeared to have a negative correlation with blue-green algae blooms. If an algal bloom occured early in the season, rooted vegetation was stunted; otherwise Ceratophyllum dominated. In three lakes the dominate algae was Aphanizomenon. Succession from Anabaena to Aphanizomenon to Microcystis was observed. Daphnia were the most numerous zooplankters. Copepod populations often followed fluctuations in Daphnia. Benthic invertebrates consisted of amphipods and chironomids. The number of oligochaetes appeared to increase, relative to chironomids, as organic enrichment increased. (Buchanan-Davidson-Wisconsin).
W75-12157

**LIFE HISTORY NOTES AND MERISTIC VARIATION IN THE FRESHWATER FOURSPINE STICKLEBACK, APELTES QUADRACUS (MITCHILL), NEAR SEPT-ILES: QUEBEC,**
Ottawa Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 2I.
W75-12176

# 9. MANPOWER, GRANTS AND FACILITIES

## 9D. Grants, Contracts, and Research Act Allotments

**WATER RESOURCES PROGRAMS IN THE SOUTHEASTERN REGION.**
Geological Survey, Atlanta, Ga. Water Resources Div.
Geological Survey, Atlanta, Georgia, Southeastern Region Water Resources Division. October 7, 1974, 63 p.

Descriptors: *Projects, *Southeast U.S., *Costs, *Water resources, Federal government, State governments, Programs, Cost sharing, Project purposes, Water resources development.
Identifiers: *1975FY projects.

Programs conducted by the U.S. Geological Survey, Water Resources Division, for the 1975FY in the Southeastern Region are listed. The summary tables include the cooperative agencies (federal, state, and local), agency funds, total funds, project titles, and project objectives for each district in the Southeastern Region: Alabama, Caribbean, Florida, Georgia, Kentucky, Mississippi, North Carolina, and Tennessee. (Woodard-USGS)
W75-11960

# 10. SCIENTIFIC AND TECHNICAL INFORMATION

## 10C. Secondary Publication And Distribution

**MINE DRAINAGE ABSTRACTS, A BIBLIOGRAPHY. 1972 SUPPLEMENT.**
Bituminous Coal Research, Inc., Monroeville, Pa.
For primary bibliographic entry see Field 5B.
W75-12158

**INTERNATIONAL ECONOMICS AND ENVIRONMENT CONTROL,**
Southampton Univ. (England). Dept. of Economics.
For primary bibliographic entry see Field 6G.
W75-12178

**EXTERNALITIES AND PUBLIC GOODS. A BIBLIOGRAPHY,**
Warwick Univ., Coventry (England). Dept. of Economics.
For primary bibliographic entry see Field 6B.
W75-12179

**RECREATION ANALYSIS. A BIBLIOGRAPHY,**
Birmingham Univ. (England). Dept. of Transportation and Environmental Planning.
For primary bibliographic entry see Field 6B.
W75-12180

**FISHERIES ECONOMICS. A BIBLIOGRAPHY,**
Manchester Univ. (England). Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3E.
W75-12181

**ECONOMIC GROWTH VS. THE ENVIRONMENT. A BIBLIOGRAPHY,**
Bristol Univ. (England). Dept. of Economics.
For primary bibliographic entry see Field 6G.
W75-12182

**THE FIFTH ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY.**
Council on Environmental Quality, Washington, D. C.
For primary bibliographic entry see Field 6G.
W75-12203

**THE LAW OF THE SEA: A SELECTIVE BIBLIOGRAPHY OF ARTICLES, DOCUMENTS AND MONOGRAPHS,**
Columbia Univ., New York. School of Law.
For primary bibliographic entry see Field 06E.
W75-12217

## 10F. Preparation Of Reviews

**POLLUTION EFFECTS ON SURFACE WATERS AND GROUNDWATERS,- (LITERATURE REVIEW),**
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W75-12070

**ORGANICS, (LITERATURE REVIEW),**
Drexel Univ., Philadelphia, Pa. Dept. of Environmental Engineering and Science.
For primary bibliographic entry see Field 05B.
W75-12071

**INORGANICS, (LITERATURE REVIEW),**
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05A.
W75-12072

**WATER CHARACTERISTICS, (LITERATURE REVIEW),**
Maine Univ. Orono.
For primary bibliographic entry see Field 05A.
W75-12073

**ANAEROBIC PROCESSES, (LITERATURE REVIEW),**
Institute of Gas Technology, Chicago, Ill.
For primary bibliographic entry see Field 05D.
W75-12074

**SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL, (LITERATURE REVIEW),**
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W75-12075

**WASTEWATER COLLECTION, (LITERATURE REVIEW),**
Nottingham (H.D.) and Associates, Inc., McLean, Va.
For primary bibliographic entry see Field 05D.
W75-12076

**WEATHER MODIFICATION: WHERE ARE WE NOW AND WHERE SHOULD WE BE GOING. AN EDITORIAL OVERVIEW,**
National Hurricane and Experimental Meteorology Lab., Coral Gables, Fla.
For primary bibliographic entry see Field 03B.
W75-12088

# SUBJECT INDEX


**PROJECTS**
Resources Programs in the Southeastern
1960 9D

of 2,4-D and Various Salts on Eurasian
nilfoil.
1990 4A

**OBIC CONDITIONS**
sk of Deoxygenation of Water in Herbi-
pplication for Aquatic Weed Control,
1996 5A

**TE LIABILITY**
y for Oil Pollution Disasters: Interna-
Law and the Delimitation of Com-
es in a Federal Policy,
2235 5G

**TION**
ptake and Utilization of Organic Carbon
ae: An Essay in Comparative Biochemis-
1980 5C

lving the Flow Equation in Unsaturated
y Optimization: Horizontal Infiltration,
2083 2G

cal Investigation of the Relation
en Absorbability and Content of Grain-
actions and Humus, (In Russian),
2344 2G

**CTS**
Drainage Abstracts, A Bibliography. 1972
ment.
2158 5B

**ION (LEGAL ASPECTS)**
ederal Common Law of Accretion: A
lement in Property Law,
2205 6E

oir Properties Affecting Matrix Acid
tion of Sandstones,
894 4B

**ACTURING**
ffect of Surface Kinetics in Fracture
ng,
887 8B

**NE WATER**
ine Drainage in Cane Creek Basin, Near
n, Walker County, Alabama,
871 5G

**TUAL SOLVENT (AMS) TECHNIQUE**
Look at Sandstone Acidizing,
878 4B

**REAMS**
ine Drainage in Cane Creek Basin, Near
n, Walker County, Alabama,
871 5G

**WATER**
ine Drainage in Cane Creek Basin, Near
n, Walker County, Alabama,
871 5G

ffect of Surface Kinetics in Fracture
ng,
887 8B

Thermodynamic and Kinetic Aspects of Argillaceous Sandstone Acidizing,
W75-11891 4B

Experimental Data for Establishing the Content of Alpha, Alpha, Beta-Trichloropropionic Acid and its Sodium Salts in Reservoir Water,
W75-12190 5C

**ACOUSTICS**
How Downhole Temperatures, Pressures Affect Drilling, Part 3, Overpressure Detection from Wireline Methods,
W75-11867 8C

**ACTIVATED CARBON**
Adsorption of Poliovirus onto Activated Carbon in Wastewater,
W75-12148 5D

**ACTIVATED SLUDGE**
Primary Developments of Air-Borne Bacteria in the OECD Activated Sludge System,
W75-12143 5D

Biological Waste Water Treatment,
W75-12149 5D

The Relationship Between Process Configuration and Process Performance,
W75-12152 5D

Principles and Techniques for Conditioning of Waste-Activated Sludge by Direct Slurry Freezing,
W75-12154 5D

The Influence of Oxygen Concentration and Turbulence Intensity on Complete-Mix Activated Sludge Performance,
W75-12155 5D

New Orleans Chooses Oxygen Activated Sludge.
W75-12318 5D

Biologically Mediated Inconsistencies in Aeration Equipment Performace,
W75-12333 5D

Recent Developments of Instrumentation, Control and Automation Systems for Wastewater Treatment Systems,
W75-12341 5D

**ADJACENT LAND OWNERS**
Gumz V. Bejes (Action by Adjoining Landowners for Injunction Against Flooding From Drainage and Irrigation Ditch).
W75-12290 6E

Gulf Shore Seafood and Company v. Cities Service Co. (Action for Damages Arising from Dam Break of Phosphate Company's Dam Permitting Phosphate Slime Pollution of River).
W75-12291 6E

Wildwood Estates of Braintree, Inc. v. Smith (Action to Determine Prescriptive Rights of Use in Defendant's Pond).
W75-12292 6E

**ADJACENT LANDOWNERS**
Borgmann V. Florissant Development Co (Action to Enjoin Adjoining Property Owners From Collecting and Discharging Surface Water onto Plaintiffs' Land).
W75-12289 6E

**ADJUDICATION PROCEDURE**
Uses of Scientific Information in Environmental Decision-Making,
W75-12204 6G

**ADMINISTRATION**
Liaison with Planning Authorities-A Vital Link,
W75-12335 6E

**ADMINISTRATIVE ACCOUNTABILITY**
Colorado Public Interest Research Group, Inc. V. Train (Citizen Suit to Compel the Environmental Protection Agency to Control Discharge or Radioactive Materials into Navigable Waters).
W75-12287 6E

**ADMINISTRATIVE AGENCIES**
Ocean Dumping Oversight.
W75-12194 5G

Federal Ocean Programs Review.
W75-12200 6E

The Fifth Annual Report of the Council on Environmental Quality.
W75-12203 6G

The Doctrine of Primary Jurisdiction Misconceived: End to Common Law Environmental Protection,
W75-12206 6G

Water Quality Management Basin Plans--Policies and Procedures.
W75-12260 5G

Marine Sanctuaries.
W75-12261 6E

Estuarine Sanctuary Grants--Application and Selection Criteria Procedures.
W75-12262 6E

Permits for Activities in Navigable Waters or Ocean Waters.
W75-12263 6E

Iron and Steel Manufacturing Point Source Category--Effluent Guidelines and Standards.
W75-12264 5G

Canned and Preserved Seafood Processing Point Source Category--Effluent Limitations Guidelines.
W75-12265 5G

Fertilizer Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Limitations.
W75-12266 5G

Timber Products Processing Point Source Category--Effluent Guidelines and Standards.
W75-12267 5G

Organic Chemicals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Application to Pretreatment Standards.
W75-12268 5G

Soap and Detergent Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-12269 5G

Grain Mills Point Source Category--Effluent Limitations Guidelines and Standards.
W75-12274 5G

**ADMINISTRATIVE AGENCIES**

Plastics and Synthetic Point Source Category--Effluent Guidelines and Standards.
W75-12275 5G

Nonferrous Metals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Limitations.
W75-12276 5G

Conservation Soc'y. of Southern Vermont, Inc. V. Secretary of Transportation (Review of Motion for Equitable Injunction Against Stream Channelization Project).
W75-12282 6E

Train V. City of New York (Class Action by City to Compel EPA to Allot Funds Authorized by the 1972 Federal Water Pollution Control Act Amendments).
W75-12284 6E

Train V. Campaign Clean Water, Inc. (Action by Environmental Group to Require EPA to Release Funds Authorized for Federal Grants to Municipalities for Water Pollution Control.
W75-12285 6E

**ADMINISTRATIVE DECISIONS**

The Doctrine of Primary Jurisdiction Misconceived: End to Common Law Environmental Protection,
W75-12206 6G

**ADMINISTRATIVE REGULATIONS**

The Florida Environmental Protection Act of 1971: The Citizen's Role in Environmental Management,
W75-12207 6G

Water Quality Management Basin Plans--Policies and Procedures.
W75-12260 5G

Marine Sanctuaries.
W75-12261 6E

Estuarine Sanctuary Grants--Application and Selection Criteria Procedures.
W75-12262 6E

Permits for Activities in Navigable Waters or Ocean Waters.
W75-12263 6E

Iron and Steel Manufacturing Point Source Category--Effluent Guidelines and Standards.
W75-12264 5G

Canned and Preserved Seafood Processing Point Source Category--Effluent Limitations Guidelines.
W75-12265 5G

Fertilizer Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Limitations.
W75-12266 5G

Timber Products Processing Point Source Category--Effluent Guidelines and Standards.
W75-12267 5G

Organic Chemicals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Application to Pretreatment Standards.
W75-12268 5G

Soap and Detergent Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-12269 5G

Meat Products Point Source Category--Effluent Guidelines and Standards.
W75-12273 5G

Grain Mills Point Source Category--Effluent Limitations Guidelines and Standards.
W75-12274 5G

Plastics and Synthetic Point Source Category--Effluent Guidelines and Standards.
W75-12275 5G

Nonferrous Metals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Limitations.
W75-12276 5G

**ADSORPTION**

Adsorption of Poliovirus onto Activated Carbon in Wastewater,
W75-12148 5D

**AERATION**

Single Basin Aerated Sewage Lagoon with Spring Time Intensified Aeration,
W75-12060 5D

Method of Treating Sewage to Enhance Aerobic Decomposition,
W75-12061 5D

Aerobic Sewage Treatment System,
W75-12063 5D

Biologically Mediated Inconsistencies in Aeration Equipment Performace,
W75-12333 5D

Aeration Upgrades Reservoir,
W75-12346 5F

**AERIAL PHOTOGRAPHY**

Deciphering of Ground Water from Aerial Photographs,
W75-11882 4B

Photographic Quantification of Water Quality in Mixing Zones,
W75-11970 5A

**AEROBIC BACTERIA**

Microbiology of a Former Dredge Spoil Disposal Area,
W75-12191 5C

**AEROBIC DECOMPOSITION**

Method of Treating Sewage to Enhance Aerobic Decomposition,
W75-12061 5D

**AEROBIC DIGESTION**

Refrigerated Surge Tank for Use With Aerobic Sewage Digestion System,
W75-11930 5D

**AEROBIC TREATMENT**

Method of Treating Sewage to Enhance Aerobic Decomposition,
W75-12061 5D

Aerobic Sewage Treatment System,
W75-12063 5D

The Effects of Aerobic and Anaerobic Incubation on the Extractabilities of Heavy Metals in Digested Sewage Sludge,
W75-12330 5D

**AEROSOLS**

Relative Throughfall Enrichment by Biologic and by Aerosol-Derived Materials in Loblolly Pines,
W75-11853 5B

**AFRICA**

Control of Groundwater at Bancroft Mines, Zambia,
W75-12395 4B

**AGRICULTURAL CHEMICALS**

Draft Proposal for Legislation to Control Water Pollution from Agricultural Sources,
W75-12213 5G

**AGRICULTURAL RUNOFF**

Draft Proposal for Legislation to Control Water Pollution from Agricultural Sources,
W75-12213 5G

**AGRICULTURAL WATERSHEDS**

Water Bank Program.
W75-12259 6E

**AIR POLLUTION**

Environmental Research Laboratories, 1973 Annual Report.
W75-12033 5A

Lidar vs. Photometer, A One Month Comparison,
W75-12036 5A

Application of a Simple Dispersion Model to a Rural Industrial Region,
W75-12037 5A

The Simple ATDL Urban Air Pollution Model,
W75-12038 5A

Diffusion Estimation for Small Emissions,
W75-12039 5A

**AIR-WATER INTERFACES**

The Floating Cover: Best Way to Cover a Finished-Water Reservoir,
W75-12360 5F

**AIRPORTS**

Environmental Water Quality Program,
W75-12331 5G

**ALABAMA**

Acid Mine Drainage in Cane Creek Basin, Near Oakman, Walker County, Alabama,
W75-11871 5G

The Water Pollution Permitting System,
W75-12245 5G

**ALASKA**

A Preliminary Study of the Formation of Landfast Ice at Barrow, Alaska, Winter 1973-74,
W75-12162 2C

Water-Quality Data, 1948-73, Anchorage and Vicinity, Alaska,
W75-19955 5A

**ALASKE**

Cook Inlet Tidal Stream Atlas,
W75-12163 2L

**ALBERTA**

Evaluating the Productivity of Pine Forests in the Hinton-Edson Area, Alberta, From Soil Survey Maps,
W75-12003 4A

**ALGAE**

Effects of the Commercial Polychlorinated Biphenyl Mixture Aroclor 1242 on Growth, Viability, Phosphate Uptake, Respiration and Oxygen Evolation in Scenedesmus,
W75-11974 5C

Response of Lake Superior Algae to Nutrients and Taconite Tailings,
W75-11976 5C

e Uptake and Utilization of Organic Carbon Algae: An Essay in Comparative Biochemis-
75-11980 5C

docytosis of Microcystis Aeruginosa by hromonas Danica,
75-11985 5C

e Utilization of Phosphorus from Muds by Phytoplankter, Scenedesmus Dimorphus, l the Significance of These Findings to the ctice of Pond Fertilization,
75-11986 5C

tergent Phosphorus and Algal Growth,
75-12001 5C

74 Annual Report of the Freshwater Biologi- Investigation Unit.
75-12008 5C

owth of the Green Alga Codium Fragile in a nnecticut Estuary,
5-12051 5C

rogen, Phosphorus, and Eutrophication in Coastal Marine Environment,
5-12236 5C

**AL CONTROL**
docytosis of Microcystis Aeruginosa by hromonas Danica,
5-11985 5C

Chemicals Used Algae Control degradable.
5-12325 5C

oxy Resin Application at Sewage Works.
5-12349 5D

**CIDES**
Chemicals Used Algae Control degradable.
5-12325 5C

**ALIS (BASES)**
ium Hydroxide Treatment of Acid Mine inage,
5-12116 5G

**TMENTS**
in V. City of New York (Class Action by to Compel EPA to Allot Funds Authorized the 1972 Federal Water Pollution Control Amendments).
5-12284 6E

**RATION OF FLOW**
es of Supply of Nitrogen and Phosphorus to e Winnipeg, Manitoba, in Relation to the ersion of Missouri River Water Into the Red Assiniboine Rivers,
5-12006 5C

**ONIUM COMPOUNDS**
ilizer Manufacturing Point Source Catego- Effluent Limitations and Guidelines.
5-12272 5G

**ONIUM IODIDE**
Explanation for the Unusual Nucleating ity of Aerosols Produced from the AgI- II-Acetone System,
5-12100 3B

**ROBIC CONDITIONS**
erobic Processes, (Literature Review),
5-12074 5D

**ROBIC DIGESTION**
erobic Processes, (Literature Review),
5-12074 5D

**ANAEROBIC TREATMENT**
The Effects of Aerobic and Anaerobic Incubation on the Extractabilities of Heavy Metals in Digested Sewage Sludge,
W75-12330 5D

**ANAEROBIOSIS**
Filtration of Neutral Red by Fresh Water Clams in Aerobic and Hypoxic Conditions,
W75-12192 5C

**ANALYTICAL TECHNIQUES**
Observations on the Atomic Absorption Behavior of Some of the Earth Elements,
W75-11862 5A

Combined Wastewater Overflows,
W75-11912 5D

A Mobile Sprinkler Irrigation Facility for Measurement of Surface Runoff and Soil Erosion (Eine Transportable Beregnungsanlage fuer die Messung von Oberflaechenabfluss und Bodenabtrag),
W75-11948 7B

Photographic Quantification of Water Quality in Mixing Zones,
W75-11970 5A

Biological and Chemical Mechanisms in Eutrophication of Freshwater Lakes,
W75-11992 5C

Analysis of Heavy Metals in Sewage Sludge and Liquids Associated with Sludges,
W75-12140 5A

The Impact of Chemical Pollution on Water Utilizationnutzung),. (Chemische Gewaesserverunreinigung und Wasser
W75-12314 5B

Application of the Methylthymol Blue Sulfate Method to Water and Wastewater Analysis,
W75-12324 5A

**ANCHORAGE (ALASKA)**
Water-Quality Data, 1948-73, Anchorage and Vicinity, Alaska,
W75-19955 5A

**ANIMAL PHYSIOLOGY**
Filtration of Neutral Red by Fresh Water Clams in Aerobic and Hypoxic Conditions,
W75-12192 5C

**ANNUAL FLOOD**
Stochastic Hydrologic Systems,
W75-12015 2A

**APALACHICOLA BAY (FLA)**
Estimation of Hurricane Storm Surge in Apalachicola Bay, Florida,
W75-12164 2B

**APPROPRIATION**
A Proposal for the Quantification of Reserved Indian Water Rights,
W75-12249 6E

**AQUATIC ANIMALS**
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. XIII. Distribution and Biomass of the Lemnaceae and the Fauna Associated with Them,
W75-12009 8I

Toxicity of Aquatic Organisms Caused by Chlorination,
W75-12353 5D

**AQUATIC LIFE**
Toward a Cleaner Aquatic Environment,
W75-12234 5G

Marine Sanctuaries.
W75-12261 6E

**AQUATIC PLANTS**
Distribution of Aquatic Macrophytes Related to Paper Mill Effluents in a Southern Michigan Stream,
W75-11991 2B

Distribution and Biomass of Macrophytes in Lake Dgal Maly,
W75-11993 8I

Experimentally Increased Fish Stock in the Pond Type Lake Warniak. XIII. Distribution and Biomass of the Lemnaceae and the Fauna Associated with Them,
W75-12009 8I

Floating Aquatic Plants Remove Chemicals From Polluted Waters.
W75-12145 5G

**AQUATIC VEGETATION**
Aquatic Weed Control - State Revenue Laws.
W75-12295 6E

**AQUATIC WEED CONTROL**
Effect of 2,4-D and Various Salts on Eurasian Watermilfoil.
W75-11990 4A

The Risk of Deoxygenation of Water in Herbicide Application for Aquatic Weed Control,
W75-11996 5A

Aquatic Weed Control - State Revenue Laws.
W75-12295 6E

**AQUATIC WEEDS**
Aquatic Weed Control - State Revenue Laws.
W75-12295 6E

**AQUIFER CHARACTERISTICS**
Land Subsidence in the San Joaquin Valley, California, as of 1972,
W75-11956 4B

Ground-Water Basic Data for Emmons County, North Dakota,
W75-11963 4B

**AQUIFER SYSTEMS**
Land Subsidence Due to Ground-Water Withdrawal in the Los Banos-Kettleman City Area, California, Part 3. Interrelations of Water-Level Change, Change in Aquifer-System Thickness, and Subsidence,
W75-11958 4B

**AQUIFER TESTING**
Well Storage,
W75-12390 8B

**ARANSAS BAY (TEXAS)**
Effects of Oilfield Brine on Marine Organisms, an Ecological Evaluation of the Aransas Bay Area, Job No. 1,
W75-11864 5C

**ARIZONA**
A Study of Flash-Flood Susceptibility -- A Basin in Southern Arizona,
W75-12167 4A

Flood Plain Information: Hassayampa River, Vicinity of Wickenburg, Arizona.
W75-12370 4A

ARKANSAS RIVER BASIN
Surface Water Supply of the United States, 1966-70: Part 7. Lower Mississippi River--Volume 2. Arkansas River Basin.
W75-11969 7C

AROCLORS
Effects of the Commercial Polychlorinated Biphenyl Mixture Aroclor 1242 on Growth, Viability, Phosphate Uptake, Respiration and Oxygen Evolation in Scenedesmus,
W75-11974 5C

ARTIFICIAL PRECIPITATION
Florida Area Cumulus Experiments 1970-1973 Rainfall Results,
W75-12091 3B

Hail Suppression Data from Western North Dakota, 1969-1972,
W75-12094 3B

Analysis of Radar Observations of a Randomized Cloud Seeding Experiment,
W75-12101 3B

Potential of Precipitation Modification in Moderate to Severe Droughts,
W75-12110 2B

ARTIFICIAL RECHARGE
Artificial Groundwater Recharge, I. Circular Recharging Area,
W75-12040 4B

Artifical Groundwater Recharge, II. Rectangular Recharging Area,
W75-12097 4B

ASIA
Observations of the Guppy, Poecilia Reticulata Peters, in Culex Pipiens Fatigans Breeding Sites in Bangkok, Rangoon, and Taipei,
W75-11989 5G

ASSESSMENT
The Assessment of Water Quality,
W75-12054 5F

ATMOSPHERE
Federal Ocean Programs Review.
W75-12200 6E

ATMOSPHERIC PRESSURE
Diurnal Fluctuations of Water Tables Induced by Atmospheric Pressure Changes,
W75-12077 2G

ATMOSPHERIC SOUNDINGS
On the Variability of 'Dynamic Seedability' as a Function of Time and Location Over South Florida: Part I. Spatial Variability,
W75-12089 3B

ATOMIC ABSORPTION SPECTROMETRY
Observations on the Atomic Absorption Behavior of Some of the Earth Elements,
W75-11862 5A

ATTITUDES
The Assessment of Water Quality,
W75-12054 5F

AUSTIN (TEX)
Flood Plain Information: Onion Creek, Austin, Texas.
W75-12374 4A

AUTOMATION
Water Plant goes Automatic,
W75-12345 8C

AVON HARBOR (NC)
A Mini-Project for Avon Harbor, North Carolina,
W75-12045 8A

BACTERIA
Studies on Metabolic Activity of Benthic Bacteria Isolated from Three Lakes,
W75-11988 5C

The Bacterial Quality of Bottled Water,
W75-12011 5F

Influence of Environmental Stress on Enumeration of Indicator Bacteria from Natural Waters,
W75-12053 5C

Primary Developments of Air-Borne Bacteria in the OECD Activated Sludge System,
W75-12143 5D

Microbiology of a Former Dredge Spoil Disposal Area,
W75-12191 5C

Clearwell Quality Doesn't Last,
W75-12340 5F

Bacterial Processes for Improved Oil Recovery.
W75-12391 2F

BARBEL ZONE (STREAMS)
The Ichthyofauna of the Rokytna River: I. Species Composition, Abundance and Biomass,
W75-12129 2I

BARDENFO PROCESS
Nutrient Removal in Biological Systems,
W75-12321 5D

BARRIER ISLANDS
Emigration of the Peamouth Chub, Mylocheilus Caurinus, Across a Dilute Seawater Bridge: An Experimental Zoogeographic Study,
W75-12151 2L

BASELINE STUDIES
Limnology of Lakes of the Sylvania Recreation Area, Ottawa National Forest,
W75-11981 2H

BASIC DATA COLLECTION
Ground-Water Basic Data for Emmons County, North Dakota,
W75-11963 4B

BASIC DATA COLLECTIONS
Water Resources Data for California, 1973: Part 2. Water Quality Records.
W75-11962 7C

Quality of Surface Waters of the United States, 1970: Part 8. Western Gulf of Mexico Basins.
W75-11965 7C

Quality of Surface Waters of the United States, 1969: Part 8. Western Gulf of Mexico Basin.
W75-11966 7C

Surface Water Supply of the United States, 1966-70: Part 2. South Atlantic Slope and Eastern Gulf of Mexico Basins - Volume 3. Basins from Apalachicola River to Pearl River.
W75-11967 7C

Surface Water Supply of the United States, 1966-70: Part 6. Missouri River Basin--Volume 1. Missouri River Basin above Williston, North Dakota.
W75-11968 7C

Surface Water Supply of the United States, 1966-70: Part 7. Lower Mississippi River--Volume 2. Arkansas River Basin.
W75-11969 7C

Hydrogeologic Data for the Lower Connecticut River Basin, Connecticut,
W75-19954 7C

Water-Quality Data, 1948-73, Anchorage and Vicinity, Alaska,
W75-19955 5A

BAYESIAN METHODOLOGY
A Bayesian Framework for the Use of Regional Information in Hydrology,
W75-12048 6A

BAYS
Oceanographic Observations in the Georgia Bight: Data Report for R.V. EASTWARD Cruises E-13-73 (4-11 September) and E-19-73 (8-9 December 1973),
W75-12169 2L

BEACH DEVELOPMENT
City of Lake Charles; Reclamation and Development of Lake Front.
W75-12298 6E

BEACH EROSION
Introduction of Shore Erosion Control Legislation.
W75-12279 6E

BEACH FRONT HOTELS
Tarshis v. Lahaina Investment Corp. (Responsibility of Owner of Beach Front Property to Warn of Surging Wave).
W75-12296 6E

BEACHES
Small Groins on the Shores of Long Island Sound,
W75-12046 8A

BEAMHOUSE LIQUORS
Some Aspects of a Chemical Treatment of the Waste Waters from the Beamhouse,
W75-12120 5D

BEDS UNDER WATER
Basic Principles Relating to the International Regime of the Oceans at the Caracas Session of the U. N. Law of the Sea Conference,
W75-12253 6E

Submerged Lands (State Title to Certain Submerged Lands).
W75-12288 6E

BEET SUGAR
Beet Sugar Processing Point Source Subcategory--Effluent Guidelines and Standards.
W75-12271 5G

BELGIAN COAST
Dispersion and Settling Around a Waste Disposal Point in a Shallow Sea,
W75-12043 5B

BENDING LOAD
Graphical Method Speeds Deviated Well Casing Design,
W75-11896 8G

BENTHIC FAUNA
Impact of Intracoastal Waterway Maintenance Dredging on a Mud Bottom Benthos Community,
W75-12189 5C

ERING SEA
Major Late-Winter Features of Ice in Northern Bering and Chukchi Seas as Determined From Satellite Imagery,
W75-12168 2C

BLIOGRAPHIES
Organics, (Literature Review),
W75-12071 5B

Inorganics, (Literature Review),
W75-12072 5A

Water Characteristics, (Literature Review),
W75-12073 5A

Anaerobic Processes, (Literature Review),
W75-12074 5D

Sludge Treatment, Utilization, and Disposal, (Literature Review),
W75-12075 5D

Wastewater Collection, (Literature Review),
W75-12076 5D

Mine Drainage Abstracts, A Bibliography. 1972 Supplement.
W75-12158 5B

Input-Output Analysis and the Environment,
W75-12177 6G

International Economics and Environment Control,
W75-12178 6G

Externalities and Public Goods. A Bibliography,
W75-12179 6B

Recreation Analysis. A Bibliography,
W75-12180 6B

Fisheries Economics. A Bibliography,
W75-12181 3E

Economic Growth Vs. the Environment. A Bibliography,
W75-12182 6G

O-OXIDATION
Bio-Oxidation Process Saves H20,
W75-12115 5D

O-PAC PROCESS
Biological Waste Water Treatment,
W75-12149 5D

OASSAY
Nitrogen, Phosphorus, and Eutrophication in he Coastal Marine Environment,
W75-12236 5C

OCHEMICAL OXYGEN DEMAND
A Comparison of the Methods Used to Calcute First Order BOD Equation Constants,
W75-11855 5B

OCHEMISTRY
he Uptake and Utilization of Organic Carbon y Algae: An Essay in Comparative Biochemisy,
W75-11980 5C

iltration of Neutral Red by Fresh Water lams in Aerobic and Hypoxic Conditions,
W75-12192 5C

ODEGRADATION
tudies of Prevention of Water Pollution, III. n the Biodegradation of Synthetic Detergents, n Japanese),
W75-12316 5B

Are Chemicals Used Algae Control Biodegradable.
W75-12325 5C

BIOINDICATORS
Influence of Environmental Stress on Enumeration of Indicator Bacteria from Natural Waters,
W75-12053 5C

Some Microbiological Aspects of the Land Disposal of Sludge,
W75-12138 5D

The Mussel Watch--A First Step in Global Marine Monitoring,
W75-12187 5B

BIOLOGICAL COMMUNITIES
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. XIV. The Relations Between the Fish and Other Biocenotic Components (Summing Up the Studies),
W75-11998 8I

BIOLOGICAL PROPERTIES
Biological and Chemical Mechanisms in Eutrophication of Freshwater Lakes,
W75-11992 5C

BIOLOGICAL TREATMENT
Package Treatment Plants and Factors Affecting Service,
W75-11857 5D

Nitrogen Removal from Municipal Wastewater,
W75-11859 5D

Bio-Oxidation Process Saves H20,
W75-12115 5D

Biological Waste Water Treatment,
W75-12149 5D

Nutrient Removal in Biological Systems,
W75-12321 5D

BIOMASS
Distribution and Biomass of Macrophytes in Lake Dgal Maly,
W75-11993 8I

Experimentally Increased Fish Stock in the Pond Type Lake Warniak. VI. Biomass and Production of Phytoplankton,
W75-12013 5C

The Ichthyofauna of the Rokytna River: I. Species Composition, Abundance and Biomass,
W75-12129 2I

Effect of Bromex-50 on Plankton Population in Fish Ponds,
W75-12188 5C

BLUE CRABS
Effects of Oilfield Brine on Marine Organisms, an Ecological Evaluation of the Aransas Bay Area, Job No. 1,
W75-11864 5C

BOD RATE CONSTANTS
A Comparison of the Methods Used to Calculate First Order BOD Equation Constants,
W75-11855 5B

BONNEVILLE SALT FLATS
Diurnal Fluctuations of Water Tables Induced by Atmospheric Pressure Changes,
W75-12077 2G

BOREHOLE GEOPHYSICS
How Downhole Temperatures, Pressures Affect Drilling, Part 9, Navel Ways to Detect Abnormal Pressure,
W75-11868 8C

Hole-to-Hole Geophysical Measurement Research for Mineral Exploration,
W75-11873 8G

Recent Application of Geophysical Methods in Coal Mining,
W75-12396 8B

BOREHOLES GEOPHYSICS
Application of Well Logging Techniques to Mining Exploration Boreholes,
W75-12398 8G

BOTTLED WATER
The Bacterial Quality of Bottled Water,
W75-12011 5F

BOTTOM ORGANISMS
Studies on Metabolic Activity of Benthic Bacteria Isolated from Three Lakes,
W75-11988 5C

BOUNDARIES (PROPERTY)
The Federal Common Law of Accretion: A New Element in Property Law,
W75-12205 6E

BOUNDARY LAYERS
An Infra-Red Psychrometer for Detecing Changes in the Humidity of Leaf Boundary Layers,
W75-12131 2I

BOUNDARY PROCESSES
Simulation of the Short-Time Scour-Fill Process in Erodible Streams with Stochastic Sediment Transfer at the Stream Bed,
W75-12029 2J

BRINE DISPOSAL
Specialized Underground Extraction Systems.
W75-12388 8B

BRINES
Effects of Oilfield Brine on Marine Organisms, an Ecological Evaluation of the Aransas Bay Area, Job No. 1,
W75-11864 5C

BRITISH COLUMBIA
Municipal Sewage Treatment to Protect Shellfish Growing Waters,
W75-12352 5D

BROWN SHRIMP
Effects of Oilfield Brine on Marine Organisms, an Ecological Evaluation of the Aransas Bay Area, Job No. 1,
W75-11864 5C

BUCKLEY-LEVERETT MODEL
Displacement Stability of Water Drives in Water-Wet Connate-Water-Bearing Reservoirs,
W75-11870 4B

BUCKLING
Graphic Solutions to Tubing Movement in Deep Wells,
W75-11875 8B

BULLHEADS
Seasonal Prevalence of Chondrococcus Columnaris Infection in Black Bullheads from Clear Lake, Iowa,
W75-11995 5C

**BULLHEADS**

Daily Fall Activity and Direction of Movements of Fish in Lake Quenouille in the Laurentians, (In French),
W75-12064 2H

**BYPASSES**
Inflatable Plug Cuts Mess, Cleanup on Sewerline ByPass,
W75-11908 8C

**CADMIUM**
Chemical Tests for Plant Available Metals in Soils.
W75-12142 5A

**CALCITE**
Studies in the System CaCO:-FeCO3: 1. Phase Relations; 2. A Method for Major-Element Spectrochemical Analysis; 3. Compositions of Some Ferroan Dolomites,
W75-12400 2F

**CALIFORNIA**
Land Subsidence in the San Joaquin Valley, California, as of 1972,
W75-11956 4B

Land Subsidence Due to Ground-Water Withdrawal in the Los Banos-Kettleman City Area, California, Part 2. Subsidence and Compaction of Deposits,
W75-11957 4B

Land Subsidence Due to Ground-Water Withdrawal in the Los Banos-Kettleman City Area, California, Part 3. Interrelations of Water-Level Change, Change in Aquifer-System Thickness, and Subsidence,
W75-11958 4B

Water Resources Data for California, 1973: Part 2. Water Quality Records.
W75-11962 7C

Formation of Graupel,
W75-12093 3B

Interim Report, Probable Maximum Precipitation in California.
W75-12165 2B

Wasting a River,
W75-12211 6G

Computer Controlled Wastewater Reclamation Plant,
W75-12361 5D

Water-Level Fluctuations and Earthquakes on the San Andreas Fault Zone,
W75-12392 4B

**CANADA**
Spray Irrigation of Treated Municipal sewage,
W75-11856 5D

Package Treatment Plants and Factors Affecting Service,
W75-11857 5D

European Dewatering System Aids Quebec Project,
W75-11918 5D

Geochemistry and Nutrient Regime of Saline Eutrophic Lakes in the Erickson-Elphinstone District of Southwestern Manitoba.
W75-11982 5C

Evaluating the Productivity of Pine Forests in the Hinton-Edson Area, Alberta, From Soil Survey Maps,
W75-12003 4A

Daily Fall Activity and Direction of Movements of Fish in Lake Quenouille in the Laurentians, (In French),
W75-12064 2H

Biochemical Characteristics of Digested Chemical Sewage Sludges,
W75-12132 5D

Emigration of the Peamouth Chub, Mylocheilus Caurinus, Across a Dilute Seawater Bridge: An Experimental Zoogeographic Study,
W75-12151 2L

Life History Notes and Meristic Variation in the Freshwater Fourspine Stickleback, Apeltes Quadracus (Mitchill), Near Sept-Iles: Quebec,
W75-12176 2I

Proceedings of the Annual Conference of the British Columbia Water and Waste Association.
W75-12350 5F

Canadian Drinking Water Surveillance Programs, Panel Discussion,
W75-12355 5G

Turbo-Drilling as Applied to Potash Developments in the Saskatchewan Field,
W75-12397 8B

**CANADIAN DRINKING WATER STANDARDS AND OBJECTIVES**
Canadian Drinking Water Surveillance Programs, Panel Discussion,
W75-12355 5G

Canadian Drinking Water Standards Review, Ontario's Programs, Panel Discussion,
W75-12356 5G

Canadian Drinking Water Standards Review, Alberta, Saskatchewan and Manitoba, Panel Discussion,
W75-12357 5G

Canadian Drinking Water Standards Review, British Columbia, Panel Discussion,
W75-12358 5G

Canadian Drinking Water Standards Review, Northwest Territories and Yukon Territory, Panel Discussion,
W75-12359 5G

**CAPILLARY ACTION**
A Simultaneous Calculation of the Capillary-Sorption Potentials, Moisture and Flow of Water in Soils Using a Computer and Equations of Soil Moisture Movement, (In Russian),
W75-12208 2G

**CARBOHYDRATES**
Studies on Metabolic Activity of Benthic Bacteria Isolated from Three Lakes,
W75-11988 5C

**CARBON**
The Uptake and Utilization of Organic Carbon by Algae: An Essay in Comparative Biochemistry,
W75-11980 5C

**CARBONATE ROCKS**
Geochemistry of Strontium in the Scioto River Drainage Basin, Ohio,
W75-12052 2K

**CARCINOGENS**
Treatment Plant to be Tested for Carcinogens,
W75-12130 5F

**CARP**
Life History, Ecology, and Management of the Carp, Cyprinus Carpio Linnaeus, in Elephant Butte Lake.
W75-11972 6B

**CASCADE MOUNTAINS**
The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part I: Natural Conditions,
W75-12096 3B

The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part II: Techniques for the Physical Evaluation of Seeding,
W75-12108 3B

The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part III: Case Studies of the Effects of Seeding,
W75-12109 3B

**CASE STUDIES**
The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part III: Case Studies of the Effects of Seeding,
W75-12109 3B

**CASINGS**
Graphic Solutions to Tubing Movement in Deep Wells,
W75-11875 8

Wanted: Fewer Bit, Casing Sizes, Reward Many Benefits for Industry,
W75-11885 8

**CATIONS**
Cation Distribution in Soils as Related to Sewage Sludge Disposal on Land,
W75-12139 5

**CEMENT**
How to Use Thixotropic Slurries to Solve Cementing Problems,
W75-11886 8

**CEMENTING**
Running and Cementing Deep Well Liners,
W75-11895 8

**CEMENTING MATERIAL**
Cementing Off, Plugging, and Redrilling,
W75-12394 8

**CERCARIAE**
Studies on Effects of Cercarial Concentration and Length of Exposure on Infection of Mice by St. Lucian Schistosoma Mansoni Cercariae in a Natural Running-Water Habitat,
W75-11903 5

**CHANNEL IMPROVEMENT**
Diked Disposal Area Site No 12, Cleveland Harbor, Cuyahoga County, Ohio.
W75-12255 5

**CHANNELS**
A Mini-Project for Avon Harbor, North Carolina,
W75-12045 8

Impact of Intracoastal Waterway Maintenance Dredging on a Mud Bottom Benthos Community,
W75-12189

HEMICAL ANALYSIS
Phenolic Compounds of Wheat Leaves Under Drought Stress,
W75-11905 2I

Inorganics, (Literature Review),
W75-12072 5A

IEMICAL FRAGMENTATION
Chemical Fragmentation,
W75-12389 8E

IEMICAL PROPERTIES
Biological and Chemical Mechanisms in Eutrophication of Freshwater Lakes,
W75-11992 5C

IEMICAL TRANSFORMATION
Pick-up and Metabolism of DDT, Dieldrin and Photodieldrin by a Fresh Water Alga (Ankistrodesmus Amalloides) and a Microcrustacean (Daphnia Pulex),
W75-12007 5C

IEMICAL WASTES
Organic Chemicals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Application to Pretreatment Standards.
W75-12268 5G

IENOPODIACEAE
Survey of the Matric Water of Various Plant Groups,
W75-11883 2I

LORINATED HYDROCARBON PESTICIDES
Pick-up and Metabolism of DDT, Dieldrin and Photodieldrin by a Fresh Water Alga (Ankistrodesmus Amalloides) and a Microcrustacean (Daphnia Pulex),
W75-12007 5C

LORINATION
Alternative Methods of Disinfection,
W75-11858 5D

Disinfection to Protect Recreational Areas and Potable Water Supplies,
W75-12351 5D

Toxicity of Aquatic Organisms Caused by Chlorination,
W75-12353 5D

LOROPHYLL
The Effect of Hydrogen in Concentrations in Simulated Rain on the Moss Tortula Ruralis (HEDW.)Sm,
W75-11987 5C

LOROPHYTA
Morphology and Ultrastructure of Some Chlorococcal Algae from the Collection pf Algal Strains in Leningrad University. II. Tetraedron Braunii (Nag, in Kutz.) Komarkova-Legnerova Strain (Gromov) 1967/231,
W75-11997 5C

Morphology and Ultrastructure of Some Chlorococcal Algae from the Collection of Algal Strains in Leningrad University. I. Pseudospongiococcum Protococcoides Gen. Nov., Sp. Nov.,
W75-12000 5C

Growth of the Green Alga Codium Fragile in a Connecticut Estuary,
W75-12051 5C

CHONDROCOCCUS-COLUMNARIS
Seasonal Prevalence of Chondrococcus Columnaris Infection in Black Bullheads from Clear Lake, Iowa,
W75-11995 5C

CHRYSOPHYTA
Endocytosis of Microcystis Aeruginosa by Ochromonas Danica,
W75-11985 5C

CHUB (PEAMOUTH)
Emigration of the Peamouth Chub, Mylocheilus Caurinus, Across a Dilute Seawater Bridge: An Experimental Zoogeographic Study,
W75-12151 2L

CHUKCHI SEA
Major Late-Winter Features of Ice in Northern Bering and Chukchi Seas as Determined From Satellite Imagery,
W75-12168 2C

CIRCADIAN RYTHMS (FISH)
Daily Fall Activity and Direction of Movements of Fish in Lake Quenouille in the Laurentians, (In French),
W75-12064 2H

CITIES
The Simple ATDL Urban Air Pollution Model,
W75-12038 5A

Train V. City of New York (Class Action by City to Compel EPA to Allot Funds Authorized by the 1972 Federal Water Pollution Control Act Amendments).
W75-12284 6E

Train V. Campaign Clean Water, Inc. (Action by Environmental Group to Require EPA to Release Funds Authorized for Federal Grants to Municipalities for Water Pollution Control.
W75-12285 6E

CITRULLUS-COLOCYNTHIS
Role of Epidermal Cell Turgor on Stomatal Regulation in Isolated Epidermal Peelings of Citrullus Colocynthis Linn. (Schrad.),
W75-12323 2I

CLAMS
Filtration of Neutral Red by Fresh Water Clams in Aerobic and Hypoxic Conditions,
W75-12192 5C

CLASS ACTION SUITS
The Florida Environmental Protection Act of 1971: The Citizen's Role in Environmental Management,
W75-12207 6G

CLASSIFICATION
Classification of Wisconsin Lakes by Trophic Condition.
W75-11979 5C

CLEANING
Running and Cementing Deep Well Liners,
W75-11895 8F

Hydraulic Sewer Pipeline Cleaner,
W75-11944 5D

Method of Cleaning and Stimulating a Water Well,
W75-12301 3B

CLEAR LAKE (IOWA)
Seasonal Prevalence of Chondrococcus Columnaris Infection in Black Bullheads from Clear Lake, Iowa,
W75-11995 5C

CLEVELAND HARBOR
Diked Disposal Area Site No 12, Cleveland Harbor, Cuyahoga County, Ohio.
W75-12255 5E

CLIMATIC ZONES
Meteoro-Hydrological Aspects of Rainfall in Japan.
W75-12030 2B

CLOGGING
A New Approach to Permeability Reduction,
W75-11872 8G

Thin Section and Permeability Studies Call for Smaller Gravels in Gravel Packing,
W75-11893 8B

CLOSTRIDIUM
Bacterial Processes for Improved Oil Recovery.
W75-12391 2F

CLOUD CHAMBERS
Testing of Cloud Seeding Materials at the Cloud Simulation and Aersol Laboratory, 1971-1973,
W75-12099 3B

CLOUD MODELS
A Detailed Microphysical Simulation of Hygroscopic Seeding on the Warm Rain Process,
W75-12090 3B

CLOUD PHYSICS
Formation of Graupel,
W75-12093 3B

CLOUD SEEDING
On the Variability of 'Dynamic Seedability' as a Function of Time and Location Over South Florida: Part I. Spatial Variability,
W75-12089 3B

A Detailed Microphysical Simulation of Hygroscopic Seeding on the Warm Rain Process,
W75-12090 3B

Florida Area Cumulus Experiments 1970-1973 Rainfall Results,
W75-12091 3B

A Numerical Model of Precipitation from Seeded and Unseeded Cold Orographic Clouds,
W75-12098 3B

Testing of Cloud Seeding Materials at the Cloud Simulation and Aersol Laboratory, 1971-1973,
W75-12099 3B

An Explanation for the Unusual Nucleating Ability of Aerosols Produced from the AgI-NH4I-Acetone System,
W75-12100 3B

Analysis of Radar Observations of a Randomized Cloud Seeding Experiment,
W75-12101 3B

The Effect of Persistence of AgI on Randomized Weather Modification Experiments,
W75-12104 3B

On the Design and Evaluation of Cumulus Modification Experiments,
W75-12105 3B

Evaluation by Monte Carlo Tests of Effects of Cloud Seeding on Growing Season Rainfall in North Dakota,
W75-12106 3B

**CLOUD SEEDING**

Bayesian and Classical Statistical Methods Applied to Randomized Weather Modification Experiments,
W75-12107 3B

The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part II: Techniques for the Physical Evaluation of Seeding,
W75-12108 3B

The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part III: Case Studies of the Effects of Seeding,
W75-12109 3B

**CLOUDS**
The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part I: Natural Conditions,
W75-12096 3B

**COAGULATION**
Study on Direct Rapid Filtration Using Reduced Coagulants, (In Japanese),
W75-11860 5D

Recyclable Coagulants Look Promising for Drinking Water Treatment,.
W75-11909 5F

Method for Processing Sludge,
W75-12312 5D

**COAL FILTRATION**
Evaluation of a Coal-Sewage Treatment Pilot Plant.
W75-12128 5D

**COAL MINE WASTES**
Water Resources Investigations of the U.S. Geological Survey in the Northern Great Plains Coal Region of Wyoming, Montana, and North Dakota, 1975.
W75-11961 5A

**COAL MINES**
Coal Mine Drainage Pollution--1973,
W75-12114 5G

**COAL REGIONS (U.S.)**
Water Resources Investigations of the U.S. Geological Survey in the Northern Great Plains Coal Region of Wyoming, Montana, and North Dakota, 1975.
W75-11961 5A

**COALS**
Evaluation of a Coal-Sewage Treatment Pilot Plant.
W75-12128 5D

**COAST GUARD REGULATIONS**
Enforcing International Law: U.S. Agencies and the Regulation of Oil Pollution in American Waters,
W75-12246 5G

**COASTAL CURRENTS**
Coastwise Currents in the Vicinity of Chicago, and Currents Elsewhere in Southern Lake Michigan,
W75-12161 2H

**COASTAL MARINE ENVIRONMENT**
Nitrogen, Phosphorus, and Eutrophication in the Coastal Marine Environment,
W75-12236 5C

**COASTAL MARSHES**
Property (Wetlands Regulation),
W75-12247 6E

**COASTAL STRUCTURES**
The Rush for Offshore Oil and Gas: Where Things Stand on the Outer Continental Shelf.
W75-12222 5G

**COASTAL WATERS**
International Law, U.S. Seabeds Policy and Ocean Resource Development,
W75-12214 6E

**COASTAL ZONE MANAGEMENT**
1974 Annual Report, Great Lakes Basin Commission.
W75-12238 5G

Marine Sanctuaries.
W75-12261 6E

Estuarine Sanctuary Grants--Application and Selection Criteria Procedures.
W75-12262 6E

**COASTAL ZONE MANAGEMENT ACT**
The Rush for Offshore Oil and Gas: Where Things Stand on the Outer Continental Shelf.
W75-12222 5G

**COASTS**
Coastwise Currents in the Vicinity of Chicago, and Currents Elsewhere in Southern Lake Michigan,
W75-12161 2H

Marine Sanctuaries.
W75-12261 6E

Estuarine Sanctuary Grants--Application and Selection Criteria Procedures.
W75-12262 6E

**COASTWISE CURRENTS**
Coastwise Currents in the Vicinity of Chicago, and Currents Elsewhere in Southern Lake Michigan,
W75-12161 2H

**COATINGS**
Corrosion.
W75-11888 8G

**CODIUM-FRAGILE**
Growth of the Green Alga Codium Fragile in a Connecticut Estuary,
W75-12051 5C

**COLIFORMS**
Comparative Survival of Enterococci, Coliforms and Salmonellas in Water, (In Russian),
W75-11973 5C

Influence of Environmental Stress on Enumeration of Indicator Bacteria from Natural Waters,
W75-12053 5C

Microbiology of a Former Dredge Spoil Disposal Area,
W75-12191 5C

**COLLOIDS**
A New Approach to Permeability Reduction,
W75-11872 8G

**COLOR**
The Assessment of Water Quality,
W75-12054 5F

**COLORADO**
Individual Home Wastewater Characterization and Treatment,
W75-11852 5D

The Effect of Persistence of AgI on Randomized Weather Modification Experiments,
W75-12104 3B

Colorado Public Interest Research Group, Inc. V. Train (Citizen Suit to Compel the Environmental Protection Agency to Control Discharge or Radioactive Materials into Navigable Waters).
W75-12287 6E

Flood Plain Information: Fountain Creek, Colorado Springs, Manitou Springs, Colorado.
W75-12372 2E

**COMBINED SEWERS**
Combined Wastewater Overflows,
W75-11912 5D

Steel, Concrete Form Sewer Support System.
W75-11921 5D

Superposition of Two Pipes in a Common, Mixed Sewer System (Recours a la superposition de deux conduites dans un reseau d'assainissement unitaire).
W75-11923 5D

Up-Flow Separator,
W75-11936 5D

**COMMERCIAL FISHING**
Fisheries Economics. A Bibliography,
W75-12181 3E

Information Report on the Law of the Sea: Understanding the Debate of the Law of the Ocean Space.
W75-12252 6E

**COMMERCIAL SHELLFISH**
Municipal Sewage Treatment to Protect Shellfish Growing Waters,
W75-12352 5D

**COMMON ENEMY RULE**
Borgmann V. Florissant Development Co (Action to Enjoin Adjoining Property Owners From Collecting and Discharging Surface Water onto Plaintiffs' Land).
W75-12289 6E

**COMMON LAW**
The Federal Common Law of Accretion: A New Element in Property Law,
W75-12205 6E

**COMPACTION**
A Laboratory Study of the Effects of Confining Pressure on Fracture Flow and Storage Capacity in Carbonate Rocks,
W75-11892 4A

**COMPETING USES**
Uses of Scientific Information in Environmental Decision-Making,
W75-12204 6G

**COMPOSITING**
Composting and use of Compost in Sweden,
W75-12339 5E

**COMPREHENSIVE PLANNING**
1974 Annual Report, Great Lakes Basin Commission.
W75-12238 5G

Those Elusive 1985 Water Quality Goals.
W75-12242 5G

**COMPUTER MODELS**
Effect of Hysteresis on the Prediction of Infiltration, Redistribution and Drainage of Water in a Layered Soil,
W75-12041 2G

**COMPUTER PROGRAMS**
A Computer Program Used to Estimate Primary Productivity from pH and Carbon Dioxide Data Employing the Upstream-Downstream Method,
W75-11971 5C

**COMPUTERS**
New Computer System Monitors Baton Rouge Sewers.
W75-11927 7C

Computer's Master Plan Signals Sewer Problems Before They Start,
W75-11928 7C

Control System for Showa Water Purification Plant, (In Japanese),
W75-12147 5F

Recent Developments of Instrumentation, Control and Automation Systems for Wastewater Treatment Systems,
W75-12341 5D

**CONCRETE MIXES**
How to Use Thixotropic Slurries to Solve Cementing Problems,
W75-11886 8F

**CONCRETE STRUCTURES**
Introduction of Bills to Authorize the Replacement of the American Falls Dam in Idaho.
W75-12278 6E

**CONDEMNATION**
United States v. 187.40 Acres of Land, Huntingdon County, Pa. (Action to Condemn Land for Use in Constructing Flood Control Project).
W75-12299 6E

**CONDENSATION**
Process and Apparatus for Recovering Clean Water and Solids from Dilute, Aqueous, Solids Containing Solutions or Dispersions,
W75-12059 5D

**CONDUITS**
Screen Retainer Assembly,
W75-11942 8C

**CONFERENCES**
Systems Approach to Hydrology.
W75-12014 2A

Are We Any Nearer to an International Agreement on Use of the Seas,
W75-12224 6E

Basic Principles Relating to the International Regime of the Oceans at the Caracas Session of the U. N. Law of the Sea Conference,
W75-12253 6E

**CONGRESSIONAL HEARINGS**
Ocean Dumping Oversight.
W75-12194 5G

Solar Sea Thermal Energy.
W75-12196 3E

Diversion and Withdrawal of Additional Water from Lake Michigan into the Illinois Waterway.
W75-12197 4A

Federal Ocean Programs Review.
W75-12200 6E

High Seas Oil Port Act.
W75-12201 5G

**CONNECTICUT**
Growth of the Green Alga Codium Fragile in a Connecticut Estuary,
W75-12051 5C

**CONNECTICUT RIVER**
Hydrogeologic Data for the Lower Connecticut River Basin, Connecticut,
W75-19954 7C

**CONSTITUTIONAL LAW**
Validity, Under Federal Constitution, of State Statute or Local Ordinance Regulating Phosphate Content of Detergents,
W75-12293 6E

**CONSTRUCTION COSTS**
Sewer System Evaluation and Rehabilitation Cost Estimates,
W75-11951 6C

New Orleans Chooses Oxygen Activated Sludge.
W75-12318 5D

**CONSTRUCTION MATERIALS**
Application of PVC Bell-and-Spigot Pressure Pipes in Construction of Water Supply Lines (Die Anwendung von PVC-Muffendruckrohren beim Bau von Wasserversorgungsnetzen),
W75-11949 8A

**CONSUMPTIVE USE**
Planning Models for Water System Development in Mississippi Communities,
W75-11851 6D

Water Consumption Trends Within the Central and Southern Florida Flood Control District,
W75-12085 6D

**CONTINENTAL SHELF**
The Rush for Offshore Oil and Gas: Where Things Stand on the Outer Continental Shelf.
W75-12222 5G

**CONTROL**
A New Approach to Permeability Reduction,
W75-11872 8G

**CONTROL SYSTEMS**
Recent Developments of Instrumentation, Control and Automation Systems for Wastewater Treatment Systems,
W75-12341 5D

**COOK INLET (ALASKA)**
Cook Inlet Tidal Stream Atlas,
W75-12163 2L

**COPPER**
Toxicity of Copper Complexes to RFreshwater Mollusks,
W75-11863 5C

Chemical Tests for Plant Available Metals in Soils.
W75-12142 5A

**COPPER COMPLEXES**
Toxicity of Copper Complexes to RFreshwater Mollusks,
W75-11863 5C

**COPPER COMPOUNDS**
Toxicity of Copper Complexes to RFreshwater Mollusks,
W75-11863 5C

**CORN (FIELD)**
Influence of Soil Water Matric Potential and Resistance to Penetration on Corn Root Elongation,
W75-12055 3F

**CORROSION**
Corrosion.
W75-11888 8G

**CORROSION CONTROL**
Corrosion.
W75-11888 8G

**COST ALLOCATION**
Wasting a River,
W75-12211 6G

**COST ANALYSIS**
Wasting a River,
W75-12211 6G

**COST-BENEFIT ANALYSIS**
Need Ways to Reduce Drilling Costs,
W75-11884 8C

Uses of Scientific Information in Environmental Decision-Making,
W75-12204 6G

Wasting a River,
W75-12211 6G

The Economics of Clean Water.
W75-12233 5G

**COST-BENEFIT RATIO**
Wasting a River,
W75-12211 6G

**COST-BENEFIT THEORY**
Wasting a River,
W75-12211 6G

**COSTS**
Need Ways to Reduce Drilling Costs,
W75-11884 8C

Water Resources Programs in the Southeastern Region.
W75-11960 9D

**CRABS**
Effects of Oilfield Brine on Marine Organisms, an Ecological Evaluation of the Aransas Bay Area, Job No. 1,
W75-11864 5C

**CROP RESPONSE**
Phenolic Compounds of Wheat Leaves Under Drought Stress,
W75-11905 2I

Nitrogen Transformation and Uptake,
W75-12136 5B

**CROSS-SECTIONS**
Hole-to-Hole Geophysical Measurement Research for Mineral Exploration,
W75-11873 8G

**CRUSTACEANS**
Effects of Oilfield Brine on Marine Organisms, an Ecological Evaluation of the Aransas Bay Area, Job No. 1,
W75-11864 5C

**CRYSTALLINE-GEL STRUCTURE (CEMENT)**
How to Use Thixotropic Slurries to Solve Cementing Problems,
W75-11886 8F

CULEX-PIPIENS-FATIGANS
Observations of the Guppy, Poecilia Reticulata Peters, in Culex Pipiens Fatigans Breeding Sites in Bangkok, Rangoon, and Taipei,
W75-11989 5G

CUMULUS CLOUDS
Florida Area Cumulus Experiments 1970-1973 Rainfall Results,
W75-12091 3B

CURRENT METERS
STD, Current Meter, and Drogue Observations in Rosario Strait, January - March 1974,
W75-12175 2L

CURRENTS
STD, Current Meter, and Drogue Observations in Rosario Strait, January - March 1974,
W75-12175 2L

CURRENTS (WATER)
Coastwise Currents in the Vicinity of Chicago, and Currents Elsewhere in Southern Lake Michigan,
W75-12161 2H

Cook Inlet Tidal Stream Atlas,
W75-12163 2L

CYCLONES
A Statistical Study of Tropical Cyclone Positioning Errors with Economic Applications,
W75-12166 2B

CZECHOSLOVAKIA (ROKYTNA RIVER)
The Ichthyofauna of the Rokytna River: I. Species Composition, Abundance and Biomass,
W75-12129 2I

DAM CONSTRUCTION
Corps' Guidelines for Dam Safety Inspection Need Revamping,
W75-12241 8A

A NEPA Settlement: Conservation Council of North Carolina v. Froehlke,
W75-12244 6E

Introduction of Bills to Authorize the Replacement of the American Falls Dam in Idaho.
W75-12278 6E

DAM DESIGN
Corps' Guidelines for Dam Safety Inspection Need Revamping,
W75-12241 8A

DAM FOUNDATIONS
Introduction of Bills to Authorize the Replacement of the American Falls Dam in Idaho.
W75-12278 6E

DAM SAFETY
Corps' Guidelines for Dam Safety Inspection Need Revamping,
W75-12241 8A

DAMS
Wasting a River,
W75-12211 6G

Corps' Guidelines for Dam Safety Inspection Need Revamping,
W75-12241 8A

A NEPA Settlement: Conservation Council of North Carolina v. Froehlke,
W75-12244 6E

Introduction of Bills to Authorize the Replacement of the American Falls Dam in Idaho.
W75-12278 6E

DATA COLLECTIONS
1974 Water Resources Data for Oregon, Surface Water Records, Precipitation Records,
W75-12087 7C

DEBRIS YIELDS
An Application of Simulated Rainfall Models to Forecasting of the Long Term Variation of River Bed,
W75-12028 2J

DECIDUOUS FORESTS
Distribution of Solar Radiation Within a Deciduous Forest,
W75-12034 2I

DECISION MAKING
Efficiency of Parameter and State Estimation Methods in Relation to Models of Lumped and Distributed Hydrologic Systems,
W75-12025 2A

A Bayesian Framework for the Use of Regional Information in Hydrology,
W75-12048 6A

Economic Growth Vs. the Environment. A Bibliography,
W75-12182 6G

DEEP WELLS
Graphic Solutions to Tubing Movement in Deep Wells,
W75-11875 8B

Tests Show Jet Drilling Has Promise,
W75-11880 8C

Running and Cementing Deep Well Liners,
W75-11895 8F

DEMINERALIZATION
Water Treatment Device,
W75-12305 5F

Process for Demineralizing Water,
W75-12311 3A

DENITRIFICATION
Nitrogen Removal from Municipal Wastewater,
W75-11859 5D

DEPENDABLE SUPPLY
Water Supply.
W75-12297 6E

DESIGN
Graphical Method Speeds Deviated Well Casing Design,
W75-11896 8G

DESIGN CRITERIA
Graphic Solution to Fracture Treatment Design,
W75-11876 8B

Bit Design is Key to Deep Drilling with Turbines,
W75-11889 8C

Design and Operating Criteria for Rural Water Systems,
W75-12126 6D

DESULFOVIBRIA HYDROCARBONOCLASTICUS
Bacterial Processes for Improved Oil Recovery.
W75-12391 2F

DETERGENTS
Detergent Phosphorus and Algal Growth,
W75-12001 5C

Soap and Detergent Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-12269 5G

Studies of Prevention of Water Pollution, III. On the Biodegradation of Synthetic Detergents, (In Japanese),
W75-12316 5B

DETERIORATION
The Floating Cover: Best Way to Cover a Finished-Water Reservoir,
W75-12360 5F

DEUTERIUM
Use of Environmental Isotope Methods as a Reconnaissance Tool in Groundwater Exploration Near San Antonio de Pichincha, Ecuador,
W75-12080 2F

DEWATERING
European Dewatering System Aids Quebec Project,
W75-11918 5D

Minneapolis Keeps on Truckin',
W75-12319 5D

Control of Groundwater at Bancroft Mines, Zambia,
W75-12395 4B

DIAGENESIS
Studies in the System CaCO:-FeCO3: 1. Phase Relations; 2. A Method for Major-Element Spectrochemical Analysis; 3. Compositions of Some Ferroan Dolomites,
W75-12400 2F

DIAMOND BIT DESIGN
Bit Design is Key to Deep Drilling with Turbines,
W75-11889 8C

DIFFUSION
Diffusion Estimation for Small Emissions,
W75-12039 5A

Dispersion and Settling Around a Waste Disposal Point in a Shallow Sea,
W75-12043 5B

DIFFUSIVITY
On Solving the Flow Equation in Unsaturated Soils by Optimization: Horizontal Infiltration,
W75-12083 2G

DIGESTER GAS
Digester Gas: Valuable Plant Fuel,
W75-12332 8C

DIGITAL COMPUTERS
Computer Controlled Wastewater Reclamation Plant,
W75-12361 5D

DIRECT FILTRATION
Operational Variables and Limitations of Direct Filtration,
W75-12127 5F

DIRECT SAND FILTRATION
Study on Direct Rapid Filtration Using Reduced Coagulants, (In Japanese),
W75-11860 5D

DISINFECTION
Alternative Methods of Disinfection,
W75-11858 5D

Disinfection to Protect Recreational Areas and Potable Water Supplies,
W75-12351 5D

ISPERSION
Environmental Research Laboratories, 1973 Annual Report.
W75-12033 5A

Application of a Simple Dispersion Model to a Rural Industrial Region,
W75-12037 5A

Diffusion Estimation for Small Emissions,
W75-12039 5A

Vertical Temperature Profiles in Open-Channel Flow,
W75-12047 5B

SSOLVED AIR FLOTATION
Primary Solids/Liquid Separation.
W75-12153 5D

SSOLVED OXYGEN
Aeration Upgrades Reservoir,
W75-12346 5F

STRIBUTION
Distribution of Aquatic Macrophytes Related to Paper Mill Effluents in a Southern Michigan Stream,
W75-11991 2B

Distribution and Biomass of Macrophytes in Lake Dgal Maly,
W75-11993 8I

STRIBUTION SYSTEMS
Clearwell Quality Doesn't Last,
W75-12340 5F

URNAL
Diurnal Fluctuations of Water Tables Induced by Atmospheric Pressure Changes,
W75-12077 2G

OLOMITE
Studies in the System CaCO:-FeCO3: 1. Phase Relations; 2. A Method for Major-Element Spectrochemical Analysis; 3. Compositions of Some Ferroan Dolomites,
W75-12400 2F

OMESTIC WASTES
Individual Home Wastewater Characterization and Treatment,
W75-11852 5D

Package Treatment Plants and Factors Affecting Service,
W75-11857 5D

AINAGE
Water Bank Program.
W75-12259 6E

AINAGE AREA
Draining Telford New Town.
W75-11917 4A

EDGE SPOIL DISPOSAL SITE
Microbiology of a Former Dredge Spoil Disposal Area,
W75-12191 5C

EDGING
Impact of Intracoastal Waterway Maintenance Dredging on a Mud Bottom Benthos Community,
W75-12189 5C

Microbiology of a Former Dredge Spoil Disposal Area,
W75-12191 5C

Diked Disposal Area Site No 12, Cleveland Harbor, Cuyahoga County, Ohio.
W75-12255 5E

DRILL BITS
Wanted: Fewer Bit, Casing Sizes, Reward: Many Benefits for Industry,
W75-11885 8C

DRILL CUTTINGS
How Downhole Temperatures, Pressures Affect Drilling, Part 9, Navel Ways to Detect Abnormal Pressure,
W75-11868 8C

DRILL HOLES
Drillability Studies: Percussive Drilling in the Field,
W75-12384 8E

DRILLABILITY
Fragmentation.
W75-12387 8E

DRILLER TRAINING
Crew Training,
W75-12385 8G

DRILLERS LOGS
Careful Sample Taking is Key to Successful Wells,
W75-11881 8G

DRILLING
How Downhole Temperatures, Pressures Affect Drilling, Part 1,
W75-11865 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 2, Detecting and Evaluating Formation Pressures,
W75-11866 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 3, Overpressure Detection from Wireline Methods,
W75-11867 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 9, Navel Ways to Detect Abnormal Pressure,
W75-11868 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 10, Miscellaneous Ways to Detect Abnormal Pressure,
W75-11869 8C

Tests Show Jet Drilling Has Promise,
W75-11880 8C

Careful Sample Taking is Key to Successful Wells,
W75-11881 8G

Need Ways to Reduce Drilling Costs,
W75-11884 8C

Graphical Method Speeds Deviated Well Casing Design,
W75-11896 8G

Drilling Impedance of Mud Solids,
W75-11897 8C

The Rush for Offshore Oil and Gas: Where Things Stand on the Outer Continental Shelf.
W75-12222 5G

Prediction of Penetration Rate for Percussive Drilling,
W75-12382 8E

Percussive Drilling: With Independent Rotation,
W75-12383 8E

Drillability Studies: Percussive Drilling in the Field,
W75-12384 8E

Crew Training,
W75-12385 8G

Fragmentation.
W75-12387 8E

Chemical Fragmentation,
W75-12389 8E

Fresh Water Strata of Mississippi as Revealed by Electrical Log Studies,
W75-12399 4B

DRILLING EQUIPMENT
Tests Show Jet Drilling Has Promise,
W75-11880 8C

Wanted: Fewer Bit, Casing Sizes, Reward: Many Benefits for Industry,
W75-11885 8C

Bit Design is Key to Deep Drilling with Turbines,
W75-11889 8C

Percussive Drilling: With Independent Rotation,
W75-12383 8E

DRILLING FLUID
Behavioural Responses of Whitefish and Rainbow Trout to Drilling Fluids,
W75-11952 5C

DRILLING FLUIDS
Drilling Impedance of Mud Solids,
W75-11897 8C

Chemical Fragmentation,
W75-12389 8E

DRILLING RATE
Need Ways to Reduce Drilling Costs,
W75-11884 8C

DRILLING SAMPLES
Careful Sample Taking is Key to Successful Wells,
W75-11881 8G

DRIP IRRIGATION
Irrigation System Emitters with Renewable Filters,
W75-12310 3F

DROGUE OBSERVATIONS
STD, Current Meter, and Drogue Observations in Rosario Strait, January - March 1974,
W75-12175 2L

DROUGHTS
Potential of Precipitation Modification in Moderate to Severe Droughts,
W75-12110 2B

DUCKWEED
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. XIII. Distribution and Biomass of the Lemnaceae and the Fauna Associated with Them,
W75-12009 8I

DUE PROCESS
Pollution Control Under the Pennsylvania Clean Streams Law,
W75-12209 5G

**DUE PROCESS**

**DUMPING**
Ocean Dumping in the New York Bight,
W75-12172 5B

**DUPUIT EQUATION**
Artificial Groundwater Recharge, I. Circular Recharging Area,
W75-12040 4B

**E. COLI**
Comparative Survival of Enterococci, Coliforms and Salmonellas in Water, (In Russian),
W75-11973 5C

**EARTHWORKS**
Sediment Basin Design,
W75-12042 2J

**ECONOMIC EFFICIENCY**
Need Ways to Reduce Drilling Costs,
W75-11884 8C

**ECONOMIC FEASIBILITY**
The Economics of Clean Water.
W75-12233 5G

**ECONOMIC IMPACT**
Input-Output Analysis and the Environment,
W75-12177 6G

Recreation Analysis. A Bibliography,
W75-12180 6B

**ECONOMIC JUSTIFICATION**
Corps' Guidelines for Dam Safety Inspection Need Revamping,
W75-12241 8A

**ECONOMIC PREDICTION**
The Economics of Clean Water.
W75-12233 5G

**ECOSYSTEMS**
The Lake as Ecosystem,
W75-11999 2H

**ECUADOR**
Use of Environmental Isotope Methods as a Reconnaissance Tool in Groundwater Exploration Near San Antonio de Pichincha, Ecuador,
W75-12080 2F

**EFFLUENT LIMITATIONS**
Iron and Steel Manufacturing Point Source Category--Effluent Guidelines and Standards.
W75-12264 5G

Canned and Preserved Seafood Processing Point Source Category--Effluent Limitations Guidelines.
W75-12265 5G

Fertilizer Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Limitations.
W75-12266 5G

Timber Products Processing Point Source Category--Effluent Guidelines and Standards.
W75-12267 5G

Organic Chemicals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Application to Pretreatment Standards.
W75-12268 5G

Soap and Detergent Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-12269 5G

Meat Products Point Source Category--Effluent Guidelines and Standards.
W75-12273 5G

Grain Mills Point Source Category--Effluent Limitations Guidelines and Standards.
W75-12274 5G

Plastics and Synthetic Point Source Category--Effluent Guidelines and Standards.
W75-12275 5G

Nonferrous Metals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Limitations.
W75-12276 5G

**EFFLUENTS**
Some Aspects of Tannery Effluent Control,
W75-12123 5D

No-Effluent Tannery Processes,
W75-12124 5D

Iron and Steel Manufacturing Point Source Category--Effluent Guidelines and Standards.
W75-12264 5G

Canned and Preserved Seafood Processing Point Source Category--Effluent Limitations Guidelines.
W75-12265 5G

Fertilizer Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Limitations.
W75-12266 5G

Timber Products Processing Point Source Category--Effluent Guidelines and Standards.
W75-12267 5G

Organic Chemicals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Application to Pretreatment Standards.
W75-12268 5G

Soap and Detergent Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-12269 5G

Meat Products Point Source Category--Effluent Guidelines and Standards.
W75-12273 5G

Grain Mills Point Source Category--Effluent Limitations Guidelines and Standards.
W75-12274 5G

Plastics and Synthetic Point Source Category--Effluent Guidelines and Standards.
W75-12275 5G

Nonferrous Metals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Limitations.
W75-12276 5G

**ELECTRIC FIELDS**
Fluid Flow in Channels, Capillaries, and Porous Media under the Influence of an Electric Field,
W75-12381 2F

**ELECTRIC POWER DEMAND**
The Potential for Energy Production from Geothermal Resources.
W75-12199 4B

**ELECTRIC POWER PRODUCTION**
Solar Sea Thermal Energy.
W75-12196 3E

**ELECTRIC WELL LOGGING**
Hole-to-Hole Geophysical Measurement Research for Mineral Exploration,
W75-11873 8G

**ELECTROCHEMISTRY**
Fluid Flow in Channels, Capillaries, and Porous Media under the Influence of an Electric Field,
W75-12381 2F

**ELEPHANT BUTTE LAKE (NEW MEXICO)**
Life History, Ecology, and Management of the Carp, Cyprinus Carpio Linnaeus, in Elephant Butte Lake.
W75-11972 6B

**ELLICOTT CREEK (NY)**
Flood Plain Information: Ellicott Creek in the Towns of Lancaster and Alden and the Village of Alden, Erie County, New York.
W75-12365 6F

**EMMONS COUNTY (N DAK)**
Ground-Water Basic Data for Emmons County, North Dakota,
W75-11963 4B

**ENDOCYTOSIS**
Endocytosis of Microcystis Aeruginosa by Ochromonas Danica,
W75-11985 5C

**ENERGY CONSERVATION**
Energy Conservation: An Essential and Urgent Problem for the Water Industry,
W75-12334 5D

**ENERGY CONVERSION**
Power Conversion Apparatus for Utilizing the Force of Waves,
W75-12062 3E

Electric Generator Responsive to Waves in Bodies of Water,
W75-12186 3E

**ENERGY TRANSFER**
Electric Generator Responsive to Waves in Bodies of Water,
W75-12186 3E

**ENFORCEMENT (INTERNATIONAL)**
Enforcing International Law: U.S. Agencies and the Regulation of Oil Pollution in American Waters,
W75-12246 5G

**ENFORCEMENT PROCEDURES**
Federal Water Pollution Control Act Amendments of 1972,
W75-12221 5G

**ENGLAND**
The Effect of Legislation of the Future Use of Water in the Leather Industry,
W75-12112 5

**ENGLISH CHANNEL**
Transfer of Heat, Fresh Water and Nutrients Through the Seasonal Thermocline,
W75-11994 5

**ENTERIC BACTERIA**
Influence of Environmental Stress on Enumeration of Indicator Bacteria from Natural Waters,
W75-12053 5

Microbiology of a Former Dredge Spoil Disposal Area,
W75-12191 5

IVIRONMENT
Toward a Cleaner Aquatic Environment,
W75-12234 5G

IVIRONMENTAL CONTROL
International Economics and Environment Control,
W75-12178 6G

The Fifth Annual Report of the Council on Environmental Quality.
W75-12203 6G

Toward a Cleaner Aquatic Environment,
W75-12234 5G

VIRONMENTAL EFFECTS
Seismic Exploration: Its Nature and Effect on Fish,
W75-11877 8G

Seattle Project Calls for Rock Weirs.
W75-11922 4A

Behavioural Responses of Whitefish and Rainbow Trout to Drilling Fluids,
W75-11952 5C

Economic Growth Vs. the Environment. A Bibliography,
W75-12182 6G

High Seas Oil Port Act.
W75-12201 5G

The Fifth Annual Report of the Council on Environmental Quality.
W75-12203 6G

The Florida Environmental Protection Act of 1971: The Citizen's Role in Environmental Management,
W75-12207 6G

River Crossing Permits for Buckeye Pipe Line Co. Proposed Petroleum Products Pipeline System Between Linden, New Jersey and Macungie, Pennsylvania (Final Environmental Impact Statement).
W75-12258 8A

VIRONMENTAL ENGINEERING
The Fifth Annual Report of the Council on Environmental Quality.
W75-12203 6G

VIRONMENTAL IMPACT STATEMENT
The Potential for Energy Production from Geothermal Resources.
W75-12199 4B

The Rush for Offshore Oil and Gas: Where Things Stand on the Outer Continental Shelf.
W75-12222 5G

Historical Guide to Federal Water Pollution Control Laws Affecting Food Processing,
W75-12226 5G

Maritime Administration Proposed Shore Facility for Treatment and Disposal of Ship Generated Oily Water Wastes.
W75-12256 5D

Mamala Bay Wastewater Treatment and Disposal System, Oahu, Hawaii (Final Environmental Impact Statement).
W75-12257 5D

VIRONMENTAL IMPACT STATEMENTS
Seattle Project Calls for Rock Weirs.
W75-11922 4A

River Crossing Permits for Buckeye Pipe Line Co. Proposed Petroleum Products Pipeline System Between Linden, New Jersey and Macungie, Pennsylvania (Final Environmental Impact Statement).
W75-12258 8A

ENVIRONMENTAL IMPACT STATMENT
Conservation Soc'y. of Southern Vermont, Inc. V. Secretary of Transportation (Review of Motion for Equitable Injunction Against Stream Channelization Project).
W75-12282 6E

ENVIRONMENTAL POLICY
Federal Ocean Programs Review.
W75-12200 6E

The Fifth Annual Report of the Council on Environmental Quality.
W75-12203 6G

Uses of Scientific Information in Environmental Decision-Making,
W75-12204 6G

Marine Sanctuaries.
W75-12261 6E

ENVIRONMENTAL PROTECTION AGENCY
Meat Products Point Source Category--Effluent Guidelines and Standards.
W75-12273 5G

ENVIRONMENTAL STRESS
Influence of Environmental Stress on Enumeration of Indicator Bacteria from Natural Waters,
W75-12053 5C

ENZYMES
Activity of Enzymes (Protease and Urease) and Forms of Mobile Nitrogen in Thin Peat Soil of the Second Year of Use, (In Russian),
W75-12216 5B

EPIDERMAL
Role of Epidermal Cell Turgor on Stomatal Regulation in Isolated Epidermal Peelings of Citrullus Colocynthis Linn. (Schrad.),
W75-12323 2I

EPOSY RESINS
Epoxy Resin Application at Sewage Works.
W75-12349 5D

EQUATIONS
A Thermodynamic Integral Equation for the Equilibrium Moisture Profile in Swelling Soil,
W75-12050 2G

EQUILIBRIUM
A Thermodynamic Integral Equation for the Equilibrium Moisture Profile in Swelling Soil,
W75-12050 2G

EQUITABLE APPORTIONMENT
Management of Interstate Ground Water,
W75-12251 4B

EROSION
Training of Sutlej River Below Rupar Headworks for the Protection of Bist Doab Canal: Model Studies,
W75-11925 4D

Small Groins on the Shores of Long Island Sound,
W75-12046 8A

Flood Plain Information: Hassayampa River, Vicinity of Wickenburg, Arizona.
W75-12370 4A

EROSION CONTROL
A Mini-Project for Avon Harbor, North Carolina,
W75-12045 8A

ERROR
Effect of an Error in Discharge Measurements on the Detection Process in Runoff Systems Analysis,
W75-12020 2A

ESTUARIES
The Effect of Wind on the Spread of Contamination in the Yeisk Estuary, (In Russian),
W75-11983 5B

Estuarine Sanctuary Grants--Application and Selection Criteria Procedures.
W75-12262 6E

ESTUARINE ENVIRONMENT
Estuarine Sanctuary Grants--Application and Selection Criteria Procedures.
W75-12262 6E

EURASIAN WATERMILFOIL
Effect of 2,4-D and Various Salts on Eurasian Watermilfoil.
W75-11990 4A

EUROPE
The Development of European Regional Law of the Sea,
W75-12220 6E

EUTROPHICATION
N and P Distribution in Lake Kinneret (Israel) with Emphasis on Dissolved Organic Nitrogen,
W75-11975 5C

Response of Lake Superior Algae to Nutrients and Taconite Tailings,
W75-11976 5C

Geochemistry and Nutrient Regime of Saline Eutrophic Lakes in the Erickson-Elphinstone District of Southwestern Manitoba.
W75-11982 5C

Biological and Chemical Mechanisms in Eutrophication of Freshwater Lakes,
W75-11992 5C

Danger Signs for Tahoe's Future,
W75-12002 5C

An Ecological Evaluation of Heated Water Discharge on Phytoplankton Blooms in the Potomac River,
W75-12004 5C

Rates of Supply of Nitrogen and Phosphorus to Lake Winnipeg, Manitoba, in Relation to the Diversion of Missouri River Water Into the Red and Assiniboine Rivers,
W75-12006 5C

1974 Annual Report of the Freshwater Biological Investigation Unit.
W75-12008 5C

Eutrophication,
W75-12010 5C

Will Baikal and Tahoe Be Saved,
W75-12012 5C

Growth of the Green Alga Codium Fragile in a Connecticut Estuary,
W75-12051 5C

Nitrogen, Phosphorus, and Eutrophication in the Coastal Marine Environment,
W75-12236 5C

EVALUATION
On the Design and Evaluation of Cumulus Modification Experiments,
W75-12105 3B

Evaluation by Monte Carlo Tests of Effects of Cloud Seeding on Growing Season Rainfall in North Dakota,
W75-12106 3B

Bayesian and Classical Statistical Methods Applied to Randomized Weather Modification Experiments,
W75-12107 3B

The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part II: Techniques for the Physical Evaluation of Seeding,
W75-12108 3B

EVAPORATION
Process and Apparatus for Recovering Clean Water and Solids from Dilute, Aqueous, Solids Containing Solutions or Dispersions,
W75-12059 5D

The Spatial and Temporal Variations of the Turbulent Fluxes of Heat, Momentum and Water Vapor over Lake Ontario,
W75-12079 2D

EVAPOTRANSPIRATION
Hydrological Studies of Evapotranspiration and Groundwater Flow in Sandy Land,
W75-12032 2D

Diurnal and Seasonal Soil Water Uptake and Flux Within a Bermudagrass Root Zone,
W75-12082 2D

EXPLORATION
Hole-to-Hole Geophysical Measurement Research for Mineral Exploration,
W75-11873 8G

Geochemistry of Oil-Field Water Applied to Exploration,
W75-11879 4B

Use of Environmental Isotope Methods as a Reconnaissance Tool in Groundwater Exploration Near San Antonio de Pichincha, Ecuador,
W75-12080 2F

EXTERNALITIES
International Economics and Environment Control,
W75-12178 6G

Externalities and Public Goods. A Bibliography,
W75-12179 6B

Economic Growth Vs. the Environment. A Bibliography,
W75-12182 6G

EXTRACTION
The Effects of Aerobic and Anaerobic Incubation on the Extractabilities of Heavy Metals in Digested Sewage Sludge,
W75-12330 5D

FALLOUT
Environmental Research Laboratories, 1973 Annual Report.
W75-12033 5A

FARM WASTES
Wetzel V. A. Duda and Sons (Action by Riparian Property Owners to Enjoin Water Pollution to Lake From Farming Operations).
W75-12286 6E

FARMS
Water Bank Program.
W75-12259 6E

FAULTS (GEOLOGIC)
Water-Level Fluctuations and Earthquakes on the San Andreas Fault Zone,
W75-12392 4B

FEASIBILITY STUDIES
Effective Use of High Water Table Areas for Sanitary Landfill. Volume I,
W75-12111 5E

FEDERAL GOVERNMENT
Conservation Soc'y. of Southern Vermont, Inc. V. Secretary of Transportation (Review of Motion for Equitable Injunction Against Stream Channelization Project).
W75-12282 6E

FEDERAL JURISDICTION
Historical Guide to Federal Water Pollution Control Laws Affecting Food Processing,
W75-12226 5G

Enforcing International Law: U.S. Agencies and the Regulation of Oil Pollution in American Waters,
W75-12246 5G

FEDERAL-STATE WATER RIGHTS CONFLICTS
The Federal Common Law of Accretion: A New Element in Property Law,
W75-12205 6E

Wyandotte and its Progency: The Quest for Environmental Protection through the Original Jurisdiction of the Supreme Court,
W75-12218 5G

FEDERAL WATER POLLUTION ACT
Litigation Under the Federal Water Pollution Control Act Amendments of 1974,
W75-12212 5G

FEDERAL WATER POLLUTION CONTROL ACT
Federal Water Pollution Control Act Amendments of 1972,
W75-12221 5G

Land Use Controls Under the Federal Water Pollution Control Act: A Citizen's Guide,
W75-12237 5G

Those Elusive 1985 Water Quality Goals.
W75-12242 5G

Enforcing International Law: U.S. Agencies and the Regulation of Oil Pollution in American Waters,
W75-12246 5G

Timber Products--Proposed Effluent Guidelines and Performances and Pretreatment Standards for New Sources.
W75-12270 5G

Fertilizer Manufacturing Point Source Category--Effluent Limitations and Guidelines.
W75-12272 5G

Colorado Public Interest Research Group, Inc. V. Train (Citizen Suit to Compel the Environmental Protection Agency to Control Discharge or Radioactive Materials into Navigable Waters).
W75-12287 6E

United States v. Ashland Oil and Transportation Co. (Appeal from Finding that Defendant had Violated FWPCA Amendments of 1972 by Discharging Oil into Navigable Stream).
W75-12294 6E

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972
Federal Water Pollution Control Act Amendments of 1972,
W75-12221 5G

Land Use Controls Under the Federal Water Pollution Control Act: A Citizen's Guide,
W75-12237 5G

Water Quality Management Basin Plans--Policies and Procedures.
W75-12260 5G

Soap and Detergent Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-12269 5G

Meat Products Point Source Category--Effluent Guidelines and Standards.
W75-12273 5G

Train V. City of New York (Class Action by City to Compel EPA to Allot Funds Authorized by the 1972 Federal Water Pollution Control Act Amendments).
W75-12284 6E

Train V. Campaign Clean Water, Inc. (Action by Environmental Group to Require EPA to Release Funds Authorized for Federal Grants to Municipalities for Water Pollution Control.
W75-12285 6E

FERTILIZATION
Effects of Aerial Forest Fertilization With Urea Pellets on Nitrogen Levels in a Mountain Stream,
W75-12113 5B

Land Disposal of Sewage Sludge,
W75-12135 5D

Nitrogen Transformation and Uptake,
W75-12136 5B

Some Microbiological Aspects of the Land Disposal of Sludge,
W75-12138 5D

Cation Distribution in Soils as Related to Sewage Sludge Disposal on Land,
W75-12139 5B

FERTILIZERS
Fertilizer Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Limitations.
W75-12266 5G

Fertilizer Manufacturing Point Source Category--Effluent Limitations and Guidelines.
W75-12272 5G

FILTER PRESSES
Filter Press, Particularly for Dewatering Sludge in Sewage Treatment Plants,
W75-12056 5D

TERING MATERIAL
pparatus for Cleaning Loose Filtering Materi- in Slow Water Filled Water Supply Filters, /75-11935 5F

TERS
pparatus for Cleaning Loose Filtering Materi- in Slow Water Filled Water Supply Filters, /75-11935 5F

rigation System Emitters with Renewable Fil- rs, /75-12310 3F

TRATION
tudy on Direct Rapid Filtration Using educed Coagulants, (In Japanese), /75-11860 5D

ilter Press, Particularly for Dewatering Sludge Sewage Treatment Plants, /75-12056 5D

/ater-Treatment Sludge Filtration Studies, /75-12069 5D

perational Variables and Limitations of Direct ltration, /75-12127 5F

ontrol System for Showa Water Purification ant, (In Japanese), /75-12147 5F

iltering and Debris Removing Apparatus for leaning a Sea Water Stream, /75-12183 5G

ltration of Neutral Red by Fresh Water lams in Aerobic and Hypoxic Conditions, /75-12192 5C

H
eismic Exploration: Its Nature and Effect on sh, /75-11877 8G

oxicity of Aquatic Organisms Caused by hlorination, /75-12353 5D

H BEHAVIOR
ehavioural Responses of Whitefish and Rain- ow Trout to Drilling Fluids, /75-11952 5C

H DIETS
xperimentally Increased Fish Stock in the ond Type Lake Warniak. XIV. The Relations etween the Fish and Other Biocenotic Com- onents (Summing Up the Studies), /75-11998 8I

H DISEASES
easonal Prevalence of Chondrococcus Colum- aris Infection in Black Bullheads from Clear ake, Iowa, /75-11995 5C

H FARMING
he Utilization of Phosphorus from Muds by e Phytoplankter, Scenedesmus Dimorphus, d the Significance of These Findings to the actice of Pond Fertilization, /75-11986 5C

xperimentally Increased Fish Stock in the ond Type Lake Warniak. XIII. Distribution d Biomass of the Lemnaceae and the Fauna ssociated with Them, /75-12009 8I

Prairie Pothole Ecology and the Feasibility of Growing Rainbow Trout (Salmo Gairdneri Richardson) in Prairie Potholes, W75-12157 8I

FISH FOOD ORGANISMS
Prairie Pothole Ecology and the Feasibility of Growing Rainbow Trout (Salmo Gairdneri Richardson) in Prairie Potholes, W75-12157 8I

FISH LADDER
A River Restored: Oregon's Willamette, W75-12210 5G

FISH MANAGEMENT
Life History, Ecology, and Management of the Carp, Cyprinus Carpio Linnaeus, in Elephant Butte Lake. W75-11972 6B

Daily Fall Activity and Direction of Movements of Fish in Lake Quenouille in the Laurentians, (In French), W75-12064 2H

FISH MIGRATION
Emigration of the Peamouth Chub, Mylocheilus Caurinus, Across a Dilute Seawater Bridge: An Experimental Zoogeographic Study, W75-12151 2L

FISH POPULATIONS
Daily Fall Activity and Direction of Movements of Fish in Lake Quenouille in the Laurentians, (In French), W75-12064 2H

FISH STOCKING
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. XIV. The Relations Between the Fish and Other Biocenotic Components (Summing Up the Studies), W75-11998 8I

Experimentally Increased Fish Stock in the Pond Type Lake Warniak. VI. Biomass and Production of Phytoplankton, W75-12013 5C

FISHERY ECONOMICS
Fisheries Economics. A Bibliography, W75-12181 3E

FISHKILL
Seismic Exploration: Its Nature and Effect on Fish, W75-11877 8G

FLASH FLOOD SUSCEPTIBILITY
A Study of Flash-Flood Susceptibility -- A Basin in Southern Arizona, W75-12167 4A

FLASH FLOODING
A Study of Flash-Flood Susceptibility -- A Basin in Southern Arizona, W75-12167 4A

FLASH FLOODS
A Study of Flash-Flood Susceptibility -- A Basin in Southern Arizona, W75-12167 4A

A Study of Flash-Flood Occurrences at a Site Versus Over a Forecast Zone, W75-12174 2E

FLOCCULATION
Flocculating Agents, W75-12058 5D

Unusual Features in Plant Design. W75-12146 5F

Process for Raw Water Clarification, W75-12300 5F

FLOOD CONTROL
Seattle Project Calls for Rock Weirs. W75-11922 4A

United States v. 187.40 Acres of Land, Huntingdon County, Pa. (Action to Condemn Land for Use in Constructing Flood Control Project). W75-12299 6E

Flood Plain Information: Meherrin River, Emporia, Virginia. W75-12368 4A

Flood Plain Information: Spring and Willow Creeks, Houston Metropolitan Area, Texas. W75-12371 4

Flood Plain Information: Tonawanda Creek and Its Affected Tributaries, Erie and Niagara Counties, New York. W75-12373 2E

Flood Plain Information: Onion Creek, Austin, Texas. W75-12374 4A

Flood Plain Information: South Santiam River, Lebanon, Oregon. W75-12376 4A

FLOOD DAMAGE
The Flood of April 1974 in Southern Mississippi and Southeastern Louisiana, W75-12170 2E

Flood Insurance and Flood Plain Zoning as Compatible Components, W75-12227 6F

Gulf Shore Seafood and Company v. Cities Service Co. (Action for Damages Arising from Dam Break of Phosphate Company's Dam Permitting Phosphate Slime Pollution of River). W75-12291 6E

Flood Plain Information: Ellicott Creek in the Towns of Lancaster and Alden and the Village of Alden, Erie County, New York. W75-12365 6F

Flood Plain Information: Fountain Creek, Colorado Springs, Manitou Springs, Colorado. W75-12372 2E

Special Flood Hazard Information: Paradise Creek, Pullman and Vicinity, Washington. W75-12378 4A

FLOOD DAMAGE REDUCTION
Flood Insurance and Flood Plain Zoning as Compatible Components, W75-12227 6F

FLOOD DATA
The Flood of April 1974 in Southern Mississippi and Southeastern Louisiana, W75-12170 2E

A Study of Flash-Flood Occurrences at a Site Versus Over a Forecast Zone, W75-12174 2E

Flood Plain Information--Coastal Flooding: Town of Poquoson, Virginia. W75-12367 4A

**FLOOD DATA**

Flood Plain Information: Spring and Willow Creeks, Houston Metropolitan Area, Texas.
W75-12371 4

Flood Plain Information: Fountain Creek, Colorado Springs, Manitou Springs, Colorado.
W75-12372 2E

**FLOOD FLOW**

Transformation System in Flood Runoff Phenomena,
W75-12016 2E

**FLOOD FORECASTING**

A Particular Comparison of Annual Maxima and Partial Duration Series Methods of Flood Frequency Prediction,
W75-11929 2E

The Use of a Multizone Hydrologic Model With Distributed Rainfall and Distributed Parameters in the National Weather Service River Forecast System,
W75-12159 2B

Storm Tide Frequencies on the South Carolina Coast,
W75-12160 2L

A Study of Flash-Flood Susceptibility -- A Basin in Southern Arizona,
W75-12167 4A

A Study of Flash-Flood Occurrences at a Site Versus Over a Forecast Zone,
W75-12174 2E

Flood Plain Information--Coastal Flooding: Town of Poquoson, Virginia.
W75-12367 4A

Flood Plain Information, Willamette River, Johnson, Kellogg and Mt. Scott Creeks, Milwaukie-Oak Grove-Lake Oswego, Oregon.
W75-12369 4A

Flood Plain Information: James River, Howardsville to Scottsville, Albemarle County, Virginia.
W75-12375 4A

Flood Plain Information: South Santiam River, Lebanon, Oregon.
W75-12376 4A

Flood Plain Information: Hackberry Creek and Cottonwood Branch, Dallas County, Texas.
W75-12379 4A

**FLOOD FREQUENCY**

Flood Profiles in the Umpqua River Basin, Oregon: Part 3, Umpqua River Below Scottburg, Scholfield, Cow Creek Above Glendale,
W75-11959 4A

Flood Plain Information--Coastal Flooding: Town of Poquoson, Virginia.
W75-12367 4A

**FLOOD PLAIN INSURANCE**

Flood Insurance and Flood Plain Zoning as Compatible Components,
W75-12227 6F

**FLOOD PLAIN ZONING**

Flood Insurance and Flood Plain Zoning as Compatible Components,
W75-12227 6F

Flood Plain Information: Ellicott Creek in the Towns of Lancaster and Alden and the Village of Alden, Erie County, New York.
W75-12365 6F

Flood Plain Information: Spring and Willow Creeks, Houston Metropolitan Area, Texas.
W75-12371 4

Flood Plain Information: Fountain Creek, Colorado Springs, Manitou Springs, Colorado.
W75-12372 2E

Flood Plain Information: Onion Creek, Austin, Texas.
W75-12374 4A

Special Flood Hazard Information: Issaquah and Tibbetts Creeks, Issaquah and Vicinity, Washington.
W75-12377 4A

Flood Plain Information: Hackberry Creek and Cottonwood Branch, Dallas County, Texas.
W75-12379 4A

**FLOOD PLAINS**

Flood Insurance and Flood Plain Zoning as Compatible Components,
W75-12227 6F

Flood Plain Information: Ellicott Creek in the Towns of Lancaster and Alden and the Village of Alden, Erie County, New York.
W75-12365 6F

Flood Plain Information: Moores Creek, Albemarle County and Charlottesville, Virginia.
W75-12366 4A

Flood Plain Information: Meherrin River, Emporia, Virginia.
W75-12368 4A

Flood Plain Information, Willamette River, Johnson, Kellogg and Mt. Scott Creeks, Milwaukie-Oak Grove-Lake Oswego, Oregon.
W75-12369 4A

Flood Plain Information: Fountain Creek, Colorado Springs, Manitou Springs, Colorado.
W75-12372 2E

Flood Plain Information: Tonawanda Creek and Its Affected Tributaries, Erie and Niagara Counties, New York.
W75-12373 2E

Flood Plain Information: Onion Creek, Austin, Texas.
W75-12374 4A

Special Flood Hazard Information: Issaquah and Tibbetts Creeks, Issaquah and Vicinity, Washington.
W75-12377 4A

Special Flood Hazard Information: Paradise Creek, Pullman and Vicinity, Washington.
W75-12378 4A

Flood Plain Information: Hackberry Creek and Cottonwood Branch, Dallas County, Texas.
W75-12379 4A

**FLOOD PROFILE**

Flood Plain Information: Hackberry Creek and Cottonwood Branch, Dallas County, Texas.
W75-12379 4A

**FLOOD PROFILES**

Flood Profiles in the Umpqua River Basin, Oregon: Part 3, Umpqua River Below Scottburg, Scholfield, Cow Creek Above Glendale,
W75-11959 4A

Flood Plain Information: Meherrin River, Emporia, Virginia.
W75-12368 4A

Flood Plain Information: Hassayampa River, Vicinity of Wickenburg, Arizona.
W75-12370 4A

Flood Plain Information: Spring and Willow Creeks, Houston Metropolitan Area, Texas.
W75-12371 4

Flood Plain Information: Fountain Creek, Colorado Springs, Manitou Springs, Colorado.
W75-12372 2E

Flood Plain Information: James River, Howardsville to Scottsville, Albemarle County, Virginia.
W75-12375 4A

Flood Plain Information: South Santiam River, Lebanon, Oregon.
W75-12376 4A

Special Flood Hazard Information: Paradise Creek, Pullman and Vicinity, Washington.
W75-12378 4A

**FLOOD PROTECTION**

Floods Protection (Schutz vor Ueberschwemmungen).
W75-11946 4A

Flood Insurance and Flood Plain Zoning as Compatible Components,
W75-12227 6F

Flood Plain Information: Ellicott Creek in the Towns of Lancaster and Alden and the Village of Alden, Erie County, New York.
W75-12365 6F

Flood Plain Information: Meherrin River, Emporia, Virginia.
W75-12368 4A

Flood Plain Information: Onion Creek, Austin, Texas.
W75-12374 4A

Flood Plain Information: South Santiam River, Lebanon, Oregon.
W75-12376 4A

**FLOOD RETENTION TANKS**

The Graphical Hydrographs Method With the Intermediary of Storm Overflows and Flood Retention Tanks (Das grafische Abflussganglinienverfahren mit Zwischenschaltung von RUE und RB),
W75-11861 5D

**FLOOD ROUTING**

Systems Simulation of Streamflows,
W75-12024 2E

Gumz V. Bejes (Action by Adjoining Landowners for Injunction Against Flooding From Drainage and Irrigation Ditch).
W75-12290 6E

**FLOOD STUDIES**

A Study of Flash-Flood Susceptibility -- A Basin in Southern Arizona,
W75-12167 4A

**FLOODING**

The Flood of April 1974 in Southern Mississippi and Southeastern Louisiana,
W75-12170 2E

A Study of Flash-Flood Occurrences at a Site Versus Over a Forecast Zone,
W75-12174 2E

A NEPA Settlement: Conservation Council of North Carolina v. Froehlke,
W75-12244 6E

Gumz V. Bejes (Action by Adjoining Landowners for Injunction Against Flooding From Drainage and Irrigation Ditch).
W75-12290 6E

Flood Plain Information: Ellicott Creek in the Towns of Lancaster and Alden and the Village of Alden, Erie County, New York.
W75-12365 6F

Flood Plain Information: Moores Creek, Albemarle County and Charlottesville, Virginia.
W75-12366 4A

Flood Plain Information: Meherrin River, Emporia, Virginia.
W75-12368 4A

Flood Plain Information, Willamette River, Johnson, Kellogg and Mt. Scott Creeks, Milwaukie-Oak Grove-Lake Oswego, Oregon.
W75-12369 4A

Flood Plain Information: Hassayampa River, Vicinity of Wickenburg, Arizona.
W75-12370 4A

Flood Plain Information: Tonawanda Creek and Its Affected Tributaries, Erie and Niagara Counties, New York.
W75-12373 2E

Flood Plain Information: James River, Howardsville to Scottsville, Albemarle County, Virginia.
W75-12375 4A

Flood Plain Information: Hackberry Creek and Cottonwood Branch, Dallas County, Texas.
W75-12379 4A

LOODING (OIL RECOVERY)
Waterflooding of Oilfields in Wyoming to 1968,
W75-12380 8B

Fluid Flow in Channels, Capillaries, and Porous Media under the Influence of an Electric Field,
W75-12381 2F

LOODS
Flood Event Data Collation,
W75-11943 7C

A Study of Flash-Flood Susceptibility -- A Basin in Southern Arizona,
W75-12167 4A

The Flood of April 1974 in Southern Mississippi and Southeastern Louisiana,
W75-12170 2E

A Study of Flash-Flood Occurrences at a Site Versus Over a Forecast Zone,
W75-12174 2E

Gulf Shore Seafood and Company v. Cities Service Co. (Action for Damages Arising from Dam Break of Phosphate Company's Dam Permitting Phosphate Slime Pollution of River).
W75-12291 6E

Flood Plain Information: Ellicott Creek in the Towns of Lancaster and Alden and the Village of Alden, Erie County, New York.
W75-12365 6F

Flood Plain Information: Moores Creek, Albemarle County and Charlottesville, Virginia.
W75-12366 4A

Flood Plain Information--Coastal Flooding: Town of Poquoson, Virginia.
W75-12367 4A

Flood Plain Information, Willamette River, Johnson, Kellogg and Mt. Scott Creeks, Milwaukie-Oak Grove-Lake Oswego, Oregon.
W75-12369 4A

Flood Plain Information: Hassayampa River, Vicinity of Wickenburg, Arizona.
W75-12370 4A

Flood Plain Information: Onion Creek, Austin, Texas.
W75-12374 4A

Flood Plain Information: James River, Howardsville to Scottsville, Albemarle County, Virginia.
W75-12375 4A

Flood Plain Information: Hackberry Creek and Cottonwood Branch, Dallas County, Texas.
W75-12379 4A

FLORIDA
Geohydrology of Collier County, Florida,
W75-11874 4B

Water Consumption Trends Within the Central and Southern Florida Flood Control District,
W75-12085 6D

Supplemental Water Use in the Everglades Agricultural Area,
W75-12086 3F

On the Variability of 'Dynamic Seedability' as a Function of Time and Location Over South Florida: Part I. Spatial Variability,
W75-12089 3B

Florida Area Cumulus Experiments 1970-1973 Rainfall Results,
W75-12091 3B

Comparison of Gage and Radar Methods of Convective Rain Measurement,
W75-12102 2B

On the Effect of Natural Rainfall Variability and Measurement Errors in the Detection of Seeding Effect,
W75-12103 3B

On the Design and Evaluation of Cumulus Modification Experiments,
W75-12105 3B

Effective Use of High Water Table Areas for Sanitary Landfill. Volume I,
W75-12111 5E

Estimation of Hurricane Storm Surge in Apalachicola Bay, Florida,
W75-12164 2B

Big Cypress National Preserve (Part 1).
W75-12195 6G

Admiralty's Power in RE Oil Pollution (States Able to Set More Stringent Penalties),
W75-12248 5G

Aquatic Weed Control - State Revenue Laws.
W75-12295 6E

Recycling Allows Zero Wastewater Discharge,
W75-12364 5D

FLOTATION
Primary Solids/Liquid Separation.
W75-12153 5D

FLOW AUGMENTATION
Reservoir Properties Affecting Matrix Acid Stimulation of Sandstones,
W75-11894 4B

FLOW CONTROL
Apparatus, for and Method of Controlling Flow of Fluids in a Pipeline,
W75-11932 8B

FLOW MEASUREMENT
STD, Current Meter, and Drogue Observations in Rosario Strait, January - March 1974,
W75-12175 2L

Flow Quantities in Residential Weeping Tile Systems--A Calculational Method,
W75-12328 4A

FLOW RATES
Surface Water Supply of the United States, 1966-70: Part 2. South Atlantic Slope and Eastern Gulf of Mexico Basins - Volume 3. Basins from Apalachicola River to Pearl River.
W75-11967 7C

Surface Water Supply of the United States, 1966-70: Part 6. Missouri River Basin--Volume 1. Missouri River Basin above Williston, North Dakota.
W75-11968 7C

Surface Water Supply of the United States, 1966-70: Part 7. Lower Mississippi River--Volume 2. Arkansas River Basin.
W75-11969 7C

FLUID MECHANICS
Displacement Stability of Water Drives in Water-Wet Connate-Water-Bearing Reservoirs,
W75-11870 4B

FOOD PROCESSING INDUSTRY
Historical Guide to Federal Water Pollution Control Laws Affecting Food Processing,
W75-12226 5G

Canned and Preserved Seafood Processing Point Source Category--Effluent Limitations Guidelines.
W75-12265 5G

FOODS
Canned and Preserved Seafood Processing Point Source Category--Effluent Limitations Guidelines.
W75-12265 5G

FOREIGN COUNTRIES
Meteoro-Hydrological Aspects of Rainfall in Japan.
W75-12030 2B

FOREIGN RESEARCH
Will Baikal and Tahoe Be Saved,
W75-12012 5C

FOREIGN TRADE
High Seas Oil Port Act.
W75-12201 5G

Information Report on the Law of the Sea: Understanding the Debate of the Law of the Ocean Space.
W75-12252 6E

FOREST MANAGEMENT
Evaluating the Productivity of Pine Forests in the Hinton-Edson Area, Alberta, From Soil Survey Maps,
W75-12003 4A

**FOREST PRESERVE RESERVOIRS**
Water Supply.
W75-12297 6E

**FORESTS**
Effects of Aerial Forest Fertilization With Urea Pellets on Nitrogen Levels in a Mountain Stream,
W75-12113 5B

**FORMATION PRESSURE**
How Downhole Temperatures, Pressures Affect Drilling, Part 1,
W75-11865 8C

**FRACTURE LENGTH**
Graphic Solution to Fracture Treatment Design,
W75-11876 8B

**FRACTURE PERMEABILITY**
A Laboratory Study of the Effects of Confining Pressure on Fracture Flow and Storage Capacity in Carbonate Rocks,
W75-11892 4B

**FRACTURES (GEOLOGIC)**
The Effect of Surface Kinetics in Fracture Acidizing,
W75-11887 8B

**FRAGMENTATION**
Fragmentation.
W75-12387 8E

**FREEZING**
Principles and Techniques for Conditioning of Waste-Activated Sludge by Direct Slurry Freezing,
W75-12154 5D

**FRENCH BROAD RIVER (NC)**
Stochastic Hydrologic Systems,
W75-12015 2A

**FREQUENCY CURVES**
Meteoro-Hydrological Aspects of Rainfall in Japan.
W75-12030 2B

Distribution of Solar Radiation Within a Deciduous Forest,
W75-12034 2I

**FRESH WATER CLAMS**
Filtration of Neutral Red by Fresh Water Clams in Aerobic and Hypoxic Conditions,
W75-12192 5C

**FRESH-WATER SANDS**
Fresh Water Strata of Mississippi as Revealed by Electrical Log Studies,
W75-12399 4B

**FRESHWATER**
Toxicity of Copper Complexes to RFreshwater Mollusks,
W75-11863 5C

**FRESHWATER FISH**
Detection of Pollutants by Fish Tests,
W75-12193 5A

**FRESHWATER MARSHES**
Property (Wetlands Regulation),
W75-12247 6E

**FROZEN GROUND**
A Preliminary Study of the Formation of Landfast Ice at Barrow, Alaska, Winter 1973-74,
W75-12162 2C

**FWPCA AMENDMENTS OF 1972**
Timber Products Processing Point Source Category--Effluent Guidelines and Standards.
W75-12267 5G

Organic Chemicals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Application to Pretreatment Standards.
W75-12268 5G

**GALVANIC CELLS**
Corrosion.
W75-11888 8G

**GARBAGE DUMPS**
Effective Use of High Water Table Areas for Sanitary Landfill. Volume I,
W75-12111 5E

**GARRISON DIVERSION (ND)**
Rates of Supply of Nitrogen and Phosphorus to Lake Winnipeg, Manitoba, in Relation to the Diversion of Missouri River Water Into the Red and Assiniboine Rivers,
W75-12006 5C

**GAS CHROMATOGRAPHY**
Determination of NTA in Environmental Water by Gas Chromatography,
W75-12363 5A

Determination of Residual Quantities of the Butyl Ester of 2,4-Dichlorophenoxyacetic Acid in Environmental Objects by Gas-Liquid Chromatography, (In Russian),
W75-12393 5A

**GASES**
Digester Gas: Valuable Plant Fuel,
W75-12332 8C

**GEOCHEMISTRY**
Geochemistry of Oil-Field Water Applied to Exploration,
W75-11879 4B

Geochemistry and Nutrient Regime of Saline Eutrophic Lakes in the Erickson-Elphinstone District of Southwestern Manitoba.
W75-11982 5C

Geochemistry of Strontium in the Scioto River Drainage Basin, Ohio,
W75-12052 2K

**GEOLOGY**
Geohydrology of Collier County, Florida,
W75-11874 4B

**GEORGIA BIGHT**
Oceanographic Observations in the Georgia Bight: Data Report for R.V. EASTWARD Cruises E-13-73 (4-11 September) and E-19-73 (8-9 December 1973),
W75-12169 2L

**GEOTHERMAL STUDIES**
The Potential for Energy Production from Geothermal Resources.
W75-12199 4B

**GOVERNMENTAL INTERRELATIONS**
Historical Guide to Federal Water Pollution Control Laws Affecting Food Processing,
W75-12226 5G

**GRAIN**
Statistical Investigation of the Relation Between Absorbability and Content of Grain-size Fractions and Humus, (In Russian),
W75-12344 2G

**GRAINS (CROPS)**
Grain Mills Point Source Category--Effluent Limitations Guidelines and Standards.
W75-12274 5G

**GRANTS**
Estuarine Sanctuary Grants--Application and Selection Criteria Procedures.
W75-12262 6E

Train V. Campaign Clean Water, Inc. (Action by Environmental Group to Require EPA to Release Funds Authorized for Federal Grants to Municipalities for Water Pollution Control.
W75-12285 6E

**GRAPHIC ANALYSIS**
Graphic Solution to Fracture Treatment Design,
W75-11876 8B

**GRAPHICAL ANALYSIS**
Graphic Solutions to Tubing Movement in Deep Wells,
W75-11875 8B

**GRAUPEL**
Formation of Graupel,
W75-12093 3B

**GRAVEL PACK**
Thin Section and Permeability Studies Call for Smaller Gravels in Gravel Packing,
W75-11893 8B

**GRAVEL-TO-SAND RATIO**
Thin Section and Permeability Studies Call for Smaller Gravels in Gravel Packing,
W75-11893 8B

**GRAVELS**
Thin Section and Permeability Studies Call for Smaller Gravels in Gravel Packing,
W75-11893 8B

**GRAVICHEMICAL POTENTIAL**
A Thermodynamic Integral Equation for the Equilibrium Moisture Profile in Swelling Soil,
W75-12050 2G

**GREAT LAKES**
Predictive Models for Great Lakes Hydrology,
W75-12049 2A

1974 Annual Report, Great Lakes Basin Commission.
W75-12238 5G

Introduction of Shore Erosion Control Legislation.
W75-12279 6E

**GREAT PLAINS**
Water Resources Investigations of the U.S. Geological Survey in the Northern Great Plains Coal Region of Wyoming, Montana, and North Dakota, 1975.
W75-11961 5A

**GREAT SALT LAKE**
Diurnal Fluctuations of Water Tables Induced by Atmospheric Pressure Changes,
W75-12077 2G

**GROINS (STRUCTURES)**
Small Groins on the Shores of Long Island Sound,
W75-12046 8A

**GROUNDWATER**
Geochemistry of Oil-Field Water Applied to Exploration,
W75-11879 4B

eciphering of Ground Water from Aerial hotographs,
/75-11882 4B

he Use of a Specialized Drilling and Ground /ater Sampling Technique for Delineation of exavalent Chromium Contamination in an nconfined Aquifer, Southern New Jersey oastal Plain,
/75-11899 5A

uropean Dewatering System Aids Quebec roject,
/75-11918 5D

and Subsidence Due to Ground-Water /ithdrawal in the Los Banos-Kettleman City rea, California, Part 2. Subsidence and Com- action of Deposits,
/75-11957 4B

and Subsidence Due to Ground-Water /ithdrawal in the Los Banos-Kettleman City rea, California, Part 3. Interrelations of /ater-Level Change, Change in Aquifer- ystem Thickness, and Subsidence,
/75-11958 4B

/ater Resources Data for California, 1973: art 2. Water Quality Records.
/75-11962 7C

/drologic Systems in Hawaii,
/75-12022 2A

/drological Studies of Evapotranspiration and roundwater Flow in Sandy Land,
/75-12032 2D

eochemistry of Strontium in the Scioto River rainage Basin, Ohio,
/75-12052 2K

/ater-Treatment Sludge Filtration Studies,
/75-12069 5D

ollution Effects on Surface Waters and roundwaters,- (Literature Review),
/75-12070 5B

ollution of Groundwater Due to Municipal umps,
/75-12119 5B

round-Water and Engineering Geology in Sit- g of Sanitary Landfills,
/75-12122 5E

nited States V. Cappaert (Action for Declara- on of Rights of United States to Underground /aters Appurtenant to Devil's Hole, Death alley National Monument).
/75-12281 6E

ight and Assimilation Number in a Small esert, Recharged-Groundwater Pond,
/75-12326 5A

/aterflooding of Oilfields in Wyoming to 1968,
/75-12380 8B

round Water and Ground-Water Control,
/75-12386 4B

ementing Off, Plugging, and Redrilling,
/75-12394 8F

ontrol of Groundwater at Bancroft Mines, ambia,
/75-12395 4B

resh Water Strata of Mississippi as Revealed y Electrical Log Studies,
/75-12399 4B

Water-Quality Data, 1948-73, Anchorage and Vicinity, Alaska,
W75-19955 5A

**GROUNDWATER AVAILABILITY**
Management of Interstate Ground Water,
W75-12251 4B

**GROUNDWATER MOUND**
Artificial Groundwater Recharge, I. Circular Recharging Area,
W75-12040 4B

**GROUNDWATER RECHARGE**
Use of Environmental Isotope Methods as a Reconnaissance Tool in Groundwater Exploration Near San Antonio de Pichincha, Ecuador,
W75-12080 2F

**GROUNDWATER RESOURCES**
Ground-Water Basic Data for Emmons County, North Dakota,
W75-11963 4B

**GROWTH RATES**
The Utilization of Phosphorus from Muds by the Phytoplankter, Scenedesmus Dimorphus, and the Significance of These Findings to the Practice of Pond Fertilization,
W75-11986 5C

Detergent Phosphorus and Algal Growth,
W75-12001 5C

**GULF OF MEXICO BASINS (WESTERN)**
Quality of Surface Waters of the United States, 1970: Part 8. Western Gulf of Mexico Basins.
W75-11965 7C

**GULF OF MEXICO RIVER BASINS (WESTERN)**
Quality of Surface Waters of the United States, 1969: Part 8. Western Gulf of Mexico Basin.
W75-11966 7C

**HACKBERRY CREEK (TEX)**
Flood Plain Information: Hackberry Creek and Cottonwood Branch, Dallas County, Texas.
W75-12379 4A

**HAIL**
Small-Scale Variability of Hail and its Significance for Hail Prevention Experiments,
W75-12092 3B

Hail Suppression Data from Western North Dakota, 1969-1972,
W75-12094 3B

Design of a Hail Suppression Project for Illinois,
W75-12095 3B

**HAIL SUPPRESSION**
Hail Suppression Data from Western North Dakota, 1969-1972,
W75-12094 3B

Design of a Hail Suppression Project for Illinois,
W75-12095 3B

**HAIL VARIABILITY**
Small-Scale Variability of Hail and its Significance for Hail Prevention Experiments,
W75-12092 3B

**HARBORS**
A Mini-Project for Avon Harbor, North Carolina,
W75-12045 8A

Deepwater Port Act of 1974.
W75-12198 5G

The Deepwater Ports Act of 1974; Half Speed Ahead,
W75-12229 5G

**HASSAYAMPA RIVER (ARIZ)**
Flood Plain Information: Hassayampa River, Vicinity of Wickenburg, Arizona.
W75-12370 4A

**HAWAII**
Systems Approach to Hydrology.
W75-12014 2A

Hydrologic Systems in Hawaii,
W75-12022 2A

Tarshis v. Lahaina Investment Corp. (Responsibility of Owner of Beach Front Property to Warn of Surging Wave).
W75-12296 6E

**HAZARDOUS SUBSTANCES (POLLUTION)**
Deepwater Port Act of 1974.
W75-12198 5G

Uses of Scientific Information in Environmental Decision-Making,
W75-12204 6G

The Doctrine of Primary Jurisdiction Misconceived: End to Common Law Environmental Protection,
W75-12206 6G

Wyandotte and its Progency: The Quest for Environmental Protection through the Original Jurisdiction of the Supreme Court,
W75-12218 5G

Overland Flow: Answer to Water Cleanup Challenge.
W75-12228 5D

The Deepwater Ports Act of 1974; Half Speed Ahead,
W75-12229 5G

Toxic Waters (Discussion of Recent Federal Action Against Water Pollution).
W75-12230 5G

Train V. Campaign Clean Water, Inc. (Action by Environmental Group to Require EPA to Release Funds Authorized for Federal Grants to Municipalities for Water Pollution Control.
W75-12285 6E

**HEAD LOSS**
How to Evaluate Water Main Capacities, Part I,
W75-12329 8B

**HEATED WATER**
Solar Sea Thermal Energy.
W75-12196 3E

**HEAVY METALS**
Observations on the Atomic Absorption Behavior of Some of the Earth Elements,
W75-11862 5A

Mercury Concentrations in Open Ocean Waters: Sampling Procedure,
W75-11953 5A

Land Disposal of Sewage Sludge,
W75-12135 5D

Analysis of Heavy Metals in Sewage Sludge and Liquids Associated with Sludges,
W75-12140 5A

Method of Removing Heavy Metals from Water and Apparatus Therefor,
W75-12304 5D

The Effects of Aerobic and Anaerobic Incubation on the Extractabilities of Heavy Metals in Digested Sewage Sludge,
W75-12330 5D

HELSINKI RULES
The Allocation of Waters of International Rivers.
W75-12219 6E

HEMLOCK TREES
The Water Relations of Hemlock (Tsuga Canadensis): I. Some Equilibrium Water Relations as Measured by the Pressure-Bomb Technique,
W75-11900 2I

The Water Relations of Hemlock (Tsuga Canadensis): II. The Kinetics of Water Exchange Between the Symplast and Apolast,
W75-11901 2I

The Water Relations of Hemlock (Tsuga Canadensis): III. The Temperature Dependence of Water Exchange in a Pressure Bomb,
W75-11902 2I

HERBICIDES
Effect of 2,4-D and Various Salts on Eurasian Watermilfoil.
W75-11990 4A

The Risk of Deoxygenation of Water in Herbicide Application for Aquatic Weed Control,
W75-11996 5A

Experimental Data for Establishing the Content of Alpha, Alpha, Beta-Trichloropropionic Acid and its Sodium Salts in Reservoir Water,
W75-12190 5C

HETEROTROPHIC ALGAE
The Uptake and Utilization of Organic Carbon by Algae: An Essay in Comparative Biochemistry,
W75-11980 5C

HETEROTROPHIC BACTERIA
Microbiology of a Former Dredge Spoil Disposal Area,
W75-12191 5C

HIGH PRESSURE
How Downhole Temperatures, Pressures Affect Drilling, Part 1,
W75-11865 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 2, Detecting and Evaluating Formation Pressures,
W75-11866 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 3, Overpressure Detection from Wireline Methods,
W75-11867 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 9, Navel Ways to Detect Abnormal Pressure,
W75-11868 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 10, Miscellaneous Ways to Detect Abnormal Pressure,
W75-11869 8C

HIGH SEAS OIL PORTS ACT
High Seas Oil Port Act.
W75-12201 5G

HIGH WATER TABLE
Effective Use of High Water Table Areas for Sanitary Landfill. Volume I,
W75-12111 5E

HIGHWAYS EFFECTS
Conservation Soc'y. of Southern Vermont, Inc. V. Secretary of Transportation (Review of Motion for Equitable Injunction Against Stream Channelization Project).
W75-12282 6E

HIRATSUKA CITY
Hydrological Studies of Evapotranspiration and Groundwater Flow in Sandy Land,
W75-12032 2D

HISTORIC FLOODS
Flood Plain Information: Hassayampa River, Vicinity of Wickenburg, Arizona.
W75-12370 4A

HOSES
Floods Protection (Schutz vor Ueberschwemmungen).
W75-11946 4A

HOUSTON (TEX)
Flood Plain Information: Spring and Willow Creeks, Houston Metropolitan Area, Texas.
W75-12371 4

HUDSON ESTUARY
Biological and Chemical Mechanisms in Eutrophication of Freshwater Lakes,
W75-11992 5C

HUMAN DISEASES
Observations of the Guppy, Poecilia Reticulata Peters, in Culex Pipiens Fatigans Breeding Sites in Bangkok, Rangoon, and Taipei,
W75-11989 5G

HUMAN INFECTION
Studies on Effects of Cercarial Concentration and Length of Exposure on Infection of Mice by St. Lucian Schistosoma Mansoni Cercariae in a Natural Running-Water Habitat,
W75-11903 5C

HUMIDITY
An Infra-Red Psychrometer for Detecing Changes in the Humidity of Leaf Boundary Layers,
W75-12131 2I

HURRICAN STORM SURGES
Estimation of Hurricane Storm Surge in Apalachicola Bay, Florida,
W75-12164 2B

HURRICANES
Estimation of Hurricane Storm Surge in Apalachicola Bay, Florida,
W75-12164 2B

A Statistical Study of Tropical Cyclone Positioning Errors with Economic Applications,
W75-12166 2B

HYDRAULIC CONDUCTIVITY
Effect of Hysteresis on the Prediction of Infiltration, Redistribution and Drainage of Water in a Layered Soil,
W75-12041 2G

Diurnal and Seasonal Soil Water Uptake and Flux Within a Bermudagrass Root Zone,
W75-12082 2D

A One-Step Wetting Procedure for Determining Both Water Characteristic and Hydraulic Conductivity of a Soil Core,
W75-12084 2G

HYDRAULIC FRACTURING
Graphic Solution to Fracture Treatment Design,
W75-11876 8B

HYDRAULIC PIPELINE CLEANER
Hydraulic Sewer Pipeline Cleaner,
W75-11944 5D

HYDRAULIC SYSTEMS
Transformation System in Flood Runoff Phenomena,
W75-12016 2E

HYDROCARBONS
Geochemistry of Oil-Field Water Applied to Exploration,
W75-11879 4B

HYDROELECTRIC POWER
Solar Sea Thermal Energy.
W75-12196 3E

HYDROFLUORIC ACID
A New Look at Sandstone Acidizing,
W75-11878 4B

HYDROGEN ION CONCENTRATION
The Effect of Hydrogen in Concentrations in Simulated Rain on the Moss Tortula Ruralis (HEDW.)Sm,
W75-11987 5C

HYDROGEOLOGY
Geohydrology of Collier County, Florida,
W75-11874 4B

Hydrogeologic Data for the Lower Connecticut River Basin, Connecticut,
W75-19954 7C

HYDROGRAPHS
The Graphical Hydrographs Method With the Intermediary of Storm Overflows and Flood Retention Tanks (Das grafische Aflussganglinienverfahren mit Zwischenschaltung von RUE und RB),
W75-11861 5D

The Stochastic Kinematic Wave,
W75-12023 2A

Effects of Movement of Precipitation Area Upon Runoff Phenomena,
W75-12026 2A

HYDROLOGIC ASPECTS
A Particular Comparison of Annual Maxima and Partial Duration Series Methods of Flood Frequency Prediction,
W75-11929 2E

Flood Event Data Collation,
W75-11943 7C

Transformation System in Flood Runoff Phenomena,
W75-12016 2E

HYDROLOGIC DATA
Land Subsidence in the San Joaquin Valley, California, as of 1972,
W75-11956 4B

Flood Profiles in the Umpqua River Basin, Oregon: Part 3, Umpqua River Below Scottburg, Scholfield, Cow Creek Above Glendale,
W75-11959 4A

Quality of Surface Waters of the United States, 1970: Part 6. Missouri River Basin.
W75-11964 7C

Hydrogeologic Data for the Lower Connecticut River Basin, Connecticut,
W75-19954 7C

HYDROLOGIC SYSTEMS
Systems Approach to Hydrology.
W75-12014 2A

Stochastic Hydrologic Systems,
W75-12015 2A

The Structure of Inputs and Outputs of Hydrologic Systems,
W75-12017 2A

A Study of Long Range Runoff System Response Based on Information Theory,
W75-12018 2A

Nonlinear Runoff Kernels of Hydrologic System,
W75-12019 2A

Kernels of Stochastic Linear Hydrologic Systems,
W75-12021 2A

Hydrologic Systems in Hawaii,
W75-12022 2A

The Stochastic Kinematic Wave,
W75-12023 2A

Efficiency of Parameter and State Estimation Methods in Relation to Models of Lumped and Distributed Hydrologic Systems,
W75-12025 2A

Effects of Movement of Precipitation Area Upon Runoff Phenomena,
W75-12026 2A

HYDROLOGICAL MODELS
The Use of a Multizone Hydrologic Model With Distributed Rainfall and Distributed Parameters in the National Weather Service River Forecast System,
W75-12159 2B

HYDROLOGY
Systems Approach to Hydrology.
W75-12014 2A

Predictive Models for Great Lakes Hydrology,
W75-12049 2A

HYDROSTATIC PRESSURE
How Downhole Temperatures, Pressures Affect Drilling, Part 1,
W75-11865 8C

HYPOXIC CONDITION
Filtration of Neutral Red by Fresh Water Clams in Aerobic and Hypoxic Conditions,
W75-12192 5C

HYSTERESIS
Effect of Hysteresis on the Prediction of Infiltration, Redistribution and Drainage of Water in a Layered Soil,
W75-12041 2G

ICE
A Preliminary Study of the Formation of Landfast Ice at Barrow, Alaska, Winter 1973-74,
W75-12162 2C

Major Late-Winter Features of Ice in Northern Bering and Chukchi Seas as Determined From Satellite Imagery,
W75-12168 2C

ICE COVER
A Preliminary Study of the Formation of Landfast Ice at Barrow, Alaska, Winter 1973-74,
W75-12162 2C

ICE FORMATION
Major Late-Winter Features of Ice in Northern Bering and Chukchi Seas as Determined From Satellite Imagery,
W75-12168 2C

ICE NUCLEI
The Effect of Persistence of AgI on Randomized Weather Modification Experiments,
W75-12104 3B

ICE-WATER INTERFACES
A Preliminary Study of the Formation of Landfast Ice at Barrow, Alaska, Winter 1973-74,
W75-12162 2C

IDAHO
Introduction of Bills to Authorize the Replacement of the American Falls Dam in Idaho.
W75-12278 6E

ILLINOIS
Small-Scale Variability of Hail and its Significance for Hail Prevention Experiments,
W75-12092 3B

Design of a Hail Suppression Project for Illinois,
W75-12095 3B

Potential of Precipitation Modification in Moderate to Severe Droughts,
W75-12110 2B

Effluent Treatment for a Small Tannery,
W75-12118 5D

Ground-Water and Engineering Geology in Siting of Sanitary Landfills,
W75-12122 5E

Submerged Lands (State Title to Certain Submerged Lands).
W75-12288 6E

IMMERSION METHOD
Rapid Soil Moisture Determination by Immersion Method, (In Korean),
W75-12240 2G

IMPAIRED WATER QUALITY
Recirculating Resin Cleaning Chemical Feeder System for Water Softeners,
W75-12307 3D

IMPAIRED WATER USE
Recycling Allows Zero Wastewater Discharge,
W75-12364 5D

IMPLIED RESERVATION
United States V. Cappaert (Action for Declaration of Rights of United States to Underground Waters Appurtenant to Devil's Hole, Death Vally National Monument).
W75-12281 6E

IN SITU MINING
Turbo-Drilling as Applied to Potash Developments in the Saskatchewan Field,
W75-12397 8B

INCINERATION
Tough Solid-Waste Laws Brewing on Capitol Hill.
W75-12243 5G

INDIA
Training of Sutlej River Below Rupar Headworks for the Protection of Bist Doab Canal: Model Studies,
W75-11925 4D

INDIAN RESERVATIONS
A Proposal for the Quantification of Reserved Indian Water Rights,
W75-12249 6E

INDIAN WATER RIGHTS
A Proposal for the Quantification of Reserved Indian Water Rights,
W75-12249 6E

INDIANA
The Stochastic and Chronologic Structure of Rainfall Sequences - Application to Indiana,
W75-11854 2B

INDUSTRIAL PRODUCTION
International Economics and Environment Control,
W75-12178 6G

Economic Growth Vs. the Environment. A Bibliography,
W75-12182 6G

INDUSTRIAL WASTES
Efficiency of Measures for the Sanitary Protection of Surface Waters in the Region of Chemical Industry Enterprises, (In Russian),
W75-11977 5G

Some Aspects of Tannery Effluent Control,
W75-12123 5D

A River Restored: Oregon's Willamette,
W75-12210 5G

Meat Products Point Source Category--Effluent Guidelines and Standards.
W75-12273 5G

United States V. Dexter Corp. (Appeal by Sanitary District From Conviction for Discharge of Manufacturing Refuse into Navigable Waters).
W75-12283 6E

Method of Removing Heavy Metals from Water and Apparatus Therefor,
W75-12304 5D

Method for Processing Sludge,
W75-12312 5D

The Impact of Chemical Pollution on Water Utilizationnutzung),. (Chemische Gewaesserverunreinigung und Wasser
W75-12314 5B

How Well Are We Handling Toxic Waste.
W75-12342 5E

INFILTRATION
A Mobile Sprinkler Irrigation Facility for Measurement of Surface Runoff and Soil Erosion (Eine Transportable Beregnungsanlage fuer die Messung von Oberflaechenabfluss und Bodenabtrag),
W75-11948 7B

Effect of Hysteresis on the Prediction of Infiltration, Redistribution and Drainage of Water in a Layered Soil,
W75-12041 2G

INFILTRATION

Mathematical Analysis of Steady Saturated Flow Through a Multilayered Soil with a Sloping Surface,
W75-12044 2G

INFORMATION (PROSECUTION)
United States V. Dexter Corp. (Appeal by Sanitary District From Conviction for Discharge of Manufacturing Refuse into Navigable Waters).
W75-12283 6E

INFORMATION THEORY
A Study of Long Range Runoff System Response Based on Information Theory,
W75-12018 2A

INHIBITION
Effects of the Commercial Polychlorinated Biphenyl Mixture Aroclor 1242 on Growth, Viability, Phosphate Uptake, Respiration and Oxygen Evolation in Scenedesmus,
W75-11974 5C

INJECTION
A New Look at Sandstone Acidizing,
W75-11878 4B

INJECTION WELLS
Recycling Allows Zero Wastewater Discharge,
W75-12364 5D

INJUNCTIVE RELIEF
The Doctrine of Primary Jurisdiction Misconceived: End to Common Law Environmental Protection,
W75-12206 6G

Wyandotte and its Progency: The Quest for Environmental Protection through the Original Jurisdiction of the Supreme Court,
W75-12218 5G

Conservation Soc'y. of Southern Vermont, Inc. V. Secretary of Transportation (Review of Motion for Equitable Injunction Against Stream Channelization Project).
W75-12282 6E

Train V. City of New York (Class Action by City to Compel EPA to Allot Funds Authorized by the 1972 Federal Water Pollution Control Act Amendments).
W75-12284 6E

Train V. Campaign Clean Water, Inc. (Action by Environmental Group to Require EPA to Release Funds Authorized for Federal Grants to Municipalities for Water Pollution Control.
W75-12285 6E

Wetzel V. A. Duda and Sons (Action by Riparian Property Owners to Enjoin Water Pollution to Lake From Farming Operations).
W75-12286 6E

Borgmann V. Florissant Development Co (Action to Enjoin Adjoining Property Owners From Collecting and Discharging Surface Water onto Plaintiffs' Land).
W75-12289 6E

INLETS (WATERWAYS)
Cook Inlet Tidal Stream Atlas,
W75-12163 2L

INORGANIC COMPOUNDS
Process and Agents for Removal of Inorganic and Organic Matter From Waste Water Systems,
W75-11926 5D

Inorganics, (Literature Review),
W75-12072 5A

INPUT-OUTPUT ANALYSIS
The Structure of Inputs and Outputs of Hydrologic Systems,
W75-12017 2A

Nonlinear Runoff Kernels of Hydrologic System,
W75-12019 2A

Input-Output Analysis and the Environment,
W75-12177 6G

INSTALLATION
European Dewatering System Aids Quebec Project,
W75-11918 5D

INSTRUMENTATION
Lidar vs. Photometer, A One Month Comparison,
W75-12036 5A

Soil Water Measurement with an Inexpensive Spectrophotometer,
W75-12081 2G

Digester Gas: Valuable Plant Fuel,
W75-12332 8C

Recent Developments of Instrumentation, Control and Automation Systems for Wastewater Treatment Systems,
W75-12341 5D

INTENTIONAL TORTS
Wetzel V. A. Duda and Sons (Action by Riparian Property Owners to Enjoin Water Pollution to Lake From Farming Operations).
W75-12286 6E

INTERGOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION
1973 IMCO Conference on Marine Pollution From Ships.
W75-12202 5G

INTERNATION FIELD YEAR FOR THE GREAT LAKES
Variations of the Turbulent Fluxes of Momentum, Heat and Moisture over Lake Ontario,
W75-12078 2H

INTERNATIONAL AGREEMENTS
Basic Principles Relating to the International Regime of the Oceans at the Caracas Session of the U. N. Law of the Sea Conference,
W75-12253 6E

INTERNATIONAL COMMISSIONS
Will Baikal and Tahoe Be Saved,
W75-12012 5C

International Law, U.S. Seabeds Policy and Ocean Resource Development,
W75-12214 6E

The Allocation of Waters of International Rivers.
W75-12219 6E

INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS
1973 IMCO Conference on Marine Pollution From Ships.
W75-12202 5G

INTERNATIONAL ECONOMICS
International Economics and Environment Control,
W75-12178 6G

INTERNATIONAL LAW
1973 IMCO Conference on Marine Pollution From Ships
W75-12202 5G

The Integrative Potential of the Proposed International Regime for the Seabed
W75-12215 6E

The Law of the Sea: A Selective Bibliography of Articles, Documents and Monographs,
W75-12217 6E

The Allocation of Waters of International Rivers.
W75-12219 6E

The Development of European Regional Law of the Sea,
W75-12220 6E

Are We Any Nearer to an International Agreement on Use of the Seas,
W75-12224 6E

Liability for Oil Pollution Disasters: International Law and the Delimitation of Competences in a Federal Policy,
W75-12235 5G

Information Report on the Law of the Sea: Understanding the Debate of the Law of the Ocean Space.
W75-12252 6E

INTERNATIONAL LICENSING
Information Report on the Law of the Sea: Understanding the Debate of the Law of the Ocean Space.
W75-12252 6E

INTERNATIONAL REGULATORY
Information Report on the Law of the Sea: Understanding the Debate of the Law of the Ocean Space.
W75-12252 6E

INTERNATIONAL WATERS
Deepwater Port Act of 1974.
W75-12198 5G

The Integrative Potential of the Proposed International Regime for the Seabed.
W75-12215 6E

The Law of the Sea: A Selective Bibliography of Articles, Documents and Monographs,
W75-12217 6E

The Allocation of Waters of International Rivers.
W75-12219 6E

The Deepwater Ports Act of 1974; Half Speed Ahead,
W75-12229 5G

Information Report on the Law of the Sea: Understanding the Debate of the Law of the Ocean Space.
W75-12252 6E

INTERSTATE COMPACTS
Management of Interstate Ground Water,
W75-12251 4B

INVESTIGATIONS
1974 Annual Report of the Freshwater Biological Investigation Unit.
W75-12008 5C

**OWA**
Seasonal Prevalence of Chondrococcus Columnaris Infection in Black Bullheads from Clear Lake, Iowa,
W75-11995 5C

**RELAND**
The Management of Water in Northern Ireland, with Particular Reference to Water Pollution,
W75-11939 5G

1974 Annual Report of the Freshwater Biological Investigation Unit.
W75-12008 5C

**RON**
Iron and Steel Manufacturing Point Source Category--Effluent Guidelines and Standards.
W75-12264 5G

Iron and Manganese Removal with Ozone. Part II
W75-12315 5F

**RON SULFIDES**
Acid Mine Drainage in Cane Creek Basin, Near Oakman, Walker County, Alabama,
W75-11871 5G

**RRADIATION**
High Energy Electron Treatment of Water,
W75-12313 5D

**RRIGATION**
Spray Irrigation of Treated Municipal sewage,
W75-11856 5D

Supplemental Water Use in the Everglades Agricultural Area,
W75-12086 3F

Irrigation Apparatus,
W75-12302 3F

Emitter for Irrigation Systems,
W75-12303 3F

**RRIGATION EFFECTS**
Fungus Diseases of Wheat on Irrigated Lands. (In Russian),
W75-11904 2I

**RRIGATION EFFICIENCY**
Emitter for Irrigation Systems,
W75-12303 3F

**RRIGATION PRACTICES**
Supplemental Water Use in the Everglades Agricultural Area,
W75-12086 3F

Irrigation System Emitters with Renewable Filters,
W75-12310 3F

**RRIGATION SYSTEMS**
Trickle Irrigation System,
W75-12184 3F

Irrigation Apparatus,
W75-12302 3F

Irrigation System,
W75-12309 3F

Irrigation System Emitters with Renewable Filters,
W75-12310 3F

**RRIGATION WELLS**
Land Subsidence in the San Joaquin Valley, California, as of 1972,
W75-11956 4B

**ISGARD MODELS**
Input-Output Analysis and the Environment,
W75-12177 6G

**ISOTOPE STUDIES**
Use of Environmental Isotope Methods as a Reconnaissance Tool in Groundwater Exploration Near San Antonio de Pichincha, Ecuador,
W75-12080 2F

**ISRAEL**
N and P Distribution in Lake Kinneret (Israel) with Emphasis on Dissolved Organic Nitrogen,
W75-11975 5C

**ISSAQUAH CREEK (WASH)**
Special Flood Hazard Information: Issaquah and Tibbetts Creeks, Issaquah and Vicinity, Washington.
W75-12377 4A

**JAMES RIVER (VA)**
Flood Plain Information: James River, Howardsville to Scottsville, Albemarle County, Virginia.
W75-12375 4A

**JAPAN**
Systems Approach to Hydrology.
W75-12014 2A

Effects of Movement of Precipitation Area Upon Runoff Phenomena,
W75-12026 2A

An Application of Simulated Rainfall Models to Forecasting of the Long Term Variation of River Bed,
W75-12028 2J

Meteoro-Hydrological Aspects of Rainfall in Japan.
W75-12030 2B

Hydrological Studies of Evapotranspiration and Groundwater Flow in Sandy Land,
W75-12032 2D

Control System for Showa Water Purification Plant, (In Japanese),
W75-12147 5F

Mathematical Models and Simulation of Wastewater Treatment Systems,
W75-12156 5D

Recent Developments of Instrumentation, Control and Automation Systems for Wastewater Treatment Systems,
W75-12341 5D

**JET DRILLING**
Tests Show Jet Drilling Has Promise,
W75-11880 8C

**JETS**
Tests Show Jet Drilling Has Promise,
W75-11880 8C

**JOINTS (CONNECTIONS)**
Flexible Joint for Sewer Pipe,
W75-11931 5D

**JUDICIAL DECISIONS**
The Federal Common Law of Accretion: A New Element in Property Law,
W75-12205 6E

The Doctrine of Primary Jurisdiction Misconceived: End to Common Law Environmental Protection,
W75-12206 6G

The Florida Environmental Protection Act of 1971: The Citizen's Role in Environmental Management,
W75-12207 6G

Pollution Control Under the Pennsylvania Clean Streams Law,
W75-12209 5G

Litigation Under the Federal Water Pollution Control Act Amendments of 1974,
W75-12212 5G

Wyandotte and its Progency: The Quest for Environmental Protection through the Original Jurisdiction of the Supreme Court,
W75-12218 5G

Toxic Waters (Discussion of Recent Federal Action Against Water Pollution).
W75-12230 5G

A NEPA Settlement: Conservation Council of North Carolina v. Froehlke,
W75-12244 6E

United States V. Cappaert (Action for Declaration of Rights of United States to Underground Waters Appurtenant to Devil's Hole, Death Vally National Monument).
W75-12281 6E

Conservation Soc'y. of Southern Vermont, Inc. V. Secretary of Transportation (Review of Motion for Equitable Injunction Against Stream Channelization Project).
W75-12282 6E

United States V. Dexter Corp. (Appeal by Sanitary District From Conviction for Discharge of Manufacturing Refuse into Navigable Waters).
W75-12283 6E

Train V. City of New York (Class Action by City to Compel EPA to Allot Funds Authorized by the 1972 Federal Water Pollution Control Act Amendments).
W75-12284 6E

Train V. Campaign Clean Water, Inc. (Action by Environmental Group to Require EPA to Release Funds Authorized for Federal Grants to Municipalities for Water Pollution Control.
W75-12285 6E

Wetzel V. A. Duda and Sons (Action by Riparian Property Owners to Enjoin Water Pollution to Lake From Farming Operations).
W75-12286 6E

Borgmann V. Florissant Development Co (Action to Enjoin Adjoining Property Owners From Collecting and Discharging Surface Water onto Plaintiffs' Land).
W75-12289 6E

Validity, Under Federal Constitution, of State Statute or Local Ordinance Regulating Phosphate Content of Detergents,
W75-12293 6E

Tarshis v. Lahaina Investment Corp. (Responsibility of Owner of Beach Front Property to Warn of Surging Wave).
W75-12296 6E

**JURISDICTION**
The Doctrine of Primary Jurisdiction Misconceived: End to Common Law Environmental Protection,
W75-12206 6G

Litigation Under the Federal Water Pollution Control Act Amendments of 1974,
W75-12212 5G

The Integrative Potential of the Proposed International Regime for the Seabed.
W75-12215 6E

Wyandotte and its Progency: The Quest for Environmental Protection through the Original Jurisdiction of the Supreme Court,
W75-12218 5G

KANNA RIVER
Effects of Movement of Precipitation Area Upon Runoff Phenomena,
W75-12026 2A

KAOLINITE
Study on Direct Rapid Filtration Using Reduced Coagulants, (In Japanese),
W75-11860 5D

KINEMATIC WAVE
The Stochastic Kinematic Wave,
W75-12023 2A

KINEMATIC WAVE THEORY
Systems Simulation of Streamflows,
W75-12024 2E

KONAKOVO (USSR)
Hygienic Effectiveness of Measures for Treating the Industrial Wastewaters of the Konakovo State Regional Electric Power Plant, (In Russian),
W75-11984 5D

LABOR
Crew Training,
W75-12385 8G

LABORATORY TESTS
Column Settling Tests for Flocculant Suspensions,
W75-12322 5D

LAKE BAIKAL (USSR)
Will Baikal and Tahoe Be Saved,
W75-12012 5C

LAKE BASINS
1974 Annual Report, Great Lakes Basin Commission.
W75-12238 5G

LAKE CIRCULATION
Coastwise Currents in the Vicinity of Chicago, and Currents Elsewhere in Southern Lake Michigan,
W75-12161 2H

LAKE CURRENTS
Coastwise Currents in the Vicinity of Chicago, and Currents Elsewhere in Southern Lake Michigan,
W75-12161 2H

LAKE DGAL MALY (POLAND)
Distribution and Biomass of Macrophytes in Lake Dgal Maly,
W75-11993 8I

LAKE FISHERIES
Distribution and Biomass of Macrophytes in Lake Dgal Maly,
W75-11993 8I

LAKE JASNE (POLAND)
Studies on Metabolic Activity of Benthic Bacteria Isolated from Three Lakes,
W75-11988 5C

LAKE JEZIORAK (POLAND)
Studies on Metabolic Activity of Benthic Bacteria Isolated from Three Lakes,
W75-11988 5C

LAKE KINNERET (ISRAEL)
N and P Distribution in Lake Kinneret (Israel) with Emphasis on Dissolved Organic Nitrogen,
W75-11975 5C

LAKE LANAO (PHILIPPINES)
Primary Production in the Plankton Community of a Tropical Lake,
W75-11978 5C

LAKE MICHIGAN
Coastwise Currents in the Vicinity of Chicago, and Currents Elsewhere in Southern Lake Michigan,
W75-12161 2H

LAKE OKEECHOBEE
Supplemental Water Use in the Everglades Agricultural Area,
W75-12086 3F

LAKE ONTARIO
Variations of the Turbulent Fluxes of Momentum, Heat and Moisture over Lake Ontario,
W75-12078 2H

The Spatial and Temporal Variations of the Turbulent Fluxes of Heat, Momentum and Water Vapor over Lake Ontario,
W75-12079 2D

LAKE QUENOUILLE (QUEBEC)
Daily Fall Activity and Direction of Movements of Fish in Lake Quenouille in the Laurentians, (In French),
W75-12064 2H

LAKE SUPERIOR
Response of Lake Superior Algae to Nutrients and Taconite Tailings,
W75-11976 5C

Toxic Waters (Discussion of Recent Federal Action Against Water Pollution).
W75-12230 5G

LAKE TAHOE (CALIF)
Danger Signs for Tahoe's Future,
W75-12002 5C

LAKE TAHOE (CALIF.-NEV.)
Will Baikal and Tahoe Be Saved,
W75-12012 5C

LAKE TYNWALD (POLAND)
Studies on Metabolic Activity of Benthic Bacteria Isolated from Three Lakes,
W75-11988 5C

LAKE WARNIAK (POLAND)
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. XIV. The Relations Between the Fish and Other Biocenotic Components (Summing Up the Studies),
W75-11998 8I

Experimentally Increased Fish Stock in the Pond Type Lake Warniak. XIII. Distribution and Biomass of the Lemnaceae and the Fauna Associated with Them,
W75-12009 8I

Experimentally Increased Fish Stock in the Pond Type Lake Warniak. VI. Biomass and Production of Phytoplankton,
W75-12013 5C

LAKE WINNIPEG (MANITOBA)
Rates of Supply of Nitrogen and Phosphorus to Lake Winnipeg, Manitoba, in Relation to the Diversion of Missouri River Water Into the Red and Assiniboine Rivers,
W75-12006 5C

LAKE WOHLFORD RESERVOIR (CALIF)
Aeration Upgrades Reservoir,
W75-12346 5F

LAKEFRONT DEVELOPMENT
City of Lake Charles; Reclamation and Development of Lake Front.
W75-12298 6E

LAKES
Primary Production in the Plankton Community of a Tropical Lake,
W75-11978 5C

Classification of Wisconsin Lakes by Trophic Condition.
W75-11979 5C

Experimentally Increased Fish Stock in the Pond Type Lake Warniak. XIV. The Relations Between the Fish and Other Biocenotic Components (Summing Up the Studies),
W75-11998 8I

The Lake as Ecosystem,
W75-11999 2H

Danger Signs for Tahoe's Future,
W75-12002 5C

Wetzel V. A. Duda and Sons (Action by Riparian Property Owners to Enjoin Water Pollution to Lake From Farming Operations).
W75-12286 6E

LAND CLASSIFICATION
Evaluating the Productivity of Pine Forests in the Hinton-Edson Area, Alberta, From Soil Survey Maps,
W75-12003 4A

LAND DEVELOPMENT
City of Lake Charles; Reclamation and Development of Lake Front.
W75-12298 6E

LAND MANAGEMENT
Land Use Controls Under the Federal Water Pollution Control Act: A Citizen's Guide,
W75-12237 5G

Water Bank Program.
W75-12259 6E

City of Lake Charles; Reclamation and Development of Lake Front.
W75-12298 6E

LAND RECLAMATION
Submerged Lands (State Title to Certain Submerged Lands).
W75-12288 6E

City of Lake Charles; Reclamation and Development of Lake Front.
W75-12298 6E

LAND SUBSIDENCE
Land Subsidence in the San Joaquin Valley, California, as of 1972,
W75-11956 4B

Land Subsidence Due to Ground-Water Withdrawal in the Los Banos-Kettleman City Area, California, Part 2. Subsidence and Compaction of Deposits,
W75-11957 4B

Land Subsidence Due to Ground-Water Withdrawal in the Los Banos-Kettleman City Area, California, Part 3. Interrelations of Water-Level Change, Change in Aquifer-System Thickness, and Subsidence,
W75-11958 4B

LAND USE
Land Use Controls Under the Federal Water Pollution Control Act: A Citizen's Guide,
W75-12237 5G

LANDFAST ICE
A Preliminary Study of the Formation of Landfast Ice at Barrow, Alaska, Winter 1973-74,
W75-12162 2C

LANDFILLS
Effective Use of High Water Table Areas for Sanitary Landfill. Volume I,
W75-12111 5E

Pollution of Groundwater Due to Municipal Dumps,
W75-12119 5B

Hydrogeological Aspects of Solid Waste Disposal,
W75-12121 5E

Ground-Water and Engineering Geology in Siting of Sanitary Landfills,
W75-12122 5E

Tough Solid-Waste Laws Brewing on Capitol Hill.
W75-12243 5G

LAW ENFORCEMENT
United States V. Dexter Corp. (Appeal by Sanitary District From Conviction for Discharge of Manufacturing Refuse into Navigable Waters).
W75-12283 6E

LAW OF THE SEA
International Law, U.S. Seabeds Policy and Ocean Resource Development,
W75-12214 6E

Basic Principles Relating to the International Regime of the Oceans at the Caracas Session of the U. N. Law of the Sea Conference,
W75-12253 6E

LAX-WENDROFF SCHEME
Systems Simulation of Streamflows,
W75-12024 2E

LEACHATE
Pollution of Groundwater Due to Municipal Dumps,
W75-12119 5B

LEAKAGE
1973 IMCO Conference on Marine Pollution From Ships.
W75-12202 5G

LEATHER INDUSTRY
The Effect of Legislation of the Future Use of Water in the Leather Industry,
W75-12112 5D

LEAVES
Phenolic Compounds of Wheat Leaves Under Drought Stress,
W75-11905 2I

An Infra-Red Psychrometer for Detecing Changes in the Humidity of Leaf Boundary Layers,
W75-12131 2I

LEBISTES RETICULATUS
Detection of Pollutants by Fish Tests,
W75-12193 5A

LEGAL ASPECTS
Uses of Scientific Information in Environmental Decision-Making,
W75-12204 6G

The Florida Environmental Protection Act of 1971: The Citizen's Role in Environmental Management,
W75-12207 6G

Federal Water Pollution Control Act Amendments of 1972,
W75-12221 5G

A Solution to the Problem of Private Compensation in Oil Discharge Situations,
W75-12254 5G

LEGAL DAMAGES
Water Supply.
W75-12297 6E

LEGISLATION
Ocean Dumping Oversight.
W75-12194 5G

Diversion and Withdrawal of Additional Water from Lake Michigan into the Illinois Waterway.
W75-12197 4A

Deepwater Port Act of 1974.
W75-12198 5G

High Seas Oil Port Act.
W75-12201 5G

The Florida Environmental Protection Act of 1971: The Citizen's Role in Environmental Management,
W75-12207 6G

Federal Water Pollution Control Act Amendments of 1972,
W75-12221 5G

The Deepwater Ports Act of 1974; Half Speed Ahead,
W75-12229 5G

Water Bank Program.
W75-12259 6E

Water Conservation in Sweden: II. Pollution Control,
W75-12317 5G

Liaison with Planning Authorities-A Vital Link,
W75-12335 6E

Historical and Legal Aspects of NEPA,
W75-12337 6G

LERNAEA
Effect of Bromex-50 on Plankton Population in Fish Ponds,
W75-12188 5C

LEVEES
City of Lake Charles; Reclamation and Development of Lake Front.
W75-12298 6E

LIABILITY (LEGAL ASPECTS)
The Florida Environmental Protection Act of 1971: The Citizen's Role in Environmental Management,
W75-12207 6G

A Solution to the Problem of Private Compensation in Oil Discharge Situations,
W75-12254 5G

LICENSES
Deepwater Port Act of 1974.
W75-12198 5G

High Seas Oil Port Act.
W75-12201 5G

LIDA
Lidar vs. Photometer, A One Month Comparison,
W75-12036 5A

LIFE HISTORY STUDIES
Life History, Ecology, and Management of the Carp, Cyprinus Carpio Linnaeus, in Elephant Butte Lake.
W75-11972 6B

Life History Notes and Meristic Variation in the Freshwater Fourspine Stickleback, Apeltes Quadracus (Mitchill), Near Sept-Iles: Quebec,
W75-12176 2I

LIMNOLOGY
Limnology of Lakes of the Sylvania Recreation Area, Ottawa National Forest,
W75-11981 2H

LINGINGS
Running and Cementing Deep Well Liners,
W75-11895 8F

LININGS
Pipe Relining Method and Apparatus,
W75-11945 8G

LITTORAL DRIFT
Small Groins on the Shores of Long Island Sound,
W75-12046 8A

LOBLOLLY PINE TREES
Relative Throughfall Enrichment by Biologic and by Aerosol-Derived Materials in Loblolly Pines,
W75-11853 5B

LOCAL GOVERNMENTS
Validity, Under Federal Constitution, of State Statute or Local Ordinance Regulating Phosphate Content of Detergents,
W75-12293 6E

LOCATION
Deciphering of Ground Water from Aerial Photographs,
W75-11882 4B

LODGEPOLE PINE TREES
Evaluating the Productivity of Pine Forests in the Hinton-Edson Area, Alberta, From Soil Survey Maps,
W75-12003 4A

LONG ISLAND SOUND
Small Groins on the Shores of Long Island Sound,
W75-12046 8A

LONG-TERM PLANNING
Planning Models for Water System Development in Mississippi Communities,
W75-11851 6D

LOUISIANA
The Flood of April 1974 in Southern Mississippi and Southeastern Louisiana,
W75-12170 2E

**LOUISIANA**

City of Lake Charles; Reclamation and Development of Lake Front.
W75-12298 6E

New Orleans Chooses Oxygen Activated Sludge.
W75-12318 5D

**LOWER CONNECTICUT RIVER BASIN**
Hydrogeologic Data for the Lower Connecticut River Basin, Connecticut,
W75-19954 7C

**LUMBER**
Timber Products Processing Point Source Category--Effluent Guidelines and Standards.
W75-12267 5G

Timber Products--Proposed Effluent Guidelines and Performances and Pretreatment Standards for New Sources.
W75-12270 5G

**MACROPHYTES**
Distribution and Biomass of Macrophytes in Lake Dgal Maly,
W75-11993 8I

**MACUNGIE (PA)**
River Crossing Permits for Buckeye Pipe Line Co. Proposed Petroleum Products Pipeline System Between Linden, New Jersey and Macungie, Pennsylvania (Final Environmental Impact Statement).
W75-12258 8A

**MAGNESITE**
Studies in the System CaCO:-FeCO3: 1. Phase Relations; 2. A Method for Major-Element Spectrochemical Analysis; 3. Compositions of Some Ferroan Dolomites,
W75-12400 2F

**MAMALA BAY**
Mamala Bay Wastewater Treatment and Disposal System, Oahu, Hawaii (Final Environmental Impact Statement).
W75-12257 5D

**MANAGEMENT**
1974 Annual Report, Great Lakes Basin Commission.
W75-12238 5G

**MANGANESE**
Iron and Manganese Removal with Ozone. Part II
W75-12315 5F

**MANITOBA**
Geochemistry and Nutrient Regime of Saline Eutrophic Lakes in the Erickson-Elphinstone District of Southwestern Manitoba.
W75-11982 5C

**MANOMETERS**
Measurement of Extremely Small Pressure Differences in Water,
W75-11915 7B

**MANPOWER**
Crew Training,
W75-12385 8G

**MARINE FISHERIES**
Fisheries Economics. A Bibliography,
W75-12181 3E

**MARINE GEOLOGY**
Assessment of Offshore Dumping in the New York Bight, Technical Background: Physical Oceanography, Geological Oceanography, and Chemical Oceanography.
W75-12171 5B

**MARINE PROTECTION**
Ocean Dumping Oversight.
W75-12194 5G

**MARINE PROTECTION RESEARCH AND SANCTUARIES ACT OF 1972**
Ocean Dumping Oversight.
W75-12194 5G

**MARINE SANCTUARIES**
Marine Sanctuaries.
W75-12261 6E

**MATHEMATICAL MODELS**
Displacement Stability of Water Drives in Water-Wet Connate-Water-Bearing Reservoirs,
W75-11870 4B

The Effect of Surface Kinetics in Fracture Acidizing,
W75-11887 8B

A Mathematical Model for Head-Discharge Relationships for Various Ferrule-House Service Pipe Combinations,
W75-11906 8B

The Structure of Inputs and Outputs of Hydrologic Systems,
W75-12017 2A

Kernels of Stochastic Linear Hydrologic Systems,
W75-12021 2A

Systems Simulation of Streamflows,
W75-12024 2E

Simulation of the Short-Time Scour-Fill Process in Erodible Streams with Stochastic Sediment Transfer at the Stream Bed,
W75-12029 2J

A Note on the Elevation of the Mean and the Mode of the Gaussian Concentration Distribution,
W75-12035 5A

The Simple ATDL Urban Air Pollution Model,
W75-12038 5A

Dispersion and Settling Around a Waste Disposal Point in a Shallow Sea,
W75-12043 5B

A Numerical Model of Precipitation from Seeded and Unseeded Cold Orographic Clouds,
W75-12098 3B

Mathematical Models and Simulation of Wastewater Treatment Systems,
W75-12156 5D

Input-Output Analysis and the Environment,
W75-12177 6G

**MATHEMATICAL STUDIES**
The Water Relations of Hemlock (Tsuga Canadensis): III. The Temperature Dependence of Water Exchange in a Pressure Bomb,
W75-11902 2I

A Practical Proportional Weir,
W75-11937 8C

Swirling Laminar Pipe Flow of Suspensions,
W75-11938 8B

Effect of an Error in Discharge Measurements on the Detection Process in Runoff Systems Analysis,
W75-12020 2A

**MATRIC WATER**
Survey of the Matric Water of Various Plant Groups,
W75-11883 2I

**MATRIX STIMULATION**
Reservoir Properties Affecting Matrix Acid Stimulation of Sandstones,
W75-11894 4B

**MAXIMUM PROBABLE FLOOD**
A Study of Flash-Flood Occurrences at a Site Versus Over a Forecast Zone,
W75-12174 2E

**MEASUREMENT**
How Downhole Temperatures, Pressures Affect Drilling, Part 2, Detecting and Evaluating Formation Pressures,
W75-11866 8C

Measurement of Extremely Small Pressure Differences in Water,
W75-11915 7B

Pipe Flow Measurements by the Pulse Velocity Method with Radioactive Isotopes,
W75-11916 8G

Lidar vs. Photometer, A One Month Comparison,
W75-12036 5A

On the Effect of Natural Rainfall Variability and Measurement Errors in the Detection of Seeding Effect,
W75-12103 3B

**MEASUREMENT ERRORS**
On the Effect of Natural Rainfall Variability and Measurement Errors in the Detection of Seeding Effect,
W75-12103 3B

**MEHERRIN RIVER (VA)**
Flood Plain Information: Meherrin River, Emporia, Virginia.
W75-12368 4A

**MEMBRANE PROCESSES**
On The Comparison of Reverse Osmosis Membrane Performance,
W75-12347 3A

**MERCURY**
Mercury Concentrations in Open Ocean Waters: Sampling Procedure,
W75-11953 5A

Wyandotte and its Progency: The Quest for Environmental Protection through the Original Jurisdiction of the Supreme Court,
W75-12218 5G

**MERCURY POLLUTION**
Wyandotte and its Progency: The Quest for Environmental Protection through the Original Jurisdiction of the Supreme Court,
W75-12218 5G

**MERISTIC VARIATION**
Life History Notes and Meristic Variation in the Freshwater Fourspine Stickleback, Apeltes Quadracus (Mitchill), Near Sept-Iles: Quebec,
W75-12176 2I

METABOLISM
The Uptake and Utilization of Organic Carbon by Algae: An Essay in Comparative Biochemistry,
W75-11980 5C

Studies on Metabolic Activity of Benthic Bacteria Isolated from Three Lakes,
W75-11988 5C

Phosphorus Metabolism and Respiration in Wheat Leaves and Roots in the Case of Water Defiency, (In Russian),
W75-12362 3F

METALS
Extractable Metals in Mixtures of Soil and Sewage Sludge,
W75-12141 5D

Chemical Tests for Plant Available Metals in Soils.
W75-12142 5A

Floating Aquatic Plants Remove Chemicals From Polluted Waters.
W75-12145 5G

Nonferrous Metals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Limitations.
W75-12276 5G

METEOROLOGY
Weather Modification: Where are We Now and Where Should We Be Going. An Editorial Overview,
W75-12088 3B

METHANE
Digester Gas: Valuable Plant Fuel,
W75-12332 8C

METHODOLOGY
Detection of Pollutants by Fish Tests,
W75-12193 5A

Saving Our Water Resources,
W75-12232 6G

METHYLTHYMOL BLUE METHOD
Application of the Methylthymol Blue Sulfate Method to Water and Wastewater Analysis,
W75-12324 5A

MICHIGAN
Limnology of Lakes of the Sylvania Recreation Area, Ottawa National Forest,
W75-11981 2H

Distribution of Aquatic Macrophytes Related to Paper Mill Effluents in a Southern Michigan Stream,
W75-11991 2B

MICROBIAL DEGRADATION
We're Fighting Oil Pollution with Bubbles, Belts and Beads,
W75-12225 5G

MICROBIOLOGY
Microbiology of a Former Dredge Spoil Disposal Area,
W75-12191 5C

MICROCYSTIS AERUGINOSA
Endocytosis of Microcystis Aeruginosa by Ochromonas Danica,
W75-11985 5C

MILLS
Grain Mills Point Source Category--Effluent Limitations Guidelines and Standards.
W75-12274 5G

MINE ACIDS
Acid Mine Drainage in Cane Creek Basin, Near Oakman, Walker County, Alabama,
W75-11871 5G

MINE DRAINAGE
Coal Mine Drainage Pollution--1973,
W75-12114 5G

Sodium Hydroxide Treatment of Acid Mine Drainage,
W75-12116 5G

Mine Drainage Abstracts, A Bibliography. 1972 Supplement.
W75-12158 5B

Pollution Control Under the Pennsylvania Clean Streams Law,
W75-12209 5G

MINE WASTES
Pollution Control Under the Pennsylvania Clean Streams Law,
W75-12209 5G

MINE WATER
Pollution Control Under the Pennsylvania Clean Streams Law,
W75-12209 5G

Ground Water and Ground-Water Control,
W75-12386 4B

MINERAL COMPOSITION
Reservoir Properties Affecting Matrix Acid Stimulation of Sandstones,
W75-11894 4B

MINING
Pollution Control Under the Pennsylvania Clean Streams Law,
W75-12209 5G

Toxic Waters (Discussion of Recent Federal Action Against Water Pollution).
W75-12230 5G

Ground Water and Ground-Water Control,
W75-12386 4B

Fragmentation.
W75-12387 8E

Specialized Underground Extraction Systems.
W75-12388 8B

Control of Groundwater at Bancroft Mines, Zambia,
W75-12395 4B

Recent Application of Geophysical Methods in Coal Mining,
W75-12396 8B

Turbo-Drilling as Applied to Potash Developments in the Saskatchewan Field,
W75-12397 8B

Application of Well Logging Techniques to Mining Exploration Boreholes,
W75-12398 8G

MISSISSIPPI
Planning Models for Water System Development in Mississippi Communities,
W75-11851 6D

The Flood of April 1974 in Southern Mississippi and Southeastern Louisiana,
W75-12170 2E

MISSOURI RIVER BASIN
Quality of Surface Waters of the United States, 1970: Part 6. Missouri River Basin.
W75-11964 7C

Surface Water Supply of the United States, 1966-70: Part 6. Missouri River Basin--Volume 1. Missouri River Basin above Williston, North Dakota.
W75-11968 7C

MIST IRRIGATION
Irrigation System,
W75-12309 3F

MIXED AND BLEND FERTILIZERS
Fertilizer Manufacturing Point Source Category--Effluent Limitations and Guidelines.
W75-12272 5G

MIXING
Transfer of Heat, Fresh Water and Nutrients Through the Seasonal Thermocline,
W75-11994 5C

MIXING ZONE
Photographic Quantification of Water Quality in Mixing Zones,
W75-11970 5A

MODE OF ACTION
The Water Relations of Hemlock (Tsuga Canadensis): II. The Kinetics of Water Exchange Between the Symplast and Apolast,
W75-11901 2I

A Quantitative Measure of Succession Rate and Its Application to the Phytoplankton of Lakes,
W75-12005 5C

MODEL STUDIES
Training of Sutlej River Below Rupar Headworks for the Protection of Bist Doab Canal: Model Studies,
W75-11925 4D

Computer's Master Plan Signals Sewer Problems Before They Start,
W75-11928 7C

Experiments with Unconventional Storm Overflows,
W75-11940 5D

The Structure of Inputs and Outputs of Hydrologic Systems,
W75-12017 2A

Efficiency of Parameter and State Estimation Methods in Relation to Models of Lumped and Distributed Hydrologic Systems,
W75-12025 2A

Effects of Movement of Precipitation Area Upon Runoff Phenomena,
W75-12026 2A

Environmental Research Laboratories, 1973 Annual Report.
W75-12033 5A

A Note on the Elevation of the Mean and the Mode of the Gaussian Concentration Distribution,
W75-12035 5A

Application of a Simple Dispersion Model to a Rural Industrial Region,
W75-12037 5A

The Simple ATDL Urban Air Pollution Model,
W75-12038 5A

Predictive Models for Great Lakes Hydrology,
W75-12049 2A

A Detailed Microphysical Simulation of Hygroscopic Seeding on the Warm Rain Process,
W75-12090 3B

A Numerical Model of Precipitation from Seeded and Unseeded Cold Orographic Clouds,
W75-12098 3B

Estimation of Hurricane Storm Surge in Apalachicola Bay, Florida,
W75-12164 2B

MODEL UNCERTAINTIES
A Bayesian Framework for the Use of Regional Information in Hydrology,
W75-12048 6A

MOISTURE STRESS
Phenolic Compounds of Wheat Leaves Under Drought Stress,
W75-11905 2I

MOLLUSCS
Filtration of Neutral Red by Fresh Water Clams in Aerobic and Hypoxic Conditions,
W75-12192 5C

MOLLUSKS
Toxicity of Copper Complexes to RFreshwater Mollusks,
W75-11863 5C

MONITORING
A Radioisotope Monitoring System for Sewage Effluent,
W75-11914 5A

New Computer System Monitors Baton Rouge Sewers.
W75-11927 7C

The Mussel Watch--A First Step in Global Marine Monitoring,
W75-12187 5B

Environmental Water Quality Program,
W75-12331 5G

MONORAPHIDIUM BRAUNII
Morphology and Ultrastructure of Some Chlorococcal Algae from the Collection pf Algal Strains in Leningrad University. II. Monoraphidium Braunii (Nag, in Kutz.) Komarkova-Legnerova Strain (Gromov) 1967/231,
W75-11997 5C

MONTE CARLO METHOD
A Statistical Study of Tropical Cyclone Positioning Errors with Economic Applications,
W75-12166 2B

MOORES CREEK (VA)
Flood Plain Information: Moores Creek, Albemarle County and Charlottesville, Virginia.
W75-12366 4A

MOSQUITO CONTROL
Observations of the Guppy, Poecilia Reticulata Peters, in Culex Pipiens Fatigans Breeding Sites in Bangkok, Rangoon, and Taipei,
W75-11989 5G

MOSSES
The Effect of Hydrogen in Concentrations in Simulated Rain on the Moss Tortula Ruralis (HEDW )Sm,
W75-11987 5C

MOUNTAINS
Pressure Control in a Mountain Area Water System.
W75-12343 8C

MUD
Impact of Intracoastal Waterway Maintenance Dredging on a Mud Bottom Benthos Community,
W75-12189 5C

MUD-WATER INTERFACES
The Utilization of Phosphorus from Muds by the Phytoplankter, Scenedesmus Dimorphus, and the Significance of These Findings to the Practice of Pond Fertilization,
W75-11986 5C

MUNICIPAL WASTES
United States V. Dexter Corp. (Appeal by Sanitary District From Conviction for Discharge of Manufacturing Refuse into Navigable Waters).
W75-12283 6E

How Well Are We Handling Toxic Waste.
W75-12342 5E

Water Quality Management in a Metropolitan Area,
W75-12354 5G

MUNICIPAL WATER
Treatment Plant to be Tested for Carcinogens,
W75-12130 5F

Unusual Features in Plant Design.
W75-12146 5F

Iron and Manganese Removal with Ozone. Part II
W75-12315 5F

MUSKAT MODEL
Displacement Stability of Water Drives in Water-Wet Connate-Water-Bearing Reservoirs,
W75-11870 4B

MUSSELS
The Mussel Watch--A First Step in Global Marine Monitoring,
W75-12187 5B

NATIONAL DAM SAFETY ACT OF 1972
Corps' Guidelines for Dam Safety Inspection Need Revamping,
W75-12241 8A

NATIONAL ENVIRONMENTAL POLICY ACT
The Fifth Annual Report of the Council on Environmental Quality.
W75-12203 6G

Litigation Under the Federal Water Pollution Control Act Amendments of 1974,
W75-12212 5G

The Rush for Offshore Oil and Gas: Where Things Stand on the Outer Continental Shelf.
W75-12222 5G

Conservation Soc'y. of Southern Vermont, Inc. V. Secretary of Transportation (Review of Motion for Equitable Injunction Against Stream Channelization Project).
W75-12282 6E

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)
Historical and Legal Aspects of NEPA,
W75-12337 6G

NATIONAL SEASHORE
Critical Choices Save Shoreline,
W75-12231 6G

NATURAL FLOW DOCTRINE
Borgmann V. Florissant Development Co (Action to Enjoin Adjoining Property Owners From Collecting and Discharging Surface Water onto Plaintiffs' Land).
W75-12289 6E

NAVIGABLE WATERS
Federal Water Pollution Control Act Amendments of 1972,
W75-12221 5G

A Solution to the Problem of Private Compensation in Oil Discharge Situations,
W75-12254 5G

Permits for Activities in Navigable Waters or Ocean Waters.
W75-12263 6E

NAVIGATION OBSTRUCTIONS
United States V. Dexter Corp. (Appeal by Sanitary District From Conviction for Discharge of Manufacturing Refuse into Navigable Waters).
W75-12283 6E

NAVIGATIONAL OBSTRUCTIONS
Permits for Activities in Navigable Waters or Ocean Waters.
W75-12263 6E

NECHES RIVER (TEXAS)
Water Quality and Salt Water Intrusion in the Lower Neches River,
W75-12327 5C

NEGLIGENCE
Tarshis v. Lahaina Investment Corp. (Responsibility of Owner of Beach Front Property to Warn of Surging Wave).
W75-12296 6E

NEPA
Recognition of Substantive Rights Under NEPA,
W75-12250 6E

NEVADA
Southern Nevada Water Project.
W75-11913 3B

NEW JERSEY
The Use of a Specialized Drilling and Ground Water Sampling Technique for Delineation of Hexavalent Chromium Contamination in an Unconfined Aquifer, Southern New Jersey Coastal Plain,
W75-11899 5A

NEW MEXICO
The Effect of Persistence of AgI on Randomized Weather Modification Experiments,
W75-12104 3B

NEW YORK
Yaphank County Center Wastewater Treatment Plant.
W75-11924 5D

Small Groins on the Shores of Long Island Sound,
W75-12046 8A

Water Supply.
W75-12297 6E

Flood Plain Information: Ellicott Creek in the Towns of Lancaster and Alden and the Village of Alden, Erie County, New York.
W75-12365 6F

lood Plain Information: Tonawanda Creek nd Its Affected Tributaries, Erie and Niagara ounties, New York.
/75-12373 2E

**W YORK BIGHT**
ssessment of Offshore Dumping in the New ork Bight, Technical Background: Physical ceanography, Geological Oceanography, and hemical Oceanography.
/75-12171 5B

cean Dumping in the New York Bight,
/75-12172 5B

**W YORK STATE BARGE CANAL**
lood Plain Information: Tonawanda Creek nd Its Affected Tributaries, Erie and Niagara ounties, New York.
/75-12373 2E

**WPORT (RI)**
Vater System of Newport, Rhode Island and s Recent Improvements,
/75-11910 5F

**NTIC RIVER (CONN)**
Growth of the Green Alga Codium Fragile in a Connecticut Estuary,
/75-12051 5C

**COTIANA-GLAUCA**
An Infra-Red Psychrometer for Detecing Changes in the Humidity of Leaf Boundary Layers,
/75-12131 2I

**TRILOTRIACETIC ACID**
Determination of NTA in Environmental Water y Gas Chromatography,
/75-12363 5A

**TROGEN**
N and P Distribution in Lake Kinneret (Israel) vith Emphasis on Dissolved Organic Nitrogen,
/75-11975 5C

Effects of Aerial Forest Fertilization With Urea Pellets on Nitrogen Levels in a Mountain Stream,
/75-12113 5B

Activity of Enzymes (Protease and Urease) and Forms of Mobile Nitrogen in Thin Peat Soil of he Second Year of Use, (In Russian),
/75-12216 5B

Nitrogen, Phosphorus, and Eutrophication in he Coastal Marine Environment,
/75-12236 5C

**TROGEN CYCLE**
Nitrogen Transformation and Uptake,
/75-12136 5B

**TROGEN REMOVAL**
Nitrogen Removal from Municipal Wastewater,
/75-11859 5D

**N-DEGRADATION POLICY**
Land Use Controls Under the Federal Water Pollution Control Act: A Citizen's Guide,
/75-12237 5G

**N-NAVIGATIONAL USES**
International Law, U.S. Seabeds Policy and Ocean Resource Development,
/75-12214 6E

**N-POINT SOURCES (POLLUTION)**
The Economics of Clean Water.
/75-12233 5G

**NORTH CAROLINA**
A Mini-Project for Avon Harbor, North Carolina,
W75-12045 8A

A NEPA Settlement: Conservation Council of North Carolina v. Froehlke,
W75-12244 6E

**NORTH DAKOTA**
Ground-Water Basic Data for Emmons County, North Dakota,
W75-11963 4B

Hail Suppression Data from Western North Dakota, 1969-1972,
W75-12094 3B

Evaluation by Monte Carlo Tests of Effects of Cloud Seeding on Growing Season Rainfall in North Dakota,
W75-12106 3B

Prairie Pothole Ecology and the Feasibility of Growing Rainbow Trout (Salmo Gairdneri Richardson) in Prairie Potholes,
W75-12157 8I

**NORTHEAST GREAT PLAINS**
Water Resources Investigations of the U.S. Geological Survey in the Northern Great Plains Coal Region of Wyoming, Montana, and North Dakota, 1975.
W75-11961 5A

**NORTHEAST US**
River Crossing Permits for Buckeye Pipe Line Co. Proposed Petroleum Products Pipeline System Between Linden, New Jersey and Macungie, Pennsylvania (Final Environmental Impact Statement).
W75-12258 8A

**NOTICE**
Federal Water Pollution Control Act Amendments of 1972,
W75-12221 5G

**NUCLEATION**
Testing of Cloud Seeding Materials at the Cloud Simulation and Aersol Laboratory, 1971-1973,
W75-12099 3B

An Explanation for the Unusual Nucleating Ability of Aerosols Produced from the AgI-NH4I-Acetone System,
W75-12100 3B

**NUISANCE (LEGAL ASPECTS)**
The Doctrine of Primary Jurisdiction Misconceived: End to Common Law Environmental Protection,
W75-12206 6G

The Florida Environmental Protection Act of 1971: The Citizen's Role in Environmental Management,
W75-12207 6G

Wetzel V. A. Duda and Sons (Action by Riparian Property Owners to Enjoin Water Pollution to Lake From Farming Operations).
W75-12286 6E

**NUMERICAL ANALYSIS**
Artificial Groundwater Recharge, I. Circular Recharging Area,
W75-12040 4B

**NUTRIENT REMOVAL**
Biochemical Characteristics of Digested Chemical Sewage Sludges,
W75-12132 5D

Nutrient Removal in Biological Systems,
W75-12321 5D

**NUTRIENTS**
Relative Throughfall Enrichment by Biologic and by Aerosol-Derived Materials in Loblolly Pines,
W75-11853 5B

Response of Lake Superior Algae to Nutrients and Taconite Tailings,
W75-11976 5C

Geochemistry and Nutrient Regime of Saline Eutrophic Lakes in the Erickson-Elphinstone District of Southwestern Manitoba.
W75-11982 5C

Rates of Supply of Nitrogen and Phosphorus to Lake Winnipeg, Manitoba, in Relation to the Diversion of Missouri River Water Into the Red and Assiniboine Rivers,
W75-12006 5C

Land Disposal of Sewage Sludge,
W75-12135 5D

Chemical Tests for Plant Available Metals in Soils.
W75-12142 5A

**OCEAN CURRENTS**
Coastwise Currents in the Vicinity of Chicago, and Currents Elsewhere in Southern Lake Michigan,
W75-12161 2H

**OCEAN DUMPING**
Ocean Dumping in the New York Bight,
W75-12172 5B

Report to the Congress on Ocean Dumping Research, January Through December 1974 Public Law 92-532, Title II, Section 201.
W75-12173 5B

**OCEAN WAVES**
Power Conversion Apparatus for Utilizing the Force of Waves,
W75-12062 3E

Electric Generator Responsive to Waves in Bodies of Water,
W75-12186 3E

**OCEANOGRAPHIC OBSERVATIONS**
Oceanographic Observations in the Georgia Bight: Data Report for R.V. EASTWARD Cruises E-13-73 (4-11 September) and E-19-73 (8-9 December 1973),
W75-12169 2L

**OCEANOGRAPHY**
Federal Ocean Programs Review.
W75-12200 6E

**OCEANS**
Mercury Concentrations in Open Ocean Waters: Sampling Procedure,
W75-11953 5A

Report to the Congress on Ocean Dumping Research, January Through December 1974 Public Law 92-532, Title II, Section 201.
W75-12173 5B

Ocean Dumping Oversight.
W75-12194 5G

Solar Sea Thermal Energy.
W75-12196 3E

Federal Ocean Programs Review.
W75-12200 6E

The Integrative Potential of the Proposed International Regime for the Seabed.
W75-12215 6E

The Law of the Sea: A Selective Bibliography of Articles, Documents and Monographs,
W75-12217 6E

The Development of European Regional Law of the Sea,
W75-12220 6E

Understanding the Ocean Science Debate,
W75-12223 6E

**OCHROMONAS**
Endocytosis of Microcystis Aeruginosa by Ochromonas Danica,
W75-11985 5C

**ODOR**
The Assessment of Water Quality,
W75-12054 5F

Beet Sugar Processing Point Source Subcategory--Effluent Guidelines and Standards.
W75-12271 5G

**OFFICE OF WATER RESOURCES RESEARCH (OWRR)**
Saving Our Water Resources,
W75-12232 6G

**OFFSHORE DUMPING**
Assessment of Offshore Dumping in the New York Bight, Technical Background: Physical Oceanography, Geological Oceanography, and Chemical Oceanography.
W75-12171 5B

**OFFSHORE PLATFORMS**
Deepwater Port Act of 1974.
W75-12198 5G

High Seas Oil Port Act.
W75-12201 5G

The Rush for Offshore Oil and Gas: Where Things Stand on the Outer Continental Shelf.
W75-12222 5G

The Deepwater Ports Act of 1974; Half Speed Ahead,
W75-12229 5G

**OHIO**
Geochemistry of Strontium in the Scioto River Drainage Basin, Ohio,
W75-12052 2K

Wyandotte and its Progency: The Quest for Environmental Protection through the Original Jurisdiction of the Supreme Court,
W75-12218 5G

Diked Disposal Area Site No 12, Cleveland Harbor, Cuyahoga County, Ohio.
W75-12255 5E

**OIL**
Bio-Oxidation Process Saves H20,
W75-12115 5D

River Crossing Permits for Buckeye Pipe Line Co. Proposed Petroleum Products Pipeline System Between Linden, New Jersey and Macungie, Pennsylvania (Final Environmental Impact Statement).
W75-12258 8A

**OIL HERDING METHODS**
We're Fighting Oil Pollution with Bubbles, Belts and Beads,
W75-12225 5G

**OIL INDUSTRY**
Complete Industrial Waste-Water Reuse Goal of Refining Study,
W75-12125 5D

Deepwater Port Act of 1974.
W75-12198 5G

High Seas Oil Port Act.
W75-12201 5G

The Deepwater Ports Act of 1974; Half Speed Ahead,
W75-12229 5G

Waterflooding of Oilfields in Wyoming to 1968,
W75-12380 8B

**OIL POLLUTION**
We're Fighting Oil Pollution with Bubbles, Belts and Beads,
W75-12225 5G

A Solution to the Problem of Private Compensation in Oil Discharge Situations,
W75-12254 5G

United States v. Ashland Oil and Transportation Co. (Appeal from Finding that Defendant had Violated FWPCA Amendments of 1972 by Discharging Oil into Navigable Stream).
W75-12294 6E

Bacterial Processes for Improved Oil Recovery.
W75-12391 2F

**OIL RECOVERY**
Bacterial Processes for Improved Oil Recovery.
W75-12391 2F

**OIL RESERVOIR**
A New Approach to Permeability Reduction,
W75-11872 8G

**OIL RESERVOIRS**
A New Look at Sandstone Acidizing,
W75-11878 4B

**OIL SPILLS**
We're Fighting Oil Pollution with Bubbles, Belts and Beads,
W75-12225 5G

Liability for Oil Pollution Disasters: International Law and the Delimitation of Competences in a Federal Policy,
W75-12235 5G

Enforcing International Law: U.S. Agencies and the Regulation of Oil Pollution in American Waters,
W75-12246 5G

Admiralty's Power in RE Oil Pollution (States Able to Set More Stringent Penalties),
W75-12248 5G

A Solution to the Problem of Private Compensation in Oil Discharge Situations,
W75-12254 5G

United States v. Ashland Oil and Transportation Co. (Appeal from Finding that Defendant had Violated FWPCA Amendments of 1972 by Discharging Oil into Navigable Stream).
W75-12294 6E

Bacterial Processes for Improved Oil Recovery.
W75-12391 2F

**OIL TAGGING SYSTEMS**
We're Fighting Oil Pollution with Bubbles, Belts and Beads,
W75-12225 5G

**OIL WASTES**
Maritime Administration Proposed Shore Facility for Treatment and Disposal of Ship Generated Oily Water Wastes.
W75-12256 5D

**OIL-WATER INTERFACES**
We're Fighting Oil Pollution with Bubbles, Belts and Beads,
W75-12225 5G

**OIL WELLS**
Geochemistry of Oil-Field Water Applied to Exploration,
W75-11879 4B

Wanted: Fewer Bit, Casing Sizes, Reward: Many Benefits for Industry,
W75-11885 8C

**OILY WATER**
We're Fighting Oil Pollution with Bubbles, Belts and Beads,
W75-12225 5G

Maritime Administration Proposed Shore Facility for Treatment and Disposal of Ship Generated Oily Water Wastes.
W75-12256 5D

**ONE-DIMENSIONAL ANALYSIS**
Systems Simulation of Streamflows,
W75-12024 2E

**ONION CREEK (TEX)**
Flood Plain Information: Onion Creek, Austin, Texas.
W75-12374 4A

**ONTARIO**
General Aspects of Water Supply and Treatment in Ontario,
W75-12067 5F

**OPEN CHANNELS**
Vertical Temperature Profiles in Open-Channel Flow,
W75-12047 5B

**OPTIMIZATION**
Fisheries Economics. A Bibliography,
W75-12181 3E

Economic Growth Vs. the Environment. A Bibliography,
W75-12182 6G

**OREGON**
Flood Profiles in the Umpqua River Basin, Oregon: Part 3, Umpqua River Below Scottburg, Scholfield, Cow Creek Above Glendale,
W75-11959 4A

1974 Water Resources Data for Oregon, Surface Water Records, Precipitation Records,
W75-12087 7C

A River Restored: Oregon's Willamette,
W75-12210 5G

Oregon Surveys its Hazardous Wastes,
W75-12239 5G

Flood Plain Information, Willamette River, Johnson, Kellogg and Mt. Scott Creeks, Milwaukie-Oak Grove-Lake Oswego, Oregon.
W75-12369 4A

Flood Plain Information: South Santiam River, Lebanon, Oregon.
W75-12376 4A

**ORGANIC ACIDS**
Experimental Data for Establishing the Content of Alpha, Alpha, Beta-Trichloropropionic Acid and its Sodium Salts in Reservoir Water,
W75-12190 5C

Determination of Residual Quantities of the Butyl Ester of 2,4-Dichlorophenoxyacetic Acid in Environmental Objects by Gas-Liquid Chromatography, (In Russian),
W75-12393 5A

**ORGANIC CARBON**
The Uptake and Utilization of Organic Carbon by Algae: An Essay in Comparative Biochemistry,
W75-11980 5C

**ORGANIC COMPOUNDS**
Process and Agents for Removal of Inorganic and Organic Matter From Waste Water Systems,
W75-11926 5D

The Uptake and Utilization of Organic Carbon by Algae: An Essay in Comparative Biochemistry,
W75-11980 5C

Organics, (Literature Review),
W75-12071 5B

The Impact of Chemical Pollution on Water Utilizationnutzung),. (Chemische Gewaesserverunreinigung und Wasser
W75-12314 5B

Organic Residue in a Recycled Effluent, Part I,
W75-12348 5D

**ORGANIC WASTES**
Organic Chemicals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Application to Pretreatment Standards.
W75-12268 5G

**OROGRAPHIC CLOUDS**
A Numerical Model of Precipitation from Seeded and Unseeded Cold Orographic Clouds,
W75-12098 3B

**OTTAWA NATIONAL FOREST (MICH)**
Limnology of Lakes of the Sylvania Recreation Area, Ottawa National Forest,
W75-11981 2H

**OVERFLOW**
The Graphical Hydrographs Method With the Intermediary of Storm Overflows and Flood Retention Tanks (Das grafische Aflussganglinienverfahren mit Zwischenschaltung von RUE und RB),
W75-11861 5D

Combined Wastewater Overflows,
W75-11912 5D

**OVERLAND FLOW**
Overland Flow: Answer to Water Cleanup Challenge.
W75-12228 5D

**OVERLAYING PROPRIETOR**
United States V. Cappaert (Action for Declaration of Rights of United States to Underground Waters Appurtenant to Devil's Hole, Death Vally National Monument).
W75-12281 6E

**OVERPRESSURE**
How Downhole Temperatures, Pressures Affect Drilling, Part 3, Overpressure Detection from Wireline Methods,
W75-11867 8C

**OWNERSHIP OF BEDS**
Submerged Lands (State Title to Certain Submerged Lands).
W75-12288 6E

**OXIDATION**
Bio-Oxidation Process Saves H20,
W75-12115 5D

Some Aspects of a Chemical Treatment of the Waste Waters from the Beamhouse,
W75-12120 5D

**OXYGEN**
Factors Affecting Oxygen Transfer During Bubble Aeration Under Laboratory Scale Conditions,
W75-12144 5D

**OXYGEN 18**
Use of Environmental Isotope Methods as a Reconnaissance Tool in Groundwater Exploration Near San Antonio de Pichincha, Ecuador,
W75-12080 2F

**OXYGEN DEMAND**
The Risk of Deoxygenation of Water in Herbicide Application for Aquatic Weed Control,
W75-11996 5A

**OXYGEN REQUIREMENTS**
Filtration of Neutral Red by Fresh Water Clams in Aerobic and Hypoxic Conditions,
W75-12192 5C

**OXYGEN TRANSFER**
Biologically Mediated Inconsistencies in Aeration Equipment Performace,
W75-12333 5D

**OXYGEN TRANSFER RATE**
Factors Affecting Oxygen Transfer During Bubble Aeration Under Laboratory Scale Conditions,
W75-12144 5D

**OZONE**
Alternative Methods of Disinfection,
W75-11858 5D

Iron and Manganese Removal with Ozone. Part II
W75-12315 5F

**PACKAGE PLANTS**
Package Treatment Plants and Factors Affecting Service,
W75-11857 5D

**PARADISE CREEK (WASH)**
Special Flood Hazard Information: Paradise Creek, Pullman and Vicinity, Washington.
W75-12378 4A

**PARTICULATE CONCENTRATIONS**
Application of a Simple Dispersion Model to a Rural Industrial Region,
W75-12037 5A

**PASCAGOULA RIVER BASIN**
The Flood of April 1974 in Southern Mississippi and Southeastern Louisiana,
W75-12170 2E

**PATENTS**
Process and Agents for Removal of Inorganic and Organic Matter From Waste Water Systems,
W75-11926 5D

Refrigerated Surge Tank for Use With Aerobic Sewage Digestion System,
W75-11930 5D

Flexible Joint for Sewer Pipe,
W75-11931 5D

Apparatus for Cleaning Loose Filtering Material in Slow Water Filled Water Supply Filters,
W75-11935 5F

Up-Flow Separator,
W75-11936 5D

Screen Retainer Assembly,
W75-11942 8C

Hydraulic Sewer Pipeline Cleaner,
W75-11944 5D

Pipe Relining Method and Apparatus,
W75-11945 8G

Filter Press, Particularly for Dewatering Sludge in Sewage Treatment Plants,
W75-12056 5D

Recovering Proteins from Waste Water,
W75-12057 5D

Flocculating Agents,
W75-12058 5D

Process and Apparatus for Recovering Clean Water and Solids from Dilute, Aqueous, Solids Containing Solutions or Dispersions,
W75-12059 5D

Single Basin Aerated Sewage Lagoon with Spring Time Intensified Aeration,
W75-12060 5D

Method of Treating Sewage to Enhance Aerobic Decomposition,
W75-12061 5D

Power Conversion Apparatus for Utilizing the Force of Waves,
W75-12062 3E

Aerobic Sewage Treatment System,
W75-12063 5D

Filtering and Debris Removing Apparatus for Cleaning a Sea Water Stream,
W75-12183 5G

Trickle Irrigation System,
W75-12184 3F

Waste Disposal System,
W75-12185 5D

Electric Generator Responsive to Waves in Bodies of Water,
W75-12186 3E

Process for Raw Water Clarification,
W75-12300 5F

PATENTS

Method of Cleaning and Stimulating a Water Well,
W75-12301 3B

Irrigation Apparatus,
W75-12302 3F

Emitter for Irrigation Systems,
W75-12303 3F

Method of Removing Heavy Metals from Water and Apparatus Therefor,
W75-12304 5D

Water Treatment Device,
W75-12305 5F

Salt Recovery System,
W75-12306 5B

Recirculating Resin Cleaning Chemical Feeder System for Water Softeners,
W75-12307 3D

Sewage Treatment Systems,
W75-12308 5D

Irrigation System,
W75-12309 3F

Irrigation System Emitters with Renewable Filters,
W75-12310 3F

Process for Demineralizing Water,
W75-12311 3A

Method for Processing Sludge,
W75-12312 5D

High Energy Electron Treatment of Water,
W75-12313 5D

PATH OF POLLUTANTS

Individual Home Wastewater Characterization and Treatment,
W75-11852 5D

The Effect of Wind on the Spread of Contamination in the Yeisk Estuary, (In Russian),
W75-11983 5B

A Note on the Elevation of the Mean and the Mode of the Gaussian Concentration Distribution,
W75-12035 5A

Dispersion and Settling Around a Waste Disposal Point in a Shallow Sea,
W75-12043 5B

Effects of Aerial Forest Fertilization With Urea Pellets on Nitrogen Levels in a Mountain Stream,
W75-12113 5B

Activity of Enzymes (Protease and Urease) and Forms of Mobile Nitrogen in Thin Peat Soil of the Second Year of Use, (In Russian),
W75-12216 5B

PATHOGENIC BACTERIA

Land Disposal of Sewage Sludge,
W75-12135 5D

Some Microbiological Aspects of the Land Disposal of Sludge,
W75-12138 5D

PEARL RIVER BASIN

The Flood of April 1974 in Southern Mississippi and Southeastern Louisiana,
W75-12170 2E

PEAT

Activity of Enzymes (Protease and Urease) and Forms of Mobile Nitrogen in Thin Peat Soil of the Second Year of Use, (In Russian),
W75-12216 5B

PENALTIES (LEGAL)

Historical Guide to Federal Water Pollution Control Laws Affecting Food Processing,
W75-12226 5G

A Solution to the Problem of Private Compensation in Oil Discharge Situations,
W75-12254 5G

Submerged Lands (State Title to Certain Submerged Lands).
W75-12288 6E

PENETRATION

Drilling Impedance of Mud Solids,
W75-11897 8C

PENNSYLVANIA

Coal Mine Drainage Pollution--1973,
W75-12114 5G

Some Aspects of Tannery Effluent Control,
W75-12123 5D

Pollution Control Under the Pennsylvania Clean Streams Law,
W75-12209 5G

PERCUSSIVE DRILLING

Prediction of Penetration Rate for Percussive Drilling,
W75-12382 8E

Percussive Drilling: With Independent Rotation,
W75-12383 8E

Drillability Studies: Percussive Drilling in the Field,
W75-12384 8E

PERFORMANCE

The Relationship Between Process Configuration and Process Performance,
W75-12152 5D

PERMAFROST

A Preliminary Study of the Formation of Landfast Ice at Barrow, Alaska, Winter 1973-74,
W75-12162 2C

PERMEABILITY

A New Approach to Permeability Reduction,
W75-11872 8G

The Effect of Surface Kinetics in Fracture Acidizing,
W75-11887 8B

A Laboratory Study of the Effects of Confining Pressure on Fracture Flow and Storage Capacity in Carbonate Rocks,
W75-11892 4B

Thin Section and Permeability Studies Call for Smaller Gravels in Gravel Packing,
W75-11893 8B

Reservoir Properties Affecting Matrix Acid Stimulation of Sandstones,
W75-11894 4B

PERMITS

The Water Pollution Permitting System,
W75-12245 5G

River Crossing Permits for Buckeye Pipe Line Co. Proposed Petroleum Products Pipeline System Between Linden, New Jersey and Macungie, Pennsylvania (Final Environmental Impact Statement).
W75-12258 8A

Permits for Activities in Navigable Waters or Ocean Waters.
W75-12263 6E

PERSISTENCE

The Effect of Persistence of AgI on Randomized Weather Modification Experiments,
W75-12104 3B

PESTICIDE RESIDUES

Pick-up and Metabolism of DDT, Dieldrin and Photodieldrin by a Fresh Water Alga (Ankistrodesmus Amalloides) and a Microcrustacean (Daphnia Pulex),
W75-12007 5C

PESTICIDES RESIDUES

Determination of Residual Quantities of the Butyl Ester of 2,4-Dichlorophenoxyacetic Acid in Environmental Objects by Gas-Liquid Chromatography, (In Russian),
W75-12393 5A

PHASE DIAGRAMS

Studies in the System CaCO:-FeCO3: 1. Phase Relations; 2. A Method for Major-Element Spectrochemical Analysis; 3. Compositions of Some Ferroan Dolomites,
W75-12400 2F

PHENOLS

Phenolic Compounds of Wheat Leaves Under Drought Stress,
W75-11905 2I

PHOSPHATES

Transfer of Heat, Fresh Water and Nutrients Through the Seasonal Thermocline,
W75-11994 5C

Nitrogen, Phosphorus, and Eutrophication in the Coastal Marine Environment,
W75-12236 5C

Gulf Shore Seafood and Company v. Cities Service Co. (Action for Damages Arising from Dam Break of Phosphate Company's Dam Permitting Phosphate Slime Pollution of River).
W75-12291 6E

Validity, Under Federal Constitution, of State Statute or Local Ordinance Regulating Phosphate Content of Detergents,
W75-12293 6E

PHOSPHORUS

N and P Distribution in Lake Kinneret (Israel) with Emphasis on Dissolved Organic Nitrogen,
W75-11975 5C

The Utilization of Phosphorus from Muds by the Phytoplankter, Scenedesmus Dimorphus, and the Significance of These Findings to the Practice of Pond Fertilization,
W75-11986 5C

Detergent Phosphorus and Algal Growth,
W75-12001 5C

Phosphorus Metabolism and Respriration in Wheat Leaves and Roots in the Case of Water Defiency, (In Russian),
W75-12362 3F

HOSPHORUS REMOVAL SYSTEMS
Biochemical Characteristics of Digested Chemical Sewage Sludges,
W75-12132 5D

HYTOPLANKTON
An Ecological Evaluation of Heated Water Discharge on Phytoplankton Blooms in the Potomac River,
W75-12004 5C

A Quantitative Measure of Succession Rate and Its Application to the Phytoplankton of Lakes,
W75-12005 5C

Experimentally Increased Fish Stock in the Pond Type Lake Warniak. VI. Biomass and Production of Phytoplankton,
W75-12013 5C

NE TREES
Evaluating the Productivity of Pine Forests in the Hinton-Edson Area, Alberta, From Soil Survey Maps,
W75-12003 4A

PE FLOW
Pipe Flow Measurements by the Pulse Velocity Method with Radioactive Isotopes,
W75-11916 8G

Swirling Laminar Pipe Flow of Suspensions,
W75-11938 8B

PELINES
Safety Installation for Preventing Pollution by Pipelines,
W75-11934 8G

Hydraulic Sewer Pipeline Cleaner,
W75-11944 5D

River Crossing Permits for Buckeye Pipe Line Co. Proposed Petroleum Products Pipeline System Between Linden, New Jersey and Macungie, Pennsylvania (Final Environmental Impact Statement).
W75-12258 8A

How to Evaluate Water Main Capacities, Part I,
W75-12329 8B

PES
A Mathematical Model for Head-Discharge Relationships for Various Ferrule-House Service Pipe Combinations,
W75-11906 8B

Steel, Concrete Form Sewer Support System.
W75-11921 5D

Flexible Joint for Sewer Pipe,
W75-11931 5D

Apparatus, for and Method of Controlling Flow of Fluids in a Pipeline,
W75-11932 8B

Pipe Relining Method and Apparatus,
W75-11945 8G

Resort Community Puts All Utilities Underground.
W75-12338 8G

T RECHARGE
Artifical Groundwater Recharge, II. Rectangular Recharging Area,
W75-12097 4B

PLANKTON
Primary Production in the Plankton Community of a Tropical Lake,
W75-11978 5C

Effect of Bromex-50 on Plankton Population in Fish Ponds,
W75-12188 5C

PLANNING
Special Flood Hazard Information: Issaquah and Tibbetts Creeks, Issaquah and Vicinity, Washington.
W75-12377 4A

Special Flood Hazard Information: Paradise Creek, Pullman and Vicinity, Washington.
W75-12378 4A

PLANT MORPHOLOGY
Morphology and Ultrastructure of Some Chlorococcal Algae from the Collection pf Algal Strains in Leningrad University. II. Monoraphidium Braunii (Nag, in Kutz.) Komarkova-Legnerova Strain (Gromov) 1967/231,
W75-11997 5C

Morphology and Ultrastructure of Some Chlorococcal Algae from the Collection of Algal Strains in Leningrad University. I. Pseudospongiococcum Protococcoides Gen. Nov., Sp. Nov.,
W75-12000 5C

PLANT PHYSIOLOGY
Effects of the Commercial Polychlorinated Biphenyl Mixture Aroclor 1242 on Growth, Viability, Phosphate Uptake, Respiration and Oxygen Evolation in Scenedesmus,
W75-11974 5C

PLASTIC PIPES
Use of Plastic Pipe for Sewers,
W75-11907 8G

Application of PVC Bell-and-Spigot Pressure Pipes in Construction of Water Supply Lines (Die Anwendung von PVC-Muffendruckrohren beim Bau von Wasserversorgungsnetzen),
W75-11949 8A

PLASTICS
Plastics and Synthetic Point Source Category--Effluent Guidelines and Standards.
W75-12275 5G

PLUMES
Environmental Research Laboratories, 1973 Annual Report.
W75-12033 5A

A Note on the Elevation of the Mean and the Mode of the Gaussian Concentration Distribution,
W75-12035 5A

PLYWOOD
Timber Products--Proposed Effluent Guidelines and Performances and Pretreatment Standards for New Sources.
W75-12270 5G

POECILIA-RETICULATA
Observations of the Guppy, Poecilia Reticulata Peters, in Culex Pipiens Fatigans Breeding Sites in Bangkok, Rangoon, and Taipei,
W75-11989 5G

POLAND
Studies on Metabolic Activity of Benthic Bacteria Isolated from Three Lakes,
W75-11988 5C

Distribution and Biomass of Macrophytes in Lake Dgal Maly,
W75-11993 8I

Experimentally Increased Fish Stock in the Pond Type Lake Warniak. XIV. The Relations Between the Fish and Other Biocenotic Components (Summing Up the Studies),
W75-11998 8I

POLICE POWER
Property (Wetlands Regulation),
W75-12247 6E

POLIOVIRUS
Adsorption of Poliovirus onto Activated Carbon in Wastewater,
W75-12148 5D

POLLUTANT CONCENTRATIONS
The Simple ATDL Urban Air Pollution Model,
W75-12038 5A

POLLUTANT IDENTIFICATION
Observations on the Atomic Absorption Behavior of Some of the Earth Elements,
W75-11862 5A

Toxicity of Copper Complexes to RFreshwater Mollusks,
W75-11863 5C

A Radioisotope Monitoring System for Sewage Effluent,
W75-11914 5A

New Computer System Monitors Baton Rouge Sewers.
W75-11927 7C

Computer's Master Plan Signals Sewer Problems Before They Start,
W75-11928 7C

The Management of Water in Northern Ireland, with Particular Reference to Water Pollution,
W75-11939 5G

Mercury Concentrations in Open Ocean Waters: Sampling Procedure,
W75-11953 5A

Virus Removals in Trickling Filter Plants,
W75-12068 5D

Inorganics, (Literature Review),
W75-12072 5A

Water Characteristics, (Literature Review),
W75-12073 5A

Treatment Plant to be Tested for Carcinogens,
W75-12130 5F

Analysis of Heavy Metals in Sewage Sludge and Liquids Associated with Sludges,
W75-12140 5A

Detection of Pollutants by Fish Tests,
W75-12193 5A

Column Settling Tests for Flocculant Suspensions,
W75-12322 5D

Application of the Methylthymol Blue Sulfate Method to Water and Wastewater Analysis,
W75-12324 5A

Light and Assimilation Number in a Small Desert, Recharged-Groundwater Pond,
W75-12326 5A

Environmental Water Quality Program,
W75-12331 5G

Determination of NTA in Environmental Water by Gas Chromatography,
W75-12363 5A

Determination of Residual Quantities of the Butyl Ester of 2,4-Dichlorophenoxyacetic Acid in Environmental Objects by Gas-Liquid Chromatography, (In Russian),
W75-12393 5A

POLLUTION ABATEMENT
Strong Impact of Textiles by U.S. Water Control Act,
W75-12117 5G

Complete Industrial Waste-Water Reuse Goal of Refining Study,
W75-12125 5D

Floating Aquatic Plants Remove Chemicals From Polluted Waters.
W75-12145 5G

Input-Output Analysis and the Environment,
W75-12177 6G

International Economics and Environment Control,
W75-12178 6G

The Doctrine of Primary Jurisdiction Misconceived: End to Common Law Environmental Protection,
W75-12206 6G

A River Restored: Oregon's Willamette,
W75-12210 5G

Litigation Under the Federal Water Pollution Control Act Amendments of 1974,
W75-12212 5G

Federal Water Pollution Control Act Amendments of 1972,
W75-12221 5G

The Economics of Clean Water.
W75-12233 5G

Toward a Cleaner Aquatic Environment,
W75-12234 5G

Water Conservation in Sweden: II. Pollution Control,
W75-12317 5G

PONDS
Wildwood Estates of Braintree, Inc. v. Smith (Action to Determine Prescriptive Rights of Use in Defendant's Pond).
W75-12292 6E

POQUOSON (VA)
Flood Plain Information--Coastal Flooding: Town of Poquoson, Virginia.
W75-12367 4A

PORTAGE CREEK (MICHIGAN)
Distribution of Aquatic Macrophytes Related to Paper Mill Effluents in a Southern Michigan Stream,
W75-11991 2B

POTABLE WATER
Recyclable Coagulants Look Promising for Drinking Water Treatment,.
W75-11909 5F

The Bacterial Quality of Bottled Water,
W75-12011 5F

The $5 Billion Flush.
W75-12277 5D

Introduction of S433 (Bill for Safe Drinking Water).
W75-12280 6E

Proceedings of the Annual Conference of the British Columbia Water and Waste Association.
W75-12350 5F

Disinfection to Protect Recreational Areas and Potable Water Supplies,
W75-12351 5D

Canadian Drinking Water Surveillance Programs, Panel Discussion,
W75-12355 5G

Canadian Drinking Water Standards Review, Ontario's Programs, Panel Discussion,
W75-12356 5G

Canadian Drinking Water Standards Review, Alberta, Saskatchewan and Manitoba, Panel Discussion,
W75-12357 5G

Canadian Drinking Water Standards Review, British Columbia, Panel Discussion,
W75-12358 5G

Canadian Drinking Water Standards Review, Northwest Territories and Yukon Territory, Panel Discussion,
W75-12359 5G

POTASH
Turbo-Drilling as Applied to Potash Developments in the Saskatchewan Field,
W75-12397 8B

POTHOLES
Prairie Pothole Ecology and the Feasibility of Growing Rainbow Trout (Salmo Gairdneri Richardson) in Prairie Potholes,
W75-12157 8I

POTOMAC RIVER
An Ecological Evaluation of Heated Water Discharge on Phytoplankton Blooms in the Potomac River,
W75-12004 5C

POWDERY MILDEW
Fungus Diseases of Wheat on Irrigated Lands. (In Russian),
W75-11904 2I

POWERPLANTS
A Note on the Elevation of the Mean and the Mode of the Gaussian Concentration Distribution,
W75-12035 5A

PRAIRIE POTHOLE LAKES
Prairie Pothole Ecology and the Feasibility of Growing Rainbow Trout (Salmo Gairdneri Richardson) in Prairie Potholes,
W75-12157 8I

PRE-TREATMENT (WATER)
Process for Demineralizing Water,
W75-12311 3A

PRECIPITATION (ATMOSPHERIC)
1974 Water Resources Data for Oregon, Surface Water Records, Precipitation Records,
W75-12087 7C

The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part I: Natural Conditions,
W75-12096 3B

Interim Report, Probable Maximum Precipitation in California.
W75-12165 2B

PRECIPITATION (CHEMICAL)
Control System for Showa Water Purification Plant, (In Japanese),
W75-12147 5F

PRECIPITATION EXCESS
The Flood of April 1974 in Southern Mississippi and Southeastern Louisiana,
W75-12170 2E

PREDICTION
How Downhole Temperatures, Pressures Affect Drilling, Part 10, Miscellaneous Ways to Detect Abnormal Pressure,
W75-11869 8C

PRESCRIPTIVE RIGHTS
Wildwood Estates of Braintree, Inc. v. Smith (Action to Determine Prescriptive Rights of Use in Defendant's Pond).
W75-12292 6E

PRESERVATION
Marine Sanctuaries.
W75-12261 6E

PRESSURE
How Downhole Temperatures, Pressures Affect Drilling, Part 1,
W75-11865 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 2, Detecting and Evaluating Formation Pressures,
W75-11866 8C

PRESSURE-BOMB MEASUREMENT
The Water Relations of Hemlock (Tsuga Canadensis): I. Some Equilibrium Water Relations as Measured by the Pressure-Bomb Technique,
W75-11900 2I

PRESSURE-BOMB MEASURING TECHNIQUE
The Water Relations of Hemlock (Tsuga Canadensis): II. The Kinetics of Water Exchange Between the Symplast and Apolast,
W75-11901 2I

PRESSURE-BOMB TECHNIQUE
The Water Relations of Hemlock (Tsuga Canadensis): III. The Temperature Dependence of Water Exchange in a Pressure Bomb,
W75-11902 2I

PRESSURE GRADIENT
How Downhole Temperatures, Pressures Affect Drilling, Part 1,
W75-11865 8C

PRESSURE MEASURING INSTRUMENTS
Measurement of Extremely Small Pressure Differences in Water,
W75-11915 7B

PRETREATMENT STANDARDS (EFFLUENT)
Iron and Steel Manufacturing Point Source Category--Effluent Guidelines and Standards.
W75-12264 5G

Canned and Preserved Seafood Processing Point Source Category--Effluent Limitations Guidelines.
W75-12265 5G

Fertilizer Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Limitations.
W75-12266 5G

Timber Products Processing Point Source Category--Effluent Guidelines and Standards.
W75-12267 5G

Organic Chemicals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Application to Pretreatment Standards.
W75-12268 5G

Soap and Detergent Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-12269 5G

Meat Products Point Source Category--Effluent Guidelines and Standards.
W75-12273 5G

Grain Mills Point Source Category--Effluent Limitations Guidelines and Standards.
W75-12274 5G

Plastics and Synthetic Point Source Category--Effluent Guidelines and Standards.
W75-12275 5G

Nonferrous Metals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Limitations.
W75-12276 5G

**RIMARY PRODUCERS**
Effect of Bromex-50 on Plankton Population in Fish Ponds,
W75-12188 5C

**RIMARY PRODUCTIVITY**
A Computer Program Used to Estimate Primary Productivity from pH and Carbon Dioxide Data Employing the Upstream-Downstream Method,
W75-11971 5C

Primary Production in the Plankton Community of a Tropical Lake,
W75-11978 5C

**RIVATE SUBSTANTIVE RIGHTS**
Recognition of Substantive Rights Under NEPA,
W75-12250 6E

**ROBABLE MAXIMUM PRECIPITATION**
Interim Report, Probable Maximum Precipitation in California.
W75-12165 2B

**RODUCTION**
Evaluating the Productivity of Pine Forests in the Hinton-Edson Area, Alberta, From Soil Survey Maps,
W75-12003 4A

**RODUCTIVITY**
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. VI. Biomass and Production of Phytoplankton,
W75-12013 5C

**ROJECT DESIGN**
Design of a Hail Suppression Project for Illinois,
W75-12095 3B

**ROJECT FEASIBILITY**
Conservation Soc'y. of Southern Vermont, Inc. V. Secretary of Transportation (Review of Motion for Equitable Injunction Against Stream Channelization Project).
W75-12282 6E

**PROJECT POST-EVALUATION**
Federal Ocean Programs Review.
W75-12200 6E

**PROJECTIONS**
Planning Models for Water System Development in Mississippi Communities,
W75-11851 6D

**PROJECTS**
Water Resources Programs in the Southeastern Region.
W75-11960 9D

Water Resources Investigations of the U.S. Geological Survey in the Northern Great Plains Coal Region of Wyoming, Montana, and North Dakota, 1975.
W75-11961 5A

Design of a Hail Suppression Project for Illinois,
W75-12095 3B

**PROPERTY RIGHTS**
Externalities and Public Goods. A Bibliography,
W75-12179 6B

**PROTEASE**
Activity of Enzymes (Protease and Urease) and Forms of Mobile Nitrogen in Thin Peat Soil of the Second Year of Use, (In Russian),
W75-12216 5B

**PROTECTION**
Ocean Dumping Oversight.
W75-12194 5G

**PROXIMATE CAUSATION**
Uses of Scientific Information in Environmental Decision-Making,
W75-12204 6G

**PSEUDOSPONGIOCOCCUM PROTOCOCCOIDES**
Morphology and Ultrastructure of Some Chlorococcal Algae from the Collection of Algal Strains in Leningrad University. I. Pseudospongiococcum Protococcoides Gen. Nov., Sp. Nov.,
W75-12000 5C

**PSYCHROMETERS (INFRARED)**
An Infra-Red Psychrometer for Detecing Changes in the Humidity of Leaf Boundary Layers,
W75-12131 2I

**PUBLIC ACCEPTANCE**
The Assessment of Water Quality,
W75-12054 5F

**PUBLIC GOODS**
Externalities and Public Goods. A Bibliography,
W75-12179 6B

**PUBLIC HEALTH**
Toxic Waters (Discussion of Recent Federal Action Against Water Pollution).
W75-12230 5G

Introduction of S433 (Bill for Safe Drinking Water).
W75-12280 6E

Disinfection to Protect Recreational Areas and Potable Water Supplies,
W75-12351 5D

Municipal Sewage Treatment to Protect Shellfish Growing Waters,
W75-12352 5D

Toxicity of Aquatic Organisms Caused by Chlorination,
W75-12353 5D

**PUBLIC RIGHTS**
Uses of Scientific Information in Environmental Decision-Making,
W75-12204 6G

The Florida Environmental Protection Act of 1971: The Citizen's Role in Environmental Management,
W75-12207 6G

Recognition of Substantive Rights Under NEPA,
W75-12250 6E

**PULLMAN (WASH)**
Special Flood Hazard Information: Paradise Creek, Pullman and Vicinity, Washington.
W75-12378 4A

**PULP WASTES**
A River Restored: Oregon's Willamette,
W75-12210 5G

**PUMPING**
Land Subsidence Due to Ground-Water Withdrawal in the Los Banos-Kettleman City Area, California, Part 2. Subsidence and Compaction of Deposits,
W75-11957 4B

Land Subsidence Due to Ground-Water Withdrawal in the Los Banos-Kettleman City Area, California, Part 3. Interrelations of Water-Level Change, Change in Aquifer-System Thickness, and Subsidence,
W75-11958 4B

**PUMPKINSEED (FISH)**
Daily Fall Activity and Direction of Movements of Fish in Lake Quenouille in the Laurentians, (In French),
W75-12064 2H

**RADAR**
Comparison of Gage and Radar Methods of Convective Rain Measurement,
W75-12102 2B

**RADAR RAINFALL MEASUREMENTS**
Comparison of Gage and Radar Methods of Convective Rain Measurement,
W75-12102 2B

**RADIOACTIVE WASTES**
Colorado Public Interest Research Group, Inc. V. Train (Citizen Suit to Compel the Environmental Protection Agency to Control Discharge or Radioactive Materials into Navigable Waters).
W75-12287 6E

**RADIOACTIVITY TECHNIQUES**
Tracers Aid Placement of Stimulation Fluids,
W75-11898 8G

**RADIOISOTOPES**
Pipe Flow Measurements by the Pulse Velocity Method with Radioactive Isotopes,
W75-11916 8G

**RAIN**
Interim Report, Probable Maximum Precipitation in California.
W75-12165 2B

RAIN GAGES
Errors and Fluctuations of Raingauge Estimates of Areal Rainfall,
W75-11933 7A

Comparison of Gage and Radar Methods of Convective Rain Measurement,
W75-12102 2B

The Use of a Multizone Hydrologic Model With Distributed Rainfall and Distributed Parameters in the National Weather Service River Forecast System,
W75-12159 2B

RAINBOW TROUT
Behavioural Responses of Whitefish and Rainbow Trout to Drilling Fluids,
W75-11952 5C

Prairie Pothole Ecology and the Feasibility of Growing Rainbow Trout (Salmo Gairdneri Richardson) in Prairie Potholes,
W75-12157 8I

RAINFALL
The Stochastic and Chronologic Structure of Rainfall Sequences - Application to Indiana,
W75-11854 2B

The Stochastic and Chronologic Structure of Rainfall Sequences - Application to Indiana,
W75-11854 2B

Errors and Fluctuations of Raingauge Estimates of Areal Rainfall,
W75-11933 7A

Transformation System in Flood Runoff Phenomena,
W75-12016 2E

Hydrologic Systems in Hawaii,
W75-12022 2A

An Application of Simulated Rainfall Models to Forecasting of the Long Term Variation of River Bed,
W75-12028 2J

Comparison of Gage and Radar Methods of Convective Rain Measurement,
W75-12102 2B

Interim Report, Probable Maximum Precipitation in California.
W75-12165 2B

RAINFALL DISTRIBUTION
The Use of a Multizone Hydrologic Model With Distributed Rainfall and Distributed Parameters in the National Weather Service River Forecast System,
W75-12159 2B

RAINFALL INTENSITY
Meteoro-Hydrological Aspects of Rainfall in Japan.
W75-12030 2B

RAINFALL OCCURRENCES
The Stochastic and Chronologic Structure of Rainfall Sequences - Application to Indiana,
W75-11854 2B

RAINFALL-RUNOFF MODELS
A Three-Component, Nonlinear Water-Yield Model,
W75-12031 2A

RAINFALL-RUNOFF RELATIONSHIPS
A Mobile Sprinkler Irrigation Facility for Measurement of Surface Runoff and Soil Erosion (Eine Transportable Beregnungsanlage fuer die Messung von Oberflaechenabfluss und Bodenabtrag),
W75-11948 7B

A Study of Long Range Runoff System Response Based on Information Theory,
W75-12018 2A

Numerical Simulation of Watershed Hydrology,
W75-12027 2A

A Three-Component, Nonlinear Water-Yield Model,
W75-12031 2A

Sediment Basin Design,
W75-12042 2J

RANDOMIZED EXPERIMENTS
Bayesian and Classical Statistical Methods Applied to Randomized Weather Modification Experiments,
W75-12107 3B

RARE EARTH ELEMENTS
Observations on the Atomic Absorption Behavior of Some of the Earth Elements,
W75-11862 5A

REAL PROPERTY
Externalities and Public Goods. A Bibliography,
W75-12179 6B

RECHARGE
Light and Assimilation Number in a Small Desert, Recharged-Groundwater Pond,
W75-12326 5A

RECLAIMED LAND
Submerged Lands (State Title to Certain Submerged Lands).
W75-12288 6E

RECLAIMED WATER
Bio-Oxidation Process Saves H20,
W75-12115 5D

Computer Controlled Wastewater Reclamation Plant,
W75-12361 5D

RECONNAISSANCE TOOL
Use of Environmental Isotope Methods as a Reconnaissance Tool in Groundwater Exploration Near San Antonio de Pichincha, Ecuador,
W75-12080 2F

RECREATION
Recreation Analysis. A Bibliography,
W75-12180 6B

RECREATION DEMAND
Recreation Analysis. A Bibliography,
W75-12180 6B

RECREATIONAL WATERS
Disinfection to Protect Recreational Areas and Potable Water Supplies,
W75-12351 5D

RECTANGULAR RECHARGE AREA
Artifical Groundwater Recharge, II. Rectangular Recharging Area,
W75-12097 4B

RECYCLING
Complete Industrial Waste-Water Reuse Goal of Refining Study,
W75-12125 5D

Minneapolis Keeps on Truckin',
W75-12319 5D

How Well Are We Handling Toxic Waste.
W75-12342 5E

Organic Residue in a Recycled Effluent, Part I,
W75-12348 5D

Recycling Allows Zero Wastewater Discharge,
W75-12364 5D

REFRIGERATION
Refrigerated Surge Tank for Use With Aerobic Sewage Digestion System,
W75-11930 5D

REGIME
Basic Principles Relating to the International Regime of the Oceans at the Caracas Session of the U. N. Law of the Sea Conference,
W75-12253 6E

REGIONAL ANALYSIS
A Bayesian Framework for the Use of Regional Information in Hydrology,
W75-12048 6A

REGIONAL FLOOD
Flood Plain Information: Spring and Willow Creeks, Houston Metropolitan Area, Texas.
W75-12371 4

REGULATION
Regulatory Aspects of Sludge Utilization on Land,
W75-12134 5G

Water Quality Management Basin Plans--Policies and Procedures.
W75-12260 5G

Marine Sanctuaries.
W75-12261 6E

Permits for Activities in Navigable Waters or Ocean Waters.
W75-12263 6E

Iron and Steel Manufacturing Point Source Category--Effluent Guidelines and Standards.
W75-12264 5G

Canned and Preserved Seafood Processing Point Source Category--Effluent Limitations Guidelines.
W75-12265 5G

Fertilizer Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Limitations.
W75-12266 5G

Timber Products Processing Point Source Category--Effluent Guidelines and Standards.
W75-12267 5G

Organic Chemicals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Application to Pretreatment Standards.
W75-12268 5G

Soap and Detergent Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-12269 5G

Meat Products Point Source Category--Effluent Guidelines and Standards.
W75-12273 5G

Grain Mills Point Source Category--Effluent Limitations Guidelines and Standards.
W75-12274 5G

Plastics and Synthetic Point Source Category--Effluent Guidelines and Standards.
W75-12275 5G

Nonferrous Metals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Limitations.
W75-12276 5G

**JURISDICTION**
The Federal Common Law of Accretion: A New Element in Property Law,
W75-12205 6E

**REPAIRING**
Inflatable Plug Cuts Mess, Cleanup on Sewer-line ByPass,
W75-11908 8C

**RESEARCH AND DEVELOPMENT**
Understanding the Ocean Science Debate,
W75-12223 6E

Those Elusive 1985 Water Quality Goals.
W75-12242 5G

Water Quality Management Basin Plans--Policies and Procedures.
W75-12260 5G

**RESERVATION DOCTRINE**
United States V. Cappaert (Action for Declaration of Rights of United States to Underground Waters Appurtenant to Devil's Hole, Death Valley National Monument).
W75-12281 6E

**RESERVE MINING CO.**
Response of Lake Superior Algae to Nutrients and Taconite Tailings,
W75-11976 5C

**RESERVOIR CONSTRUCTION**
Water Supply.
W75-12297 6E

United States v. 187.40 Acres of Land, Huntingdon County, Pa. (Action to Condemn and for Use in Constructing Flood Control Project).
W75-12299 6E

**RESERVOIR COVERS**
The Floating Cover: Best Way to Cover a Finished-Water Reservoir,
W75-12360 5F

**RESERVOIR SITES**
Water Supply.
W75-12297 6E

**RESERVOIR STORAGE**
The Floating Cover: Best Way to Cover a Finished-Water Reservoir,
W75-12360 5F

**RESERVOIR YIELD**
Laboratory Study of the Effects of Confining Pressure on Fracture Flow and Storage Capacity in Carbonate Rocks,
W75-11892 4B

**RESERVOIRS**
NEPA Settlement: Conservation Council of North Carolina v. Froehlke,
W75-12244 6E

Water Supply.
W75-12297 6E

Aeration Upgrades Reservoir,
W75-12346 5F

**RESOURCE ALLOCATION**
International Law, U.S. Seabeds Policy and Ocean Resource Development,
W75-12214 6E

**RESOURCES DEVELOPMENT**
International Law, U.S. Seabeds Policy and Ocean Resource Development,
W75-12214 6E

Understanding the Ocean Science Debate,
W75-12223 6E

**RESPIRATION**
Phosphorus Metabolism and Respriration in Wheat Leaves and Roots in the Case of Water Defiency, (In Russian),
W75-12362 3F

**REVERSE OSMOSIS**
Analysis of Reverse Osmosis Facilities, Greenfield, Iowa,
W75-12320 5F

On The Comparison of Reverse Osmosis Membrane Performance,
W75-12347 3A

**REVIEWS**
Efficiency of Parameter and State Estimation Methods in Relation to Models of Lumped and Distributed Hydrologic Systems,
W75-12025 2A

General Aspects of Water Supply and Treatment in Ontario,
W75-12067 5F

Pollution Effects on Surface Waters and Groundwaters,- (Literature Review),
W75-12070 5B

Organics, (Literature Review),
W75-12071 5B

Inorganics, (Literature Review),
W75-12072 5A

Water Characteristics, (Literature Review),
W75-12073 5A

Sludge Treatment, Utilization, and Disposal, (Literature Review),
W75-12075 5D

Wastewater Collection, (Literature Review),
W75-12076 5D

Weather Modification: Where are We Now and Where Should We Be Going. An Editorial Overview,
W75-12088 3B

**RHINE RIVER**
The Impact of Chemical Pollution on Water Utilizationnutzung),. (Chemische Gewaesserverunreinigung und Wasser
W75-12314 5B

**RHODE ISLAND**
Water System of Newport, Rhode Island and its Recent Improvements,
W75-11910 5F

**RIME**
Formation of Graupel,
W75-12093 3B

**RINFALL**
On the Effect of Natural Rainfall Variability and Measurement Errors in the Detection of Seeding Effect,
W75-12103 3B

**RIP CURRENTS**
Coastwise Currents in the Vicinity of Chicago, and Currents Elsewhere in Southern Lake Michigan,
W75-12161 2H

**RIPARIAN LAND**
Borgmann V. Florissant Development Co (Action to Enjoin Adjoining Property Owners From Collecting and Discharging Surface Water onto Plaintiffs' Land).
W75-12289 6E

**RIPARIAN RIGHTS**
The Allocation of Waters of International Rivers.
W75-12219 6E

Borgmann V. Florissant Development Co (Action to Enjoin Adjoining Property Owners From Collecting and Discharging Surface Water onto Plaintiffs' Land).
W75-12289 6E

**RISKS**
A Bayesian Framework for the Use of Regional Information in Hydrology,
W75-12048 6A

**RIVER BASIN DEVELOPMENT**
The Allocation of Waters of International Rivers.
W75-12219 6E

Water Quality Management Basin Plans--Policies and Procedures.
W75-12260 5G

**RIVER BASINS**
Quality of Surface Waters of the United States, 1969: Part 8. Western Gulf of Mexico Basin.
W75-11966 7C

Surface Water Supply of the United States, 1966-70: Part 7. Lower Mississippi River--Volume 2. Arkansas River Basin.
W75-11969 7C

The Allocation of Waters of International Rivers.
W75-12219 6E

**RIVER BEDS**
An Application of Simulated Rainfall Models to Forecasting of the Long Term Variation of River Bed,
W75-12028 2J

**RIVER FORECAST SYSTEM**
The Use of a Multizone Hydrologic Model With Distributed Rainfall and Distributed Parameters in the National Weather Service River Forecast System,
W75-12159 2B

**RIVER FORECASTING**
The Use of a Multizone Hydrologic Model With Distributed Rainfall and Distributed Parameters in the National Weather Service River Forecast System,
W75-12159 2B

**RIVER REGULATION**
A River Restored: Oregon's Willamette,
W75-12210 5G

RIVERS
Training of Sutlej River Below Rupar Headworks for the Protection of Bist Doab Canal: Model Studies,
W75-11925 4D

The Allocation of Waters of International Rivers.
W75-12219 6E

RIVERS AND HARBORS ACT
United States V. Dexter Corp. (Appeal by Sanitary District From Conviction for Discharge of Manufacturing Refuse into Navigable Waters).
W75-12283 6E

ROCK DRILLABILITY
Drillability Studies: Percussive Drilling in the Field,
W75-12384 8E

ROCK WEIR
Seattle Project Calls for Rock Weirs.
W75-11922 4A

ROOT DEVELOPMENT
Influence of Soil Water Matric Potential and Resistance to Penetration on Corn Root Elongation,
W75-12055 3F

ROSARIO STRAITS
STD, Current Meter, and Drogue Observations in Rosario Strait, January - March 1974,
W75-12175 2L

ROTARY DRILLING
Bit Design is Key to Deep Drilling with Turbines,
W75-11889 8C

Chemical Fragmentation,
W75-12389 8E

Turbo-Drilling as Applied to Potash Developments in the Saskatchewan Field,
W75-12397 8B

ROUGHNESS COEFFICIENT
How to Evaluate Water Main Capacities, Part I,
W75-12329 8B

RUNOFF
Transformation System in Flood Runoff Phenomena,
W75-12016 2E

Nonlinear Runoff Kernels of Hydrologic System,
W75-12019 2A

Effect of an Error in Discharge Measurements on the Detection Process in Runoff Systems Analysis,
W75-12020 2A

Kernels of Stochastic Linear Hydrologic Systems,
W75-12021 2A

Effects of Movement of Precipitation Area Upon Runoff Phenomena,
W75-12026 2A

RUNOFF DYNAMICS
Transformation System in Flood Runoff Phenomena,
W75-12016 2E

RURAL AREAS
Design and Operating Criteria for Rural Water Systems,
W75-12126 6D

RURAL WATER SURVEYS
Introduction of S433 (Bill for Safe Drinking Water).
W75-12280 6E

RUSTS
Fungus Diseases of Wheat on Irrigated Lands. (In Russian),
W75-11904 2I

SABINO CANYON (ARIZ)
A Study of Flash-Flood Susceptibility -- A Basin in Southern Arizona,
W75-12167 4A

SAFE DRINKING WATER ACT
Introduction of S433 (Bill for Safe Drinking Water).
W75-12280 6E

SAFETY
Safety Installation for Preventing Pollution by Pipelines,
W75-11934 8G

SALINE LAKES
Geochemistry and Nutrient Regime of Saline Eutrophic Lakes in the Erickson-Elphinstone District of Southwestern Manitoba.
W75-11982 5C

SALINE WATER-FRESHWATER INTERFACES
Emigration of the Peamouth Chub, Mylocheilus Caurinus, Across a Dilute Seawater Bridge: An Experimental Zoogeographic Study,
W75-12151 2L

SALINE WATER INTRUSION
Water Quality and Salt Water Intrusion in the Lower Neches River,
W75-12327 5C

SALINITY
Transfer of Heat, Fresh Water and Nutrients Through the Seasonal Thermocline,
W75-11994 5C

SALMONELLA
Comparative Survival of Enterococci, Coliforms and Salmonellas in Water, (In Russian),
W75-11973 5C

SALTS
Effect of 2,4-D and Various Salts on Eurasian Watermilfoil.
W75-11990 4A

Experimental Data for Establishing the Content of Alpha, Alpha, Beta-Trichloropropionic Acid and its Sodium Salts in Reservoir Water,
W75-12190 5C

SAMPLING
Careful Sample Taking is Key to Successful Wells,
W75-11881 8G

The Use of a Specialized Drilling and Ground Water Sampling Technique for Delineation of Hexavalent Chromium Contamination in an Unconfined Aquifer, Southern New Jersey Coastal Plain,
W75-11899 5A

Mercury Concentrations in Open Ocean Waters: Sampling Procedure,
W75-11953 5A

SAN ANDREAS FAULT ZONE (CALIF.)
Water-Level Fluctuations and Earthquakes on the San Andreas Fault Zone,
W75-12392 4B

SAN JOAQUIN VALLEY (CALIF)
Land Subsidence in the San Joaquin Valley, California, as of 1972,
W75-11956 4B

Land Subsidence Due to Ground Water Withdrawal in the Los Banos-Kettleman City Area, California, Part 2. Subsidence and Compaction of Deposits,
W75-11957 4B

Land Subsidence Due to Ground-Water Withdrawal in the Los Banos-Kettleman City Area, California, Part 3. Interrelations of Water-Level Change, Change in Aquifer-System Thickness, and Subsidence,
W75-11958 4B

SAND AQUIFERS
Thin Section and Permeability Studies Call for Smaller Gravels in Gravel Packing,
W75-11893 8B

SAND BRIDGING
A New Approach to Permeability Reduction,
W75-11872 8G

SANDSTONE ACIDIZING
A New Look at Sandstone Acidizing,
W75-11878 4B

SANDSTONES
Thermodynamic and Kinetic Aspects of Argillaceous Sandstone Acidizing,
W75-11891 4B

Thin Section and Permeability Studies Call for Smaller Gravels in Gravel Packing,
W75-11893 8B

Reservoir Properties Affecting Matrix Acid Stimulation of Sandstones,
W75-11894 4B

SANGAMON RIVER (ILL)
Stochastic Hydrologic Systems,
W75-12015 2A

SATURATED FLOW
Mathematical Analysis of Steady Saturated Flow Through a Multilayered Soil with a Sloping Surface,
W75-12044 2G

SCENEDESMUS OBTUSIUSCULUS
Effects of the Commercial Polychlorinated Biphenyl Mixture Aroclor 1242 on Growth, Viability, Phosphate Uptake, Respiration and Oxygen Evolation in Scenedesmus,
W75-11974 5C

SCENERY
Critical Choices Save Shoreline,
W75-12231 6G

SCHISTOSOMA-MANSONI
Studies on Effects of Cercarial Concentration and Length of Exposure on Infection of Mice by St. Lucian Schistosoma Mansoni Cercariae in a Natural Running-Water Habitat,
W75-11903 5C

SCIOTO RIVER BASIN (OHIO)
Geochemistry of Strontium in the Scioto River Drainage Basin, Ohio,
W75-12052 2K

SCREEN RETAINER ASSEMBLY
Screen Retainer Assembly,
W75-11942 8C

CREENS
Up-Flow Separator,
W75-11936 5D

Screen Retainer Assembly,
W75-11942 8C

EA ICE
Major Late-Winter Features of Ice in Northern Bering and Chukchi Seas as Determined From Satellite Imagery,
W75-12168 2C

EA WATER
Mercury Concentrations in Open Ocean Waters: Sampling Procedure,
W75-11953 5A

Transfer of Heat, Fresh Water and Nutrients Through the Seasonal Thermocline,
W75-11994 5C

The Law of the Sea: A Selective Bibliography of Articles, Documents and Monographs,
W75-12217 6E

The Development of European Regional Law of the Sea,
W75-12220 6E

EALANTS
Running and Cementing Deep Well Liners,
W75-11895 8F

EASONAL
Transfer of Heat, Fresh Water and Nutrients Through the Seasonal Thermocline,
W75-11994 5C

ECONDARY RECOVERY (OIL)
Graphic Solution to Fracture Treatment Design,
W75-11876 8B

A New Look at Sandstone Acidizing,
W75-11878 4B

Thermodynamic and Kinetic Aspects of Argillaceous Sandstone Acidizing,
W75-11891 4B

Reservoir Properties Affecting Matrix Acid Stimulation of Sandstones,
W75-11894 4B

Tracers Aid Placement of Stimulation Fluids,
W75-11898 8G

EDIMENT TRANSPORT
Quality of Surface Waters of the United States, 1970: Part 6. Missouri River Basin.
W75-11964 7C

Quality of Surface Waters of the United States, 1970: Part 8. Western Gulf of Mexico Basins.
W75-11965 7C

Quality of Surface Waters of the United States, 1969: Part 8. Western Gulf of Mexico Basin.
W75-11966 7C

An Application of Simulated Rainfall Models to Forecasting of the Long Term Variation of River Bed,
W75-12028 2J

EDIMENTATION
Sediment Basin Design,
W75-12042 2J

EEDING EFFECTS
On the Design and Evaluation of Cumulus Modification Experiments,
W75-12105 3B

SEEPAGE
Mathematical Analysis of Steady Saturated Flow Through a Multilayered Soil with a Sloping Surface,
W75-12044 2G

SEISMIC EXPLORATION
Seismic Exploration: Its Nature and Effect on Fish,
W75-11877 8G

SEPARATED SEWERS
Superposition of Two Pipes in a Common, Mixed Sewer System (Recours a la superposition de deux conduites dans un reseau d'assainissement unitaire).
W75-11923 5D

SEPARATION TECHNIQUES
Flocculating Agents,
W75-12058 5D

Primary Solids/Liquid Separation.
W75-12153 5D

Filtering and Debris Removing Apparatus for Cleaning a Sea Water Stream,
W75-12183 5G

We're Fighting Oil Pollution with Bubbles, Belts and Beads,
W75-12225 5G

SEQUENCES
The Stochastic and Chronologic Structure of Rainfall Sequences - Application to Indiana,
W75-11854 2B

SETTLING BASINS
Sediment Basin Design,
W75-12042 2J

SEWAGE
Refrigerated Surge Tank for Use With Aerobic Sewage Digestion System,
W75-11930 5D

The Use of Storm Tanks for Tertiary Treatment of Sewage,
W75-11941 5D

Microbiology of a Former Dredge Spoil Disposal Area,
W75-12191 5C

Overland Flow: Answer to Water Cleanup Challenge.
W75-12228 5D

SEWAGE BACTERIA
Microbiology of a Former Dredge Spoil Disposal Area,
W75-12191 5C

Overland Flow: Answer to Water Cleanup Challenge.
W75-12228 5D

SEWAGE DISPOSAL
Ocean Dumping in the New York Bight,
W75-12172 5B

Overland Flow: Answer to Water Cleanup Challenge.
W75-12228 5D

SEWAGE DUMPING
Ocean Dumping in the New York Bight,
W75-12172 5B

SEWAGE EFFLUENTS
A Radioisotope Monitoring System for Sewage Effluent,
W75-11914 5A

The Effect of Wind on the Spread of Contamination in the Yeisk Estuary, (In Russian),
W75-11983 5B

SEWAGE SLUDGE
Land Disposal of Sewage Sludge,
W75-12135 5D

Analysis of Heavy Metals in Sewage Sludge and Liquids Associated with Sludges,
W75-12140 5A

Extractable Metals in Mixtures of Soil and Sewage Sludge,
W75-12141 5D

Assessment of Offshore Dumping in the New York Bight, Technical Background: Physical Oceanography, Geological Oceanography, and Chemical Oceanography.
W75-12171 5B

Ocean Dumping in the New York Bight,
W75-12172 5B

Report to the Congress on Ocean Dumping Research, January Through December 1974 Public Law 92-532, Title II, Section 201.
W75-12173 5B

Composting and use of Compost in Sweden,
W75-12339 5E

SEWAGE SLUDGE TREATMENT
Filter Press, Particularly for Dewatering Sludge in Sewage Treatment Plants,
W75-12056 5D

SEWAGE TREATMENT
Package Treatment Plants and Factors Affecting Service,
W75-11857 5D

Refrigerated Surge Tank for Use With Aerobic Sewage Digestion System,
W75-11930 5D

Flocculating Agents,
W75-12058 5D

Single Basin Aerated Sewage Lagoon with Spring Time Intensified Aeration,
W75-12060 5D

Method of Treating Sewage to Enhance Aerobic Decomposition,
W75-12061 5D

Aerobic Sewage Treatment System,
W75-12063 5D

Wastewater Collection, (Literature Review),
W75-12076 5D

Evaluation of a Coal-Sewage Treatment Pilot Plant.
W75-12128 5D

Adsorption of Poliovirus onto Activated Carbon in Wastewater,
W75-12148 5D

Berry Hill Sludge Treatment Works,
W75-12150 5D

Waste Disposal System,
W75-12185 5D

Overland Flow: Answer to Water Cleanup Challenge.
W75-12228 5D

The $5 Billion Flush.
W75-12277 5D

Sewage Treatment Systems,
W75-12308 5D

High Energy Electron Treatment of Water,
W75-12313 5D

New Orleans Chooses Oxygen Activated Sludge.
W75-12318 5D

Energy Conservation: An Essential and Urgent Problem for the Water Industry,
W75-12334 5D

Epoxy Resin Application at Sewage Works.
W75-12349 5D

SEWERAGE
Draining Telford New Town.
W75-11917 4A

European Dewatering System Aids Quebec Project,
W75-11918 5D

Steel, Concrete Form Sewer Support System.
W75-11921 5D

Superposition of Two Pipes in a Common, Mixed Sewer System (Recours a la superposition de deux conduites dans un reseau d'assainissement unitaire).
W75-11923 5D

New Computer System Monitors Baton Rouge Sewers.
W75-11927 7C

Computer's Master Plan Signals Sewer Problems Before They Start,
W75-11928 7C

Wastewater Collection, (Literature Review),
W75-12076 5D

Resort Community Puts All Utilities Underground.
W75-12338 8G

SEWERS
Use of Plastic Pipe for Sewers,
W75-11907 8G

Inflatable Plug Cuts Mess, Cleanup on Sewerline ByPass,
W75-11908 8C

Draining Telford New Town.
W75-11917 4A

Tough Digging, Tight Quarters Hamper Hull Collector Sewer Job,
W75-11919 5D

Sanitary Sewer Suspended within Storm Sewer,
W75-11920 5D

Flexible Joint for Sewer Pipe,
W75-11931 5D

Laying a Main Sewer in the Reservation Area of the St. Poelten Waterworks (Verlegung eines Abwassersammlers im Schutz- und Schoengeblet des Wasserwerkes St. Poelten).,
W75-11947 5D

Fairfax Goes for AWT.
W75-11950 5D

Sewer System Evaluation and Rehabilitation Cost Estimates,
W75-11951 6C

Wastewater Collection, (Literature Review),
W75-12076 5D

SHALE SLURRY
How Downhole Temperatures, Pressures Affect Drilling, Part 9, Navel Ways to Detect Abnormal Pressure,
W75-11868 8C

SHORE PROTECTION
Critical Choices Save Shoreline,
W75-12231 6G

Introduction of Shore Erosion Control Legislation.
W75-12279 6E

SHORELINE RECESSION
Small Groins on the Shores of Long Island Sound,
W75-12046 8A

SHORES
Small Groins on the Shores of Long Island Sound,
W75-12046 8A

1974 Annual Report, Great Lakes Basin Commission.
W75-12238 5G

SHRIMP
Effects of Oilfield Brine on Marine Organisms, an Ecological Evaluation of the Aransas Bay Area, Job No. 1,
W75-11864 5C

SIDERITE
Studies in the System CaCO:-FeCO3: 1. Phase Relations; 2. A Method for Major-Element Spectrochemical Analysis; 3. Compositions of Some Ferroan Dolomites,
W75-12400 2F

SIERRA NEVADA (CALIF)
Formation of Graupel,
W75-12093 3B

SILVER IODIDE
The Effect of Persistence of AgI on Randomized Weather Modification Experiments,
W75-12104 3B

SIMULATION ANALYSIS
Systems Simulation of Streamflows,
W75-12024 2E

Numerical Simulation of Watershed Hydrology,
W75-12027 2A

An Application of Simulated Rainfall Models to Forecasting of the Long Term Variation of River Bed,
W75-12028 2J

A Three-Component, Nonlinear Water-Yield Model,
W75-12031 2A

Predictive Models for Great Lakes Hydrology,
W75-12049 2A

SITES
Hydrogeological Aspects of Solid Waste Disposal,
W75-12121 5E

Ground-Water and Engineering Geology in Siting of Sanitary Landfills,
W75-12122 5E

SLOPES
Mathematical Analysis of Steady Saturated Flow Through a Multilayered Soil with a Sloping Surface,
W75-12044 2G

SLUDGE
Biochemical Characteristics of Digested Chemical Sewage Sludges,
W75-12132 5D

SLUDGE DISPOSAL
Water-Treatment Sludge Filtration Studies,
W75-12069 5D

Sludge Treatment, Utilization, and Disposal, (Literature Review),
W75-12075 5D

Land Disposal of Sewage Sludge,
W75-12135 5D

Nitrogen Transformation and Uptake,
W75-12136 5B

Some Microbiological Aspects of the Land Disposal of Sludge,
W75-12138 5D

Cation Distribution in Soils as Related to Sewage Sludge Disposal on Land,
W75-12139 5B

Composting and use of Compost in Sweden,
W75-12339 5E

SLUDGE DISPOSALS
Assessment of Offshore Dumping in the New York Bight, Technical Background: Physical Oceanography, Geological Oceanography, and Chemical Oceanography.
W75-12171 5B

SLUDGE TREATMENT
Water-Treatment Sludge Filtration Studies,
W75-12069 5D

Sludge Treatment, Utilization, and Disposal, (Literature Review),
W75-12075 5D

Berry Hill Sludge Treatment Works,
W75-12150 5D

Principles and Techniques for Conditioning of Waste-Activated Sludge by Direct Slurry Freezing,
W75-12154 5D

Method for Processing Sludge,
W75-12312 5D

Composting and use of Compost in Sweden,
W75-12339 5E

SLURRIES
How to Use Thixotropic Slurries to Solve Cementing Problems,
W75-11886 8F

SNAD BRIDGING
Thin Section and Permeability Studies Call for Smaller Gravels in Gravel Packing,
W75-11893 8B

SNOW
The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part I: Natural Conditions,
W75-12096 3B

OAPS
Soap and Detergent Manufacturing Point Source Category-Effluent Limitations Guidelines.
W75-12269 5G

ODIUM COMPOUNDS
Sodium Hydroxide Treatment of Acid Mine Drainage,
W75-12116 5G

ODIUM HYDROXIDE
Sodium Hydroxide Treatment of Acid Mine Drainage,
W75-12116 5G

OIL ALGAE
Morphology and Ultrastructure of Some Chlorococcal Algae from the Collection of Algal Strains in Leningrad University. I. Pseudospongiococcum Protococcoides Gen. Nov., Sp. Nov.,
W75-12000 5C

OIL COLUMNS
Effect of Hysteresis on the Prediction of Infiltration, Redistribution and Drainage of Water in a Layered Soil,
W75-12041 2G

OIL EROSION
A Mobile Sprinkler Irrigation Facility for Measurement of Surface Runoff and Soil Erosion (Eine Transportable Beregnungsanlage fuer die Messung von Oberflaechenabfluss und Bodenabtrag),
W75-11948 7B

Introduction of Shore Erosion Control Legislation.
W75-12279 6E

OIL FUNGI
Fungus Diseases of Wheat on Irrigated Lands. (In Russian),
W75-11904 2I

OIL HORIZONS
Transformation System in Flood Runoff Phenomena,
W75-12016 2E

OIL MOISTURE
A Thermodynamic Integral Equation for the Equilibrium Moisture Profile in Swelling Soil,
W75-12050 2G

A Simultaneous Calculation of the Capillary-Sorption Potentials, Moisture and Flow of Water in Soils Using a Computer and Equations of Soil Moisture Movement, (In Russian),
W75-12208 2G

Rapid Soil Moisture Determination by Immersion Method, (In Korean),
W75-12240 2G

OIL MOISTURE METERS
Soil Water Measurement with an Inexpensive Spectrophotometer,
W75-12081 2G

OIL PROFILES
Cation Distribution in Soils as Related to Sewage Sludge Disposal on Land,
W75-12139 5B

OIL SCIENCE
Cation Distribution in Soils as Related to Sewage Sludge Disposal on Land,
W75-12139 5B

SOIL SURVEYS
Evaluating the Productivity of Pine Forests in the Hinton-Edson Area, Alberta, From Soil Survey Maps,
W75-12003 4A

SOIL TYPES
The Utilization of Phosphorus from Muds by the Phytoplankter, Scenedesmus Dimorphus, and the Significance of These Findings to the Practice of Pond Fertilization,
W75-11986 5C

SOIL WATER
Effect of Hysteresis on the Prediction of Infiltration, Redistribution and Drainage of Water in a Layered Soil,
W75-12041 2G

Influence of Soil Water Matric Potential and Resistance to Penetration on Corn Root Elongation,
W75-12055 3F

Soil Water Measurement with an Inexpensive Spectrophotometer,
W75-12081 2G

Diurnal and Seasonal Soil Water Uptake and Flux Within a Bermudagrass Root Zone,
W75-12082 2D

SOIL WATER CHARACTERISTIC
A One-Step Wetting Procedure for Determining Both Water Characteristic and Hydraulic Conductivity of a Soil Core,
W75-12084 2G

SOIL WATER CONTENT
Soil Water Measurement with an Inexpensive Spectrophotometer,
W75-12081 2G

SOIL WATER MOVEMENT
A One-Step Wetting Procedure for Determining Both Water Characteristic and Hydraulic Conductivity of a Soil Core,
W75-12084 2G

SOILS
Chemical Tests for Plant Available Metals in Soils.
W75-12142 5A

Statistical Investigation of the Relation Between Absorbability and Content of Grain-size Fractions and Humus, (In Russian),
W75-12344 2G

SOLAR RADIATION
Distribution of Solar Radiation Within a Deciduous Forest,
W75-12034 2I

SOLAR SEA POWERPLANTS
Solar Sea Thermal Energy.
W75-12196 3E

SOLID WASTES
1973 IMCO Conference on Marine Pollution From Ships.
W75-12202 5G

Tough Solid-Waste Laws Brewing on Capitol Hill.
W75-12243 5G

SOLIDS REMOVAL
Primary Solids/Liquid Separation.
W75-12153 5D

SOLUTION MINING TECHNIQUES
Specialized Underground Extraction Systems.
W75-12388 8B

SORPTION
A Simultaneous Calculation of the Capillary-Sorption Potentials, Moisture and Flow of Water in Soils Using a Computer and Equations of Soil Moisture Movement, (In Russian),
W75-12208 2G

SOUNDING
On the Variability of 'Dynamic Seedability' as a Function of Time and Location Over South Florida: Part I. Spatial Variability,
W75-12089 3B

SOUTH CAROLINA
Storm Tide Frequencies on the South Carolina Coast,
W75-12160 2L

SOUTH SANTIAM RIVER (ORE)
Flood Plain Information: South Santiam River, Lebanon, Oregon.
W75-12376 4A

SOUTHEAST U.S.
Water Resources Programs in the Southeastern Region.
W75-11960 9D

Surface Water Supply of the United States, 1966-70: Part 2. South Atlantic Slope and Eastern Gulf of Mexico Basins - Volume 3. Basins from Apalachicola River to Pearl River.
W75-11967 7C

SPATIAL DISTRIBUTION
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. XIII. Distribution and Biomass of the Lemnaceae and the Fauna Associated with Them,
W75-12009 8I

SPECIFIC CAPACITY
Innovative Workover for Wasson Water Wells,
W75-11890 3B

SPECIFIC DRILLING IMPEDANCE
Drilling Impedance of Mud Solids,
W75-11897 8C

SPECTROMETERS
Soil Water Measurement with an Inexpensive Spectrophotometer,
W75-12081 2G

SPECTROPHMETRY
Observations on the Atomic Absorption Behavior of Some of the Earth Elements,
W75-11862 5A

SPECTROPHOTOMETRY
Toxicity of Copper Complexes to RFreshwater Mollusks,
W75-11863 5C

SPILLOVER EFFECTS
International Economics and Environment Control,
W75-12178 6G

SPILLWAYS
Corps' Guidelines for Dam Safety Inspection Need Revamping,
W75-12241 8A

SPRAY IRRIGATION
Spray Irrigation of Treated Municipal sewage,
W75-11856 5D

SPRAYS
Irrigation System,
W75-12309 3F

SPREADING BASINS
Artificial Groundwater Recharge, I. Circular Recharging Area,
W75-12040 4B

SPRINKLER IRRIGATION
Irrigation Apparatus,
W75-12302 3F

ST. PETERSBURG (FLA)
Recycling Allows Zero Wastewater Discharge,
W75-12364 5D

STACK EFFLUENTS
Diffusion Estimation for Small Emissions,
W75-12039 5A

STANDARDS
The Effect of Legislation of the Future Use of Water in the Leather Industry,
W75-12112 5D

Timber Products Processing Point Source Category--Effluent Guidelines and Standards.
W75-12267 5G

Nonferrous Metals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Limitations.
W75-12276 5G

STANDING (LEGAL)
The Florida Environmental Protection Act of 1971: The Citizen's Role in Environmental Management,
W75-12207 6G

STANFORD WATERSHED MODEL
Numerical Simulation of Watershed Hydrology,
W75-12027 2A

STATE GOVERNMENTS
The Water Pollution Permitting System,
W75-12245 5G

Beet Sugar Processing Point Source Subcategory--Effluent Guidelines and Standards.
W75-12271 5G

STATE JURISDICTION
Property (Wetlands Regulation),
W75-12247 6E

Admiralty's Power in RE Oil Pollution (States Able to Set More Stringent Penalties),
W75-12248 5G

STATE POLICY
A Proposal for the Quantification of Reserved Indian Water Rights,
W75-12249 6E

STATISTICAL METHODS
A Study of Long Range Runoff System Response Based on Information Theory,
W75-12018 2A

STATISTICAL MODELS
Systems Approach to Hydrology.
W75-12014 2A

STATISTICAL STUDIES
Statistical Investigation of the Relation Between Absorbability and Content of Grain-size Fractions and Humus, (In Russian),
W75-12344 2G

STATISTICS
Bayesian and Classical Statistical Methods Applied to Randomized Weather Modification Experiments,
W75-12107 3B

STD OBSERVATIONS
STD, Current Meter, and Drogue Observations in Rosario Strait, January - March 1974,
W75-12175 2L

STEAM
The Potential for Energy Production from Geothermal Resources.
W75-12199 4B

STEEL
Iron and Steel Manufacturing Point Source Category--Effluent Guidelines and Standards.
W75-12264 5G

STICKLEBACKES
Life History Notes and Meristic Variation in the Freshwater Fourspine Stickleback, Apeltes Quadracus (Mitchill), Near Sept-Iles: Quebec,
W75-12176 2I

STOCHASTIC PROCESSES
Stochastic Hydrologic Systems,
W75-12015 2A

A Study of Long Range Runoff System Response Based on Information Theory,
W75-12018 2A

Nonlinear Runoff Kernels of Hydrologic System,
W75-12019 2A

Kernels of Stochastic Linear Hydrologic Systems,
W75-12021 2A

The Stochastic Kinematic Wave,
W75-12023 2A

Simulation of the Short-Time Scour-Fill Process in Erodible Streams with Stochastic Sediment Transfer at the Stream Bed,
W75-12029 2J

STOMATA
Role of Epidermal Cell Turgor on Stomatal Regulation in Isolated Epidermal Peelings of Citrullus Colocynthis Linn. (Schrad.),
W75-12323 2I

STORAGE TANKS
The Floating Cover: Best Way to Cover a Finished-Water Reservoir,
W75-12360 5F

STORM DRAINS
Tough Digging, Tight Quarters Hamper Hull Collector Sewer Job,
W75-11919 5D

Sanitary Sewer Suspended within Storm Sewer,
W75-11920 5D

Steel, Concrete Form Sewer Support System.
W75-11921 5D

STORM OVERFLOW
The Graphical Hydrographs Method With the Intermediary of Storm Overflows and Flood Retention Tanks (Das grafische Abfluss-ganglinienverfahren mit Zwischenschaltung von RUE und RB),
W75-11861 5D

STORM RUNOFF
Experiments with Unconventional Storm Overflows,
W75-11940 5D

STORM SEWAGE TANKS
The Use of Storm Tanks for Tertiary Treatment of Sewage,
W75-11941 5D

STORM SURGE
Storm Tide Frequencies on the South Carolina Coast,
W75-12160 2L

Estimation of Hurricane Storm Surge in Apalachicola Bay, Florida,
W75-12164 2B

STORM TIDES
Storm Tide Frequencies on the South Carolina Coast,
W75-12160 2L

STORMS
Estimation of Hurricane Storm Surge in Apalachicola Bay, Florida,
W75-12164 2B

STREAM EROSION
Simulation of the Short-Time Scour-Fill Process in Erodible Streams with Stochastic Sediment Transfer at the Stream Bed,
W75-12029 2J

STREAM FLOW
The Use of a Multizone Hydrologic Model With Distributed Rainfall and Distributed Parameters in the National Weather Service River Forecast System,
W75-12159 2B

STREAMFLOW
Flood Profiles in the Umpqua River Basin, Oregon: Part 3, Umpqua River Below Scottburg, Scholfield, Cow Creek Above Glendale,
W75-11959 4A

Surface Water Supply of the United States, 1966-70: Part 2. South Atlantic Slope and Eastern Gulf of Mexico Basins - Volume 3. Basins from Apalachicola River to Pearl River.
W75-11967 7C

Surface Water Supply of the United States, 1966-70: Part 6. Missouri River Basin--Volume 1. Missouri River Basin above Williston, North Dakota.
W75-11968 7C

Surface Water Supply of the United States, 1966-70: Part 7. Lower Mississippi River--Volume 2. Arkansas River Basin.
W75-11969 7C

A Bayesian Framework for the Use of Regional Information in Hydrology,
W75-12048 6A

1974 Water Resources Data for Oregon, Surface Water Records, Precipitation Records,
W75-12087 7C

STREAMS
A Computer Program Used to Estimate Primary Productivity from pH and Carbon Dioxide Data Employing the Upstream-Downstream Method,
W75-11971 5C

Distribution of Aquatic Macrophytes Related to Paper Mill Effluents in a Southern Michigan Stream,
W75-11991 2B

TREPTOCOCCUS
Comparative Survival of Enterococci, Coliforms and Salmonellas in Water, (In Russian),
W75-11973 5C

TRESS
Influence of Environmental Stress on Enumeration of Indicator Bacteria from Natural Waters,
W75-12053 5C

TRICT LIABILITY
Admiralty's Power in RE Oil Pollution (States Able to Set More Stringent Penalties),
W75-12248 5G

TRONTIUM
Geochemistry of Strontium in the Scioto River Drainage Basin, Ohio,
W75-12052 2K

TRUCTURES
Permits for Activities in Navigable Waters or Ocean Waters.
W75-12263 6E

UBMERGED LANDS
Submerged Lands (State Title to Certain Submerged Lands).
W75-12288 6E

UBSURFACE WATERS
Fresh Water Strata of Mississippi as Revealed by Electrical Log Studies,
W75-12399 4B

UCCESSION
A Quantitative Measure of Succession Rate and Its Application to the Phytoplankton of Lakes,
W75-12005 5C

UCCESSION RATE
A Quantitative Measure of Succession Rate and Its Application to the Phytoplankton of Lakes,
W75-12005 5C

UGAR BEETS
Beet Sugar Processing Point Source Subcategory--Effluent Guidelines and Standards.
W75-12271 5G

ULFATES
Application of the Methylthymol Blue Sulfate Method to Water and Wastewater Analysis,
W75-12324 5A

ULFURIC ACID
Acid Mine Drainage in Cane Creek Basin, Near Oakman, Walker County, Alabama,
W75-11871 5G

URF
Tarshis v. Lahaina Investment Corp. Responsibility of Owner of Beach Front Property to Warn of Surging Wave).
W75-12296 6E

URFACE IRRIGATION
Trickle Irrigation System,
W75-12184 3F

URFACE WATER
Water-Treatment Sludge Filtration Studies,
W75-12069 5D

Pollution Effects on Surface Waters and Groundwaters,- (Literature Review),
W75-12070 5B

SURFACE WATERS
Water Resources Data for California, 1973: Part 2. Water Quality Records.
W75-11962 7C

Quality of Surface Waters of the United States, 1970: Part 6. Missouri River Basin.
W75-11964 7C

Quality of Surface Waters of the United States, 1970: Part 8. Western Gulf of Mexico Basins.
W75-11965 7C

Quality of Surface Waters of the United States, 1969: Part 8. Western Gulf of Mexico Basin.
W75-11966 7C

Surface Water Supply of the United States, 1966-70: Part 2. South Atlantic Slope and Eastern Gulf of Mexico Basins - Volume 3. Basins from Apalachicola River to Pearl River.
W75-11967 7C

Water-Quality Data, 1948-73, Anchorage and Vicinity, Alaska,
W75-19955 5A

SURGE TANKS
Refrigerated Surge Tank for Use With Aerobic Sewage Digestion System,
W75-11930 5D

SURVEYS
Oregon Surveys its Hazardous Wastes,
W75-12239 5G

SUSPENDED SOLIDS
Study on Direct Rapid Filtration Using Reduced Coagulants, (In Japanese),
W75-11860 5D

Operational Variables and Limitations of Direct Filtration,
W75-12127 5F

SUSPENSION
Study on Direct Rapid Filtration Using Reduced Coagulants, (In Japanese),
W75-11860 5D

SWAMPS
Big Cypress National Preserve (Part 1).
W75-12195 6G

SWEDEN
Water Conservation in Sweden: II. Pollution Control,
W75-12317 5G

Composting and use of Compost in Sweden,
W75-12339 5E

SWELLING SOIL
A Thermodynamic Integral Equation for the Equilibrium Moisture Profile in Swelling Soil,
W75-12050 2G

SYLVANIA RECREATION AREA (MICH)
Limnology of Lakes of the Sylvania Recreation Area, Ottawa National Forest,
W75-11981 2H

SYNTHETIC HYDROLOGY
Numerical Simulation of Watershed Hydrology,
W75-12027 2A

A Three-Component, Nonlinear Water-Yield Model,
W75-12031 2A

SYSTEMATICS
Morphology and Ultrastructure of Some Chlorococcal Algae from the Collection pf Algal Strains in Leningrad University. II. Monoraphidium Braunii (Nag, in Kutz.) Komarkova-Legnerova Strain (Gromov) 1967/231,
W75-11997 5C

Morphology and Ultrastructure of Some Chlorococcal Algae from the Collection of Algal Strains in Leningrad University. I. Pseudospongiococcum Protococcoides Gen. Nov., Sp. Nov.,
W75-12000 5C

SYSTEMS ANALYSIS
Systems Approach to Hydrology.
W75-12014 2A

The Structure of Inputs and Outputs of Hydrologic Systems,
W75-12017 2A

Effect of an Error in Discharge Measurements on the Detection Process in Runoff Systems Analysis,
W75-12020 2A

Efficiency of Parameter and State Estimation Methods in Relation to Models of Lumped and Distributed Hydrologic Systems,
W75-12025 2A

TACONITE TAILINGS
Response of Lake Superior Algae to Nutrients and Taconite Tailings,
W75-11976 5C

TANNERY WASTES
The Effect of Legislation of the Future Use of Water in the Leather Industry,
W75-12112 5D

Effluent Treatment for a Small Tannery,
W75-12118 5D

Some Aspects of a Chemical Treatment of the Waste Waters from the Beamhouse,
W75-12120 5D

No-Effluent Tannery Processes,
W75-12124 5D

TANNING WASTES
Some Aspects of Tannery Effluent Control,
W75-12123 5D

TAXES
Aquatic Weed Control - State Revenue Laws.
W75-12295 6E

TEMPERATURE
How Downhole Temperatures, Pressures Affect Drilling, Part 2, Detecting and Evaluating Formation Pressures,
W75-11866 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 3, Overpressure Detection from Wireline Methods,
W75-11867 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 10, Miscellaneous Ways to Detect Abnormal Pressure,
W75-11869 8C

The Water Relations of Hemlock (Tsuga Canadensis): III. The Temperature Dependence of Water Exchange in a Pressure Bomb,
W75-11902 2I

TEMPERATURE CONTROL
Irrigation System,
W75-12309 3F

TENNEESSEE
Application of a Simple Dispersion Model to a Rural Industrial Region,
W75-12037 5A

TERRITORIAL SEAS
International Law, U.S. Seabeds Policy and Ocean Resource Development,
W75-12214 6E

TERTIARY TREATMENT
The Use of Storm Tanks for Tertiary Treatment of Sewage,
W75-11941 5D

Fairfax Goes for AWT.
W75-11950 5D

TESTING
Testing of Cloud Seeding Materials at the Cloud Simulation and Aersol Laboratory, 1971-1973,
W75-12099 3B

TESTING PROCEDURES
The Use of a Specialized Drilling and Ground Water Sampling Technique for Delineation of Hexavalent Chromium Contamination in an Unconfined Aquifer, Southern New Jersey Coastal Plain,
W75-11899 5A

TEXAS
Effects of Oilfield Brine on Marine Organisms, an Ecological Evaluation of the Aransas Bay Area, Job No. 1,
W75-11864 5C

Innovative Workover for Wasson Water Wells,
W75-11890 3B

Tracers Aid Placement of Stimulation Fluids,
W75-11898 8G

Flood Plain Information: Spring and Willow Creeks, Houston Metropolitan Area, Texas.
W75-12371 4

Flood Plain Information: Onion Creek, Austin, Texas.
W75-12374 4A

Flood Plain Information: Hackberry Creek and Cottonwood Branch, Dallas County, Texas.
W75-12379 4A

TEXTILE INDUSTRY
Strong Impact of Textiles by U.S. Water Control Act,
W75-12117 5G

TEXTILES
Strong Impact of Textiles by U.S. Water Control Act,
W75-12117 5G

THEORETICAL ANALYSIS
Effect of an Error in Discharge Measurements on the Detection Process in Runoff Systems Analysis,
W75-12020 2A

THERMAL POLLUTION
An Ecological Evaluation of Heated Water Discharge on Phytoplankton Blooms in the Potomac River,
W75-12004 5C

THERMAL POWER
Solar Sea Thermal Energy.
W75-12196 3E

THERMAL STRATIFICATION
Vertical Temperature Profiles in Open-Channel Flow,
W75-12047 5B

THERMOCLINE
Transfer of Heat, Fresh Water and Nutrients Through the Seasonal Thermocline,
W75-11994 5C

THERMODYNAMICS
Thermodynamic and Kinetic Aspects of Argillaceous Sandstone Acidizing,
W75-11891 4B

A Thermodynamic Integral Equation for the Equilibrium Moisture Profile in Swelling Soil,
W75-12050 2G

THIXOTROPIC CEMENT
How to Use Thixotropic Slurries to Solve Cementing Problems,
W75-11886 8F

THROUGHFALL
Relative Throughfall Enrichment by Biologic and by Aerosol-Derived Materials in Loblolly Pines,
W75-11853 5B

TIBBETTS CREEK (WASH)
Special Flood Hazard Information: Issaquah and Tibbetts Creeks, Issaquah and Vicinity, Washington.
W75-12377 4A

TIDAL EFFECTS
Dispersion and Settling Around a Waste Disposal Point in a Shallow Sea,
W75-12043 5B

TIDAL STREAMS
Cook Inlet Tidal Stream Atlas,
W75-12163 2L

TIDAL WATERS
Cook Inlet Tidal Stream Atlas,
W75-12163 2L

TIDES
Storm Tide Frequencies on the South Carolina Coast,
W75-12160 2L

Cook Inlet Tidal Stream Atlas,
W75-12163 2L

TILE DRAINS
Flow Quantities in Residential Weeping Tile Systems--A Calculational Method,
W75-12328 4A

TIME SERIES ANALYSIS
Stochastic Hydrologic Systems,
W75-12015 2A

TOKYO (JAPAN)
Mathematical Models and Simulation of Wastewater Treatment Systems,
W75-12156 5D

TONAWANDA CREEK (NEW YORK)
Flood Plain Information: Tonawanda Creek and Its Affected Tributaries, Erie and Niagara Counties, New York.
W75-12373 2E

TOPOGRAPHIC MAPPING
Oceanographic Observations in the Georgia Bight: Data Report for R V EASTWARD Cruises E-13-73 (4-11 September) and E-19-73 (8-9 December 1973),
W75-12169 2L

TORT LIABILITY
Tarshis v. Lahaina Investment Corp. (Responsibility of Owner of Beach Front Property to Warn of Surging Wave).
W75-12296 6E

TORTULA-RURALIS
The Effect of Hydrogen in Concentrations in Simulated Rain on the Moss Tortula Ruralis (HEDW.)Sm,
W75-11987 5C

TOXICITY
Toxicity of Copper Complexes to RFreshwater Mollusks,
W75-11863 5C

Effects of Oilfield Brine on Marine Organisms, an Ecological Evaluation of the Aransas Bay Area, Job No. 1,
W75-11864 5C

Pollution Effects on Surface Waters and Groundwaters,- (Literature Review),
W75-12070 5B

Are Chemicals Used Algae Control Biodegradable.
W75-12325 5C

Toxicity of Aquatic Organisms Caused by Chlorination,
W75-12353 5D

TOXINS
Effect of Bromex-50 on Plankton Population in Fish Ponds,
W75-12188 5C

TRACE ELEMENTS
Observations on the Atomic Absorption Behavior of Some of the Earth Elements,
W75-11862 5A

TRACERS
Tracers Aid Placement of Stimulation Fluids,
W75-11898 8G

TRACKING TECHNIQUES
The Use of a Specialized Drilling and Ground Water Sampling Technique for Delineation of Hexavalent Chromium Contamination in an Unconfined Aquifer, Southern New Jersey Coastal Plain,
W75-11899 5A

TRAINING
Saving Our Water Resources,
W75-12232 6G

Crew Training,
W75-12385 8G

TREATIES
1973 IMCO Conference on Marine Pollution From Ships.
W75-12202 5G

Are We Any Nearer to an International Agreement on Use of the Seas,
W75-12224 6E

A Proposal for the Quantification of Reserved Indian Water Rights,
W75-12249 6E

**TREATMENT**
Plastics and Synthetic Point Source Category--Effluent Guidelines and Standards.
W75-12275 5G

**TREATMENT FACILITIES**
Yaphank County Center Wastewater Treatment Plant.
W75-11924 5D

Laying a Main Sewer in the Reservation Area of the St. Poelten Waterworks (Verlegung eines Abwassersammlers im Schutz- und Schoengeblet des Wasserwerkes St. Poelten).,
W75-11947 5D

Fairfax Goes for AWT.
W75-11950 5D

Remodelling at Norwich,
W75-12065 5D

Oklahoma Plans Ahead for Wastewater Reuse,
W75-12066 5D

Regulatory Aspects of Sludge Utilization on Land,
W75-12134 5G

Unusual Features in Plant Design.
W75-12146 5F

Control System for Showa Water Purification Plant, (In Japanese),
W75-12147 5F

Berry Hill Sludge Treatment Works,
W75-12150 5D

Train V. City of New York (Class Action by City to Compel EPA to Allot Funds Authorized by the 1972 Federal Water Pollution Control Act Amendments).
W75-12284 6E

Train V. Campaign Clean Water, Inc. (Action by Environmental Group to Require EPA to Release Funds Authorized for Federal Grants to Municipalities for Water Pollution Control.
W75-12285 6E

Minneapolis Keeps on Truckin',
W75-12319 5D

Digester Gas: Valuable Plant Fuel,
W75-12332 8C

Water Plant goes Automatic,
W75-12345 8C

**RESPASS**
Wetzel V. A. Duda and Sons (Action by Riparian Property Owners to Enjoin Water Pollution to Lake From Farming Operations).
W75-12286 6E

**RICKLE IRRIGATION SYSTEMS**
Trickle Irrigation System,
W75-12184 3F

**RICKLING FILTERS**
Virus Removals in Trickling Filter Plants,
W75-12068 5D

Biological Waste Water Treatment,
W75-12149 5D

**RITIUM**
Use of Environmental Isotope Methods as a Reconnaissance Tool in Groundwater Exploration Near San Antonio de Pichincha, Ecuador,
W75-12080 2F

**TROPHIC LEVEL**
Classification of Wisconsin Lakes by Trophic Condition.
W75-11979 5C

**TROPICAL CYCLONES**
A Statistical Study of Tropical Cyclone Positioning Errors with Economic Applications,
W75-12166 2B

**TROPICAL REGIONS**
Primary Production in the Plankton Community of a Tropical Lake,
W75-11978 5C

**TROUT**
The Ichthyofauna of the Rokytna River: I. Species Composition, Abundance and Biomass,
W75-12129 2I

**TUBES**
Graphic Solutions to Tubing Movement in Deep Wells,
W75-11875 8B

**TUBING MOVEMENT**
Graphic Solutions to Tubing Movement in Deep Wells,
W75-11875 8B

**TUNNELING MACHINES**
Mole Drives Through Clay-Shale Face.
W75-11911 8H

**TUNNELS**
Mole Drives Through Clay-Shale Face.
W75-11911 8H

**TURBIDITY**
Dispersion and Settling Around a Waste Disposal Point in a Shallow Sea,
W75-12043 5B

The Assessment of Water Quality,
W75-12054 5F

Diked Disposal Area Site No 12, Cleveland Harbor, Cuyahoga County, Ohio.
W75-12255 5E

**TURBINES**
Bit Design is Key to Deep Drilling with Turbines,
W75-11889 8C

**TURBO-DRILLING**
Turbo-Drilling as Applied to Potash Developments in the Saskatchewan Field,
W75-12397 8B

**TURBULENCE**
Variations of the Turbulent Fluxes of Momentum, Heat and Moisture over Lake Ontario,
W75-12078 2H

Tarshis v. Lahaina Investment Corp. (Responsibility of Owner of Beach Front Property to Warn of Surging Wave).
W75-12296 6E

**TURBULENT FLOW**
The Spatial and Temporal Variations of the Turbulent Fluxes of Heat, Momentum and Water Vapor over Lake Ontario,
W75-12079 2D

**ULTIMATE DISPOSAL**
Tough Solid-Waste Laws Brewing on Capitol Hill.
W75-12243 5G

**UMPQUA RIVER BASIN (OREG)**
Flood Profiles in the Umpqua River Basin, Oregon: Part 3, Umpqua River Below Scottburg, Scholfield, Cow Creek Above Glendale,
W75-11959 4A

**UNCERTAINTY**
Economic Growth Vs. the Environment. A Bibliography,
W75-12182 6G

**UNITED NATIONS**
International Law, U.S. Seabeds Policy and Ocean Resource Development,
W75-12214 6E

Basic Principles Relating to the International Regime of the Oceans at the Caracas Session of the U. N. Law of the Sea Conference,
W75-12253 6E

**UNITED STATES**
International Law, U.S. Seabeds Policy and Ocean Resource Development,
W75-12214 6E

**UNSATURATED FLOW**
Diurnal and Seasonal Soil Water Uptake and Flux Within a Bermudagrass Root Zone,
W75-12082 2D

On Solving the Flow Equation in Unsaturated Soils by Optimization: Horizontal Infiltration,
W75-12083 2G

A One-Step Wetting Procedure for Determining Both Water Characteristic and Hydraulic Conductivity of a Soil Core,
W75-12084 2G

**UPTAKE (BIOLOGICAL)**
Pick-up and Metabolism of DDT, Dieldrin and Photodieldrin by a Fresh Water Alga (Ankistrodesmus Amalloides) and a Microcrustacean (Daphnia Pulex),
W75-12007 5C

**URBANIZATION**
Sediment Basin Design,
W75-12042 2J

**UREAS**
Effects of Aerial Forest Fertilization With Urea Pellets on Nitrogen Levels in a Mountain Stream,
W75-12113 5B

**UREASE**
Activity of Enzymes (Protease and Urease) and Forms of Mobile Nitrogen in Thin Peat Soil of the Second Year of Use, (In Russian),
W75-12216 5B

**USSR**
Statistical Investigation of the Relation Between Absorbability and Content of Grain-size Fractions and Humus, (In Russian),
W75-12344 2G

**UTAH**
Diurnal Fluctuations of Water Tables Induced by Atmospheric Pressure Changes,
W75-12077 2G

**VARIABILITY**
Variations of the Turbulent Fluxes of Momentum, Heat and Moisture over Lake Ontario,
W75-12078 2H

The Spatial and Temporal Variations of the Turbulent Fluxes of Heat, Momentum and Water Vapor over Lake Ontario,
W75-12079 2D

**VARIABILITY**

Small-Scale Variability of Hail and its Significance for Hail Prevention Experiments,
W75-12092 3B

On the Effect of Natural Rainfall Variability and Measurement Errors in the Detection of Seeding Effect,
W75-12103 3B

**VENEER**

Timber Products--Proposed Effluent Guidelines and Performances and Pretreatment Standards for New Sources.
W75-12270 5G

**VERMONT**

Conservation Soc'y. of Southern Vermont, Inc. V. Secretary of Transportation (Review of Motion for Equitable Injunction Against Stream Channelization Project).
W75-12282 6E

**VIRAL REMOVAL**

Virus Removals in Trickling Filter Plants,
W75-12068 5D

**VIRGINIA**

Flood Plain Information: Moores Creek, Albemarle County and Charlottesville, Virginia.
W75-12366 4A

Flood Plain Information--Coastal Flooding: Town of Poquoson, Virginia.
W75-12367 4A

Flood Plain Information: Meherrin River, Emporia, Virginia.
W75-12368 4A

Flood Plain Information: James River, Howardsville to Scottsville, Albemarle County, Virginia.
W75-12375 4A

**VIRUSES**

Virus Removals in Trickling Filter Plants,
W75-12068 5D

Virological Investigations on Sludges from Selected Ontario Sewage Plants,
W75-12133 5D

Adsorption of Poliovirus onto Activated Carbon in Wastewater,
W75-12148 5D

**WARNING SYSTEMS**

A Statistical Study of Tropical Cyclone Positioning Errors with Economic Applications,
W75-12166 2B

**WASHINGTON**

The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part I: Natural Conditions,
W75-12096 3B

The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part II: Techniques for the Physical Evaluation of Seeding,
W75-12108 3B

The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part III: Case Studies of the Effects of Seeding,
W75-12109 3B

Special Flood Hazard Information: Issaquah and Tibbetts Creeks, Issaquah and Vicinity, Washington.
W75-12377 4A

Special Flood Hazard Information: Paradise Creek, Pullman and Vicinity, Washington.
W75-12378 4A

**WASTE DILUTION**

Photographic Quantification of Water Quality in Mixing Zones,
W75-11970 5A

**WASTE DISPOSAL**

Dispersion and Settling Around a Waste Disposal Point in a Shallow Sea,
W75-12043 5B

Sludge Treatment, Utilization, and Disposal, (Literature Review),
W75-12075 5D

Hydrogeological Aspects of Solid Waste Disposal,
W75-12121 5E

Ocean Dumping in the New York Bight,
W75-12172 5B

Report to the Congress on Ocean Dumping Research, January Through December 1974 Public Law 92-532, Title II, Section 201.
W75-12173 5B

1973 IMCO Conference on Marine Pollution From Ships.
W75-12202 5G

Oregon Surveys its Hazardous Wastes,
W75-12239 5G

Diked Disposal Area Site No 12, Cleveland Harbor, Cuyahoga County, Ohio.
W75-12255 5E

How Well Are We Handling Toxic Waste.
W75-12342 5E

**WASTE DUMPS**

Ocean Dumping Oversight.
W75-12194 5G

**WASTE IDENTIFICATION**

Individual Home Wastewater Characterization and Treatment,
W75-11852 5D

**WASTE TREATMENT**

Meat Products Point Source Category--Effluent Guidelines and Standards.
W75-12273 5G

**WASTE WATER DISPOSAL**

Spray Irrigation of Treated Municipal sewage,
W75-11856 5D

Mamala Bay Wastewater Treatment and Disposal System, Oahu, Hawaii (Final Environmental Impact Statement).
W75-12257 5D

**WASTE WATER TREATMENT**

Individual Home Wastewater Characterization and Treatment,
W75-11852 5D

Spray Irrigation of Treated Municipal sewage,
W75-11856 5D

Package Treatment Plants and Factors Affecting Service,
W75-11857 5D

Alternative Methods of Disinfection,
W75-11858 5D

Nitrogen Removal from Municipal Wastewater,
W75-11859 5D

Study on Direct Rapid Filtration Using Reduced Coagulants, (In Japanese),
W75-11860 5D

The Graphical Hydrographs Method With the Intermediary of Storm Overflows and Flood Retention Tanks (Das grafische Abfluss-ganglinienverfahren mit Zwischenschaltung von RUE und RB),
W75-11861 5D

Tough Digging, Tight Quarters Hamper Hull Collector Sewer Job,
W75-11919 5D

Yaphank County Center Wastewater Treatment Plant.
W75-11924 5D

Process and Agents for Removal of Inorganic and Organic Matter From Waste Water Systems,
W75-11926 5D

Refrigerated Surge Tank for Use With Aerobic Sewage Digestion System,
W75-11930 5D

Up-Flow Separator,
W75-11936 5D

The Use of Storm Tanks for Tertiary Treatment of Sewage,
W75-11941 5D

Hydraulic Sewer Pipeline Cleaner,
W75-11944 5D

Fairfax Goes for AWT.
W75-11950 5D

Hygienic Effectiveness of Measures for Treating the Industrial Wastewaters of the Konakovo State Regional Electric Power Plant, (In Russian),
W75-11984 5D

Filter Press, Particularly for Dewatering Sludge in Sewage Treatment Plants,
W75-12056 5D

Recovering Proteins from Waste Water,
W75-12057 5D

Flocculating Agents,
W75-12058 5D

Process and Apparatus for Recovering Clean Water and Solids from Dilute, Aqueous, Solids Containing Solutions or Dispersions,
W75-12059 5D

Single Basin Aerated Sewage Lagoon with Spring Time Intensified Aeration,
W75-12060 5D

Method of Treating Sewage to Enhance Aerobic Decomposition,
W75-12061 5D

Aerobic Sewage Treatment System,
W75-12063 5D

Remodelling at Norwich,
W75-12065 5D

Oklahoma Plans Ahead for Wastewater Reuse,
W75-12066 5D

rus Removals in Trickling Filter Plants,
75-12068 5D

ater-Treatment Sludge Filtration Studies,
75-12069 5D

aerobic Processes, (Literature Review),
75-12074 5D

dge Treatment, Utilization, and Disposal,
terature Review),
75-12075 5D

stewater Collection, (Literature Review),
75-12076 5D

e Effect of Legislation of the Future Use of
ter in the Leather Industry,
75-12112 5D

-Oxidation Process Saves H20,
75-12115 5D

dium Hydroxide Treatment of Acid Mine
ainage,
75-12116 5G

fluent Treatment for a Small Tannery,
75-12118 5D

me Aspects of a Chemical Treatment of the
ste Waters from the Beamhouse,
75-12120 5D

me Aspects of Tannery Effluent Control,
75-12123 5D

-Effluent Tannery Processes,
75-12124 5D

aluation of a Coal-Sewage Treatment Pilot
nt.
75-12128 5D

chemical Characteristics of Digested
emical Sewage Sludges,
75-12132 5D

rological Investigations on Sludges from
ected Ontario Sewage Plants,
75-12133 5D

mary Developments of Air-Borne Bacteria
he OECD Activated Sludge System,
75-12143 5D

ctors Affecting Oxygen Transfer During
bble Aeration Under Laboratory Scale Con-
ons,
75-12144 5D

sorption of Poliovirus onto Activated Car-
n in Wastewater,
75-12148 5D

ological Waste Water Treatment,
75-12149 5D

rry Hill Sludge Treatment Works,
75-12150 5D

e Relationship Between Process Configura-
n and Process Performance,
75-12152 5D

mary Solids/Liquid Separation.
75-12153 5D

nciples and Techniques for Conditioning of
ste-Activated Sludge by Direct Slurry
ezing,
75-12154 5D

The Influence of Oxygen Concentration and Turbulence Intensity on Complete-Mix Activated Sludge Performance,
W75-12155 5D

Mathematical Models and Simulation of Wastewater Treatment Systems,
W75-12156 5D

Waste Disposal System,
W75-12185 5D

Mamala Bay Wastewater Treatment and Disposal System, Oahu, Hawaii (Final Environmental Impact Statement).
W75-12257 5D

Method of Removing Heavy Metals from Water and Apparatus Therefor,
W75-12304 5D

Sewage Treatment Systems,
W75-12308 5D

Method for Processing Sludge,
W75-12312 5D

High Energy Electron Treatment of Water,
W75-12313 5D

Water Conservation in Sweden: II. Pollution Control,
W75-12317 5G

New Orleans Chooses Oxygen Activated Sludge.
W75-12318 5D

Minneapolis Keeps on Truckin',
W75-12319 5D

Nutrient Removal in Biological Systems,
W75-12321 5D

Column Settling Tests for Flocculant Suspensions,
W75-12322 5D

The Effects of Aerobic and Anaerobic Incubation on the Extractabilities of Heavy Metals in Digested Sewage Sludge,
W75-12330 5D

Biologically Mediated Inconsistencies in Aeration Equipment Performace,
W75-12333 5D

Energy Conservation: An Essential and Urgent Problem for the Water Industry,
W75-12334 5D

Recent Developments of Instrumentation, Control and Automation Systems for Wastewater Treatment Systems,
W75-12341 5D

Organic Residue in a Recycled Effluent, Part I,
W75-12348 5D

Epoxy Resin Application at Sewage Works.
W75-12349 5D

Proceedings of the Annual Conference of the British Columbia Water and Waste Association.
W75-12350 5F

Disinfection to Protect Recreational Areas and Potable Water Supplies,
W75-12351 5D

Municipal Sewage Treatment to Protect Shellfish Growing Waters,
W75-12352 5D

Toxicity of Aquatic Organisms Caused by Chlorination,
W75-12353 5D

Computer Controlled Wastewater Reclamation Plant,
W75-12361 5D

Recycling Allows Zero Wastewater Discharge,
W75-12364 5D

**WASTES**

Assessment of Offshore Dumping in the New York Bight, Technical Background: Physical Oceanography, Geological Oceanography, and Chemical Oceanography.
W75-12171 5B

**WATER ALLOCATION (POLICY)**

A Proposal for the Quantification of Reserved Indian Water Rights,
W75-12249 6E

**WATER ANALYSIS**

Inorganics, (Literature Review),
W75-12072 5A

Water Characteristics, (Literature Review),
W75-12073 5A

Application of the Methylthymol Blue Sulfate Method to Water and Wastewater Analysis,
W75-12324 5A

**WATER BALANCE**

The Water Relations of Hemlock (Tsuga Canadensis): I. Some Equilibrium Water Relations as Measured by the Pressure-Bomb Technique,
W75-11900 2I

The Water Relations of Hemlock (Tsuga Canadensis): II. The Kinetics of Water Exchange Between the Symplast and Apolast,
W75-11901 2I

The Water Relations of Hemlock (Tsuga Canadensis): III. The Temperature Dependence of Water Exchange in a Pressure Bomb,
W75-11902 2I

**WATER BANK PROGRAM**

Water Bank Program.
W75-12259 6E

**WATER CONSERVATION**

The Effect of Legislation of the Future Use of Water in the Leather Industry,
W75-12112 5D

Complete Industrial Waste-Water Reuse Goal of Refining Study,
W75-12125 5D

**WATER CONTROL**

Diversion and Withdrawal of Additional Water from Lake Michigan into the Illinois Waterway.
W75-12197 4A

A NEPA Settlement: Conservation Council of North Carolina v. Froehlke,
W75-12244 6E

**WATER DEMAND**

Planning Models for Water System Development in Mississippi Communities,
W75-11851 6D

Water Consumption Trends Within the Central and Southern Florida Flood Control District,
W75-12085 6D

**WATER DEMAND**

Design and Operating Criteria for Rural Water Systems,
W75-12126 6D

Those Elusive 1985 Water Quality Goals.
W75-12242 5G

**WATER DISTRIBUTION (APPLIED)**
Design and Operating Criteria for Rural Water Systems,
W75-12126 6D

How to Evaluate Water Main Capacities, Part I,
W75-12329 8B

Pressure Control in a Mountain Area Water System.
W75-12343 8C

**WATER HYACINTH**
Aquatic Weed Control - State Revenue Laws.
W75-12295 6E

**WATER HYACINTHS**
Floating Aquatic Plants Remove Chemicals From Polluted Waters.
W75-12145 5G

**WATER INJURY**
Influence of Environmental Stress on Enumeration of Indicator Bacteria from Natural Waters,
W75-12053 5C

**WATER LAW**
Diversion and Withdrawal of Additional Water from Lake Michigan into the Illinois Waterway.
W75-12197 4A

Uses of Scientific Information in Environmental Decision-Making,
W75-12204 6G

A Proposal for the Quantification of Reserved Indian Water Rights,
W75-12249 6E

**WATER LEVEL FLUCTUATIONS**
Power Conversion Apparatus for Utilizing the Force of Waves,
W75-12062 3E

Diurnal Fluctuations of Water Tables Induced by Atmospheric Pressure Changes,
W75-12077 2G

Diversion and Withdrawal of Additional Water from Lake Michigan into the Illinois Waterway.
W75-12197 4A

Water-Level Fluctuations and Earthquakes on the San Andreas Fault Zone,
W75-12392 4B

**WATER MANAGEMENT (APPLIED)**
Diversion and Withdrawal of Additional Water from Lake Michigan into the Illinois Waterway.
W75-12197 4A

Saving Our Water Resources,
W75-12232 6G

**WATER MEASUREMENT**
Soil Water Measurement with an Inexpensive Spectrophotometer,
W75-12081 2G

**WATER MEASUREMENTS**
STD, Current Meter, and Drogue Observations in Rosario Strait, January - March 1974,
W75-12175 2L

**WATER POLICY**
Recognition of Substantive Rights Under NEPA,
W75-12250 6E

Liaison with Planning Authorities-A Vital Link,
W75-12335 6E

**WATER POLLUTION**
Photographic Quantification of Water Quality in Mixing Zones,
W75-11970 5A

Vertical Temperature Profiles in Open-Channel Flow,
W75-12047 5B

Pollution Effects on Surface Waters and Groundwaters,- (Literature Review),
W75-12070 5B

Ocean Dumping in the New York Bight,
W75-12172 5B

Report to the Congress on Ocean Dumping Research, January Through December 1974 Public Law 92-532, Title II, Section 201.
W75-12173 5B

Draft Proposal for Legislation to Control Water Pollution from Agricultural Sources,
W75-12213 5G

Toxic Waters (Discussion of Recent Federal Action Against Water Pollution).
W75-12230 5G

Wetzel V. A. Duda and Sons (Action by Riparian Property Owners to Enjoin Water Pollution to Lake From Farming Operations).
W75-12286 6E

United States v. Ashland Oil and Transportation Co. (Appeal from Finding that Defendant had Violated FWPCA Amendments of 1972 by Discharging Oil into Navigable Stream).
W75-12294 6E

North West: A Dirty Inheritance.
W75-12336 5G

**WATER POLLUTION CONTROL**
Efficiency of Measures for the Sanitary Protection of Surface Waters in the Region of Chemical Industry Enterprises, (In Russian),
W75-11977 5G

Recovering Proteins from Waste Water,
W75-12057 5D

Process and Apparatus for Recovering Clean Water and Solids from Dilute, Aqueous, Solids Containing Solutions or Dispersions,
W75-12059 5D

Coal Mine Drainage Pollution--1973,
W75-12114 5G

Strong Impact of Textiles by U.S. Water Control Act,
W75-12117 5G

Pollution of Groundwater Due to Municipal Dumps,
W75-12119 5B

Draft Proposal for Legislation to Control Water Pollution from Agricultural Sources,
W75-12213 5G

Liability for Oil Pollution Disasters: International Law and the Delimitation of Competences in a Federal Policy,
W75-12235 5G

The Water Pollution Permitting System,
W75-12245 5G

Colorado Public Interest Research Group, Inc. V. Train (Citizen Suit to Compel the Environmental Protection Agency to Control Discharge or Radioactive Materials into Navigable Waters).
W75-12287 6E

United States v. Ashland Oil and Transportation Co. (Appeal from Finding that Defendant had Violated FWPCA Amendments of 1972 by Discharging Oil into Navigable Stream).
W75-12294 6E

Salt Recovery System,
W75-12306 5B

Sewage Treatment Systems,
W75-12308 5D

Process for Demineralizing Water,
W75-12311 3A

Method for Processing Sludge,
W75-12312 5D

High Energy Electron Treatment of Water,
W75-12313 5D

Environmental Water Quality Program,
W75-12331 5G

Historical and Legal Aspects of NEPA,
W75-12337 6G

Water Quality Management in a Metropolitan Area,
W75-12354 5G

**WATER POLLUTION EFFECTS**
Behavioural Responses of Whitefish and Rainbow Trout to Drilling Fluids,
W75-11952 5C

Pollution Effects on Surface Waters and Groundwaters,- (Literature Review),
W75-12070 5B

Ocean Dumping in the New York Bight,
W75-12172 5B

Report to the Congress on Ocean Dumping Research, January Through December 1974 Public Law 92-532, Title II, Section 201.
W75-12173 5B

Experimental Data for Establishing the Content of Alpha, Alpha, Beta-Trichloropropionic Acid and its Sodium Salts in Reservoir Water,
W75-12190 5C

Draft Proposal for Legislation to Control Water Pollution from Agricultural Sources,
W75-12213 5G

Water Quality and Salt Water Intrusion in the Lower Neches River,
W75-12327 5C

**WATER POLLUTION SOURCES**
The Effect of Wind on the Spread of Contamination in the Yeisk Estuary, (In Russian),
W75-11983 5B

1974 Annual Report of the Freshwater Biological Investigation Unit.
W75-12008 5C

Eutrophication,
W75-12010 5C

Pollution Effects on Surface Waters and Groundwaters,- (Literature Review),
W75-12070 5B

Organics, (Literature Review),
W75-12071 5B

Pollution of Groundwater Due to Municipal Dumps,
W75-12119 5B

Fertilizer Manufacturing Point Source Category--Effluent Limitations and Guidelines.
W75-12272 5G

Validity, Under Federal Constitution, of State Statute or Local Ordinance Regulating Phosphate Content of Detergents,
W75-12293 6E

United States v. Ashland Oil and Transportation Co. (Appeal from Finding that Defendant had Violated FWPCA Amendments of 1972 by Discharging Oil into Navigable Stream).
W75-12294 6E

Salt Recovery System,
W75-12306 5B

The Impact of Chemical Pollution on Water Utilizationnutzung),. (Chemische Gewaesserverunreinigung und Wasser
W75-12314 5B

Water Quality Management in a Metropolitan Area,
W75-12354 5G

**WATER POLLUTION TREATMENT**

Efficiency of Measures for the Sanitary Protection of Surface Waters in the Region of Chemical Industry Enterprises, (In Russian),
W75-11977 5G

Filter Press, Particularly for Dewatering Sludge in Sewage Treatment Plants,
W75-12056 5D

Recovering Proteins from Waste Water,
W75-12057 5D

Aerobic Sewage Treatment System,
W75-12063 5D

Coal Mine Drainage Pollution--1973,
W75-12114 5G

Report to the Congress on Ocean Dumping Research, January Through December 1974 Public Law 92-532, Title II, Section 201.
W75-12173 5B

Filtering and Debris Removing Apparatus for Cleaning a Sea Water Stream,
W75-12183 5G

Waste Disposal System,
W75-12185 5D

Salt Recovery System,
W75-12306 5B

High Energy Electron Treatment of Water,
W75-12313 5D

**WATER PRESSURE**

Pressure Control in a Mountain Area Water System.
W75-12343 8C

**WATER PURIFICATION**

Recyclable Coagulants Look Promising for Drinking Water Treatment,.
W75-11909 5F

Process and Apparatus for Recovering Clean Water and Solids from Dilute, Aqueous, Solids Containing Solutions or Dispersions,
W75-12059 5D

Introduction of S433 (Bill for Safe Drinking Water).
W75-12280 6E

Process for Raw Water Clarification,
W75-12300 5F

Process for Demineralizing Water,
W75-12311 3A

**WATER QUALITY**

Water System of Newport, Rhode Island and its Recent Improvements,
W75-11910 5F

The Management of Water in Northern Ireland, with Particular Reference to Water Pollution,
W75-11939 5G

Water Resources Investigations of the U.S. Geological Survey in the Northern Great Plains Coal Region of Wyoming, Montana, and North Dakota, 1975.
W75-11961 5A

Water Resources Data for California, 1973: Part 2. Water Quality Records.
W75-11962 7C

Ground-Water Basic Data for Emmons County, North Dakota,
W75-11963 4B

Quality of Surface Waters of the United States, 1970: Part 6. Missouri River Basin.
W75-11964 7C

Quality of Surface Waters of the United States, 1969: Part 8. Western Gulf of Mexico Basin.
W75-11966 7C

Danger Signs for Tahoe's Future,
W75-12002 5C

The Assessment of Water Quality,
W75-12054 5F

Maritime Administration Proposed Shore Facility for Treatment and Disposal of Ship Generated Oily Water Wastes.
W75-12256 5D

Introduction of S433 (Bill for Safe Drinking Water).
W75-12280 6E

Environmental Water Quality Program,
W75-12331 5G

Water-Quality Data, 1948-73, Anchorage and Vicinity, Alaska,
W75-19955 5A

**WATER QUALITY ACT**

Admiralty's Power in RE Oil Pollution (States Able to Set More Stringent Penalties),
W75-12248 5G

**WATER QUALITY CONTROL**

Filtering and Debris Removing Apparatus for Cleaning a Sea Water Stream,
W75-12183 5G

Mamala Bay Wastewater Treatment and Disposal System, Oahu, Hawaii (Final Environmental Impact Statement).
W75-12257 5D

Water Quality Management Basin Plans--Policies and Procedures.
W75-12260 5G

Process for Raw Water Clarification,
W75-12300 5F

Recirculating Resin Cleaning Chemical Feeder System for Water Softeners,
W75-12307 3D

Process for Demineralizing Water,
W75-12311 3A

High Energy Electron Treatment of Water,
W75-12313 5D

The Impact of Chemical Pollution on Water Utilizationnutzung),. (Chemische Gewaesserverunreinigung und Wasser
W75-12314 5B

Water Quality Management in a Metropolitan Area,
W75-12354 5G

**WATER QUALITY STANDARDS**

Oregon Surveys its Hazardous Wastes,
W75-12239 5G

Timber Products--Proposed Effluent Guidelines and Performances and Pretreatment Standards for New Sources.
W75-12270 5G

Meat Products Point Source Category--Effluent Guidelines and Standards.
W75-12273 5G

Canadian Drinking Water Surveillance Programs, Panel Discussion,
W75-12355 5G

Canadian Drinking Water Standards Review, Ontario's Programs, Panel Discussion,
W75-12356 5G

Canadian Drinking Water Standards Review, Alberta, Saskatchewan and Manitoba, Panel Discussion,
W75-12357 5G

Canadian Drinking Water Standards Review, British Columbia, Panel Discussion,
W75-12358 5G

Canadian Drinking Water Standards Review, Northwest Territories and Yukon Territory, Panel Discussion,
W75-12359 5G

**WATER QUALITY TREATMENT**

Salt Recovery System,
W75-12306 5B

**WATER QUANTIFICATION**

A Proposal for the Quantification of Reserved Indian Water Rights,
W75-12249 6E

**WATER RESOURCES**

Water Resources Programs in the Southeastern Region.
W75-11960 9D

Understanding the Ocean Science Debate,
W75-12223 6E

**WATER RESOURCES DEVELOPMENT**

Water Resources Investigations of the U.S. Geological Survey in the Northern Great Plains Coal Region of Wyoming, Montana, and North Dakota, 1975.
W75-11961 5A

Recognition of Substantive Rights Under NEPA,
W75-12250 6E

WATER REUSE
Individual Home Wastewater Characterization and Treatment,
W75-11852 5D

Spray Irrigation of Treated Municipal sewage,
W75-11856 5D

Complete Industrial Waste-Water Reuse Goal of Refining Study,
W75-12125 5D

Light and Assimilation Number in a Small Desert, Recharged-Groundwater Pond,
W75-12326 5A

Organic Residue in a Recycled Effluent, Part I,
W75-12348 5D

Computer Controlled Wastewater Reclamation Plant,
W75-12361 5D

Recycling Allows Zero Wastewater Discharge,
W75-12364 5D

WATER RIGHTS
A Proposal for the Quantification of Reserved Indian Water Rights,
W75-12249 6E

United States V. Cappaert (Action for Declaration of Rights of United States to Underground Waters Appurtenant to Devil's Hole, Death Vally National Monument).
W75-12281 6E

WATER SOFTENING
Water Treatment Device,
W75-12305 5F

Salt Recovery System,
W75-12306 5B

Recirculating Resin Cleaning Chemical Feeder System for Water Softeners,
W75-12307 3D

WATER SOURCES
Southern Nevada Water Project.
W75-11913 3B

General Aspects of Water Supply and Treatment in Ontario,
W75-12067 5F

Use of Environmental Isotope Methods as a Reconnaissance Tool in Groundwater Exploration Near San Antonio de Pichincha, Ecuador,
W75-12080 2F

North West: A Dirty Inheritance.
W75-12336 5G

WATER SPREADING
Artificial Groundwater Recharge, I. Circular Recharging Area,
W75-12040 4B

WATER STORAGE
Flood Plain Information: South Santiam River, Lebanon, Oregon.
W75-12376 4A

WATER SUPPLY
Innovative Workover for Wasson Water Wells,
W75-11890 3B

Southern Nevada Water Project.
W75-11913 3B

The Management of Water in Northern Ireland, with Particular Reference to Water Pollution,
W75-11939 5G

General Aspects of Water Supply and Treatment in Ontario,
W75-12067 5F

Design and Operating Criteria for Rural Water Systems,
W75-12126 6D

Treatment Plant to be Tested for Carcinogens,
W75-12130 5F

Water Supply.
W75-12297 6E

Method of Cleaning and Stimulating a Water Well,
W75-12301 3B

Liaison with Planning Authorities-A Vital Link,
W75-12335 6E

Proceedings of the Annual Conference of the British Columbia Water and Waste Association.
W75-12350 5F

Canadian Drinking Water Surveillance Programs, Panel Discussion,
W75-12355 5G

Canadian Drinking Water Standards Review, Alberta, Saskatchewan and Manitoba, Panel Discussion,
W75-12357 5G

Canadian Drinking Water Standards Review, British Columbia, Panel Discussion,
W75-12358 5G

Canadian Drinking Water Standards Review, Northwest Territories and Yukon Territory, Panel Discussion,
W75-12359 5G

WATER SUPPLY CONSTRUCTION
Water Supply.
W75-12297 6E

WATER SUPPLY OCCUPATIONS
Introduction of S433 (Bill for Safe Drinking Water).
W75-12280 6E

WATER TABLE
Diurnal Fluctuations of Water Tables Induced by Atmospheric Pressure Changes,
W75-12077 2G

Effective Use of High Water Table Areas for Sanitary Landfill. Volume I,
W75-12111 5E

WATER TABLE AQUIFERS
Artifical Groundwater Recharge, II. Rectangular Recharging Area,
W75-12097 4B

WATER TEMPERATURE
Quality of Surface Waters of the United States, 1970: Part 8. Western Gulf of Mexico Basins.
W75-11965 7C

Quality of Surface Waters of the United States, 1969: Part 8. Western Gulf of Mexico Basin.
W75-11966 7C

WATER TREATMENT
Recyclable Coagulants Look Promising for Drinking Water Treatment,.
W75-11909 5F

Apparatus for Cleaning Loose Filtering Material in Slow Water Filled Water Supply Filters,
W75-11935 5F

General Aspects of Water Supply and Treatment in Ontario,
W75-12067 5F

Water-Treatment Sludge Filtration Studies,
W75-12069 5D

Operational Variables and Limitations of Direct Filtration,
W75-12127 5F

Unusual Features in Plant Design.
W75-12146 5F

Control System for Showa Water Purification Plant, (In Japanese),
W75-12147 5F

Primary Solids/Liquid Separation.
W75-12153 5D

The $5 Billion Flush.
W75-12277 5D

Process for Raw Water Clarification,
W75-12300 5F

Water Treatment Device,
W75-12305 5F

Recirculating Resin Cleaning Chemical Feeder System for Water Softeners,
W75-12307 3D

Process for Demineralizing Water,
W75-12311 3A

Analysis of Reverse Osmosis Facilities, Greenfield, Iowa,
W75-12320 5F

Energy Conservation: An Essential and Urgent Problem for the Water Industry,
W75-12334 5D

Clearwell Quality Doesn't Last,
W75-12340 5F

Canadian Drinking Water Standards Review, Ontario's Programs, Panel Discussion,
W75-12356 5G

WATER TREATMENTS
Treatment Plant to be Tested for Carcinogens,
W75-12130 5F

WATER UPTAKE
Diurnal and Seasonal Soil Water Uptake and Flux Within a Bermudagrass Root Zone,
W75-12082 2D

WATER USERS
Design and Operating Criteria for Rural Water Systems,
W75-12126 6D

WATER UTILIZATION
Planning Models for Water System Development in Mississippi Communities,
W75-11851 6D

The Water Relations of Hemlock (Tsuga Canadensis): III. The Temperature Dependence of Water Exchange in a Pressure Bomb,
W75-11902 2I

Water Consumption Trends Within the Central and Southern Florida Flood Control District,
W75-12085 6D

Supplemental Water Use in the Everglades Agricultural Area,
W75-12086 3F

Design and Operating Criteria for Rural Water Systems,
W75-12126 6D

**ATER VAPOR**
An Infra-Red Psychrometer for Detecing Changes in the Humidity of Leaf Boundary Layers,
W75-12131 2I

**ATER WELLS**
Wanted: Fewer Bit, Casing Sizes, Reward: Many Benefits for Industry,
W75-11885 8C

Innovative Workover for Wasson Water Wells,
W75-11890 3B

Method of Cleaning and Stimulating a Water Well,
W75-12301 3B

Well Storage,
W75-12390 8B

Water-Level Fluctuations and Earthquakes on the San Andreas Fault Zone,
W75-12392 4B

Fresh Water Strata of Mississippi as Revealed by Electrical Log Studies,
W75-12399 4B

**ATER YIELD**
Innovative Workover for Wasson Water Wells,
W75-11890 3B

Stochastic Hydrologic Systems,
W75-12015 2A

**ATER YIELD IMPROVEMENT**
Method of Cleaning and Stimulating a Water Well,
W75-12301 3B

**ATERCOURSES (LEGAL ASPECTS)**
Gumz V. Bejes (Action by Adjoining Landowners for Injunction Against Flooding From Drainage and Irrigation Ditch).
W75-12290 6E

**ATERQUALITY**
Quality of Surface Waters of the United States, 1970: Part 8. Western Gulf of Mexico Basins.
W75-11965 7C

**AVES**
Tarshis v. Lahaina Investment Corp. (Responsibility of Owner of Beach Front Property to Warn of Surging Wave).
W75-12296 6E

**AVES (WATER)**
A Mini-Project for Avon Harbor, North Carolina,
W75-12045 8A

Power Conversion Apparatus for Utilizing the Force of Waves,
W75-12062 3E

Electric Generator Responsive to Waves in Bodies of Water,
W75-12186 3E

**EATHER MODIFICATION**
Weather Modification: Where are We Now and Where Should We Be Going. An Editorial Overview,
W75-12088 3B

On the Variability of 'Dynamic Seedability' as a Function of Time and Location Over South Florida: Part I. Spatial Variability,
W75-12089 3B

A Detailed Microphysical Simulation of Hygroscopic Seeding on the Warm Rain Process,
W75-12090 3B

Florida Area Cumulus Experiments 1970-1973 Rainfall Results,
W75-12091 3B

Small-Scale Variability of Hail and its Significance for Hail Prevention Experiments,
W75-12092 3B

Formation of Graupel,
W75-12093 3B

Hail Suppression Data from Western North Dakota, 1969-1972,
W75-12094 3B

Design of a Hail Suppression Project for Illinois,
W75-12095 3B

A Numerical Model of Precipitation from Seeded and Unseeded Cold Orographic Clouds,
W75-12098 3B

Testing of Cloud Seeding Materials at the Cloud Simulation and Aersol Laboratory, 1971-1973,
W75-12099 3B

An Explanation for the Unusual Nucleating Ability of Aerosols Produced from the AgI-NH4I-Acetone System,
W75-12100 3B

Analysis of Radar Observations of a Randomized Cloud Seeding Experiment,
W75-12101 3B

The Effect of Persistence of AgI on Randomized Weather Modification Experiments,
W75-12104 3B

On the Design and Evaluation of Cumulus Modification Experiments,
W75-12105 3B

Evaluation by Monte Carlo Tests of Effects of Cloud Seeding on Growing Season Rainfall in North Dakota,
W75-12106 3B

Bayesian and Classical Statistical Methods Applied to Randomized Weather Modification Experiments,
W75-12107 3B

The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part II: Techniques for the Physical Evaluation of Seeding,
W75-12108 3B

The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part III: Case Studies of the Effects of Seeding,
W75-12109 3B

Potential of Precipitation Modification in Moderate to Severe Droughts,
W75-12110 2B

**WEIRS**
Seattle Project Calls for Rock Weirs.
W75-11922 4A

A Practical Proportional Weir,
W75-11937 8C

**WELFARE DISTRIBUTION**
Economic Growth Vs. the Environment. A Bibliography,
W75-12182 6G

**WELFARE (ECONOMICS)**
Externalities and Public Goods. A Bibliography,
W75-12179 6B

**WELL CASINGS**
Graphical Method Speeds Deviated Well Casing Design,
W75-11896 8G

**WELL DATA**
Land Subsidence in the San Joaquin Valley, California, as of 1972,
W75-11956 4B

**WELL FILTERS**
A New Approach to Permeability Reduction,
W75-11872 8G

**WELL LOGGING**
Recent Application of Geophysical Methods in Coal Mining,
W75-12396 8B

Application of Well Logging Techniques to Mining Exploration Boreholes,
W75-12398 8G

**WELL REGULATIONS**
Water Supply.
W75-12297 6E

**WELL STORAGE**
Well Storage,
W75-12390 8B

**WELLS**
Innovative Workover for Wasson Water Wells,
W75-11890 3B

Thin Section and Permeability Studies Call for Smaller Gravels in Gravel Packing,
W75-11893 8B

Running and Cementing Deep Well Liners,
W75-11895 8F

Prediction of Penetration Rate for Percussive Drilling,
W75-12382 8E

Percussive Drilling: With Independent Rotation,
W75-12383 8E

Well Storage,
W75-12390 8B

Cementing Off, Plugging, and Redrilling,
W75-12394 8F

Recent Application of Geophysical Methods in Coal Mining,
W75-12396 8B

Turbo-Drilling as Applied to Potash Developments in the Saskatchewan Field,
W75-12397 8B

Application of Well Logging Techniques to Mining Exploration Boreholes,
W75-12398 8G

WEST VIRGINIA
Sodium Hydroxide Treatment of Acid Mine Drainage,
W75-12116 5G

WETLANDS
Property (Wetlands Regulation),
W75-12247 6E

WHEAT
Fungus Diseases of Wheat on Irrigated Lands. (In Russian),
W75-11904 2I

Phenolic Compounds of Wheat Leaves Under Drought Stress,
W75-11905 2I

Phosphorus Metabolism and Respriration in Wheat Leaves and Roots in the Case of Water Defiency, (In Russian),
W75-12362 3F

WHITEFISH
Behavioural Responses of Whitefish and Rainbow Trout to Drilling Fluids,
W75-11952 5C

WILLAMETTE RIVER (ORE)
Flood Plain Information, Willamette River, Johnson, Kellogg and Mt. Scott Creeks, Milwaukie-Oak Grove-Lake Oswego, Oregon.
W75-12369 4A

WINDS
The Effect of Wind on the Spread of Contamination in the Yeisk Estuary, (In Russian),
W75-11983 5B

WIRELINE TECHNIQUES
How Downhole Temperatures, Pressures Affect Drilling, Part 3, Overpressure Detection from Wireline Methods,
W75-11867 8C

WISCONSIN
Classification of Wisconsin Lakes by Trophic Condition.
W75-11979 5C

WOOD WASTES
Timber Products--Proposed Effluent Guidelines and Performances and Pretreatment Standards for New Sources.
W75-12270 5G

WUCHERERIA-BANCROFTI
Observations of the Guppy, Poecilia Reticulata Peters, in Culex Pipiens Fatigans Breeding Sites in Bangkok, Rangoon, and Taipei,
W75-11989 5G

WYOMING
Waterflooding of Oilfields in Wyoming to 1968,
W75-12380 8B

YEISK (RFSFR)
The Effect of Wind on the Spread of Contamination in the Yeisk Estuary, (In Russian),
W75-11983 5B

YELLOW PERCH
Daily Fall Activity and Direction of Movements of Fish in Lake Quenouille in the Laurentians, (In French),
W75-12064 2H

YORK COUNTY (VA)
Maritime Administration Proposed Shore Facility for Treatment and Disposal of Ship Generated Oily Water Wastes.
W75-12256 5D

ZAMBIA
Control of Groundwater at Bancroft Mines, Zambia,
W75-12395 4B

ZOOPLANKTON
Effect of Bromex-50 on Plankton Population in Fish Ponds,
W75-12188 5C

# AUTHOR INDEX


**ABER, H. S.**
Water Treatment Device,
W75-12305 5F

**ABRAMS, G. H.**
Flood Insurance and Flood Plain Zoning as Compatible Components,
W75-12227 6F

**ACHTEMEIER, G. L.**
Design of a Hail Suppression Project for Illinois,
W75-12095 3B

**ADAM, Y.**
Dispersion and Settling Around a Waste Disposal Point in a Shallow Sea,
W75-12043 5B

**ADAMS, V. D.**
Organic Residue in a Recycled Effluent, Part I,
W75-12348 5D

**ADAMSKI, J. M.**
Application of the Methylthymol Blue Sulfate Method to Water and Wastewater Analysis,
W75-12324 5A

**ADAMSON, J. N.**
Turbo-Drilling as Applied to Potash Developments in the Saskatchewan Field,
W75-12397 8B

**AHUJA, L. R.**
A One-Step Wetting Procedure for Determining Both Water Characteristic and Hydraulic Conductivity of a Soil Core,
W75-12084 2G

**AL-SAADI, H.**
Survey of the Matric Water of Various Plant Groups,
W75-11883 2I

**ALBERTSON, O. E.**
Biologically Mediated Inconsistencies in Aeration Equipment Performace,
W75-12333 5D

**ALSPAUGH, T. A.**
Strong Impact of Textiles by U.S. Water Control Act,
W75-12117 5G

**AMERASHINGHE, C. F.**
Basic Principles Relating to the International Regime of the Oceans at the Caracas Session of the U. N. Law of the Sea Conference,
W75-12253 6E

**ANGER, H.**
Pollution of Groundwater Due to Municipal Dumps,
W75-12119 5B

**AOYANAGI, Y.**
Study on Direct Rapid Filtration Using Reduced Coagulants, (In Japanese),
W75-11860 5D

**ARGABRIGHT, P. A.**
A New Approach to Permeability Reduction,
W75-11872 8G

**ARMITAGE, B. J.**
An Ecological Evaluation of Heated Water Discharge on Phytoplankton Blooms in the Potomac River,
W75-12004 5C

**ARMSTRONG, C. A.**
Ground-Water Basic Data for Emmons County, North Dakota,
W75-11963 4B

**ARNERI, G.**
On The Comparison of Reverse Osmosis Membrane Performance,
W75-12347 3A

**ATKINSON, L. P.**
Oceanographic Observations in the Georgia Bight: Data Report for R.V. EASTWARD Cruises E-13-73 (4-11 September) and E-19-73 (8-9 December 1973),
W75-12169 2L

**AULT, J. W.**
Reservoir Properties Affecting Matrix Acid Stimulation of Sandstones,
W75-11894 4B

**AUSTIN, G.**
Inflatable Plug Cuts Mess, Cleanup on Sewerline ByPass,
W75-11908 8C

**BABIN, B. P.**
Irrigation System Emitters with Renewable Filters,
W75-12310 3F

**BADMAN, D. G.**
Filtration of Neutral Red by Fresh Water Clams in Aerobic and Hypoxic Conditions,
W75-12192 5C

**BAHR, A.**
Filter Press, Particularly for Dewatering Sludge in Sewage Treatment Plants,
W75-12056 5D

**BAILEY, D. A.**
The Effect of Legislation of the Future Use of Water in the Leather Industry,
W75-12112 5D

**BAILEY, W.**
Canadian Drinking Water Standards Review, British Columbia, Panel Discussion,
W75-12358 5G

**BALDWIN, A. D.**
Geochemistry of Strontium in the Scioto River Drainage Basin, Ohio,
W75-12052 2K

**BANASZAK, K. J.**
Relative Throughfall Enrichment by Biologic and by Aerosol-Derived Materials in Loblolly Pines,
W75-11853 5B

**BARICA, J.**
Geochemistry and Nutrient Regime of Saline Eutrophic Lakes in the Erickson-Elphinstone District of Southwestern Manitoba.
W75-11982 5C

**BARNARD, J. L.**
Nutrient Removal in Biological Systems,
W75-12321 5D

**BARODZ'KA, S. M.**
Activity of Enzymes (Protease and Urease) and Forms of Mobile Nitrogen in Thin Peat Soil of the Second Year of Use, (In Russian),
W75-12216 5B

**BATES, T. E.**
Chemical Tests for Plant Available Metals in Soils.
W75-12142 5A

Land Disposal of Sewage Sludge,
W75-12135 5D

**BAY, E. C.**
Observations of the Guppy, Poecilia Reticulata Peters, in Culex Pipiens Fatigans Breeding Sites in Bangkok, Rangoon, and Taipei,
W75-11989 5G

**BEAN, B. R.**
The Spatial and Temporal Variations of the Turbulent Fluxes of Heat, Momentum and Water Vapor over Lake Ontario,
W75-12079 2D

**BEAUCHAMP, E. G.**
Land Disposal of Sewage Sludge,
W75-12135 5D

Nitrogen Transformation and Uptake,
W75-12136 5B

**BECK, J. A.**
Water Consumption Trends Within the Central and Southern Florida Flood Control District,
W75-12085 6D

**BEETON, A. M.**
Limnology of Lakes of the Sylvania Recreation Area, Ottawa National Forest,
W75-11981 2H

**BELL, M. G. W.**
The Management of Water in Northern Ireland, with Particular Reference to Water Pollution,
W75-11939 5G

**BELUCHE, R. A.**
Effective Use of High Water Table Areas for Sanitary Landfill. Volume I,
W75-12111 5E

**BELYAEV, I. I.**
Efficiency of Measures for the Sanitary Protection of Surface Waters in the Region of Chemical Industry Enterprises, (In Russian),
W75-11977 5G

**BENHAM, D. B.**
Oklahoma Plans Ahead for Wastewater Reuse,
W75-12066 5D

**BENIS, M.**
The Water Relations of Hemlock (Tsuga Canadensis): I. Some Equilibrium Water Relations as Measured by the Pressure-Bomb Technique,
W75-11900 2I

The Water Relations of Hemlock (Tsuga Canadensis): III. The Temperature Dependence of Water Exchange in a Pressure Bomb,
W75-11902 2I

**BENNETT, E. R.**
Individual Home Wastewater Characterization and Treatment,
W75-11852 5D

**BERGSTROM, G. I.**
Effective Use of High Water Table Areas for Sanitary Landfill. Volume I,
W75-12111 5E

BHANDARI, M. C.
Role of Epidermal Cell Turgor on Stomatal Regulation in Isolated Epidermal Peelings of Citrullus Colocynthis Linn. (Schrad.),
W75-12323 2I

BIGGS, P.
Waterflooding of Oilfields in Wyoming to 1968,
W75-12380 8B

BINGHAM, J. W.
Hydrogeologic Data for the Lower Connecticut River Basin, Connecticut,
W75-19954 7C

BIRELEY, L. E.
Microbiology of a Former Dredge Spoil Disposal Area,
W75-12191 5C

BISSONNETTE, G. K.
Influence of Environmental Stress on Enumeration of Indicator Bacteria from Natural Waters,
W75-12053 5C

BLAKE, J. H.
Complete Industrial Waste-Water Reuse Goal of Refining Study,
W75-12125 5D

BLOMQUIST, M. W.
Column Settling Tests for Flocculant Suspensions,
W75-12322 5D

BLOOMFIELD, C.
The Effects of Aerobic and Anaerobic Incubation on the Extractabilities of Heavy Metals in Digested Sewage Sludge,
W75-12330 5D

BLUME, O. H.
Computer's Master Plan Signals Sewer Problems Before They Start,
W75-11928 7C

BOARI, G.
Process for Demineralizing Water,
W75-12311 3A

BOICHENKO, V. K.
Hygienic Effectiveness of Measures for Treating the Industrial Wastewaters of the Konakovo State Regional Electric Power Plant, (In Russian),
W75-11984 5D

BONANNO, A. J.
Process and Apparatus for Recovering Clean Water and Solids from Dilute, Aqueous, Solids Containing Solutions or Dispersions,
W75-12059 5D

BOULANGER, A.
On the Variability of 'Dynamic Seedability' as a Function of Time and Location Over South Florida: Part I. Spatial Variability,
W75-12089 3B

BOWERS, S. A.
Soil Water Measurement with an Inexpensive Spectrophotometer,
W75-12081 2G

BOWSER, P. R.
Seasonal Prevalence of Chondrococcus Columnaris Infection in Black Bullheads from Clear Lake, Iowa,
W75-11995 5C

BOYD, C. E.
The Utilization of Phosphorus from Muds by the Phytoplankter, Scenedesmus Dimorphus, and the Significance of These Findings to the Practice of Pond Fertilization,
W75-11986 5C

BOYD, E. I.
Hail Suppression Data from Western North Dakota, 1969-1972,
W75-12094 3B

BRADFORD, B.
How to Use Thixotropic Slurries to Solve Cementing Problems,
W75-11886 8F

BREMNER, R. M.
Pipe Relining Method and Apparatus,
W75-11945 8G

BRIGGS, G. A.
Diffusion Estimation for Small Emissions,
W75-12039 5A

BRIGGS, R. N.
Canadian Drinking Water Standards Review, Alberta, Saskatchewan and Manitoba, Panel Discussion,
W75-12357 5G

BROOKER, M. P.
The Risk of Deoxygenation of Water in Herbicide Application for Aquatic Weed Control,
W75-11996 5A

BROOKS, A. E.
Detergent Phosphorus and Algal Growth,
W75-12001 5C

BROWN, S. R.
The Effect of Persistence of AgI on Randomized Weather Modification Experiments,
W75-12104 3B

BRUCE, W. E.
Prediction of Penetration Rate for Percussive Drilling,
W75-12382 8E

BRUNE, P.
Oklahoma Plans Ahead for Wastewater Reuse,
W75-12066 5D

BRUNSKILL, G. J.
Rates of Supply of Nitrogen and Phosphorus to Lake Winnipeg, Manitoba, in Relation to the Diversion of Missouri River Water Into the Red and Assiniboine Rivers,
W75-12006 5C

BUCK, J. D.
Microbiology of a Former Dredge Spoil Disposal Area,
W75-12191 5C

BUEHLER, B.
Corps' Guidelines for Dam Safety Inspection Need Revamping,
W75-12241 8A

BULL, W. B.
Land Subsidence Due to Ground-Water Withdrawal in the Los Banos-Kettleman City Area, California, Part 2. Subsidence and Compaction of Deposits,
W75-11957 4B

Land Subsidence Due to Ground-Water Withdrawal in the Los Banos-Kettleman City Area, California, Part 3. Interrelations of Water-Level Change, Change in Aquifer-System Thickness, and Subsidence,
W75-11958 4B

BUMGARNER, J. C.
A Mini-Project for Avon Harbor, North Carolina,
W75-12045 8A

BURNS, J. J.
Major Late-Winter Features of Ice in Northern Bering and Chukchi Seas as Determined From Satellite Imagery,
W75-12168 2C

BURRY, A.
Superposition of Two Pipes in a Common, Mixed Sewer System (Recours a la superposition de deux conduites dans un reseau d'assainissement unitaire).
W75-11923 5D

BUTLIN, J. A.
Fisheries Economics. A Bibliography,
W75-12181 3E

CAHILL, T. A.
Danger Signs for Tahoe's Future,
W75-12002 5C

CAIN, D. E.
Analysis of Radar Observations of a Randomized Cloud Seeding Experiment,
W75-12101 3B

Evaluation by Monte Carlo Tests of Effects of Cloud Seeding on Growing Season Rainfall in North Dakota,
W75-12106 3B

CALVERT, D. G.
Cementing Off, Plugging, and Redrilling,
W75-12394 8F

CAMPBELL, S. M.
A Proposal for the Quantification of Reserved Indian Water Rights,
W75-12249 6E

CARR, J. R.
Careful Sample Taking is Key to Successful Wells,
W75-11881 8G

CARROLL, J.
Critical Choices Save Shoreline,
W75-12231 6G

CARTWRIGHT, K.
Ground-Water and Engineering Geology in Siting of Sanitary Landfills,
W75-12122 5E

CASPARIAN, R. E.
Process and Apparatus for Recovering Clean Water and Solids from Dilute, Aqueous, Solids Containing Solutions or Dispersions,
W75-12059 5D

CASSIDY, J. E.
Berry Hill Sludge Treatment Works,
W75-12150 5D

CATE, J. L. JR.
A Radioisotope Monitoring System for Sewage Effluent,
W75-11914 5A

CHANGNON, S. A.
Design of a Hail Suppression Project for Illinois,
W75-12095 3B

Weather Modification: Where are We Now and Where Should We Be Going. An Editorial Overview,
W75-12088 3B

HARLSON, A.
Pollution Control Under the Pennsylvania Clean Streams Law,
W75-12209 5G

HAUDHURI, N.
A Mathematical Model for Head-Discharge Relationships for Various Ferrule-House Service Pipe Combinations,
W75-11906 8B

HAWLA, V. K.
Biochemical Characteristics of Digested Chemical Sewage Sludges,
W75-12132 5D

HEN, C. K.
Combined Wastewater Overflows,
W75-11912 5D

HEN, C. S.
A Detailed Microphysical Simulation of Hygroscopic Seeding on the Warm Rain Process,
W75-12090 3B

HIN, E. H.
The Flood of April 1974 in Southern Mississippi and Southeastern Louisiana,
W75-12170 2E

HIOU, C-J.
The Utilization of Phosphorus from Muds by the Phytoplankter, Scenedesmus Dimorphus, and the Significance of These Findings to the Practice of Pond Fertilization,
W75-11986 5C

HMIL', V. D.
Determination of Residual Quantities of the Butyl Ester of 2,4-Dichlorophenoxyacetic Acid in Environmental Objects by Gas-Liquid Chromatography, (In Russian),
W75-12393 5A

HO, I. S.
Rapid Soil Moisture Determination by Immersion Method, (In Korean),
W75-12240 2G

HOW, V. T.
Stochastic Hydrologic Systems,
W75-12015 2A

LABORN, B. J.
Numerical Simulation of Watershed Hydrology,
W75-12027 2A

LAPP, J. L.
Photographic Quantification of Water Quality in Mixing Zones,
W75-11970 5A

LARK, D. W.
Emigration of the Peamouth Chub, Mylocheilus Caurinus, Across a Dilute Seawater Bridge: An Experimental Zoogeographic Study,
W75-12151 2L

LARKSON, K.
International Law, U.S. Seabeds Policy and Ocean Resource Development,
W75-12214 6E

LERE, L. T.
Bio-Oxidation Process Saves H20,
W75-12115 5D

CLIMENHAGE, D. C.
Nitrogen Removal from Municipal Wastewater,
W75-11859 5D

COAD, B. W.
Life History Notes and Meristic Variation in the Freshwater Fourspine Stickleback, Apeltes Quadracus (Mitchill), Near Sept-Iles: Quebec,
W75-12176 2I

COLE, G. T.
Endocytosis of Microcystis Aeruginosa by Ochromonas Danica,
W75-11985 5C

COLLINS, A. G.
Geochemistry of Oil-Field Water Applied to Exploration,
W75-11879 4B

CONRAD, J. R.
Anaerobic Processes, (Literature Review),
W75-12074 5D

CONSEDINE, R. L.
European Dewatering System Aids Quebec Project,
W75-11918 5D

Tough Digging, Tight Quarters Hamper Hull Collector Sewer Job,
W75-11919 5D

COOK, J. H.
Wanted: Fewer Bit, Casing Sizes, Reward: Many Benefits for Industry,
W75-11885 8C

COTTON, W. R.
On the Variability of 'Dynamic Seedability' as a Function of Time and Location Over South Florida: Part I. Spatial Variability,
W75-12089 3B

CRUMBRINE, J. P.
Limnology of Lakes of the Sylvania Recreation Area, Ottawa National Forest,
W75-11981 2H

CULKOWSKI, W. M.
Lidar vs. Photometer, A One Month Comparison,
W75-12036 5A

CUNNANE, C.
A Particular Comparison of Annual Maxima and Partial Duration Series Methods of Flood Frequency Prediction,
W75-11929 2E

CURNOE, W. E.
Runoff and Erosion Losses,
W75-12137 5B

CURRY, M. D.
How to Evaluate Water Main Capacities, Part I,
W75-12329 8B

CURTIS, J. B. JR.
Geochemistry of Strontium in the Scioto River Drainage Basin, Ohio,
W75-12052 2K

D'CRUZ, J.
Pollution of Groundwater Due to Municipal Dumps,
W75-12119 5B

DAINTY, J.
The Water Relations of Hemlock (Tsuga Canadensis): I. Some Equilibrium Water Relations as Measured by the Pressure-Bomb Technique,
W75-11900 2I

The Water Relations of Hemlock (Tsuga Canadensis): II. The Kinetics of Water Exchange Between the Symplast and Apolast,
W75-11901 2I

The Water Relations of Hemlock (Tsuga Canadensis): III. The Temperature Dependence of Water Exchange in a Pressure Bomb,
W75-11902 2I

DALY, C. C.
Need Ways to Reduce Drilling Costs,
W75-11884 8C

DANE, J. H.
Effect of Hysteresis on the Prediction of Infiltration, Redistribution and Drainage of Water in a Layered Soil,
W75-12041 2G

DANILS, J. J.
Hole-to-Hole Geophysical Measurement Research for Mineral Exploration,
W75-11873 8G

DAVIS, B. L.
An Explanation for the Unusual Nucleating Ability of Aerosols Produced from the AgI-NH4I-Acetone System,
W75-12100 3B

DAVIS, T. P.
A NEPA Settlement: Conservation Council of North Carolina v. Froehlke,
W75-12244 6E

DAVYDOV, O. L.
The Effect of Wind on the Spread of Contamination in the Yeisk Estuary, (In Russian),
W75-11983 5B

DAY, R. O.
Iron and Manganese Removal with Ozone. Part II
W75-12315 5F

DE MOHAN, S.
Some Aspects of Tannery Effluent Control,
W75-12123 5D

DEJU, R. A.
Geohydrology of Collier County, Florida,
W75-11874 4B

DELLAIRE, G.
The Floating Cover: Best Way to Cover a Finished-Water Reservoir,
W75-12360 5F

DELLEUR, J. W.
The Stochastic and Chronologic Structure of Rainfall Sequences - Application to Indiana,
W75-11854 2B

DENNIS, A. S.
Analysis of Radar Observations of a Randomized Cloud Seeding Experiment,
W75-12101 3B

Evaluation by Monte Carlo Tests of Effects of Cloud Seeding on Growing Season Rainfall in North Dakota,
W75-12106 3B

Hail Suppression Data from Western North Dakota, 1969-1972,
W75-12094 3B

DICK, R. I.
Sludge Treatment, Utilization, and Disposal, (Literature Review),
W75-12075 5D

DIGNEY, K. A.
Method of Treating Sewage to Enhance Aerobic Decomposition,
W75-12061 5D

DIGREGORIO, D.
Biologically Mediated Inconsistencies in Aeration Equipment Performace,
W75-12333 5D

DIXON, K. W.
Process for Raw Water Clarification,
W75-12300 5F

DOEMEL, W. N.
Detergent Phosphorus and Algal Growth,
W75-12001 5C

DONALDSON, D. E.
Water-Quality Data, 1948-73, Anchorage and Vicinity, Alaska,
W75-19955 5A

DONDERSKI, W.
Studies on Metabolic Activity of Benthic Bacteria Isolated from Three Lakes,
W75-11988 5C

DONLEY, D.
Land Use Controls Under the Federal Water Pollution Control Act: A Citizen's Guide,
W75-12237 5G

DORCEY, A. H. J.
Water Quality Management in a Metropolitan Area,
W75-12354 5G

DOVE, L. A.
Recycling Allows Zero Wastewater Discharge,
W75-12364 5D

DOWNES, W. E.
Environmental Water Quality Program,
W75-12331 5G

DUMANSKI, J.
Evaluating the Productivity of Pine Forests in the Hinton-Edson Area, Alberta, From Soil Survey Maps,
W75-12003 4A

DUNLAP, R. G.
Reservoir Properties Affecting Matrix Acid Stimulation of Sandstones,
W75-11894 4B

DUNSTAN, W. M.
Nitrogen, Phosphorus, and Eutrophication in the Coastal Marine Environment,
W75-12236 5C

EAGLESON, P. S.
The Stochastic Kinematic Wave,
W75-12023 2A

EDEN, J. C.
On the Design and Evaluation of Cumulus Modification Experiments,
W75-12105 3B

EISENHAUER, D. L.
Computer Controlled Wastewater Reclamation Plant,
W75-12361 5D

EKERN, P. C.
Hydrologic Systems in Hawaii,
W75-12022 2A

EMERSON, P. M.
Historical Guide to Federal Water Pollution Control Laws Affecting Food Processing,
W75-12226 5G

EMMANUEL, C. B.
The Spatial and Temporal Variations of the Turbulent Fluxes of Heat, Momentum and Water Vapor over Lake Ontario,
W75-12079 2D

ENGELMANN, W. H.
Chemical Fragmentation,
W75-12389 8E

ENGLANDE, A. J. JR.
The Influence of Oxygen Concentration and Turbulence Intensity on Complete-Mix Activated Sludge Performance,
W75-12155 5D

EVERETT, A. D.
Digester Gas: Valuable Plant Fuel,
W75-12332 8C

FALK, M. R.
Seismic Exploration: Its Nature and Effect on Fish,
W75-11877 8G

FARLEY, R. D.
A Detailed Microphysical Simulation of Hygroscopic Seeding on the Warm Rain Process,
W75-12090 3B

FARMER, H.
Sewer System Evaluation and Rehabilitation Cost Estimates,
W75-11951 6C

FAST, C. R.
Graphic Solution to Fracture Treatment Design,
W75-11876 8B

FEENSTRA, R.
Tests Show Jet Drilling Has Promise,
W75-11880 8C

FERTL, W. H.
How Downhole Temperatures, Pressures Affect Drilling, Part 1,
W75-11865 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 2, Detecting and Evaluating Formation Pressures,
W75-11866 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 3, Overpressure Detection from Wireline Methods,
W75-11867 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 9, Navel Ways to Detect Abnormal Pressure,
W75-11868 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 10, Miscellaneous Ways to Detect Abnormal Pressure,
W75-11869 8C

FICKEN, B. W.
Wyandotte and its Progency: The Quest for Environmental Protection through the Original Jurisdiction of the Supreme Court,
W75-12218 5G

FIELD, J. R.
Flocculating Agents,
W75-12058 5D

FINLEY, J. W.
Recovering Proteins from Waste Water,
W75-12057 5D

FISCHER, W. H.
Management of Interstate Ground Water,
W75-12251 4B

FISHER, H. D.
Soil Water Measurement with an Inexpensive Spectrophotometer,
W75-12081 2G

FITZGERALD, G. P.
Are Chemicals Used Algae Control Biodegradable.
W75-12325 5C

FITZGERALD, W. F.
Mercury Concentrations in Open Ocean Waters: Sampling Procedure,
W75-11953 5A

FLETCHER, R. I.
Refrigerated Surge Tank for Use With Aerobic Sewage Digestion System,
W75-11930 5D

FLETCHER, R. J.
Refrigerated Surge Tank for Use With Aerobic Sewage Digestion System,
W75-11930 5D

FOEHNER, O. H.
The Effect of Persistence of AgI on Randomized Weather Modification Experiments,
W75-12104 3B

FONTENOT, J. E.
Bit Design is Key to Deep Drilling with Turbines,
W75-11889 8C

FORD, B.
We're Fighting Oil Pollution with Bubbles, Belts and Beads,
W75-12225 5G

FOSTER, J. M.
Light and Assimilation Number in a Small Desert, Recharged-Groundwater Pond,
W75-12326 5A

FOUNTAINE, L. C.
Oklahoma Plans Ahead for Wastewater Reuse,
W75-12066 5D

FRANSSEN, H. T.
Understanding the Ocean Science Debate,
W75-12223 6E

FRIANT, S.
Organics, (Literature Review),
W75-12071 5B

FRICK, J. R.
Bacterial Processes for Improved Oil Recovery.
W75-12391 2F

FRIEDRICH, K.
Application of PVC Bell-and-Spigot Pressure Pipes in Construction of Water Supply Lines (Die Anwendung von PVC-Muffendruckrohren beim Bau von Wasserversorgungsnetzen),
W75-11949 8A

FUKUTA, N.
A Numerical Model of Precipitation from Seeded and Unseeded Cold Orographic Clouds,
W75-12098 3B

**FUMANTI, R. R.**
Percussive Drilling: With Independent Rotation,
W75-12383 8E

**FURGASON, R. R.**
Iron and Manganese Removal with Ozone. Part II
W75-12315 5F

**GALLAURESI, A. P.**
Method of Treating Sewage to Enhance Aerobic Decomposition,
W75-12061 5D

**GARRETT, B. B.**
Flexible Joint for Sewer Pipe,
W75-11931 5D

**GARVEY, D. M.**
Testing of Cloud Seeding Materials at the Cloud Simulation and Aersol Laboratory, 1971-1973,
W75-12099 3B

**GAYNOR, J. D.**
Extractable Metals in Mixtures of Soil and Sewage Sludge,
W75-12141 5D

**GELDREICH, E. E.**
The Bacterial Quality of Bottled Water,
W75-12011 5F

**GELPE, M. R.**
Uses of Scientific Information in Environmental Decision-Making,
W75-12204 6G

**GERBA, C.P.**
Adsorption of Poliovirus onto Activated Carbon in Wastewater,
W75-12148 5D

**GERLACZYNSKA, B.**
Distribution and Biomass of Macrophytes in Lake Dgal Maly,
W75-11993 8I

**GHOSE, D. N.**
A Mathematical Model for Head-Discharge Relationships for Various Ferrule-House Service Pipe Combinations,
W75-11906 8B

**GHOSH, M. M.**
Water Characteristics, (Literature Review),
W75-12073 5A

**GHOSH, S.**
Anaerobic Processes, (Literature Review),
W75-12074 5D

**GIBSON, J. G.**
Recreation Analysis. A Bibliography,
W75-12180 6B

**GIDLEY, J. L.**
A New Look at Sandstone Acidizing,
W75-11878 4B

**GIFFORD, F. A.**
A Note on the Elevation of the Mean and the Mode of the Gaussian Concentration Distribution,
W75-12035 5A

The Simple ATDL Urban Air Pollution Model,
W75-12038 5A

**GILMER, R. O.**
The Spatial and Temporal Variations of the Turbulent Fluxes of Heat, Momentum and Water Vapor over Lake Ontario,
W75-12079 2D

**GLEDHILL, E. G. B.**
Apparatus, for and Method of Controlling Flow of Fluids in a Pipeline,
W75-11932 8B

**GOLDBERG, E. D.**
The Mussel Watch--A First Step in Global Marine Monitoring,
W75-12187 5B

**GOLDIE, L. F. E.**
Liability for Oil Pollution Disasters: International Law and the Delimitation of Competences in a Federal Policy,
W75-12235 5G

**GOLDMAN, C. R.**
Danger Signs for Tahoe's Future,
W75-12002 5C

A Quantitative Measure of Succession Rate and Its Application to the Phytoplankton of Lakes,
W75-12005 5C

Will Baikal and Tahoe Be Saved,
W75-12012 5C

**GOLDSMITH, J. R.**
Studies in the System CaCO:-FeCO3: 1. Phase Relations; 2. A Method for Major-Element Spectrochemical Analysis; 3. Compositions of Some Ferroan Dolomites,
W75-12400 2F

**GOODWIN, G. L.**
Design and Operating Criteria for Rural Water Systems,
W75-12126 6D

**GOPHEN, M.**
N and P Distribution in Lake Kinneret (Israel) with Emphasis on Dissolved Organic Nitrogen,
W75-11975 5C

**GRACHEVA, M. P.**
Efficiency of Measures for the Sanitary Protection of Surface Waters in the Region of Chemical Industry Enterprises, (In Russian),
W75-11977 5G

**GRAF, D. C**
Studies in the System CaCO:-FeCO3: 1. Phase Relations; 2. A Method for Major-Element Spectrochemical Analysis; 3. Compositions of Some Ferroan Dolomites,
W75-12400 2F

**GRAINGE, J. W.**
Canadian Drinking Water Standards Review, Northwest Territories and Yukon Territory, Panel Discussion,
W75-12359 5G

**GRANT, L. O.**
Weather Modification: Where are We Now and Where Should We Be Going. An Editorial Overview,
W75-12088 3B

**GREENFIELD, C.**
Process and Apparatus for Recovering Clean Water and Solids from Dilute, Aqueous, Solids Containing Solutions or Dispersions,
W75-12059 5D

**GRIFFIN, D. B.**
Process and Agents for Removal of Inorganic and Organic Matter From Waste Water Systems,
W75-11926 5D

**GROBBELAAR, C.**
Irrigation Apparatus,
W75-12302 3F

**GROMOV, B. V.**
Morphology and Ultrastructure of Some Chlorococcal Algae from the Collection of Algal Strains in Leningrad University. I. Pseudospongiococcum Protococcoides Gen. Nov., Sp. Nov.,
W75-12000 5C

Morphology and Ultrastructure of Some Chlorococcal Algae from the Collection pf Algal Strains in Leningrad University. II. Monoraphidium Braunii (Nag, in Kutz.) Komarkova-Legnerova Strain (Gromov) 1967/231,
W75-11997 5C

**GROSH, R. C.**
Design of a Hail Suppression Project for Illinois,
W75-12095 3B

**GROSS, J. R.**
Irrigation System,
W75-12309 3F

**GUIN, J. A.**
The Effect of Surface Kinetics in Fracture Acidizing,
W75-11887 8B

**GULATI, M. S.**
Thin Section and Permeability Studies Call for Smaller Gravels in Gravel Packing,
W75-11893 8B

**GUU, J. Y.**
Hole-to-Hole Geophysical Measurement Research for Mineral Exploration,
W75-11873 8G

**HAGOORT, J.**
Displacement Stability of Water Drives in Water-Wet Connate-Water-Bearing Reservoirs,
W75-11870 4B

**HALL, K. J.**
Water Quality Management in a Metropolitan Area,
W75-12354 5G

**HALL, K. L.**
Litigation Under the Federal Water Pollution Control Act Amendments of 1974,
W75-12212 5G

**HALL, N. W.**
Effective Use of High Water Table Areas for Sanitary Landfill. Volume I,
W75-12111 5E

**HANNA, S. R.**
Application of a Simple Dispersion Model to a Rural Industrial Region,
W75-12037 5A

**HAQ, A.**
Chemical Tests for Plant Available Metals in Soils.
W75-12142 5A

HARASHIMA, Y.
Control System for Showa Water Purification Plant, (In Japanese),
W75-12147 5F

HARMONY, R. C.
Emitter for Irrigation Systems,
W75-12303 3F

HARPER, R. S.
Aeration Upgrades Reservoir,
W75-12346 5F

HARREL, R. C.
Water Quality and Salt Water Intrusion in the Lower Neches River,
W75-12327 5C

HARRIS, D. H.
The Assessment of Water Quality,
W75-12054 5F

HASBROUCK, W. P.
Hole-to-Hole Geophysical Measurement Research for Mineral Exploration,
W75-11873 8G

HASH, L. J.
Clearwell Quality Doesn't Last,
W75-12340 5F

HASHIMOTO, T.
Effects of Movement of Precipitation Area Upon Runoff Phenomena,
W75-12026 2A

HASHINO, M.
An Application of Simulated Rainfall Models to Forecasting of the Long Term Variation of River Bed,
W75-12028 2J

HAWKINS, F. C.
Water-Treatment Sludge Filtration Studies,
W75-12069 5D

HEADLEY, L. C.
Fluid Flow in Channels, Capillaries, and Porous Media under the Influence of an Electric Field,
W75-12381 2F

HEBERT, J. M.
Salt Recovery System,
W75-12306 5B

HEFFERNAN, T. L.
Effects of Oilfield Brine on Marine Organisms, an Ecological Evaluation of the Aransas Bay Area, Job No. 1,
W75-11864 5C

HENDERSON, J. S.
Inorganics, (Literature Review),
W75-12072 5A

HERNDON, A.
Comparison of Gage and Radar Methods of Convective Rain Measurement,
W75-12102 2B

HEWITT, J. P.
A Comparison of the Methods Used to Calculate First Order BOD Equation Constants,
W75-11855 5B

HILLBRICHT-ILKOWSKA, A.
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. VI. Biomass and Production of Phytoplankton,
W75-12013 5C

HINO, M.
Nonlinear Runoff Kernels of Hydrologic System,
W75-12019 2A

HIRSCH, J. H.
Analysis of Radar Observations of a Randomized Cloud Seeding Experiment,
W75-12101 3B

HIRSCH, L.
Use of Plastic Pipe for Sewers,
W75-11907 8G

HITSCHFIELD, W. F.
Weather Modification: Where are We Now and Where Should We Be Going. An Editorial Overview,
W75-12088 3B

HITZ, H. R.
Primary Developments of Air-Borne Bacteria in the OECD Activated Sludge System,
W75-12143 5D

HOBBS, P. V.
The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part I: Natural Conditions,
W75-12096 3B

The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part II: Techniques for the Physical Evaluation of Seeding,
W75-12108 3B

The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part III: Case Studies of the Effects of Seeding,
W75-12109 3B

Weather Modification: Where are We Now and Where Should We Be Going. An Editorial Overview,
W75-12088 3B

HOEGER, T. O.
A Radioisotope Monitoring System for Sewage Effluent,
W75-11914 5A

HOFFMAN, K. F.
The Doctrine of Primary Jurisdiction Misconceived: End to Common Law Environmental Protection,
W75-12206 6G

HOLASEK, F.
Innovative Workover for Wasson Water Wells,
W75-11890 3B

HORSTKOTTE, G. A. JR.
Computer Controlled Wastewater Reclamation Plant,
W75-12361 5D

HOVSENIUS, G.
Composting and use of Compost in Sweden,
W75-12339 5E

HUANG, C-Y.
Factors Affecting Oxygen Transfer During Bubble Aeration Under Laboratory Scale Conditions,
W75-12144 5D

HUFF, F. A.
Potential of Precipitation Modification in Moderate to Severe Droughts,
W75-12110 2B

HUGHES, G.
Pollution of Groundwater Due to Municipal Dumps,
W75-12119 5B

HUME, D. N.
Determination of NTA in Environmental Water by Gas Chromatography,
W75-12363 5A

HUNTER, J. V.
A Comparison of the Methods Used to Calculate First Order BOD Equation Constants,
W75-11855 5B

HUTCHISON, B. A.
Distribution of Solar Radiation Within a Deciduous Forest,
W75-12034 2I

HUTCHISON, W. R.
Operational Variables and Limitations of Direct Filtration,
W75-12127 5F

HYDE, L. W.
Acid Mine Drainage in Cane Creek Basin, Near Oakman, Walker County, Alabama,
W75-11871 5G

IKEBUCHI, S.
A Study of Long Range Runoff System Response Based on Information Theory,
W75-12018 2A

IM, K. N.
Rapid Soil Moisture Determination by Immersion Method, (In Korean),
W75-12240 2G

INOUE, K.
Systems Simulation of Streamflows,
W75-12024 2E

IRELAND, R. L.
Land Subsidence in the San Joaquin Valley, California, as of 1972,
W75-11956 4B

ISHIHARA, T.
A Study of Long Range Runoff System Response Based on Information Theory,
W75-12018 2A

Transformation System in Flood Runoff Phenomena,
W75-12016 2E

IVERSON, M. L.
Method of Removing Heavy Metals from Water and Apparatus Therefor,
W75-12304 5D

IWASA, Y.
Systems Simulation of Streamflows,
W75-12024 2E

JANIS, M. W.
The Development of European Regional Law of the Sea,
W75-12220 6E

JANJIGIAN, P. V.
Water System of Newport, Rhode Island and its Recent Improvements,
W75-11910 5F

JASSBY, A. D.
A Quantitative Measure of Succession Rate and Its Application to the Phytoplankton of Lakes,
W75-12005 5C

JENKINS, J. D.
Method of Cleaning and Stimulating a Water Well,
W75-12301 3B

JEZESKI, J. J.
Influence of Environmental Stress on Enumeration of Indicator Bacteria from Natural Waters,
W75-12053 5C

JOHNSON, L. R.
An Explanation for the Unusual Nucleating Ability of Aerosols Produced from the AgI-NH4I-Acetone System,
W75-12100 3B

JOHNSTON, R. A.
Some Microbiological Aspects of the Land Disposal of Sludge,
W75-12138 5D

JONES, F. O. JR.
A Laboratory Study of the Effects of Confining Pressure on Fracture Flow and Storage Capacity in Carbonate Rocks,
W75-11892 4B

JONES, W. E.
Detection of Pollutants by Fish Tests,
W75-12193 5A

JUDKINS, J. F. JR.
Water-Treatment Sludge Filtration Studies,
W75-12069 5D

KAJAK, Z.
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. XIV. The Relations Between the Fish and Other Biocenotic Components (Summing Up the Studies),
W75-11998 8I

KALINA, G. G.
Comparative Survival of Enterococci, Coliforms and Salmonellas in Water, (In Russian),
W75-11973 5C

KALIWODA, R.
Laying a Main Sewer in the Reservation Area of the St. Poelten Waterworks (Verlegung eines Abwassersammlers im Schutz- und Schoengeblet des Wasserwerkes St. Poelten).,
W75-11947 5D

KANEKO, R.
Hydrological Studies of Evapotranspiration and Groundwater Flow in Sandy Land,
W75-12032 2D

KAPKOV, V. T.
Toxicity of Copper Complexes to RFreshwater Mollusks,
W75-11863 5C

KARL, J.
A Mobile Sprinkler Irrigation Facility for Measurement of Surface Runoff and Soil Erosion (Eine Transportable Beregnungsanlage fuer die Messung von Oberflaechenabfluss und Bodenabtrag),
W75-11948 7B

KATO, S.
Recent Developments of Instrumentation, Control and Automation Systems for Wastewater Treatment Systems,
W75-12341 5D

KAVVAS, M. L.
The Stochastic and Chronologic Structure of Rainfall Sequences - Application to Indiana,
W75-11854 2B

KAWATA, K.
Virus Removals in Trickling Filter Plants,
W75-12068 5D

KAY, G. H.
Canadian Drinking Water Standards Review, Ontario's Programs, Panel Discussion,
W75-12356 5G

KEILIN, B.
Salt Recovery System,
W75-12306 5B

KENNEDY, J. L.
Sodium Hydroxide Treatment of Acid Mine Drainage,
W75-12116 5G

KETCHESON, J. W.
Influence of Soil Water Matric Potential and Resistance to Penetration on Corn Root Elongation,
W75-12055 3F

Land Disposal of Sewage Sludge,
W75-12135 5D

KETCHUM, R.
Property (Wetlands Regulation),
W75-12247 6E

KHABAKHBASHEV, Y. M.
The Effect of Wind on the Spread of Contamination in the Yeisk Estuary, (In Russian),
W75-11983 5B

KHAN, M. A. Q.
Pick-up and Metabolism of DDT, Dieldrin and Photodieldrin by a Fresh Water Alga (Ankistrodesmus Amalloides) and a Microcrustacean (Daphnia Pulex),
W75-12007 5C

KHAN, M. Z. A.
Principles and Techniques for Conditioning of Waste-Activated Sludge by Direct Slurry Freezing,
W75-12154 5D

KIKKAWA, H.
Nonlinear Runoff Kernels of Hydrologic System,
W75-12019 2A

KINBARA, K.
Recent Developments of Instrumentation, Control and Automation Systems for Wastewater Treatment Systems,
W75-12341 5D

KIRKHAM, D.
Mathematical Analysis of Steady Saturated Flow Through a Multilayered Soil with a Sloping Surface,
W75-12044 2G

KISHI, T.
Effect of an Error in Discharge Measurements on the Detection Process in Runoff Systems Analysis,
W75-12020 2A

KISIEL, C. C.
Efficiency of Parameter and State Estimation Methods in Relation to Models of Lumped and Distributed Hydrologic Systems,
W75-12025 2A

KITAHORI, T.
Method for Processing Sludge,
W75-12312 5D

KLINE, P. B.
Computer's Master Plan Signals Sewer Problems Before They Start,
W75-11928 7C

KNAUSS, J. A.
Are We Any Nearer to an International Agreement on Use of the Seas,
W75-12224 6E

KNOWLES, B. W.
Analysis of Reverse Osmosis Facilities, Greenfield, Iowa,
W75-12320 5F

KNOWLES, W. L. C.
General Aspects of Water Supply and Treatment in Ontario,
W75-12067 5F

KOBUSZEWSKA, D. M.
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. XIII. Distribution and Biomass of the Lemnaceae and the Fauna Associated with Them,
W75-12009 8I

KOCH, C. A.
Waterflooding of Oilfields in Wyoming to 1968,
W75-12380 8B

KOIDE, M.
Mathematical Models and Simulation of Wastewater Treatment Systems,
W75-12156 5D

KOMATSU, H.
Control System for Showa Water Purification Plant, (In Japanese),
W75-12147 5F

KORABAVA, H. YA.
Activity of Enzymes (Protease and Urease) and Forms of Mobile Nitrogen in Thin Peat Soil of the Second Year of Use, (In Russian),
W75-12216 5B

KORNDER, L.
Disinfection to Protect Recreational Areas and Potable Water Supplies,
W75-12351 5D

KOSCIELSKI, A.
Analysis of Radar Observations of a Randomized Cloud Seeding Experiment,
W75-12101 3B

KOVACH, R. L.
Water-Level Fluctuations and Earthquakes on the San Andreas Fault Zone,
W75-12392 4B

KRAMER, A. J.
Minneapolis Keeps on Truckin',
W75-12319 5D

KRAWCZYK, D. F.
Effects of Aerial Forest Fertilization With Urea Pellets on Nitrogen Levels in a Mountain Stream,
W75-12113 5B

KREITMAN, A.
Water Consumption Trends Within the Central and Southern Florida Flood Control District,
W75-12085 6D

KRON, C.
Water Plant goes Automatic,
W75-12345 8C

KULESHOV, L. N.
Statistical Investigation of the Relation Between Absorbability and Content of Grain-size Fractions and Humus, (In Russian),
W75-12344 2G

KULIK, V. YA
A Simultaneous Calculation of the Capillary-Sorption Potentials, Moisture and Flow of Water in Soils Using a Computer and Equations of Soil Moisture Movement, (In Russian),
W75-12208 2G

KULLBERG, R. G.
Distribution of Aquatic Macrophytes Related to Paper Mill Effluents in a Southern Michigan Stream,
W75-11991 2B

KUNST, B.
On The Comparison of Reverse Osmosis Membrane Performance,
W75-12347 3A

LABRID, J. C.
Thermodynamic and Kinetic Aspects of Argillaceous Sandstone Acidizing,
W75-11891 4B

LAMANTIA, J.
Water Treatment Device,
W75-12305 5F

LANGSTON, J. V.
Crew Training,
W75-12385 8G

LARSSON, C-M.
Effects of the Commercial Polychlorinated Biphenyl Mixture Aroclor 1242 on Growth, Viability, Phosphate Uptake, Respiration and Oxygen Evolation in Scenedesmus,
W75-11974 5C

LATALL, R. C.
Hydraulic Sewer Pipeline Cleaner,
W75-11944 5D

LAU, L. S.
Hydrologic Systems in Hawaii,
W75-12022 2A

LAUGHTON, E. C.
Recent Application of Geophysical Methods in Coal Mining,
W75-12396 8B

LAUTRICH, R.
The Graphical Hydrographs Method With the Intermediary of Storm Overflows and Flood Retention Tanks (Das grafische Aflussganglinienverfahren mit Zwischenschaltung von RUE und RB),
W75-11861 5D

LAWRENCE, M.
Behavioural Responses of Whitefish and Rainbow Trout to Drilling Fluids,
W75-11952 5C

LAWRENCE, M. J.
Seismic Exploration: Its Nature and Effect on Fish,
W75-11877 8G

LEAL-DIAZ, J.
Trickle Irrigation System,
W75-12184 3F

LEAN, D. R. S.
Biological and Chemical Mechanisms in Eutrophication of Freshwater Lakes,
W75-11992 5C

LECOMBER, R.
Economic Growth Vs. the Environment. A Bibliography,
W75-12182 6G

LEE, G. F.
Response of Lake Superior Algae to Nutrients and Taconite Tailings,
W75-11976 5C

LEEDY, D. L.
Saving Our Water Resources,
W75-12232 6G

LENIARSKA, U.
Studies on Metabolic Activity of Benthic Bacteria Isolated from Three Lakes,
W75-11988 5C

LESLIE, H. A.
The Water Pollution Permitting System,
W75-12245 5G

LEWIN, R. A.
The Uptake and Utilization of Organic Carbon by Algae: An Essay in Comparative Biochemistry,
W75-11980 5C

LEWIS, W. M.
Primary Production in the Plankton Community of a Tropical Lake,
W75-11978 5C

LIEDBERG, A.
Water Conservation in Sweden: II. Pollution Control,
W75-12317 5G

LILLESAND, T. M.
Photographic Quantification of Water Quality in Mixing Zones,
W75-11970 5A

LILLEY, E. E.
Tracers Aid Placement of Stimulation Fluids,
W75-11898 8G

LINDSAY, J. D.
Evaluating the Productivity of Pine Forests in the Hinton-Edson Area, Alberta, From Soil Survey Maps,
W75-12003 4A

LINDSEY, H. E.
Running and Cementing Deep Well Liners,
W75-11895 8F

LINSTEDT, K. D.
Individual Home Wastewater Characterization and Treatment,
W75-11852 5D

LIU, D.
Biochemical Characteristics of Digested Chemical Sewage Sludges,
W75-12132 5D

LOCKHART, D. K.
Power Conversion Apparatus for Utilizing the Force of Waves,
W75-12062 3E

LOFGREN, B. E.
Land Subsidence in the San Joaquin Valley, California, as of 1972,
W75-11956 4B

LOOFBOUROW, R. L.
Ground Water and Ground-Water Control
W75-12386 4B

LOVELL, HAROLD L.
Coal Mine Drainage Pollution--1973,
W75-12114 5G

LOWING, M. J.
Flood Event Data Collation,
W75-11943 7C

LUMSDEN, T. W.
General Aspects of Water Supply and Treatment in Ontario,
W75-12067 5F

LUSK, S.
The Ichthyofauna of the Rokytna River: I. Species Composition, Abundance and Biomass,
W75-12129 2I

LYALL, R. A.
Control of Groundwater at Bancroft Mines, Zambia,
W75-12395 4B

LYONS, W. B.
Mercury Concentrations in Open Ocean Waters: Sampling Procedure,
W75-11953 5A

MACHEMEHL, J. L.
A Mini-Project for Avon Harbor, North Carolina,
W75-12045 8A

MACKENTHUN, K. M.
Toward a Cleaner Aquatic Environment,
W75-12234 5G

MAITOKO, T.
Method for Processing Sludge,
W75-12312 5D

MALIKOVA, A. V.
Fungus Diseases of Wheat on Irrigated Lands. (In Russian),
W75-11904 2I

MALINOWSKI, K. C.
Growth of the Green Alga Codium Fragile in a Connecticut Estuary,
W75-12051 5C

MALUEG, K. W.
Effects of Aerial Forest Fertilization With Urea Pellets on Nitrogen Levels in a Mountain Stream,
W75-12113 5B

MALY, G. P.
Thin Section and Permeability Studies Call for Smaller Gravels in Gravel Packing,
W75-11893 8B

MAMKAEVA, K. A.
Morphology and Ultrastructure of Some Chlorococcal Algae from the Collection of Algal Strains in Leningrad University. I. Pseudospongiococcum Protococcoides Gen. Nov., Sp. Nov.,
W75-12000 5C

Morphology and Ultrastructure of Some Chlorococcal Algae from the Collection pf Algal Strains in Leningrad University. II. Monoraphidium Braunii (Nag, in Kutz.) Komarkova-Legnerova Strain (Gromov) 1967/231,
W75-11997 5C

**MARCINKIEWICZ, C.**
Organics, (Literature Review),
W75-12071 5B

**MARCUS, A. L.**
Flood Insurance and Flood Plain Zoning as Compatible Components,
W75-12227 6F

**MARINO, M. A.**
Artifical Groundwater Recharge, II. Rectangular Recharging Area,
W75-12097 4B

Artificial Groundwater Recharge, I. Circular Recharging Area,
W75-12040 4B

**MARTIN, P. H.**
Package Treatment Plants and Factors Affecting Service,
W75-11857 5D

**MATHUR, P. N.**
Input-Output Analysis and the Environment,
W75-12177 6G

**MATSUMOTO, K.**
Biological Waste Water Treatment,
W75-12149 5D

**MATT, D. R.**
Distribution of Solar Radiation Within a Deciduous Forest,
W75-12034 2I

**MAZZE, E. M.**
Federal Water Pollution Control Act Amendments of 1972,
W75-12221 5G

**MCBEAN, G. A.**
Variations of the Turbulent Fluxes of Momentum, Heat and Moisture over Lake Ontario,
W75-12078 2H

**MCCOY, L. R.**
Method of Removing Heavy Metals from Water and Apparatus Therefor,
W75-12304 5D

**MCCUNE, C. C.**
Reservoir Properties Affecting Matrix Acid Stimulation of Sandstones,
W75-11894 4B

**MCENTYRE, C. L.**
Inorganics, (Literature Review),
W75-12072 5A

**MCFETERS, G. A.**
Influence of Environmental Stress on Enumeration of Indicator Bacteria from Natural Waters,
W75-12053 5C

**MCGAVIN, R. E.**
The Spatial and Temporal Variations of the Turbulent Fluxes of Heat, Momentum and Water Vapor over Lake Ontario,
W75-12079 2D

**MCGINTY, J. E.**
Cementing Off, Plugging, and Redrilling,
W75-12394 8F

**MCGRATH, T. F.**
Sewage Treatment Systems,
W75-12308 5D

**MCGUIRE, M. J.**
Organics, (Literature Review),
W75-12071 5B

**MCINERNEY, J. E.**
Emigration of the Peamouth Chub, Mylocheilus Caurinus, Across a Dilute Seawater Bridge: An Experimental Zoogeographic Study,
W75-12151 2L

**MCLELLON, W.**
Effective Use of High Water Table Areas for Sanitary Landfill. Volume I,
W75-12111 5E

**MCVIE, A.**
Remodelling at Norwich,
W75-12065 5D

**MELNICK, J. L.**
Adsorption of Poliovirus onto Activated Carbon in Wastewater,
W75-12148 5D

**MELTZ, R.**
The Deepwater Ports Act of 1974; Half Speed Ahead,
W75-12229 5G

**MEREDITH, D. D.**
Predictive Models for Great Lakes Hydrology,
W75-12049 2A

**MEZHERA, O. V.**
The Effect of Wind on the Spread of Contamination in the Yeisk Estuary, (In Russian),
W75-11983 5B

**MIDDLEBROOKS, E. J.**
Organic Residue in a Recycled Effluent, Part I,
W75-12348 5D

**MIERAU, R.**
Supplemental Water Use in the Everglades Agricultural Area,
W75-12086 3F

**MILLER, G. E.**
Soil Water Measurement with an Inexpensive Spectrophotometer,
W75-12081 2G

**MILLER, J. R. JR.**
Evaluation by Monte Carlo Tests of Effects of Cloud Seeding on Growing Season Rainfall in North Dakota,
W75-12106 3B

Hail Suppression Data from Western North Dakota, 1969-1972,
W75-12094 3B

**MILLER, W. L.**
Geohydrology of Collier County, Florida,
W75-11874 4B

**MILLIGAN, R. T.**
Complete Industrial Waste-Water Reuse Goal of Refining Study,
W75-12125 5D

**MILLS, W. C.**
A Three-Component, Nonlinear Water-Yield Model,
W75-12031 2A

**MILSTEN, D. E.**
Enforcing International Law: U.S. Agencies and the Regulation of Oil Pollution in American Waters,
W75-12246 5G

**MINEAR, R. A.**
Inorganics, (Literature Review),
W75-12072 5A

**MIRREH, H. F.**
Influence of Soil Water Matric Potential and Resistance to Penetration on Corn Root Elongation,
W75-12055 3F

**MIZUGUCHI, K.**
Method for Processing Sludge,
W75-12312 5D

**MOENG, F. J.**
An Explanation for the Unusual Nucleating Ability of Aerosols Produced from the AgI-NH4I-Acetone System,
W75-12100 3B

**MOHLER, E. F.**
Bio-Oxidation Process Saves H20,
W75-12115 5D

**MONAHAN, E. C.**
Coastwise Currents in the Vicinity of Chicago, and Currents Elsewhere in Southern Lake Michigan,
W75-12161 2H

**MONIER, J.**
Effects of Oilfield Brine on Marine Organisms, an Ecological Evaluation of the Aransas Bay Area, Job No. 1,
W75-11864 5C

**MOORE, W. L.**
Numerical Simulation of Watershed Hydrology,
W75-12027 2A

**MORELAND, R. S.**
Externalities and Public Goods. A Bibliography,
W75-12179 6B

**MORGAN, G. M. JR.**
Design of a Hail Suppression Project for Illinois,
W75-12095 3B

Small-Scale Variability of Hail and its Significance for Hail Prevention Experiments,
W75-12092 3B

**MORGAN, J. M.**
Water-Treatment Sludge Filtration Studies,
W75-12069 5D

**MORRIS, D. G.**
The Use of a Multizone Hydrologic Model With Distributed Rainfall and Distributed Parameters in the National Weather Service River Forecast System,
W75-12159 2B

**MOSELEY, N. F.**
Graphic Solutions to Tubing Movement in Deep Wells,
W75-11875 8B

**MOSER, H.**
Use of Environmental Isotope Methods as a Reconnaissance Tool in Groundwater Exploration Near San Antonio de Pichincha, Ecuador,
W75-12080 2F

**MOSS, E.**
Land Use Controls Under the Federal Water Pollution Control Act: A Citizen's Guide,
W75-12237 5G

**MOYER, J.**
Nitrogen Transformation and Uptake,
W75-12136 5B

**MOYER, J. R.**
Land Disposal of Sewage Sludge,
W75-12135 5D

**MUNGALL, J.C.H.**
Cook Inlet Tidal Stream Atlas,
W75-12163 2L

**MUROTA, A.**
An Application of Simulated Rainfall Models to Forecasting of the Long Term Variation of River Bed,
W75-12028 2J

**MURPHY, D. S.**
Single Basin Aerated Sewage Lagoon with Spring Time Intensified Aeration,
W75-12060 5D

**MURRELL, D. K.**
Screen Retainer Assembly,
W75-11942 8C

**MUSHIAKE, K.**
Effects of Movement of Precipitation Area Upon Runoff Phenomena,
W75-12026 2A

**MYERS, G. L.**
Prairie Pothole Ecology and the Feasibility of Growing Rainbow Trout (Salmo Gairdneri Richardson) in Prairie Potholes,
W75-12157 8I

**MYERS, P. H.**
Validity, Under Federal Constitution, of State Statute or Local Ordinance Regulating Phosphate Content of Detergents,
W75-12293 6E

**MYERS, V. A.**
Storm Tide Frequencies on the South Carolina Coast,
W75-12160 2L

**NANCE, P. D.**
Organic Residue in a Recycled Effluent, Part I,
W75-12348 5D

**NAPARSTEK, J. D.**
Virus Removals in Trickling Filter Plants,
W75-12068 5D

**NASH, H. D.**
The Bacterial Quality of Bottled Water,
W75-12011 5F

**NEFEDOV, K. E.**
Deciphering of Ground Water from Aerial Photographs,
W75-11882 4B

**NEILSON, A. H.**
The Uptake and Utilization of Organic Carbon by Algae: An Essay in Comparative Biochemistry,
W75-11980 5C

**NELSON, M. D.**
Drilling Impedance of Mud Solids,
W75-11897 8C

**NEUDORF, S.**
Pick-up and Metabolism of DDT, Dieldrin and Photodieldrin by a Fresh Water Alga (Ankistrodesmus Amalloides) and a Microcrustacean (Daphnia Pulex),
W75-12007 5C

**NEUMANN, C. J.**
A Statistical Study of Tropical Cyclone Positioning Errors with Economic Applications,
W75-12166 2B

**NEWSON, M. D.**
Flood Event Data Collation,
W75-11943 7C

**NIHOUL, J. C. J.**
Dispersion and Settling Around a Waste Disposal Point in a Shallow Sea,
W75-12043 5B

**NOBLE, G.**
Historical and Legal Aspects of NEPA,
W75-12337 6G

**NOGITA, S.**
Mathematical Models and Simulation of Wastewater Treatment Systems,
W75-12156 5D

**NORGAARD, R. B.**
Wasting a River,
W75-12211 6G

**NORTHROP, D. A.**
Studies in the System CaCO:-FeCO3: 1. Phase Relations; 2. A Method for Major-Element Spectrochemical Analysis; 3. Compositions of Some Ferroan Dolomites,
W75-12400 2F

**NUR, A.**
Water-Level Fluctuations and Earthquakes on the San Andreas Fault Zone,
W75-12392 4B

**O'NEILL, J.**
The Use of Storm Tanks for Tertiary Treatment of Sewage,
W75-11941 5D

**OBRECHT, M. F.**
Environmental Water Quality Program,
W75-12331 5G

**ODOM, J. J.**
Process and Agents for Removal of Inorganic and Organic Matter From Waste Water Systems,
W75-11926 5D

**OHUCHI, M.**
Method for Processing Sludge,
W75-12312 5D

**OLDHAM, W. K.**
Spray Irrigation of Treated Municipal sewage,
W75-11856 5D

**OLIVIERI, V. P.**
Virus Removals in Trickling Filter Plants,
W75-12068 5D

**OLOFSON, J. A.**
Water Characteristics, (Literature Review),
W75-12073 5A

**OLSEN, A. R.**
Bayesian and Classical Statistical Methods Applied to Randomized Weather Modification Experiments,
W75-12107 3B

Comparison of Gage and Radar Methods of Convective Rain Measurement,
W75-12102 2B

On the Design and Evaluation of Cumulus Modification Experiments,
W75-12105 3B

On the Effect of Natural Rainfall Variability and Measurement Errors in the Detection of Seeding Effect,
W75-12103 3B

**OLSON, R. J.**
A Computer Program Used to Estimate Primary Productivity from pH and Carbon Dioxide Data Employing the Upstream-Downstream Method,
W75-11971 5C

**OLSSON, I.**
Water Conservation in Sweden: II. Pollution Control,
W75-12317 5G

**OMHOLT, T.**
Small Groins on the Shores of Long Island Sound,
W75-12046 8A

**OSTER, E. A.**
Flood Profiles in the Umpqua River Basin, Oregon: Part 3, Umpqua River Below Scottburg, Scholfield, Cow Creek Above Glendale,
W75-11959 4A

**OTO, T.**
Recent Developments of Instrumentation, Control and Automation Systems for Wastewater Treatment Systems,
W75-12341 5D

**OUTEN, R.**
Land Use Controls Under the Federal Water Pollution Control Act: A Citizen's Guide,
W75-12237 5G

**OVERLAND, J. E.**
Estimation of Hurricane Storm Surge in Apalachicola Bay, Florida,
W75-12164 2B

**PAGE, S.**
Effects of Oilfield Brine on Marine Organisms, an Ecological Evaluation of the Aransas Bay Area, Job No. 1,
W75-11864 5C

**PAINE, F. D.**
Hydrogeologic Data for the Lower Connecticut River Basin, Connecticut,
W75-19954 7C

**PANZER, H. P.**
Process for Raw Water Clarification,
W75-12300 5F

**PARLANGE, J-Y.**
On Solving the Flow Equation in Unsaturated Soils by Optimization: Horizontal Infiltration,
W75-12083 2G

**PARRY, B. T.**
Wasting a River,
W75-12211 6G

**PASSINO, R.**
Process for Demineralizing Water,
W75-12311 3A

**PATERSON, R. D.**
Variations of the Turbulent Fluxes of Momentum, Heat and Moisture over Lake Ontario,
W75-12078 2H

**PEARCE, E.**
International Economics and Environment Control,
W75-12178 6G

**PENNYCUICK, L.**
Transfer of Heat, Fresh Water and Nutrients Through the Seasonal Thermocline,
W75-11994 5C

**PERLMUTTER, D.**
Impact of Intracoastal Waterway Maintenance Dredging on a Mud Bottom Benthos Community,
W75-12189 5C

**PETERSON, F. L.**
Hydrologic Systems in Hawaii,
W75-12022 2A

**PHILLIPS, B. L.**
A New Approach to Permeability Reduction,
W75-11872 8G

**PIAMPIANO, R.**
Draft Proposal for Legislation to Control Water Pollution from Agricultural Sources,
W75-12213 5G

**PICKFORD, J.**
Experiments with Unconventional Storm Overflows,
W75-11940 5D

**PIERCE, C. I.**
Fluid Flow in Channels, Capillaries, and Porous Media under the Influence of an Electric Field,
W75-12381 2F

**PILGRIM, P. C.**
Coastwise Currents in the Vicinity of Chicago, and Currents Elsewhere in Southern Lake Michigan,
W75-12161 2H

**PINGREE, R. D.**
Transfer of Heat, Fresh Water and Nutrients Through the Seasonal Thermocline,
W75-11994 5C

**PIOMUGINA, N. V.**
A Simultaneous Calculation of the Capillary-Sorption Potentials, Moisture and Flow of Water in Soils Using a Computer and Equations of Soil Moisture Movement, (In Russian),
W75-12208 2G

**PLICHTA, G.**
Primary Developments of Air-Borne Bacteria in the OECD Activated Sludge System,
W75-12143 5D

**PLOOSTER, M. N.**
A Numerical Model of Precipitation from Seeded and Unseeded Cold Orographic Clouds,
W75-12098 3B

**PLUMB, R. H.**
Response of Lake Superior Algae to Nutrients and Taconite Tailings,
W75-11976 5C

**POLAND, J. F.**
Land Subsidence Due to Ground-Water Withdrawal in the Los Banos-Kettleman City Area, California, Part 3. Interrelations of Water-Level Change, Change in Aquifer-System Thickness, and Subsidence,
W75-11958 4B

Land Subsidence in the San Joaquin Valley, California, as of 1972,
W75-11956 4B

**POLLINGHER, U.**
N and P Distribution in Lake Kinneret (Israel) with Emphasis on Dissolved Organic Nitrogen,
W75-11975 5C

**POLS, A. C.**
Tests Show Jet Drilling Has Promise,
W75-11880 8C

**POPOVA, T. A.**
Deciphering of Ground Water from Aerial Photographs,
W75-11882 4B

**PORTER, J. W.**
Complete Industrial Waste-Water Reuse Goal of Refining Study,
W75-12125 5D

**POST, T. R.**
A Solution to the Problem of Private Compensation in Oil Discharge Situations,
W75-12254 5G

**POWELL, G. E.**
Graphical Method Speeds Deviated Well Casing Design,
W75-11896 8G

**POWER, G.**
Life History Notes and Meristic Variation in the Freshwater Fourspine Stickleback, Apeltes Quadracus (Mitchill), Near Sept-Iles: Quebec,
W75-12176 2I

**POWERS, C. F.**
Effects of Aerial Forest Fertilization With Urea Pellets on Nitrogen Levels in a Mountain Stream,
W75-12113 5B

**PRESLEY, C. T.**
A New Approach to Permeability Reduction,
W75-11872 8G

**PRICE, S.**
Hydrologic Systems in Hawaii,
W75-12022 2A

**PRICE, W. J.**
Observations on the Atomic Absorption Behavior of Some of the Earth Elements,
W75-11862 5A

**PRIDDY, R. R.**
Fresh Water Strata of Mississippi as Revealed by Electrical Log Studies,
W75-12399 4B

**PROKOPENKO, V. A.**
The Effect of Wind on the Spread of Contamination in the Yeisk Estuary, (In Russian),
W75-11983 5B

**PROTZ, R.**
Cation Distribution in Soils as Related to Sewage Sludge Disposal on Land,
W75-12139 5B

Land Disposal of Sewage Sludge,
W75-12135 5D

**PRUDEN, G.**
The Effects of Aerobic and Anaerobic Incubation on the Extractabilities of Heavy Metals in Digested Sewage Sludge,
W75-12330 5D

**PUGH, R. G.**
Land Subsidence in the San Joaquin Valley, California, as of 1972,
W75-11956 4B

**PULFREY, R.**
Hydrologic Systems in Hawaii,
W75-12022 2A

**PUSHKAR, P.**
Geochemistry of Strontium in the Scioto River Drainage Basin, Ohio,
W75-12052 2K

**QUIMPO, R. G.**
Kernels of Stochastic Linear Hydrologic Systems,
W75-12021 2A

**RADKE, L. F.**
The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part II: Techniques for the Physical Evaluation of Seeding,
W75-12108 3B

**RAMUS, J.**
Growth of the Green Alga Codium Fragile in a Connecticut Estuary,
W75-12051 5C

**RANGEL-GARZA, J.**
Trickle Irrigation System,
W75-12184 3F

**REASONER, D. J.**
The Bacterial Quality of Bottled Water,
W75-12011 5F

**REDDY, Y. R.**
Experiments with Unconventional Storm Overflows,
W75-11940 5D

**REID, J. S.**
Waste Disposal System,
W75-12185 5D

**REINKING, R. F.**
Formation of Graupel,
W75-12093 3B

**REITER, G. M.**
Use of Plastic Pipe for Sewers,
W75-11907 8G

**RENARD, K. G.**
Simulation of the Short-Time Scour-Fill Process in Erodible Streams with Stochastic Sediment Transfer at the Stream Bed,
W75-12029 2J

**RENOVITCH, P. A.**
The Florida Environmental Protection Act of 1971: The Citizen's Role in Environmental Management,
W75-12207 6G

**REYNOLDS, R. M.**
STD, Current Meter, and Drogue Observations in Rosario Strait, January - March 1974,
W75-12175 2L

**RICE, R. C.**
Diurnal and Seasonal Soil Water Uptake and Flux Within a Bermudagrass Root Zone,
W75-12082 2D

**RIGGS, D. D.**
Water Treatment Device,
W75-12305 5F

**RILEY, J. P.**
Simulation of the Short-Time Scour-Fill Process in Erodible Streams with Stochastic Sediment Transfer at the Stream Bed,
W75-12029 2J

**RINEY, J. R.**
Treatment Plant to be Tested for Carcinogens,
W75-12130 5F

**ROBERTS, K. J.**
Alternative Methods of Disinfection,
W75-11858 5D

ROBERTS, L. D.
The Effect of Surface Kinetics in Fracture Acidizing,
W75-11887 8B

ROBIE, R. B.
Recognition of Substantive Rights Under NEPA,
W75-12250 6E

ROBINSON, R.
Water-Level Fluctuations and Earthquakes on the San Andreas Fault Zone,
W75-12392 4B

RODRIGUEZ-ITURBE, I.
A Bayesian Framework for the Use of Regional Information in Hydrology,
W75-12048 6A

ROSE, R. R.
Inorganics, (Literature Review),
W75-12072 5A

ROSENSTRETER, R.
The Effect of Hydrogen in Concentrations in Simulated Rain on the Moss Tortula Ruralis (HEDW.)Sm,
W75-11987 5C

ROTTNER, D.
The Effect of Persistence of AgI on Randomized Weather Modification Experiments,
W75-12104 3B

ROUSSEAU, A.
Daily Fall Activity and Direction of Movements of Fish in Lake Quenouille in the Laurentians, (In French),
W75-12064 2H

ROWE, D. R.
Treatment Plant to be Tested for Carcinogens,
W75-12130 5F

RYCHKOVA, T. A.
Phosphorus Metabolism and Respriration in Wheat Leaves and Roots in the Case of Water Defiency, (In Russian),
W75-12362 3F

RYTHER, J. H.
Nitrogen, Phosphorus, and Eutrophication in the Coastal Marine Environment,
W75-12236 5C

SAKAGUCHI, O.
Studies of Prevention of Water Pollution, III. On the Biodegradation of Synthetic Detergents, (In Japanese),
W75-12316 5B

SAKHAN, K.
Simulation of the Short-Time Scour-Fill Process in Erodible Streams with Stochastic Sediment Transfer at the Stream Bed,
W75-12029 2J

SATCHELL, R.
Liaison with Planning Authorities-A Vital Link,
W75-12335 6E

SAWYER, W. K.
Fluid Flow in Channels, Capillaries, and Porous Media under the Influence of an Electric Field,
W75-12381 2F

SAX, R. I.
Weather Modification: Where are We Now and Where Should We Be Going. An Editorial Overview,
W75-12088 3B

SAXTON, W. W.
Combined Wastewater Overflows,
W75-11912 5D

SAYRE, W. W.
Vertical Temperature Profiles in Open-Channel Flow,
W75-12047 5B

SCARPACE, F. L.
Photographic Quantification of Water Quality in Mixing Zones,
W75-11970 5A

SCHAAKE, J. C. JR.
A Bayesian Framework for the Use of Regional Information in Hydrology,
W75-12048 6A

SCHERA, E. L. JR.
Electric Generator Responsive to Waves in Bodies of Water,
W75-12186 3E

SCHERER, E.
Behavioural Responses of Whitefish and Rainbow Trout to Drilling Fluids,
W75-11952 5C

SCHERR, J. H.
Admiralty's Power in RE Oil Pollution (States Able to Set More Stringent Penalties),
W75-12248 5G

SCHILLER, E. J.
Vertical Temperature Profiles in Open-Channel Flow,
W75-12047 5B

SCHINDLER, D. W.
Biological and Chemical Mechanisms in Eutrophication of Freshwater Lakes,
W75-11992 5C

Eutrophication,
W75-12010 5C

SCHLEUSENER, R. A.
Hail Suppression Data from Western North Dakota, 1969-1972,
W75-12094 3B

SCHMIDT, R. L.
Drillability Studies: Percussive Drilling in the Field,
W75-12384 8E

SCHMITZ, D. W.
Property (Wetlands Regulation),
W75-12247 6E

SCHROEDER, E. D.
The Relationship Between Process Configuration and Process Performance,
W75-12152 5D

SCHROEDER, G. L.
Effect of Bromex-50 on Plankton Population in Fish Ponds,
W75-12188 5C

SCHUMACHER, J. D.
STD, Current Meter, and Drogue Observations in Rosario Strait, January - March 1974,
W75-12175 2L

SCHWABE, G. H.
The Lake as Ecosystem,
W75-11999 2H

SCHWALLER, R. I.
Evaluation by Monte Carlo Tests of Effects of Cloud Seeding on Growing Season Rainfall in North Dakota,
W75-12106 3B

SCOTT, J. H.
Hole-to-Hole Geophysical Measurement Research for Mineral Exploration,
W75-11873 8G

SELF, L. S.
Observations of the Guppy, Poecilia Reticulata Peters, in Culex Pipiens Fatigans Breeding Sites in Bangkok, Rangoon, and Taipei,
W75-11989 5G

SELIM, A. A.
Prediction of Penetration Rate for Percussive Drilling,
W75-12382 8E

SELIM, H. M.
Mathematical Analysis of Steady Saturated Flow Through a Multilayered Soil with a Sloping Surface,
W75-12044 2G

SELIM, M. S.
Mathematical Analysis of Steady Saturated Flow Through a Multilayered Soil with a Sloping Surface,
W75-12044 2G

SEMONIN, R. G.
Potential of Precipitation Modification in Moderate to Severe Droughts,
W75-12110 2B

SEN, D. N.
Role of Epidermal Cell Turgor on Stomatal Regulation in Isolated Epidermal Peelings of Citrullus Colocynthis Linn. (Schrad.),
W75-12323 2I

SERRUYA, C.
N and P Distribution in Lake Kinneret (Israel) with Emphasis on Dissolved Organic Nitrogen,
W75-11975 5C

SERVIZI, J. A.
Toxicity of Aquatic Organisms Caused by Chlorination,
W75-12353 5D

SHAPIRO, L. H.
Major Late-Winter Features of Ice in Northern Bering and Chukchi Seas as Determined From Satellite Imagery,
W75-12168 2C

A Preliminary Study of the Formation of Landfast Ice at Barrow, Alaska, Winter 1973-74,
W75-12162 2C

SHARMA, B. D.
Training of Sutlej River Below Rupar Headworks for the Protection of Bist Doab Canal: Model Studies,
W75-11925 4D

SHCHARBAKOVA, T. A.
Activity of Enzymes (Protease and Urease) and Forms of Mobile Nitrogen in Thin Peat Soil of the Second Year of Use, (In Russian),
W75-12216 5B

SHERIDAN, R. P.
The Effect of Hydrogen in Concentrations in Simulated Rain on the Moss Tortula Ruralis (HEDW.)Sm,
W75-11987 5C

**SHERIFF, D. W.**
An Infra-Red Psychrometer for Detecing Changes in the Humidity of Leaf Boundary Layers,
W75-12131 2I

**SHERMAN, F. B.**
Ground-Water and Engineering Geology in Siting of Sanitary Landfills,
W75-12122 5E

**SHERMAN, V. R.**
Virus Removals in Trickling Filter Plants,
W75-12068 5D

**SHERWOOD, B. I.**
Light and Assimilation Number in a Small Desert, Recharged-Groundwater Pond,
W75-12326 5A

**SHEWAN, J. M.**
Primary Developments of Air-Borne Bacteria in the OECD Activated Sludge System,
W75-12143 5D

**SHIN, Y. H.**
Rapid Soil Moisture Determination by Immersion Method, (In Korean),
W75-12240 2G

**SHIOYA, M.**
Mathematical Models and Simulation of Wastewater Treatment Systems,
W75-12156 5D

**SHULL, S. C.**
Planning Models for Water System Development in Mississippi Communities,
W75-11851 6D

**SHUMAKER, T. P.**
Process and Agents for Removal of Inorganic and Organic Matter From Waste Water Systems,
W75-11926 5D

**SIMMONS, G. M.**
An Ecological Evaluation of Heated Water Discharge on Phytoplankton Blooms in the Potomac River,
W75-12004 5C

**SIMPSON, J.**
Florida Area Cumulus Experiments 1970-1973 Rainfall Results,
W75-12091 3B

On the Design and Evaluation of Cumulus Modification Experiments,
W75-12105 3B

**SINGH, G.**
Training of Sutlej River Below Rupar Headworks for the Protection of Bist Doab Canal: Model Studies,
W75-11925 4D

**SINGH, T.**
Wastewater Collection, (Literature Review),
W75-12076 5D

**SMALLEY, G.**
Flocculating Agents,
W75-12058 5D

**SMITH, P. L. JR.**
Analysis of Radar Observations of a Randomized Cloud Seeding Experiment,
W75-12101 3B

**SMITH, R. E.**
A New Approach to Permeability Reduction,
W75-11872 8G

**SMITH, S. J.**
Soil Water Measurement with an Inexpensive Spectrophotometer,
W75-12081 2G

**SNYDER, W. M.**
A Three-Component, Nonlinear Water-Yield Model,
W75-12031 2A

**SOBSEY, M. D.**
Adsorption of Poliovirus onto Activated Carbon in Wastewater,
W75-12148 5D

**SONTHEIMER, H.**
The Impact of Chemical Pollution on Water Utilizationnutzung),. (Chemische Gewaesserverunreinigung und Wasser
W75-12314 5B

**SOO, S. L.**
Swirling Laminar Pipe Flow of Suspensions,
W75-11938 8B

**SPENCE, R.**
The Management of Water in Northern Ireland, with Particular Reference to Water Pollution,
W75-11939 5G

**SPETH, G.**
Land Use Controls Under the Federal Water Pollution Control Act: A Citizen's Guide,
W75-12237 5G

**SPODNIEWSKA, I.**
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. VI. Biomass and Production of Phytoplankton,
W75-12013 5C

**SPOSITO, G.**
A Thermodynamic Integral Equation for the Equilibrium Moisture Profile in Swelling Soil,
W75-12050 2G

**STARBIRD, E. A.**
A River Restored: Oregon's Willamette,
W75-12210 5G

**STEELE, J. D.**
Geochemistry of Strontium in the Scioto River Drainage Basin, Ohio,
W75-12052 2K

**STEPHENS, J. C.**
A Three-Component, Nonlinear Water-Yield Model,
W75-12031 2A

**STEPHENSON, D. A.**
Hydrogeological Aspects of Solid Waste Disposal,
W75-12121 5E

**STEPHENSON, J. D.**
Biochemical Characteristics of Digested Chemical Sewage Sludges,
W75-12132 5D

**STERN, D. N.**
Federal Water Pollution Control Act Amendments of 1972,
W75-12221 5G

**STICHLER, W.**
Use of Environmental Isotope Methods as a Reconnaissance Tool in Groundwater Exploration Near San Antonio de Pichincha, Ecuador,
W75-12080 2F

**STICKNEY, R. R.**
Impact of Intracoastal Waterway Maintenance Dredging on a Mud Bottom Benthos Community,
W75-12189 5C

**STILL, P. J.**
Water-Quality Data, 1948-73, Anchorage and Vicinity, Alaska,
W75-19955 5A

**STOLZBERG, R. J.**
Determination of NTA in Environmental Water by Gas Chromatography,
W75-12363 5A

**STOREY, J. H.**
Turbo-Drilling as Applied to Potash Developments in the Saskatchewan Field,
W75-12397 8B

**STRZELEZYK, E.**
Studies on Metabolic Activity of Benthic Bacteria Isolated from Three Lakes,
W75-11988 5C

**STUART, D. G.**
Influence of Environmental Stress on Enumeration of Indicator Bacteria from Natural Waters,
W75-12053 5C

**STUEBER, A. M.**
Geochemistry of Strontium in the Scioto River Drainage Basin, Ohio,
W75-12052 2K

**SUBRAHMANYAN, T. P.**
Virological Investigations on Sludges from Selected Ontario Sewage Plants,
W75-12133 5D

**SUBRAMANYA, K.**
A Practical Proportional Weir,
W75-11937 8C

**SUFFET, I. H.**
Organics, (Literature Review),
W75-12071 5B

**SUKIGARA, T.**
Nonlinear Runoff Kernels of Hydrologic System,
W75-12019 2A

**SUMER, M.**
Measurement of Extremely Small Pressure Differences in Water,
W75-11915 7B

**SWANSON, R. L.**
Ocean Dumping in the New York Bight,
W75-12172 5B

**SWISHER, S. D.**
Lidar vs. Photometer, A One Month Comparison,
W75-12036 5A

**SYNAK, M.**
Oregon Surveys its Hazardous Wastes,
W75-12239 5G

**TAFLIN, C. O.**
Minneapolis Keeps on Truckin',
W75-12319 5D

**TAKAHASI, Y.**
Effects of Movement of Precipitation Area Upon Runoff Phenomena,
W75-12026 2A

TAKASAO, T.
Transformation System in Flood Runoff Phenomena,
W75-12016 2E

TAKASHITA, S.
Studies of Prevention of Water Pollution, III. On the Biodegradation of Synthetic Detergents, (In Japanese),
W75-12316 5B

TANUMA, M.
Mathematical Models and Simulation of Wastewater Treatment Systems,
W75-12156 5D

TARLOCK, A. D.
Uses of Scientific Information in Environmental Decision-Making,
W75-12204 6G

TAYLOR, R. H.
The Bacterial Quality of Bottled Water,
W75-12011 5F

TERAUCHI, Y.
Control System for Showa Water Purification Plant, (In Japanese),
W75-12147 5F

TEVENDALE, T. J.
Municipal Sewage Treatment to Protect Shellfish Growing Waters,
W75-12352 5D

THOMERSON, D. R.
Observations on the Atomic Absorption Behavior of Some of the Earth Elements,
W75-11862 5A

THREADGOLD, P.
Application of Well Logging Techniques to Mining Exploration Boreholes,
W75-12398 8G

TILLBERG, J-E.
Effects of the Commercial Polychlorinated Biphenyl Mixture Aroclor 1242 on Growth, Viability, Phosphate Uptake, Respiration and Oxygen Evolation in Scenedesmus,
W75-11974 5C

TIMKO, D. J.
How Downhole Temperatures, Pressures Affect Drilling, Part 1,
W75-11865 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 2, Detecting and Evaluating Formation Pressures,
W75-11866 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 3, Overpressure Detection from Wireline Methods,
W75-11867 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 9, Navel Ways to Detect Abnormal Pressure,
W75-11868 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 10, Miscellaneous Ways to Detect Abnormal Pressure,
W75-11869 8C

TOLDRIAN, H.
A Mobile Sprinkler Irrigation Facility for Measurement of Surface Runoff and Soil Erosion (Eine Transportable Beregnungsanlage fuer die Messung von Oberflaechenabfluss und Bodenabtrag),
W75-11948 7B

TOMKINS, J. M.
Fisheries Economics. A Bibliography,
W75-12181 3E

TOOD, G. W.
Phenolic Compounds of Wheat Leaves Under Drought Stress,
W75-11905 2I

TOWERY, N. B.
Small-Scale Variability of Hail and its Significance for Hail Prevention Experiments,
W75-12092 3B

TOWERY, N. G.
Design of a Hail Suppression Project for Illinois,
W75-12095 3B

TREMBLAY, J. J.
Pollution of Groundwater Due to Municipal Dumps,
W75-12119 5B

TRUMP, J. G.
High Energy Electron Treatment of Water,
W75-12313 5D

TSAI, S.-D.
Phenolic Compounds of Wheat Leaves Under Drought Stress,
W75-11905 2I

TSUNEMATSU, Y.
Systems Simulation of Streamflows,
W75-12024 2E

TSUNODA, S.
Study on Direct Rapid Filtration Using Reduced Coagulants, (In Japanese),
W75-11860 5D

TUNG, S. K.
Swirling Laminar Pipe Flow of Suspensions,
W75-11938 8B

TUPPER, C. E.
Canadian Drinking Water Surveillance Programs, Panel Discussion,
W75-12355 5G

TURK, L. J.
Diurnal Fluctuations of Water Tables Induced by Atmospheric Pressure Changes,
W75-12077 2G

TYREE, M. T.
The Water Relations of Hemlock (Tsuga Canadensis): I. Some Equilibrium Water Relations as Measured by the Pressure-Bomb Technique,
W75-11900 2I

The Water Relations of Hemlock (Tsuga Canadensis): II. The Kinetics of Water Exchange Between the Symplast and Apolast,
W75-11901 2I

The Water Relations of Hemlock (Tsuga Canadensis): III. The Temperature Dependence of Water Exchange in a Pressure Bomb,
W75-11902 2I

UNGER, H. F.
Percussive Drilling: With Independent Rotation,
W75-12383 8E

UPATHAM, E. S.
Studies on Effects of Cercarial Concentration and Length of Exposure on Infection of Mice by St. Lucian Schistosoma Mansoni Cercariae in a Natural Running-Water Habitat,
W75-11903 5C

VAINAHT, Z.
On The Comparison of Reverse Osmosis Membrane Performance,
W75-12347 3A

VALIQUET, R. W.
Environmental Water Quality Program,
W75-12331 5G

VAMBERY, J. T.
The Law of the Sea: A Selective Bibliography of Articles, Documents and Monographs,
W75-12217 6E

VAN LOON, J. C.
Analysis of Heavy Metals in Sewage Sludge and Liquids Associated with Sludges,
W75-12140 5A

VAN MEER, A. J. J.
Some Aspects of a Chemical Treatment of the Waste Waters from the Beamhouse,
W75-12120 5D

VAN STEVENINCK, J.
Tests Show Jet Drilling Has Promise,
W75-11880 8C

VASILIEVA, V. E.
Morphology and Ultrastructure of Some Chlorococcal Algae from the Collection pf Algal Strains in Leningrad University. II. Monoraphidium Braunii (Nag, in Kutz.) Komarkova-Legnerova Strain (Gromov) 1967/231,
W75-11997 5C

VASYAGINA, R. D.
Determination of Residual Quantities of the Butyl Ester of 2,4-Dichlorophenoxyacetic Acid in Environmental Objects by Gas-Liquid Chromatography, (In Russian),
W75-12393 5A

VENKATARAMAN, P.
A Practical Proportional Weir,
W75-11937 8C

VICENS, G. J.
A Bayesian Framework for the Use of Regional Information in Hydrology,
W75-12048 6A

VILLARD, S. P.
Application of the Methylthymol Blue Sulfate Method to Water and Wastewater Analysis,
W75-12324 5A

VINGOE, R. L.
Wanted: Fewer Bit, Casing Sizes, Reward: Many Benefits for Industry,
W75-11885 8C

VOLOKH, B. F.
Apparatus for Cleaning Loose Filtering Material in Slow Water Filled Water Supply Filters,
W75-11935 5F

WADDELL, J.
Well Storage,
W75-12390 8B

WALKER, R. H.
Water Consumption Trends Within the Central and Southern Florida Flood Control District,
W75-12085 6D

**WALLIS, C.**
Adsorption of Poliovirus onto Activated Carbon in Wastewater,
W75-12148 5D

**WALSH, J. J.**
The Federal Common Law of Accretion: A New Element in Property Law,
W75-12205 6E

**WATANABE, H.**
Control System for Showa Water Purification Plant, (In Japanese),
W75-12147 5F

**WEBBER, M. D.**
Extractable Metals in Mixtures of Soil and Sewage Sludge,
W75-12141 5D

**WEBER, N. F.**
Minneapolis Keeps on Truckin',
W75-12319 5D

**WEIHS, D.**
Measurement of Extremely Small Pressure Differences in Water,
W75-11915 7B

**WEIRENGA, P. J.**
Effect of Hysteresis on the Prediction of Infiltration, Redistribution and Drainage of Water in a Layered Soil,
W75-12041 2G

**WEISS, L. A.**
Hydrogeologic Data for the Lower Connecticut River Basin, Connecticut,
W75-19954 7C

**WESSON, R. L.**
Water-Level Fluctuations and Earthquakes on the San Andreas Fault Zone,
W75-12392 4B

**WESTFALL, T. R.**
Up-Flow Separator,
W75-11936 5D

**WHEELER, C. L.**
1974 Water Resources Data for Oregon, Surface Water Records, Precipitation Records,
W75-12087 7C

**WHITAKER, J.**
Minneapolis Keeps on Truckin',
W75-12319 5D

**WHYTE, W. J.**
Control of Groundwater at Bancroft Mines, Zambia,
W75-12395 4B

**WICKS, P. H.**
Oregon Surveys its Hazardous Wastes,
W75-12239 5G

**WIEBE, H. H.**
Survey of the Matric Water of Various Plant Groups,
W75-11883 2I

**WIGGERT, V.**
Comparison of Gage and Radar Methods of Convective Rain Measurement,
W75-12102 2B

**WILLIAMS, G.**
A Study of Flash-Flood Susceptibility -- A Basin in Southern Arizona,
W75-12167 4A

**WILLIAMS, GERALD**
A Study of Flash-Flood Occurrences at a Site Versus Over a Forecast Zone,
W75-12174 2E

**WILLIAMS, J. L.**
Recirculating Resin Cleaning Chemical Feeder System for Water Softeners,
W75-12307 3D

**WILLIAMS-WYNN, D. A.**
No-Effluent Tannery Processes,
W75-12124 5D

**WITTERS, J.**
Studies in the System CaCO:-FeCO3: 1. Phase Relations; 2. A Method for Major-Element Spectrochemical Analysis; 3. Compositions of Some Ferroan Dolomites,
W75-12400 2F

**WITTGENSTEIN, G. F.**
Safety Installation for Preventing Pollution by Pipelines,
W75-11934 8G

**WOLF, E. G.**
A Computer Program Used to Estimate Primary Productivity from pH and Carbon Dioxide Data Employing the Upstream-Downstream Method,
W75-11971 5C

**WONG, D. T-L.**
Organics, (Literature Review),
W75-12071 5B

**WOOD, E. W.**
Planning Models for Water System Development in Mississippi Communities,
W75-11851 6D

**WOOD, G. M.**
Regulatory Aspects of Sludge Utilization on Land,
W75-12134 5G

**WOODALL, L. C.**
Strong Impact of Textiles by U.S. Water Control Act,
W75-12117 5G

**WOODLAN, B.**
Graphical Method Speeds Deviated Well Casing Design,
W75-11896 8G

**WOODLEY, W. L.**
Comparison of Gage and Radar Methods of Convective Rain Measurement,
W75-12102 2B

Florida Area Cumulus Experiments 1970-1973 Rainfall Results,
W75-12091 3B

On the Effect of Natural Rainfall Variability and Measurement Errors in the Detection of Seeding Effect,
W75-12103 3B

**WRIGHT, J. C.**
Evaluating the Productivity of Pine Forests in the Hinton-Edson Area, Alberta, From Soil Survey Maps,
W75-12003 4A

**WRIGHT, R. R.**
How to Evaluate Water Main Capacities, Part I,
W75-12329 8B

**WURZEL, P.**
Pipe Flow Measurements by the Pulse Velocity Method with Radioactive Isotopes,
W75-11916 8G

**WYNNE, M. J.**
Endocytosis of Microcystis Aeruginosa by Ochromonas Danica,
W75-11985 5C

**YAMAUCHI, T.**
Biological Waste Water Treatment,
W75-12149 5D

**YARE, B. S.**
The Use of a Specialized Drilling and Ground Water Sampling Technique for Delineation of Hexavalent Chromium Contamination in an Unconfined Aquifer, Southern New Jersey Coastal Plain,
W75-11899 5A

**YES'KINA, O. V.**
Experimental Data for Establishing the Content of Alpha, Alpha, Beta-Trichloropropionic Acid and its Sodium Salts in Reservoir Water,
W75-12190 5C

**YEVJEVICH, V.**
The Structure of Inputs and Outputs of Hydrologic Systems,
W75-12017 2A

**YOKOTA, K.**
Studies of Prevention of Water Pollution, III. On the Biodegradation of Synthetic Detergents, (In Japanese),
W75-12316 5B

**YOST, K. J.**
Aerobic Sewage Treatment System,
W75-12063 5D

**YOUNG, H. H.**
Effluent Treatment for a Small Tannery,
W75-12118 5D

**YOUNG, J. A.**
Energy Conservation: An Essential and Urgent Problem for the Water Industry,
W75-12334 5D

**YOUNG, J. E. P.**
Primary Developments of Air-Borne Bacteria in the OECD Activated Sludge System,
W75-12143 5D

**YOUNG, R. H. F.**
Pollution Effects on Surface Waters and Groundwaters,- (Literature Review),
W75-12070 5B

**YRJANAINEU, G.**
Sediment Basin Design,
W75-12042 2J

**ZANONI, A. E.**
Column Settling Tests for Flocculant Suspensions,
W75-12322 5D

**ZAPOROZEC, A.**
Hydrogeological Aspects of Solid Waste Disposal,
W75-12121 5E

**ZARNETT, G. D.**
Flow Quantities in Residential Weeping Tile Systems--A Calculational Method,
W75-12328 4A

**ZAWADZKI, I. I.**
Errors and Fluctuations of Raingauge Estimates of Areal Rainfall,
W75-11933 7A

**ZAWISZA, J.**
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. XIV. The Relations Between the Fish and Other Biocenotic Components (Summing Up the Studies),
W75-11998 8I

**ZENONE, C.**
Water-Quality Data, 1948-73, Anchorage and Vicinity, Alaska,
W75-19955 5A

**ZUCCOLOTTO, H. M.**
Filtering and Debris Removing Apparatus for Cleaning a Sea Water Stream,
W75-12183 5G

# ORGANIZATIONAL INDEX


ELAIDE UNIV. (AUSTRALIA). DEPT. OF TANY.
n Infra-Red Psychrometer for Detecing hanges in the Humidity of Leaf Boundary ayers,
75-12131 2I

RICULTURAL RESEARCH GANIZATION, DOR (ISRAEL). FISH AND CACULTURE STATION.
ffect of Bromex-50 on Plankton Population in ish Ponds,
75-12188 5C

RICULTURAL RESEARCH SERVICE, HENS, GA. SOUTHEAST WATERSHED SEARCH CENTER.
Three-Component, Nonlinear Water-Yield odel,
75-12031 2A

RICULTURAL RESEARCH SERVICE, RANT, OKLA. WATER QUALITY NAGEMENT.
il Water Measurement with an Inexpensive pectrophotometer,
75-12081 2G

RICULTURAL RESEARCH SERVICE, ENIX, ARIZ. WATER CONSERVATION
urnal and Seasonal Soil Water Uptake and ux Within a Bermudagrass Root Zone,
75-12082 2D

ADEMIYA NAVUK BSSR, MINSK. INST. OF ERIMENTAL BOTANY.
ctivity of Enzymes (Protease and Urease) and rms of Mobile Nitrogen in Thin Peat Soil of e Second Year of Use, (In Russian),
75-12216 5B

BAMA AGRICULTURAL EXPERIMENT TION, AUBURN.
e Utilization of Phosphorus from Muds by e Phytoplankter, Scenedesmus Dimorphus, d the Significance of These Findings to the actice of Pond Fertilization.
75-11986 5C

SKA UNIV., COLLEGE. GEOPHYSICAL
Preliminary Study of the Formation of Land-st Ice at Barrow, Alaska, Winter 1973-74,
75-12162 2C

ajor Late-Winter Features of Ice in Northern ring and Chukchi Seas as Determined From tellite Imagery,
75-12168 2C

IED COLLOIDS LTD., BRADFORD GLAND). (ASSIGNEE).
occulating Agents,
75-12058 5D

RICAN CYANAMID, STAMFORD CONN. IGNEE).
ocess for Raw Water Clarification,
75-12300 5F

OCO PRODUCTION CO., TULSA, OKLA.
aphic Solution to Fracture Treatment sign,
75-11876 8B

Laboratory Study of the Effects of Confin-Pressure on Fracture Flow and Storage pacity in Carbonate Rocks,
75-11892 4B

ANACAPA SCIENCES, INC., SANTA BARBARA, CALIF.
The Assessment of Water Quality,
W75-12054 5F

ARIZONA STATE UNIV., TEMPE. DEPT. OF ZOOLOGY.
Light and Assimilation Number in a Small Desert, Recharged-Groundwater Pond,
W75-12326 5A

ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY AND WATER RESOURCES.
Efficiency of Parameter and State Estimation Methods in Relation to Models of Lumped and Distributed Hydrologic Systems,
W75-12025 2A

ARIZONA WATER RESOURCES RESEARCH CENTER, TUCSON.
A Thermodynamic Integral Equation for the Equilibrium Moisture Profile in Swelling Soil,
W75-12050 2G

ARMCO STEEL CORP., MIDDLETOWN, OHIO.
Wanted: Fewer Bit, Casing Sizes, Reward: Many Benefits for Industry,
W75-11885 8C

ARMY ENGINEER DISTRICT, ALBUQUERQUE, N. MEX.
Flood Plain Information: Fountain Creek, Colorado Springs, Manitou Springs, Colorado.
W75-12372 2E

ARMY ENGINEER DISTRICT, BUFFALO, N. Y.
Diked Disposal Area Site No 12, Cleveland Harbor, Cuyahoga County, Ohio.
W75-12255 5E

Flood Plain Information: Ellicott Creek in the Towns of Lancaster and Alden and the Village of Alden, Erie County, New York.
W75-12365 6F

Flood Plain Information: Tonawanda Creek and Its Affected Tributaries, Erie and Niagara Counties, New York.
W75-12373 2E

ARMY ENGINEER DISTRICT, FORT WORTH, TEX.
Flood Plain Information: Hackberry Creek and Cottonwood Branch, Dallas County, Texas.
W75-12379 4A

ARMY ENGINEER DISTRICT, GALVESTON, TEX.
Flood Plain Information: Spring and Willow Creeks, Houston Metropolitan Area, Texas.
W75-12371 4

ARMY ENGINEER DISTRICT, LOS ANGELES, CALIF.
Flood Plain Information: Hassayampa River, Vicinity of Wickenburg, Arizona.
W75-12370 4A

ARMY ENGINEER DISTRICT, NORFOLK, VA.
Flood Plain Information: Moores Creek, Albemarle County and Charlottesville, Virginia.
W75-12366 4A

Flood Plain Information--Coastal Flooding: Town of Poquoson, Virginia.
W75-12367 4A

Flood Plain Information: Meherrin River, Emporia, Virginia.
W75-12368 4A

Flood Plain Information: James River, Howardsville to Scottsville, Albemarle County, Virginia.
W75-12375 4A

ARMY ENGINEER DISTRICT, PORTLAND, OREG.
Flood Plain Information, Willamette River, Johnson, Kellogg and Mt. Scott Creeks, Milwaukie-Oak Grove-Lake Oswego, Oregon.
W75-12369 4A

Flood Plain Information: South Santiam River, Lebanon, Oregon.
W75-12376 4A

ARMY ENGINEER DISTRICT, SEATTLE WASH.
Special Flood Hazard Information: Issaquah and Tibbetts Creeks, Issaquah and Vicinity, Washington.
W75-12377 4A

ARMY ENGINEER DISTRICT, WALLA WALLA, WASH.
Special Flood Hazard Information: Paradise Creek, Pullman and Vicinity, Washington.
W75-12378 4A

ARMY ENGINEER DIV. NORTH ATLANTIC, NEW YORK.
River Crossing Permits for Buckeye Pipe Line Co. Proposed Petroleum Products Pipeline System Between Linden, New Jersey and Macungie, Pennsylvania (Final Environmental Impact Statement).
W75-12258 8A

ATARA CORP., MONTREAL (CANADA). (ASSIGNEE).
Single Basin Aerated Sewage Lagoon with Spring Time Intensified Aeration,
W75-12060 5D

ATMOSPHERIC ENVIRONMENT SERVICE, TORONTO (ONTARIO).
Variations of the Turbulent Fluxes of Momentum, Heat and Moisture over Lake Ontario,
W75-12078 2H

AUBURN UNIV., ALA. DEPT. OF CIVIL ENGINEERING.
Water-Treatment Sludge Filtration Studies,
W75-12069 5D

BAKER OIL TOOLS, INC., OKLAHOMA CITY, OKLA.
Graphic Solutions to Tubing Movement in Deep Wells,
W75-11875 8B

BASRAH UNIV., AL BASRAH (IRAQ).
Survey of the Matric Water of Various Plant Groups,
W75-11883 2I

BATTELLE-NORTHWEST, RICHLAND, WASH.
On the Effect of Natural Rainfall Variability and Measurement Errors in the Detection of Seeding Effect,
W75-12103 3B

Bayesian and Classical Statistical Methods Applied to Randomized Weather Modification Experiments,
W75-12107 3B

BATTELLE-PACIFIC NORTHWEST LABS., RICHLAND, WASH.
A Computer Program Used to Estimate Primary Productivity from pH and Carbon Dioxide

Data Employing the Upstream-Downstream Method,
W75-11971 5C

**BAYLOR COLL. OF MEDICINE, HOUSTON , TEXAS. DEPT. OF VIROLOGY AND EPIDEMIOLOGY.**
Adsorption of Poliovirus onto Activated Carbon in Wastewater,
W75-12148 5D

**BECHTEL CORP., SAN FRANCISCO, CALIF. ECOLOGY AND WATER QUALITY GROUP.**
Complete Industrial Waste-Water Reuse Goal of Refining Study,
W75-12125 5D

**BENHAN-BLAIR AND AFFILIATES, INC., OKLAHOMA CITY.**
Oklahoma Plans Ahead for Wastewater Reuse,
W75-12066 5D

**BIRMINGHAM UNIV. (ENGLAND). DEPT. OF TRANSPORTATION AND ENVIRONMENTAL PLANNING.**
Recreation Analysis. A Bibliography,
W75-12180 6B

**BITUMINOUS COAL RESEARCH, INC., MONROEVILLE, PA.**
Mine Drainage Abstracts, A Bibliography. 1972 Supplement.
W75-12158 5B

**BLACK, CROW, AND EIDSNESS, INC., CLEARWATER, FLA.**
Recycling Allows Zero Wastewater Discharge,
W75-12364 5D

**BLUME (JOHN A.) AND ASSOCIATES, ENGINEERS, SAN FRANCISCO, CALIF.**
Combined Wastewater Overflows,
W75-11912 5D

**BRISTOL UNIV. (ENGLAND). DEPT. OF ECONOMICS.**
Economic Growth Vs. the Environment. A Bibliography,
W75-12182 6G

**BRITISH COLUMBIA DEPT. OF HEALTH, VANCOUVER. ENVIRONMENTAL ENGINEERING DIV.**
Canadian Drinking Water Standards Review, British Columbia, Panel Discussion,
W75-12358 5G

**BRITISH COLUMBIA DEPT. OF HEALTH, VANCOUVER. OCCUPATIONAL HEALTH DIV.**
Disinfection to Protect Recreational Areas and Potable Water Supplies,
W75-12351 5D

**BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF CIVIL ENGINEERING.**
Spray Irrigation of Treated Municipal sewage,
W75-11856 5D

**BRITISH COLUMBIA UNIV., VANCOUVER. WESTWATER RESEARCH CENTRE.**
Water Quality Management in a Metropolitan Area,
W75-12354 5G

**BRITISH PETROLEUM CO. LTD., SUNBURY-ON-THAMES (ENGLAND). RESEARCH CENTRE.**
Application of Well Logging Techniques to Mining Exploration Boreholes,
W75-12398 8G

**BUREAU OF MINES, BARTLESVILLE, OKLA. BARTLESVILLE ENERGY RESEARCH CENTER.**
Geochemistry of Oil-Field Water Applied to Exploration,
W75-11879 4B

**BUREAU OF MINES, LARAMIE, WYO. MINERAL RESOURCES FIELD OFFICE.**
Waterflooding of Oilfields in Wyoming to 1968,
W75-12380 8B

**BUREAU OF MINES, MORGANTOWN, W. VA. PETROLEUM RESEARCH LAB.**
Fluid Flow in Channels, Capillaries, and Porous Media under the Influence of an Electric Field,
W75-12381 2F

**BUREAU OF MINES, TWIN CITIES, MINN. TWIN CITIES MINING RESEARCH CENTER.**
Percussive Drilling: With Independent Rotation,
W75-12383 8E

Drillability Studies: Percussive Drilling in the Field,
W75-12384 8E

**BUREAU OF RECLAMATION, DENVER, COLO.**
The Effect of Persistence of AgI on Randomized Weather Modification Experiments,
W75-12104 3B

**CALIFORNIA STATE WATER RESOURCES CONTROL BOARD, SACRAMENTO.**
Recognition of Substantive Rights Under NEPA,
W75-12250 6E

**CALIFORNIA UNIV., BERKELEY, COLL. OF NATURAL RESOURCES.**
Wasting a River,
W75-12211 6G

**CALIFORNIA UNIV., DAVIS. DEPT. OF WATER SCIENCE AND ENGINEERING.**
Artificial Groundwater Recharge, I. Circular Recharging Area,
W75-12040 4B

Artifical Groundwater Recharge, II. Rectangular Recharging Area,
W75-12097 4B

**CALIFORNIA UNIV., DAVIS. DIV. OF ENVIRONMENTAL STUDIES.**
Danger Signs for Tahoe's Future,
W75-12002 5C

Will Baikal and Tahoe Be Saved,
W75-12012 5C

**CALIFORNIA UNIV., DAVIS. INST. OF ECOLOGY.**
A Quantitative Measure of Succession Rate and Its Application to the Phytoplankton of Lakes,
W75-12005 5C

**CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.**
A Radioisotope Monitoring System for Sewage Effluent,
W75-11914 5A

**CAMBRIDGE UNIV. (ENGLAND). DEPT. OF APPLIED MATHEMATICS AND THEORETICAL PHYSICS.**
Measurement of Extremely Small Pressure Differences in Water,
W75-11915 7B

**CEMENTATION MINING, LTD., LONDON (ENGLAND).**
Turbo-Drilling as Applied to Potash Developments in the Saskatchewan Field,
W75-12397 8B

**CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT, WEST PALM BEACH. RESOURCES PLANNING DEPT.**
Water Consumption Trends Within the Central and Southern Florida Flood Control District,
W75-12085 6D

Supplemental Water Use in the Everglades Agricultural Area,
W75-12086 3F

**CENTRAL CONTRA COSTA SANITARY DISTRICT, WALNUT CREEK, CALIF.**
Computer Controlled Wastewater Reclamation Plant,
W75-12361 5D

**CESKOSLOVENSKA AKADEMIE VED, BRNO. USTAV PRO VYZKUM OBRATLOVCU.**
The Ichthyofauna of the Rokytna River: I. Species Composition, Abundance and Biomass,
W75-12129 2I

**CHAMPLIN PETROLEUM CO., WILMINGTON, CALIF.**
Graphical Method Speeds Deviated Well Casing Design,
W75-11896 8G

**CHEVRON OIL FIELD RESEARCH CO., LA HABRE, CALIF.**
Reservoir Properties Affecting Matrix Acid Stimulation of Sandstones,
W75-11894 4B

**CHICAGO DEPT. OF AVIATION, ILL.**
Environmental Water Quality Program,
W75-12331 5G

**CHICAGO UNIV., DEPT. OF GEOPHYSICAL SCIENCES.**
Studies in the System CaCO:-FeCO3: 1. Phase Relations; 2. A Method for Major-Element Spectrochemical Analysis; 3. Compositions of Some Ferroan Dolomites,
W75-12400 2F

**CIBA-GEIGY LTD., BASEL (SWITZERLAND). DYESTUFFS AND CHEMICAL DIV.**
Primary Developments of Air-Borne Bacteria in the OECD Activated Sludge System,
W75-12143 5D

**CLARK UNIV., WORCESTER, MASS. DEPT. OF GEOGRAPHY.**
Flood Insurance and Flood Plain Zoning as Compatible Components,
W75-12227 6F

**COATE BURIAL VAULT, INC., WEST MILTON, OHIO. (ASSIGNEE).**
Aerobic Sewage Treatment System,
W75-12063 5D

**COLORADO STATE UNIV., FORT COLLINS. DEPT. OF ATMOSPHERIC SCIENCE.**
Testing of Cloud Seeding Materials at the Cloud Simulation and Aersol Laboratory, 1971-1973,
W75-12099 3B

**COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.**
The Structure of Inputs and Outputs of Hydrologic Systems,
W75-12017 2A

**COLORADO UNIV., BOULDER. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.**
Individual Home Wastewater Characterization and Treatment,
W75-11852 5D

**COLUMBIA UNIV., NEW YORK. SCHOOL OF LAW.**
The Law of the Sea: A Selective Bibliography of Articles, Documents and Monographs,
W75-12217 6E

**CONNECTICUT AGRICULTURAL EXPERIMENT STATION, NEW HAVEN. DEPT. OF ECOLOGY AND CLIMATOLOGY.**
On Solving the Flow Equation in Unsaturated Soils by Optimization: Horizontal Infiltration,
W75-12083 2G

**CONNECTICUT UNIV., GROTON. MARINE SCIENCES INST.; AND CONNECTICUT UNIV., GROTON. DEPT. OF GEOLOGY.**
Mercury Concentrations in Open Ocean Waters: Sampling Procedure,
W75-11953 5A

**CONSIGLIO NAZIONALE DELLE RICERCHE, ROME (ITALY). (ASSIGNEE).**
Process for Demineralizing Water,
W75-12311 3A

**CONTINENTAL OIL CO., HOUSTON, TEX.**
How Downhole Temperatures, Pressures Affect Drilling, Part 10, Miscellaneous Ways to Detect Abnormal Pressure,
W75-11869 8C

**CONTINENTAL OIL CO., PONCA CITY, OKLA.**
How Downhole Temperatures, Pressures Affect Drilling, Part 1,
W75-11865 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 2, Detecting and Evaluating Formation Pressures,
W75-11866 8C

How Downhole Temperatures, Pressures Affect Drilling, Part 3, Overpressure Detection from Wireline Methods,
W75-11867 8C

**CONTINENTAL OIL., PONCA CITY, OKLA.**
How Downhole Temperatures, Pressures Affect Drilling, Part 9, Navel Ways to Detect Abnormal Pressure,
W75-11868 8C

**CORPS OF ENGINEERS, WASHINGTON, D. C.**
Permits for Activities in Navigable Waters or Ocean Waters.
W75-12263 6E

**COUNCIL ON ENVIRONMENTAL QUALITY, WASHINGTON, D. C.**
The Fifth Annual Report of the Council on Environmental Quality.
W75-12203 6G

**DAMES AND MOORE, PARK RIDGE, ILL.**
Geohydrology of Collier County, Florida,
W75-11874 4B

**DAR ES SALAAM UNIV. (TANZANIA).**
Vertical Temperature Profiles in Open-Channel Flow,
W75-12047 5B

**DELAWARE UNIV., NEWARK. DEPT. OF CIVIL ENGINEERING.**
Sludge Treatment, Utilization, and Disposal, (Literature Review),
W75-12075 5D

**DENVER RESEARCH INST., COLO.**
A Numerical Model of Precipitation from Seeded and Unseeded Cold Orographic Clouds,
W75-12098 3B

**DEPARTMENT OF AGRICULTURE, OTTAWA (ONTARIO). SOIL RESEARCH INST.**
Evaluating the Productivity of Pine Forests in the Hinton-Edson Area, Alberta, From Soil Survey Maps,
W75-12003 4A

Extractable Metals in Mixtures of Soil and Sewage Sludge,
W75-12141 5D

**DEPARTMENT OF THE ENVIRONMENT, EDMONTON (ALBERTA). DIV. OF POLLUTION CONTROL.**
Canadian Drinking Water Standards Review, Alberta, Saskatchewan and Manitoba, Panel Discussion,
W75-12357 5G

**DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). INLAND WATERS DIRECTORATE.**
Pollution of Groundwater Due to Municipal Dumps,
W75-12119 5B

**DON BOSCO POLYTECHNIC, CALCUTTA (INDIA).**
A Mathematical Model for Head-Discharge Relationships for Various Ferrule-House Service Pipe Combinations,
W75-11906 8B

**DOW CHEMICAL CO., TULSA, OKLA. DOWELL DIV.**
How to Use Thixotropic Slurries to Solve Cementing Problems,
W75-11886 8F

Cementing Off, Plugging, and Redrilling,
W75-12394 8F

**DREXEL UNIV., PHILADELPHIA, PA. DEPT. OF ENVIRONMENTAL ENGINEERING AND SCIENCE.**
Organics, (Literature Review),
W75-12071 5B

**DU PONT OF CANADA LTD., MONTREAL (QUEBEC).**
Nitrogen Removal from Municipal Wastewater,
W75-11859 5D

**ECONOMIC RESEARCH SERVICE, WASHINGTON, D.C.**
Historical Guide to Federal Water Pollution Control Laws Affecting Food Processing,
W75-12226 5G

**EIMCO CORP., SALT LAKE CITY, UTAH.**
Biologically Mediated Inconsistencies in Aeration Equipment Performace,
W75-12333 5D

**ENVIREX, INC. MILWAUKEE, WIS. ENVIRONMENTAL SCIENCE DIV.**
Column Settling Tests for Flocculant Suspensions,
W75-12322 5D

**ENVIRONMENTAL LAW INST., WASHINGTON, D.C.**
Litigation Under the Federal Water Pollution Control Act Amendments of 1974,
W75-12212 5G

**ENVIRONMENTAL PROTECTION AGENCY, CINCINNATI, OHIO. WATER SUPPLY RESEARCH LAB.**
The Bacterial Quality of Bottled Water,
W75-12011 5F

**ENVIRONMENTAL PROTECTION AGENCY, RIVESVILLE, W. VA. CROION MINE DRAINAGE CONTROL FIELD SITE.**
Sodium Hydroxide Treatment of Acid Mine Drainage,
W75-12116 5G

**ENVIRONMENTAL PROTECTION AGENCY, SAN FRANCISCO, CALIF. REGION IX.**
Mamala Bay Wastewater Treatment and Disposal System, Oahu, Hawaii (Final Environmental Impact Statement).
W75-12257 5D

**ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D. C.**
The Economics of Clean Water.
W75-12233 5G

Water Quality Management Basin Plans--Policies and Procedures.
W75-12260 5G

Iron and Steel Manufacturing Point Source Category--Effluent Guidelines and Standards.
W75-12264 5G

Canned and Preserved Seafood Processing Point Source Category--Effluent Limitations Guidelines.
W75-12265 5G

Fertilizer Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Limitations.
W75-12266 5G

Timber Products Processing Point Source Category--Effluent Guidelines and Standards.
W75-12267 5G

Organic Chemicals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Application to Pretreatment Standards.
W75-12268 5G

Soap and Detergent Manufacturing Point Source Category--Effluent Limitations Guidelines.
W75-12269 5G

Timber Products--Proposed Effluent Guidelines and Performances and Pretreatment Standards for New Sources.
W75-12270 5G

Beet Sugar Processing Point Source Subcategory--Effluent Guidelines and Standards.
W75-12271 5G

Fertilizer Manufacturing Point Source Category--Effluent Limitations and Guidelines.
W75-12272 5G

Meat Products Point Source Category--Effluent Guidelines and Standards.
W75-12273 5G

**ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D. C.**

Grain Mills Point Source Category--Effluent Limitations Guidelines and Standards.
W75-12274 5G

Plastics and Synthetic Point Source Category--Effluent Guidelines and Standards.
W75-12275 5G

Nonferrous Metals Manufacturing Point Source Category--Effluent Guidelines and Standards and Proposed Limitations.
W75-12276 5G

**ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D. C. OFFICE OF AIR AND WATER PROGRAMS.**
Toward a Cleaner Aquatic Environment,
W75-12234 5G

**ENVIRONMENTAL PROTECTION SERVICE, EDMONTON (ALBERTA). NORTHWEST REGION.**
Canadian Drinking Water Standards Review, Northwest Territories and Yukon Territory, Panel Discussion,
W75-12359 5G

**ENVIRONMENTAL PROTECTION SERVICE, OTTAWA (ONTARIO). WATER TECHNOLOGY CENTRE.**
Biochemical Characteristics of Digested Chemical Sewage Sludges,
W75-12132 5D

**ENVIRONMENTAL PROTECTION SERVICE, VANCOUVER (BRITISH COLUMBIA). PACIFIC REGION.**
Municipal Sewage Treatment to Protect Shellfish Growing Waters,
W75-12352 5D

**ESCONDIDO MUTUAL WATER CO., CALIF.**
Aeration Upgrades Reservoir,
W75-12346 5F

**EXXON CO., HOUSTON, TEX.**
Crew Training,
W75-12385 8G

**EXXON PRODUCTION RESEARCH CO., HOUSTON, TEX.**
A New Look at Sandstone Acidizing,
W75-11878 4B

**FAIRFAX COUNTY WASTEWATER SYSTEM, VA.**
Fairfax Goes for AWT.
W75-11950 5D

**FISCHER AND BEATTY, FORT COLLINS, COLO.**
Management of Interstate Ground Water,
W75-12251 4B

**FISHERIES AND MARINE SERVICE, WINNIPEG (MANITOBA).**
Seismic Exploration: Its Nature and Effect on Fish,
W75-11877 8G

Behavioural Responses of Whitefish and Rainbow Trout to Drilling Fluids,
W75-11952 5C

**FISHERIES RESEARCH BOARD OF CANADA, WINNIPEG (MANITOBA). FRESHWATER INST.**
Geochemistry and Nutrient Regime of Saline Eutrophic Lakes in the Erickson-Elphinstone District of Southwestern Manitoba.
W75-11982 5C

Biological and Chemical Mechanisms in Eutrophication of Freshwater Lakes,
W75-11992 5C

Rates of Supply of Nitrogen and Phosphorus to Lake Winnipeg, Manitoba, in Relation to the Diversion of Missouri River Water Into the Red and Assiniboine Rivers,
W75-12006 5C

Eutrophication,
W75-12010 5C

**FLORIDA ATTORNEY GENERAL'S OFFICE, TALLAHASSEE.**
The Doctrine of Primary Jurisdiction Misconceived: End to Common Law Environmental Protection,
W75-12206 6G

**FLORIDA UNIV., GAINESVILLE. DEPT. OF SOIL SCIENCE.**
Mathematical Analysis of Steady Saturated Flow Through a Multilayered Soil with a Sloping Surface,
W75-12044 2G

**GARDEN STATE TANNING CO., READING, PA.**
Some Aspects of Tannery Effluent Control,
W75-12123 5D

**GEOLOGICAL SURVEY, ANCHORAGE, ALASKA.**
Water-Quality Data, 1948-73, Anchorage and Vicinity, Alaska,
W75-19955 5A

**GEOLOGICAL SURVEY, ATLANTA, GA. WATER RESOURCES DIV.**
Water Resources Programs in the Southeastern Region.
W75-11960 9D

**GEOLOGICAL SURVEY, BISMARCK, N. DAK.**
Ground-Water Basic Data for Emmons County, North Dakota,
W75-11963 4B

**GEOLOGICAL SURVEY, DENVER, COLO.**
Hole-to-Hole Geophysical Measurement Research for Mineral Exploration,
W75-11873 8G

**GEOLOGICAL SURVEY, DENVER, COLO. WATER RESOURCES DIV.**
Water Resources Investigations of the U.S. Geological Survey in the Northern Great Plains Coal Region of Wyoming, Montana, and North Dakota, 1975.
W75-11961 5A

**GEOLOGICAL SURVEY, HARTFORD, CONN.**
Hydrogeologic Data for the Lower Connecticut River Basin, Connecticut,
W75-19954 7C

**GEOLOGICAL SURVEY, MENLO PARK, CALIF.**
Water Resources Data for California, 1973: Part 2. Water Quality Records.
W75-11962 7C

**GEOLOGICAL SURVEY OF ALABAMA, UNIVERSITY.**
Acid Mine Drainage in Cane Creek Basin, Near Oakman, Walker County, Alabama,
W75-11871 5G

**GEOLOGICAL SURVEY, PORTLAND, OREG.**
Flood Profiles in the Umpqua River Basin, Oregon: Part 3, Umpqua River Below Scottburg, Scholfield, Cow Creek Above Glendale,
W75-11959 4A

**GEOLOGICAL SURVEY, RESTON, VA.**
Land Subsidence in the San Joaquin Valley, California, as of 1972,
W75-11956 4B

Land Subsidence Due to Ground-Water Withdrawal in the Los Banos-Kettleman City Area, California, Part 2. Subsidence and Compaction of Deposits,
W75-11957 4B

Land Subsidence Due to Ground-Water Withdrawal in the Los Banos-Kettleman City Area, California, Part 3. Interrelations of Water-Level Change, Change in Aquifer-System Thickness, and Subsidence,
W75-11958 4B

Quality of Surface Waters of the United States, 1970: Part 6. Missouri River Basin.
W75-11964 7C

Quality of Surface Waters of the United States, 1970: Part 8. Western Gulf of Mexico Basins.
W75-11965 7C

Quality of Surface Waters of the United States, 1969: Part 8. Western Gulf of Mexico Basin.
W75-11966 7C

Surface Water Supply of the United States, 1966-70: Part 2. South Atlantic Slope and Eastern Gulf of Mexico Basins - Volume 3. Basins from Apalachicola River to Pearl River.
W75-11967 7C

Surface Water Supply of the United States, 1966-70: Part 6. Missouri River Basin--Volume 1. Missouri River Basin above Williston, North Dakota.
W75-11968 7C

Surface Water Supply of the United States, 1966-70: Part 7. Lower Mississippi River--Volume 2. Arkansas River Basin.
W75-11969 7C

**GEORGETOWN UNIV., WASHINGTON, D.C. LAW CENTER.**
The Allocation of Waters of International Rivers.
W75-12219 6E

**GESELLSCHAFT FUER STRAHLEN- UND UMWELTFORSCHUNG M.B.H., NEUHERBERG BEI MUNICH (WEST GERMANY). INSTITUT FUER RADIOHYDROMETRIE.**
Use of Environmental Isotope Methods as a Reconnaissance Tool in Groundwater Exploration Near San Antonio de Pichincha, Ecuador,
W75-12080 2F

**GETTY OIL CO., ANDREWS, TEX.**
Tracers Aid Placement of Stimulation Fluids,
W75-11898 8G

**GORKOVSKII MEDITSINSKII INSTITUT (USSR).**
Efficiency of Measures for the Sanitary Protection of Surface Waters in the Region of Chemical Industry Enterprises, (In Russian),
W75-11977 5G

REAT LAKES BASIN COMMISSION, ANN RBOR, MICH.
1974 Annual Report, Great Lakes Basin Commission.
W75-12238 5G

UELPH UNIV. (ONTARIO). DEPT. OF LAND ESOURCE SCIENCE.
Land Disposal of Sewage Sludge,
W75-12135 5D

Nitrogen Transformation and Uptake,
W75-12136 5B

Cation Distribution in Soils as Related to Sewage Sludge Disposal on Land,
W75-12139 5B

Chemical Tests for Plant Available Metals in Soils.
W75-12142 5A

UELPH UNIV. (ONTARIO). DEPT. OF CROBIOLOGY.
Some Microbiological Aspects of the Land Disposal of Sludge,
W75-12138 5D

LLIBURTON SERVICES, DUNCAN, OKLA.
The Effect of Surface Kinetics in Fracture Acidizing,
W75-11887 8B

NOVER RESEARCH CORP., EAST NOVER, N.J. (ASSIGNEE).
Process and Apparatus for Recovering Clean Water and Solids from Dilute, Aqueous, Solids Containing Solutions or Dispersions,
W75-12059 5D

RMONY EMITTER CO., INC., TUCSON, IZ. (ASSIGNEE).
Emitter for Irrigation Systems,
W75-12303 3F

WAII UNIV., HONOLULU. DEPT. OF RONOMY AND SOIL SCIENCE.
Hydrologic Systems in Hawaii,
W75-12022 2A

One-Step Wetting Procedure for Determining oth Water Characteristic and Hydraulic Conuctivity of a Soil Core,
W75-12084 2G

WAII UNIV., HONOLULU. DEPT. OF CIVIL GINEERING.
ollution Effects on Surface Waters and roundwaters,- (Literature Review),
W75-12070 5B

H VOLTAGE ENGINEERING CORP., RLINGTON, MASS. (ASSIGNEE).
igh Energy Electron Treatment of Water,
W75-12313 5D

KKAIDO UNIV., SAPPORO (JAPAN). DEPT. CIVIL ENGINEERING.
ffect of an Error in Discharge Measurements the Detection Process in Runoff Systems nalysis,
W75-12020 2A

DRAULIC RESEARCH STATION, AKPUR(INDIA).
aining of Sutlej River Below Rupar Headorks for the Protection of Bist Doab Canal: odel Studies,
W75-11925 4D

ILLINOIS STATE GEOLOGICAL SURVEY, URBANA.
Ground-Water and Engineering Geology in Siting of Sanitary Landfills,
W75-12122 5E

ILLINOIS STATE WATER SURVEY, URBANA.
Small-Scale Variability of Hail and its Significance for Hail Prevention Experiments,
W75-12092 3B

Design of a Hail Suppression Project for Illinois,
W75-12095 3B

Potential of Precipitation Modification in Moderate to Severe Droughts,
W75-12110 2B

ILLINOIS UNIV., CHICAGO. DEPT. OF BIOLOGICAL SCIENCES.
Pick-up and Metabolism of DDT, Dieldrin and Photodieldrin by a Fresh Water Alga (Ankistrodesmus Amalloides) and a Microcrustacean (Daphnia Pulex),
W75-12007 5C

ILLINOIS UNIV., URBANA, DEPT. OF HYDRAULIC ENGINEERING.
Stochastic Hydrologic Systems,
W75-12015 2A

ILLINOIS UNIV., URBANA. DEPT. OF MECHANICAL AND INDUSTRIAL ENGINEERING.
Swirling Laminar Pipe Flow of Suspensions,
W75-11938 8B

INDIANA UNIV., BLOOMINGTON, SCHOOL OF LAW.
Uses of Scientific Information in Environmental Decision-Making,
W75-12204 6G

INST. OF MARINE SCIENCE. ALASKA UNIV., COLLEGE.
Cook Inlet Tidal Stream Atlas,
W75-12163 2L

INSTITUT FRANCAIS DU PETROLE, RUEIL-MALMAISON (FRANCE).
Thermodynamic and Kinetic Aspects of Argillaceous Sandstone Acidizing,
W75-11891 4B

INSTITUTE OF GAS TECHNOLOGY, CHICAGO, ILL.
Anaerobic Processes, (Literature Review),
W75-12074 5D

INSTITUTE OF GENERAL AND MUNICIPAL HYGIENE, MOSCOW(USSR).
Comparative Survival of Enterococci, Coliforms and Salmonellas in Water, (In Russian),
W75-11973 5C

INSTITUTE OF HYDROLOGY, WALLINGFORD (ENGLAND).
A Particular Comparison of Annual Maxima and Partial Duration Series Methods of Flood Frequency Prediction,
W75-11929 2E

Flood Event Data Collation,
W75-11943 7C

INSTITUTE OF OCEANOGRAPHIC SCIENCES, WORMLEY (ENGLAND).
Transfer of Heat, Fresh Water and Nutrients Through the Seasonal Thermocline,
W75-11994 5C

INSTITUTE OF PLANT ENVIRONMENT, SUWON (REPUBLIC OF KOREA).
Rapid Soil Moisture Determination by Immersion Method, (In Korean),
W75-12240 2G

INSTITUTE TNO VOOR LEDER EN SCHOENEN, WAALWIJK (NETHERLANDS).
Some Aspects of a Chemical Treatment of the Waste Waters from the Beamhouse,
W75-12120 5D

INSTYTUT RYBACTWA SRODLADOWEGO, OLSZTYN-KORTOWO (POLAND).
Distribution and Biomass of Macrophytes in Lake Dgal Maly,
W75-11993 8I

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT, WASHINGTON, D.C.
Basic Principles Relating to the International Regime of the Oceans at the Caracas Session of the U. N. Law of the Sea Conference,
W75-12253 6E

INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION, NEW WESTMINSTER (BRITISH COLUMBIA). ENVIRONMENTAL CONSERVATION DIV.
Toxicity of Aquatic Organisms Caused by Chlorination,
W75-12353 5D

IOWA CITY WATER SUPERINTENDENT OFFICE.
Water Plant goes Automatic,
W75-12345 8C

IOWA STATE UNIV., AMES. DEPT. OF ZOOLOGY AND ENTOMOLOGY.
Seasonal Prevalence of Chondrococcus Columnaris Infection in Black Bullheads from Clear Lake, Iowa,
W75-11995 5C

IOWA UNIV., IOWA CITY.
Factors Affecting Oxygen Transfer During Bubble Aeration Under Laboratory Scale Conditions,
W75-12144 5D

ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LTD., HAIFA.
N and P Distribution in Lake Kinneret (Israel) with Emphasis on Dissolved Organic Nitrogen,
W75-11975 5C

JODHPUR UNIV. (INDIA). DEPT. OF BOTANY.
Role of Epidermal Cell Turgor on Stomatal Regulation in Isolated Epidermal Peelings of Citrullus Colocynthis Linn. (Schrad.),
W75-12323 2I

KALAMAZOO COLL., MICH, DEPT. OF BIOLOGY.
Filtration of Neutral Red by Fresh Water Clams in Aerobic and Hypoxic Conditions,
W75-12192 5C

KANZAKI PAPER MFG. CO. LTD., HYOGO (JAPAN); AND NIIGATA-ZIMPRO LTD., TOKYO (JAPAN). (ASSIGNEES).
Method for Processing Sludge,
W75-12312 5D

KARLSRUHE UNIV. (WEST GERMANY). CARL ENGLER-UND HANS-BUNTE-INSTITUT FUER MINERALOEL-UND KOHLEFORSCHUNG.
The Impact of Chemical Pollution on Water Utilizationnutzung),. (Chemische Gewaesser-verunreinigung und Wasser
W75-12314 5B

KONINKLIJKE-SHELL EXPLORATIE EN. PRODUKTIE LABORATORIUM, RIJSWIJK (NETHERLANDS).
Displacement Stability of Water Drives in Water-Wet Connate-Water-Bearing Reservoirs,
W75-11870 4B

Tests Show Jet Drilling Has Promise,
W75-11880 8C

KYOTO UNIV. (JAPAN). DEPT. OF CIVIL ENGINEERING.
Transformation System in Flood Runoff Phenomena,
W75-12016 2E

A Study of Long Range Runoff System Response Based on Information Theory,
W75-12018 2A

Systems Simulation of Streamflows,
W75-12024 2E

LAMAR UNIV. BEAUMONT, TEX. DEPT. OF BIOLOGY.
Water Quality and Salt Water Intrusion in the Lower Neches River,
W75-12327 5C

LEE, MEYER AND ASSOCIATES, INC., WESTLAKE VILLAGE, CALIF. (ASSIGNEE).
Sewage Treatment Systems,
W75-12308 5D

LENINGRAD STATE UNIV. (USSR). BIOLOGICAL INST.
Morphology and Ultrastructure of Some Chlorococcal Algae from the Collection pf Algal Strains in Leningrad University. II. Monoraphidium Braunii (Nag, in Kutz.) Komarkova-Legnerova Strain (Gromov) 1967/231,
W75-11997 5C

Morphology and Ultrastructure of Some Chlorococcal Algae from the Collection of Algal Strains in Leningrad University. I. Pseudospongiococcum Protococcoides Gen. Nov., Sp. Nov.,
W75-12000 5C

LIEGE UNIV. (BELGIUM). INSTITUT DE MATHEMATIQUE.
Dispersion and Settling Around a Waste Disposal Point in a Shallow Sea,
W75-12043 5B

LOUGHBOROUGH UNIV. OF TECHNOLOGY (ENGLAND).
Experiments with Unconventional Storm Overflows,
W75-11940 5D

LOUISIANA STATE UNIV., BATON ROUGE. OFFICE OF SEA GRANT DEVELOPMENT.
Overland Flow: Answer to Water Cleanup Challenge.
W75-12228 5D

MACLAREN (JAMES F.) LTD., WILLOWDALE, (ONTARIO).
General Aspects of Water Supply and Treatment in Ontario,
W75-12067 5F

MAINE UNIV. ORONO.
Water Characteristics, (Literature Review),
W75-12073 5A

MANCHESTER UNIV. (ENGLAND). DEPT. OF AGRICULTURAL ECONOMICS.
Fisheries Economics. A Bibliography,
W75-12181 3E

MARATHON OIL CO., LITTLETON, COLO.
A New Approach to Permeability Reduction,
W75-11872 8G

MARITIME ADMINISTRATION, WASHINGTON, D. C.
Maritime Administration Proposed Shore Facility for Treatment and Disposal of Ship Generated Oily Water Wastes.
W75-12256 5D

MARYLAND UNIV., COLLEGE PARK. DEPT. OF ENTOMOLOGY.
Observations of the Guppy, Poecilia Reticulata Peters, in Culex Pipiens Fatigans Breeding Sites in Bangkok, Rangoon, and Taipei,
W75-11989 5G

MARYLAND UNIV., COLLEGE PARK. DEPT. OF POLITICAL SCIENCE.
Enforcing International Law: U.S. Agencies and the Regulation of Oil Pollution in American Waters,
W75-12246 5G

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF CHEMISTRY.
Determination of NTA in Environmental Water by Gas Chromatography,
W75-12363 5A

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF CIVIL ENGINEERING.
The Stochastic Kinematic Wave,
W75-12023 2A

MCGILL UNIV., MONTREAL (QUEBEC).
Errors and Fluctuations of Raingauge Estimates of Areal Rainfall,
W75-11933 7A

MEDITSINSKII INSTITUT, SARATOV (USSR). DEPT. OF GENERAL HYGIENE.
Experimental Data for Establishing the Content of Alpha, Alpha, Beta-Trichloropropionic Acid and its Sodium Salts in Reservoir Water,
W75-12190 5C

METEOROLOGICAL RESEARCH INST., TOKYO (JAPAN). TYPHOON RESEARCH LAB.
Meteoro-Hydrological Aspects of Rainfall in Japan.
W75-12030 2B

MIAMI UNIV., OXFORD, OHIO. DEPT. OF GEOLOGY.
Geochemistry of Strontium in the Scioto River Drainage Basin, Ohio,
W75-12052 2K

MICHIGAN UNIV., ANN ARBOR. DEPT. OF ATMOSPHERIC AND OCEANIC SCIENCE.
Coastwise Currents in the Vicinity of Chicago, and Currents Elsewhere in Southern Lake Michigan,
W75-12161 2H

MILLSAPS COLL., JACKSON, MISS.
Fresh Water Strata of Mississippi as Revealed by Electrical Log Studies,
W75-12399 4B

MINISTRY OF AGRICULTURE, ANTRIM (NORTHERN IRELAND). FRESHWATER BIOLOGICAL INVESTIGATION UNIT.
1974 Annual Report of the Freshwater Biological Investigation Unit.
W75-12008 5C

MINNEAPOLIS WATER WORKS, MINN.
Minneapolis Keeps on Truckin',
W75-12319 5D

MISSISSIPPI UNIV., UNIVERSITY. DEPT. OF ECONOMICS AND FINANCE.
Planning Models for Water System Development in Mississippi Communities,
W75-11851 6D

MISSISSIPPI UNIV., UNIVERSITY. DEPT. OF GEOLOGY AND GEOLOGICAL ENGINEERING.
Relative Throughfall Enrichment by Biologic and by Aerosol-Derived Materials in Loblolly Pines,
W75-11853 5B

MONTANA STATE UNIV., BOZEMAN. DEPT. OF MICROBIOLOGY.
Influence of Environmental Stress on Enumeration of Indicator Bacteria from Natural Waters,
W75-12053 5C

MONTANA UNIV., MISSOULA. DEPT. OF BOTANY.
The Effect of Hydrogen in Concentrations in Simulated Rain on the Moss Tortula Ruralis (HEDW.)Sm,
W75-11987 5C

MWL TOOL AND SUPPLY CO., MIDLAND, TEX.
Running and Cementing Deep Well Liners,
W75-11895 8F

NATIONAL COAL BOARD, LONDON (ENGLAND).
Recent Application of Geophysical Methods in Coal Mining,
W75-12396 8B

NATIONAL GEOGRAPHIC SOCIETY, WASHINGTON, D. C.
A River Restored: Oregon's Willamette,
W75-12210 5G

NATIONAL HURRICANE AND EXPERIMENTAL METEOROLOGY LAB., CORAL GABLES, FLA.
Weather Modification: Where are We Now and Where Should We Be Going. An Editorial Overview,
W75-12088 3B

On the Variability of 'Dynamic Seedability' as a Function of Time and Location Over South Florida: Part I. Spatial Variability,
W75-12089 3B

NATIONAL HURRICANE CENTER, CORAL GABLES, FLA.
A Statistical Study of Tropical Cyclone Positioning Errors with Economic Applications,
W75-12166 2B

NATIONAL INST. OF SCIENTIFIC RESEARCH, QUEBEC.
Daily Fall Activity and Direction of Movements of Fish in Lake Quenouille in the Laurentians, (In French),
W75-12064 2H

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BOULDER, COLO. ENVIRONMENTAL RESEARCH LABS.
The Spatial and Temporal Variations of the Turbulent Fluxes of Heat, Momentum and Water Vapor over Lake Ontario,
W75-12079 2D

STD, Current Meter, and Drogue Observations in Rosario Strait, January - March 1974,
W75-12175 2L

ATIONAL OCEANIC AND ATMOSPHERIC DMINISTRATION, BOULDER, COLO. IARINE ECOSYSTEMS ANALYSIS ROGRAM.
Ocean Dumping in the New York Bight,
W75-12172 5B

ATIONAL OCEANIC AND ATMOSPHERIC DMINISTRATION, CORAL GABLES, FLA. XPERIMENTAL METEOROLOGY LAB.
Comparison of Gage and Radar Methods of Convective Rain Measurement,
W75-12102 2B

ATIONAL OCEANIC AND ATMOSPHERIC DMINISTRATION, MIAMI, FLA. ATLANTIC CEANOGRAPHIC AND METEOROLOGICAL ABS.
Assessment of Offshore Dumping in the New York Bight, Technical Background: Physical Oceanography, Geological Oceanography, and Chemical Oceanography.
W75-12171 5B

TIONAL OCEANIC AND ATMOSPHERIC DMINISTRATION, OAK RIDGE, TENN. AIR SOURCES ATMOSPHERIC TURBULENCE D DIFFUSION LAB.
Environmental Research Laboratories, 1973 Annual Report.
W75-12033 5A

Distribution of Solar Radiation Within a Deciduous Forest,
W75-12034 2I

A Note on the Elevation of the Mean and the Mode of the Gaussian Concentration Distribution,
W75-12035 5A

Lidar vs. Photometer, A One Month Comparison,
W75-12036 5A

Application of a Simple Dispersion Model to a Rural Industrial Region,
W75-12037 5A

The Simple ATDL Urban Air Pollution Model,
W75-12038 5A

Diffusion Estimation for Small Emissions,
W75-12039 5A

IONAL OCEANIC AND ATMOSPHERIC INISTRATION, ROCKVILLE, MD.
Estuarine Sanctuary Grants--Application and Selection Criteria Procedures.
W75-12262 6E

IONAL OCEANIC AND ATMOSPHERIC INISTRATION, WASHINGTON, D.C.
Report to the Congress on Ocean Dumping Research, January Through December 1974 Public Law 92-532, Title II, Section 201.
W75-12173 5B

Marine Sanctuaries.
W75-12261 6E

NATIONAL RESEARCH INST. OF AGRICULTURAL ENGINEERING, HIRATSUKA (JAPAN).
Hydrological Studies of Evapotranspiration and Groundwater Flow in Sandy Land,
W75-12032 2D

NATIONAL RESOURCES DEFENSE COUNCIL, WASHINGTON, D. C.
Land Use Controls Under the Federal Water Pollution Control Act: A Citizen's Guide,
W75-12237 5G

NATIONAL SWEDISH ENVIRONMENT PROTECTION BOARD, STOCKHOLM.
Water Conservation in Sweden: II. Pollution Control,
W75-12317 5G

Composting and use of Compost in Sweden,
W75-12339 5E

NATIONAL WEATHER SERVICE, SALT LAKE CITY, UTAH. WESTERN REGION.
A Study of Flash-Flood Susceptibility -- A Basin in Southern Arizona,
W75-12167 4A

A Study of Flash-Flood Occurrences at a Site Versus Over a Forecast Zone,
W75-12174 2E

NATIONAL WEATHER SERVICE, SILVER SPRING, MD.
Storm Tide Frequencies on the South Carolina Coast,
W75-12160 2L

Estimation of Hurricane Storm Surge in Apalachicola Bay, Florida,
W75-12164 2B

NATIONAL WEATHER SERVICE, SLIDELL, LA. LOWER MISSISSIPPI RIVER FORECAST CENTER.
The Use of a Multizone Hydrologic Model With Distributed Rainfall and Distributed Parameters in the National Weather Service River Forecast System,
W75-12159 2B

NATIONAL WEATHER SERVICE, WASHINGTON, D.C.
The Flood of April 1974 in Southern Mississippi and Southeastern Louisiana,
W75-12170 2E

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
The Development of European Regional Law of the Sea,
W75-12220 6E

NAVAL WEAPONS CENTER, CHINA LAKE, CALIF.
Formation of Graupel,
W75-12093 3B

NEW MEXICO AGRICULTURAL EXPERIMENT STATION, UNIVERSITY PARK.
Life History, Ecology, and Management of the Carp, Cyprinus Carpio Linnaeus, in Elephant Butte Lake.
W75-11972 6B

NEW MEXICO STATE UNIV., UNIVERSITY PARK. DEPT. OF AGRONOMY.
Effect of Hysteresis on the Prediction of Infiltration, Redistribution and Drainage of Water in a Layered Soil,
W75-12041 2G

NEW YORK OCEAN SCIENCE LAB., MONTAUK.
Small Groins on the Shores of Long Island Sound,
W75-12046 8A

NEWPORT CITY ENGINEERS OFFICE, R.I.
Water System of Newport, Rhode Island and its Recent Improvements,
W75-11910 5F

NICOLAS COPERNICUS UNIV. OF TORUN (POLAND). LAB. OF MICROBIOLOGY.
Studies on Metabolic Activity of Benthic Bacteria Isolated from Three Lakes,
W75-11988 5C

NORTH CAROLINA STATE UNIV., RALEIGH. CENTER FOR MARINE COASTAL STUDIES.
A Mini-Project for Avon Harbor, North Carolina,
W75-12045 8A

NORTH DAKOTA STATE UNIV., FARGO. DEPT. OF ZOOLOGY.
Prairie Pothole Ecology and the Feasibility of Growing Rainbow Trout (Salmo Gairdneri Richardson) in Prairie Potholes,
W75-12157 8I

NORTHEAST NUCLEAR ENERGY CO., WATERFORD, CONN. MILLSTONE ENVIRONMENTAL LAB.
Microbiology of a Former Dredge Spoil Disposal Area,
W75-12191 5C

NORTHERN PURIFICATION SERVICES LTD., NORTH VANCOUVER (BRITISH COLUMBIA).
Package Treatment Plants and Factors Affecting Service,
W75-11857 5D

NORTHWESTERN UNIV., EVANSTON, ILL. SCHOOL OF LAW.
A NEPA Settlement: Conservation Council of North Carolina v. Froehlke,
W75-12244 6E

NOTTINGHAM (H.D.) AND ASSOCIATES, INC., MCLEAN, VA.
Wastewater Collection, (Literature Review),
W75-12076 5D

NOVA SCOTIA DEPT. OF PUBLIC HEALTH, HALIFAX. DIV. OF PUBLIC HEALTH ENGINEERING.
Canadian Drinking Water Surveillance Programs, Panel Discussion,
W75-12355 5G

O'BRIEN MFG. CO., INC., CHICAGO, ILL. (ASSIGNEE).
Hydraulic Sewer Pipeline Cleaner,
W75-11944 5D

OAKLAND COUNTY DRAIN COMMISSIONER'S OFFICE, PONTIAC, MICH.
Sediment Basin Design,
W75-12042 2J

OFFICE OF WATER RESOURCES RESEARCH, WASHINGTON, D.C.
Saving Our Water Resources,
W75-12232 6G

OKLAHOMA STATE UNIV., STILLWATER. DEPT. OF AGRICULTURAL ENGINEERING.
Design and Operating Criteria for Rural Water Systems,
W75-12126 6D

OKLAHOMA STATE UNIV., STILLWATER. DEPT. OF BOTANY AND PLANT PATHOLOGY.
Phenolic Compounds of Wheat Leaves Under Drought Stress,
W75-11905 2I

ONTARIO MINISTRY OF HEALTH, TORONTO.
Virological Investigations on Sludges from Selected Ontario Sewage Plants,
W75-12133 5D

ONTARIO MINISTRY OF THE ENVIRONMENT, REXDALE, WATER QUALITY BRANCH.
Application of the Methylthymol Blue Sulfate Method to Water and Wastewater Analysis,
W75-12324 5A

ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO. CONTINGENCY PLANNING SECTION.
Canadian Drinking Water Standards Review, Ontario's Programs, Panel Discussion,
W75-12356 5G

ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO. POLLUTION CONTROL BRANCH.
Alternative Methods of Disinfection,
W75-11858 5D

Operational Variables and Limitations of Direct Filtration,
W75-12127 5F

Regulatory Aspects of Sludge Utilization on Land,
W75-12134 5G

Flow Quantities in Residential Weeping Tile Systems--A Calculational Method,
W75-12328 4A

OREGON STATE DEPT. OF ENVIRONMENTAL QUALITY, PORTLAND.
Oregon Surveys its Hazardous Wastes,
W75-12239 5G

OREGON STATE ENGINEERS OFFICE, SALEM. WATER RESOURCES DEPT.
1974 Water Resources Data for Oregon, Surface Water Records, Precipitation Records,
W75-12087 7C

OSAKA UNIV. (JAPAN). DEPT. OF CIVIL ENGINEERING.
An Application of Simulated Rainfall Models to Forecasting of the Long Term Variation of River Bed,
W75-12028 2J

OTAY MUNICIPAL WATER DISTRICT, SPRING VALLEY, CALIF.
Use of Plastic Pipe for Sewers,
W75-11907 8G

OTTAWA UNIV. (ONTARIO). DEPT. OF BIOLOGY.
Life History Notes and Meristic Variation in the Freshwater Fourspine Stickleback, Apeltes Quadracus (Mitchill), Near Sept-Iles: Quebec,
W75-12176 2I

PACIFIC NORTHWEST WATER LAB., CORVALLIS, OREG.
Effects of Aerial Forest Fertilization With Urea Pellets on Nitrogen Levels in a Mountain Stream,
W75-12113 5B

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. MINE DRAINAGE RESEARCH SECTION.
Coal Mine Drainage Pollution--1973,
W75-12114 5G

PEPPER, HAMILTON AND SCHULTZ, PHILADELPHIA, PA.
Wyandotte and its Progency: The Quest for Environmental Protection through the Original Jurisdiction of the Supreme Court,
W75-12218 5G

PITTSBURGH UNIV., PA. DEPT. OF CIVIL ENGINEERING.
Kernels of Stochastic Linear Hydrologic Systems,
W75-12021 2A

POLISH ACADEMY OF SCIENCES, WARSAW. INST. OF ECOLOGY.
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. XIV. The Relations Between the Fish and Other Biocenotic Components (Summing Up the Studies),
W75-11998 8I

Experimentally Increased Fish Stock in the Pond Type Lake Warniak. VI. Biomass and Production of Phytoplankton,
W75-12013 5C

PRETORIA (SOUTH AFRICA).
Nutrient Removal in Biological Systems,
W75-12321 5D

PURDUE UNIV., LAFAYETTE, IND. WATER RESOURCES RESEARCH CENTER.
The Stochastic and Chronologic Structure of Rainfall Sequences - Application to Indiana,
W75-11854 2B

PYE UNICAM LTD., CAMBRIDGE (ENGLAND).
Observations on the Atomic Absorption Behavior of Some of the Earth Elements,
W75-11862 5A

RESEARCH ADVISORY SERVICE, INC., WESTERN SPRINGS, ILL.
Effluent Treatment for a Small Tannery,
W75-12118 5D

RESOURCE ANALYSIS, INC., CAMBRIDGE, MASS.
A Bayesian Framework for the Use of Regional Information in Hydrology,
W75-12048 6A

RESOURCES FOR THE FUTURE, INC., WASHINGTON, D.C.
Toxic Waters (Discussion of Recent Federal Action Against Water Pollution).
W75-12230 5G

RHODE ISLAND UNIV., KINGSTON. GRADUATE SCHOOL OF OCEANOGRAPHY.
Are We Any Nearer to an International Agreement on Use of the Seas,
W75-12224 6E

RHODES UNIV., GRAHAMSTOWN (SOUTH AFRICA). LEATHER INDUSTRIES RESEARCH INST.
No-Effluent Tannery Processes,
W75-12124 5D

ROBBINSDALE WATER AND SEWER SUPERINTENDENT'S OFFICE, MINN.
Inflatable Plug Cuts Mess, Cleanup on Sewerline ByPass,
W75-11908 8C

ROBERTSHAW CONTROLS CO, RICHMOND, VA.
Screen Retainer Assembly,
W75-11942 8C

ROCKWELL INTERNATIONAL CORP., EL SEGUNDO, CALIF. (ASSIGNEE).
Method of Removing Heavy Metals from Water and Apparatus Therefor,
W75-12304 5D

ROTHAMSTED EXPERIMENTAL STATION, HARPENDEN (ENGLAND).
The Effects of Aerobic and Anaerobic Incubation on the Extractabilities of Heavy Metals in Digested Sewage Sludge,
W75-12330 5D

ROTHERHAM DEPT. OF WATER POLLUTION CONTROL (ENGLAND).
The Use of Storm Tanks for Tertiary Treatment of Sewage,
W75-11941 5D

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N. J. DEPT. OF ENVIRONMENTAL SCIENCE.
A Comparison of the Methods Used to Calculate First Order BOD Equation Constants,
W75-11855 5B

SAINT LUCIA RESEARCH AND CONTROL DEPT., CASTRIES.
Studies on Effects of Cercarial Concentration and Length of Exposure on Infection of Mice by St. Lucian Schistosoma Mansoni Cercariae in a Natural Running-Water Habitat,
W75-11903 5C

SANITARY EPIDEMIOLOGY STATION, KONAKOVO (USSR).
Hygienic Effectiveness of Measures for Treating the Industrial Wastewaters of the Konakovo State Regional Electric Power Plant, (In Russian),
W75-11984 5D

SAVANNAH RIVER ECOLOGY LAB., AIKEN, S.C.
Primary Production in the Plankton Community of a Tropical Lake,
W75-11978 5C

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF.
The Mussel Watch--A First Step in Global Marine Monitoring,
W75-12187 5B

SECRETARY OF AGRICULTURE, WASHINGTON, D.C. (ASSIGNEE).
Recovering Proteins from Waste Water,
W75-12057 5D

SHELL OIL CO., NEW ORLEANS, LA.
Bit Design is Key to Deep Drilling with Turbines,
W75-11889 8C

SIOUX FALLS WATER DEPT., S. DAK.
Clearwell Quality Doesn't Last,
W75-12340 5F

SKIDAWAY INST. OF OCEANOGRAPHY, SAVANNAH, GA.
Oceanographic Observations in the Georgia Bight: Data Report for R.V. EASTWARD Cruises E-13-73 (4-11 September) and E-19-73 (8-9 December 1973),
W75-12169 2L

Impact of Intracoastal Waterway Maintenance Dredging on a Mud Bottom Benthos Community,
W75-12189 5C

SOIL CONSERVATION SERVICE, WASHINGTON, D. C.
Water Bank Program.
W75-12259 6E

SOUTH BURLINGTON WASTE TREATMENT PLANT, N. C.
Digester Gas: Valuable Plant Fuel,
W75-12332 8C

SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY, RAPID CITY. INST. OF ATMOSPHERIC SCIENCES.
A Detailed Microphysical Simulation of Hygroscopic Seeding on the Warm Rain Process,
W75-12090 3B

Hail Suppression Data from Western North Dakota, 1969-1972,
W75-12094 3B

An Explanation for the Unusual Nucleating Ability of Aerosols Produced from the AgI-NH4I-Acetone System,
W75-12100 3B

Analysis of Radar Observations of a Randomized Cloud Seeding Experiment,
W75-12101 3B

Evaluation by Monte Carlo Tests of Effects of Cloud Seeding on Growing Season Rainfall in North Dakota,
W75-12106 3B

SOUTHAMPTON UNIV. (ENGLAND). DEPT. OF ECONOMICS.
International Economics and Environment Control,
W75-12178 6G

SOUTHEAST MISSOURI STATE UNIV., CAPE GIRARDEAU. DEPT. OF BIOLOGY.
Distribution of Aquatic Macrophytes Related to Paper Mill Effluents in a Southern Michigan Stream,
W75-11991 2B

SRI VENKATESWARA UNIV., TIRUPATI (INDIA). DEPT. OF CIVIL ENGINEERING.
A Practical Proportional Weir,
W75-11937 8C

STANDARD PRODUCTS CO., CLEVELAND, OHIO. (ASSIGNEE).
Waste Disposal System,
W75-12185 5D

STANFORD UNIV., CALIF. DEPT. OF GEOPHYSICS.
Water-Level Fluctuations and Earthquakes on the San Andreas Fault Zone,
W75-12392 4B

STATE UNIV. OF NEW YORK, BUFFALO. DEPT. OF CIVIL ENGINEERING.
Predictive Models for Great Lakes Hydrology,
W75-12049 2A

STOCKHOLM UNIV. (SWEDEN). ARRHENIUS LAB.
The Uptake and Utilization of Organic Carbon by Algae: An Essay in Comparative Biochemistry,
W75-11980 5C

STOCKHOLM UNIV. (SWEDEN). BOTANY INST.
Effects of the Commercial Polychlorinated Biphenyl Mixture Aroclor 1242 on Growth, Viability, Phosphate Uptake, Respiration and Oxygen Evolation in Scenedesmus,
W75-11974 5C

SUFFOLK COUNTY DEPT. OF BUILDINGS AND GROUNDS, NEW YORK.
Yaphank County Center Wastewater Treatment Plant.
W75-11924 5D

SUN OIL CO., TOLEDO, OHIO.
Bio-Oxidation Process Saves H20,
W75-12115 5D

SWECO, INC., LOS ANGELES, CALIF. (ASSIGNEE).
Up-Flow Separator,
W75-11936 5D

SYRACUSE UNIV., N. Y. COLL. OF LAW.
Liability for Oil Pollution Disasters: International Law and the Delimitation of Competences in a Federal Policy,
W75-12235 5G

TALBOT (F. W.) CO. LTD., WINCHESTER (ENGLAND). (ASSIGNEE).
Apparatus, for and Method of Controlling Flow of Fluids in a Pipeline,
W75-11932 8B

TENNESSEE UNIV., KNOXVILLE. DEPT. OF CIVIL ENGINEERING.
Inorganics, (Literature Review),
W75-12072 5A

TENNESSEE VALLEY AUTHORITY, KNOXVILLE. FLOOD CONTROL BRANCH.
Corps' Guidelines for Dam Safety Inspection Need Revamping,
W75-12241 8A

TENNESSEE VALLEY AUTHORITY, MUSCLE SHOALS, ALA. ENVIRONMENTAL BIOLOGY BRANCH.
Effect of 2,4-D and Various Salts on Eurasian Watermilfoil.
W75-11990 4A

TEXAS PARKS AND WILDLIFE DEPT., AUSTIN.
Effects of Oilfield Brine on Marine Organisms, an Ecological Evaluation of the Aransas Bay Area, Job No. 1,
W75-11864 5C

TEXAS UNIV. AT AUSTIN. DEPT. OF BOTANY.
Endocytosis of Microcystis Aeruginosa by Ochromonas Danica,
W75-11985 5C

TEXAS UNIV., AT AUSTIN. DEPT. OF CIVIL ENGINEERING.
Numerical Simulation of Watershed Hydrology,
W75-12027 2A

TEXAS UNIV. AT AUSTIN. DEPT. OF GEOLOGICAL SCIENCES.
Diurnal Fluctuations of Water Tables Induced by Atmospheric Pressure Changes,
W75-12077 2G

TEXAS UNIV. AT DALLAS, RICHARDSON. INST. FOR ENVIRONMENTAL SCIENCES.
Response of Lake Superior Algae to Nutrients and Taconite Tailings,
W75-11976 5C

THOUSAND OAKS UTILITIES DEPT., CALIF.
Computer's Master Plan Signals Sewer Problems Before They Start,
W75-11928 7C

TOKYO INST. OF TECH. (JAPAN). DEPT. OF CIVIL ENGINEERING.
Nonlinear Runoff Kernels of Hydrologic System,
W75-12019 2A

TOKYO (JAPAN). SEWERAGE BUREAU.
Recent Developments of Instrumentation, Control and Automation Systems for Wastewater Treatment Systems,
W75-12341 5D

TOKYO SEWERAGE BUREAU (JAPAN).
Mathematical Models and Simulation of Wastewater Treatment Systems,
W75-12156 5D

TOKYO UNIV., (JAPAN). DEPT. OF CIVIL ENGINEERING.
Effects of Movement of Precipitation Area Upon Runoff Phenomena,
W75-12026 2A

TORONTO UNIV. (ONTARIO). DEPT. OF BOTANY.
The Water Relations of Hemlock (Tsuga Canadensis): I. Some Equilibrium Water Relations as Measured by the Pressure-Bomb Technique,
W75-11900 2I

The Water Relations of Hemlock (Tsuga Canadensis): II. The Kinetics of Water Exchange Between the Symplast and Apolast,
W75-11901 2I

The Water Relations of Hemlock (Tsuga Canadensis): III. The Temperature Dependence of Water Exchange in a Pressure Bomb,
W75-11902 2I

TORONTO UNIV. (ONTARIO). DEPT. OF GEOLOGY; AND TORONTO UNIV. (ONTARIO). DEPT. OF CHEMISTRY,
Analysis of Heavy Metals in Sewage Sludge and Liquids Associated with Sludges,
W75-12140 5A

TULSA UNIV., OKLA.
Bacterial Processes for Improved Oil Recovery.
W75-12391 2F

TURNER, COLLIE AND BRADEN, INC., HOUSTON, TEX.; AND ARMY ENGINEER DISTRICT, GALVESTON, TEX.
Flood Plain Information: Onion Creek, Austin, Texas.
W75-12374 4A

UNION BANK AND TRUST CO., MONTGOMERY, ALA.
The Water Pollution Permitting System,
W75-12245 5G

UNIVERSAL OIL PRODUCTS, ST. PAUL, MINN. JOHNSON DIV.
Careful Sample Taking is Key to Successful Wells,
W75-11881 8G

UNIVERSITY COLL. OF SWANSEA (WALES). DEPT. OF CHEMICAL ENGINEERING.
The Relationship Between Process Configuration and Process Performance,
W75-12152 5D

**UNIVERSITY COLL. OF WALES, ABERYSTWYTH. DEPT. OF ECONOMICS.**
Input-Output Analysis and the Environment,
W75-12177 6G

**UNIVERSITY OF WALES INST. OF SCIENCE AND TECH., CARDIFF.**
The Risk of Deoxygenation of Water in Herbicide Application for Aquatic Weed Control,
W75-11996 5A

**UTAH STATE UNIV., LOGAN.**
Organic Residue in a Recycled Effluent, Part I,
W75-12348 5D

**UTAH WATER RESEARCH LAB., LOGAN.**
Simulation of the Short-Time Scour-Fill Process in Erodible Streams with Stochastic Sediment Transfer at the Stream Bed,
W75-12029 2J

**VANDERBILT UNIV., NASHVILLE, TENN.**
The Influence of Oxygen Concentration and Turbulence Intensity on Complete-Mix Activated Sludge Performance,
W75-12155 5D

**VICTORIA UNIV. (BRITISH COLUMBIA). DEPT. OF BIOLOGY.**
Emigration of the Peamouth Chub, Mylocheilus Caurinus, Across a Dilute Seawater Bridge: An Experimental Zoogeographic Study,
W75-12151 2L

**VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.**
Principles and Techniques for Conditioning of Waste-Activated Sludge by Direct Slurry Freezing,
W75-12154 5D

**VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF BIOLOGY.**
An Ecological Evaluation of Heated Water Discharge on Phytoplankton Blooms in the Potomac River,
W75-12004 5C

**VIRGINIA UNIV., CHARLOTTESVILLE. DEPT. OF ENVIRONMENTAL SCIENCES; AND VIRGINIA UNIV., CHARLOTTESVILLE. CENTER FOR ADVANCED STUDIES.**
Florida Area Cumulus Experiments 1970-1973 Rainfall Results,
W75-12091 3B

On the Design and Evaluation of Cumulus Modification Experiments,
W75-12105 3B

**VIRGINIA UNIV., CHARLOTTSVILLE.**
International Law, U.S. Seabeds Policy and Ocean Resource Development,
W75-12214 6E

**VOLGOGRAD AGRICULTURAL INST. (USSR).**
Fungus Diseases of Wheat on Irrigated Lands. (In Russian),
W75-11904 2I

**VSESOYUZNYI INSTITUT RASTENIEVODSTVA, LENINGRAD (USSR).**
Phosphorus Metabolism and Respriration in Wheat Leaves and Roots in the Case of Water Defiency, (In Russian),
W75-12362 3F

**VSESOYUZNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT GIGIENI I TOKSIKOLOGII PESTITSIDOV, KIEV (USSR).**
Determination of Residual Quantities of the Butyl Ester of 2,4-Dichlorophenoxyacetic Acid in Environmental Objects by Gas-Liquid Chromatography, (In Russian),
W75-12393 5A

**VTN, INC., ORLANDO, FLA.**
Effective Use of High Water Table Areas for Sanitary Landfill. Volume I,
W75-12111 5E

**WABASH COLL., CRAWFORDSVILLE, IND. DEPT. OF BIOLOGY.**
Detergent Phosphorus and Algal Growth,
W75-12001 5C

**WARSAW UNIV. (POLAND). ZOOLOGICAL INST.**
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. XIII. Distribution and Biomass of the Lemnaceae and the Fauna Associated with Them,
W75-12009 8I

**WARWICK UNIV., COVENTRY (ENGLAND). DEPT. OF ECONOMICS.**
Externalities and Public Goods. A Bibliography,
W75-12179 6B

**WASHINGTON UNIV., SEATTLE. DEPT. OF ATMOSPHERIC SCIENCES.**
The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part I: Natural Conditions,
W75-12096 3B

The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part II: Techniques for the Physical Evaluation of Seeding,
W75-12108 3B

The Nature of Winter Clouds and Precipitation in the Cascade Mountains and Their Modification by Artificial Seeding. Part III: Case Studies of the Effects of Seeding,
W75-12109 3B

**WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).**
The Effect of Legislation of the Future Use of Water in the Leather Industry,
W75-12112 5D

**WATER TECHNOLOGY SERVICE, INC., CLEVELAND, OHIO. (ASSIGNEE).**
Water Treatment Device,
W75-12305 5F

**WEATHER BUREAU, WASHINGTON, D.C. HYDROMETEOROLOGICAL SECTION.**
Interim Report, Probable Maximum Precipitation in California.
W75-12165 2B

**WESSEX WATER AUTHORITY (ENGLAND). AVON AND DORSET RECOVERY DIV.**
Berry Hill Sludge Treatment Works,
W75-12150 5D

Energy Conservation: An Essential and Urgent Problem for the Water Industry,
W75-12334 5D

**WESTERN KENTUCKY UNIV., BOWLING GREEN. DEPT. OF ENGINEERING TECHNOLOGY.**
Treatment Plant to be Tested for Carcinogens,
W75-12130 5F

**WISCONSIN DEPT. OF NATURAL RESOURCES, MADISON. BUREAU OF WATER QUALITY.**
Classification of Wisconsin Lakes by Trophic Condition.
W75-11979 5C

**WISCONSIN UNIV., MADISON.**
Are Chemicals Used Algae Control Biodegradable.
W75-12325 5C

**WISCONSIN UNIV., MADISON. INST. FOR ENVIRONMENTAL STUDIES.**
Photographic Quantification of Water Quality in Mixing Zones,
W75-11970 5A

**WISCONSIN UNIV., MADISON. WATER RESOURCES MANAGEMENT PROGRAM.**
Hydrogeological Aspects of Solid Waste Disposal,
W75-12121 5E

**WISCONSIN UNIV., MILWAUKEE. CENTER FOR GREAT LAKES STUDIES.**
Limnology of Lakes of the Sylvania Recreation Area, Ottawa National Forest,
W75-11981 2H

**WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.**
Understanding the Ocean Science Debate,
W75-12223 6E

Nitrogen, Phosphorus, and Eutrophication in the Coastal Marine Environment,
W75-12236 5C

**WOODWARD-CLYDE CONSULTANTS, CLIFTON, N.J.**
The Use of a Specialized Drilling and Ground Water Sampling Technique for Delineation of Hexavalent Chromium Contamination in an Unconfined Aquifer, Southern New Jersey Coastal Plain,
W75-11899 5A

**YALE UNIV., NEW HAVEN, CONN. DEPT. OF BIOLOGY.**
Growth of the Green Alga Codium Fragile in a Connecticut Estuary,
W75-12051 5C

**ZAGREB UNIV. (YUGOSLAVIA). INST. OF PHYSICAL CHEMISTRY.**
On The Comparison of Reverse Osmosis Membrane Performance,
W75-12347 3A

# ACCESSION NUMBER INDEX


W75-11851 6D
W75-11852 5D
W75-11853 5B
W75-11854 2B
W75-11855 5B
W75-11856 5D
W75-11857 5D
W75-11858 5D
W75-11859 5D
W75-11860 5D
W75-11861 5D
W75-11862 5A
W75-11863 5C
W75-11864 5C
W75-11865 8C
W75-11866 8C
W75-11867 8C
W75-11868 8C
W75-11869 8C
W75-11870 4B
W75-11871 5G
W75-11872 8G
W75-11873 8G
W75-11874 4B
W75-11875 8B
W75-11876 8H
W75-11877 8G
W75-11878 4B
W75-11879 4B
W75-11880 8C
W75-11881 8G
W75-11882 4B
W75-11883 2I
W75-11884 8C
W75-11885 8C
W75-11886 8F
W75-11887 8B
W75-11888 8G
W75-11889 8C
W75-11890 3B
W75-11891 4B
W75-11892 4B
W75-11893 8B
W75-11894 4B
W75-11895 8F
W75-11896 8G
W75-11897 8C
W75-11898 8G
W75-11899 5A
W75-11900 2I
W75-11901 2I
W75-11902 2I
W75-11903 5C
W75-11904 2I
W75-11905 2I
W75-11906 8B
W75-11907 8G
W75-11908 8C
W75-11909 5F
W75-11910 5F
W75-11911 8H
W75-11912 5D
W75-11913 3B
W75-11914 5A
W75-11915 7B
W75-11916 8G
W75-11917 4A
W75-11918 5D
W75-11919 5D
W75-11920 5D
W75-11921 5D
W75-11922 4A
W75-11923 5D
W75-11924 5D
W75-11925 4D
W75-11926 5D
W75-11927 7C
W75-11928 7C
W75-11929 2E
W75-11930 5D
W75-11931 5D
W75-11932 8B
W75-11933 7A
W75-11934 8G
W75-11935 5F
W75-11936 5D
W75-11937 8C
W75-11938 8B
W75-11939 5G
W75-11940 5D
W75-11941 5D
W75-11942 8C
W75-11943 7C
W75-11944 5D
W75-11945 8G
W75-11946 4A
W75-11947 5D
W75-11948 7B
W75-11949 8A
W75-11950 5D
W75-11951 6C
W75-11952 5C
W75-11953 5A
W75-11956 4B
W75-11957 4B
W75-11958 4B
W75-11959 4A
W75-11960 9D
W75-11961 5A
W75-11962 7C
W75-11963 4B
W75-11964 7C
W75-11965 7C
W75-11966 7C
W75-11967 7C
W75-11968 7C
W75-11969 7C
W75-11970 5A
W75-11971 5C
W75-11972 6B
W75-11973 5C
W75-11974 5C
W75-11975 5C
W75-11976 5C
W75-11977 5G
W75-11978 5C
W75-11979 5C
W75-11980 5C
W75-11981 2H
W75-11982 5C
W75-11983 5B
W75-11984 5D
W75-11985 5C
W75-11986 5C
W75-11987 5C
W75-11988 5C
W75-11989 5G
W75-11990 4A
W75-11991 2B
W75-11992 5C
W75-11993 8I
W75-11994 5C
W75-11995 5C
W75-11996 5A
W75-11997 5C
W75-11998 8I
W75-11999 2H
W75-12000 5C
W75-12001 5C
W75-12002 5C
W75-12003 4A
W75-12004 5C
W75-12005 5C
W75-12006 5C
W75-12007 5C
W75-12008 5C
W75-12009 8I
W75-12010 5C
W75-12011 5F
W75-12012 5C
W75-12013 5C
W75-12014 2A
W75-12015 2A
W75-12016 2E
W75-12017 2A
W75-12018 2A
W75-12019 2A
W75-12020 2A
W75-12021 2A
W75-12022 2A
W75-12023 2A
W75-12024 2E
W75-12025 2A
W75-12026 2A
W75-12027 2A
W75-12028 2J
W75-12029 2J
W75-12030 2B
W75-12031 2A
W75-12032 2D
W75-12033 5A
W75-12034 2I
W75-12035 5A
W75-12036 5A
W75-12037 5A
W75-12038 5A
W75-12039 5A
W75-12040 4B
W75-12041 2G
W75-12042 2J
W75-12043 5B
W75-12044 2G
W75-12045 8A
W75-12046 8A
W75-12047 5B
W75-12048 6A
W75-12049 2A
W75-12050 2G
W75-12051 5C
W75-12052 2K
W75-12053 5C
W75-12054 5F
W75-12055 3F
W75-12056 5D
W75-12057 5D
W75-12058 5D
W75-12059 5D
W75-12060 5D
W75-12061 5D
W75-12062 3E
W75-12063 5D
W75-12064 2H
W75-12065 5D
W75-12066 5D
W75-12067 5F
W75-12068 5D
W75-12069 5D
W75-12070 5B
W75-12071 5B
W75-12072 5A
W75-12073 5A
W75-12074 5D
W75-12075 5D
W75-12076 5D
W75-12077 2G
W75-12078 2H
W75-12079 2D
W75-12080 2F
W75-12081 2G
W75-12082 2D
W75-12083 2G
W75-12084 2G
W75-12085 6D
W75-12086 3F
W75-12087 7C
W75-12088 3B
W75-12089 3B
W75-12090 3B
W75-12091 3B
W75-12092 3B
W75-12093 3B
W75-12094 3B
W75-12095 3B
W75-12096 3B
W75-12097 4B
W75-12098 3B
W75-12099 3B
W75-12100 3B
W75-12101 3B
W75-12102 2B
W75-12103 3B
W75-12104 3B
W75-12105 3B
W75-12106 3B
W75-12107 3B
W75-12108 3B
W75-12109 3B
W75-12110 2B
W75-12111 5E
W75-12112 5D
W75-12113 5B
W75-12114 5G
W75-12115 5D
W75-12116 5G
W75-12117 5G
W75-12118 5D
W75-12119 5B
W75-12120 5D
W75-12121 5E
W75-12122 5E
W75-12123 5D
W75-12124 5D
W75-12125 5D
W75-12126 6D
W75-12127 5F
W75-12128 5D
W75-12129 2I
W75-12130 5F
W75-12131 2I
W75-12132 5D
W75-12133 5D
W75-12134 5G
W75-12135 5D
W75-12136 5B
W75-12137 5B
W75-12138 5D
W75-12139 5B
W75-12140 5A
W75-12141 5D
W75-12142 5A
W75-12143 5D
W75-12144 5D
W75-12145 5G
W75-12146 5F
W75-12147 5F
W75-12148 5D
W75-12149 5D
W75-12150 5D
W75-12151 2L
W75-12152 5D
W75-12153 5D
W75-12154 5D
W75-12155 5D
W75-12156 5D
W75-12157 8I
W75-12158 5B
W75-12159 2B
W75-12160 2L
W75-12161 2H
W75-12162 2C
W75-12163 2L
W75-12164 2B

W75-12165 2B
W75-12166 2B
W75-12167 4A
W75-12168 2C
W75-12169 2L
W75-12170 2E
W75-12171 5B
W75-12172 5B
W75-12173 5B
W75-12174 2E
W75-12175 2L
W75-12176 2I
W75-12177 6G
W75-12178 6G
W75-12179 6B
W75-12180 6B
W75-12181 3E
W75-12182 6G
W75-12183 5G
W75-12184 3F
W75-12185 5D
W75-12186 3E
W75-12187 5B
W75-12188 5C
W75-12189 5C
W75-12190 5C
W75-12191 5C
W75-12192 5C
W75-12193 5A
W75-12194 5G
W75-12195 6G
W75-12196 3E
W75-12197 4A
W75-12198 5G
W75-12199 4B
W75-12200 6E
W75-12201 5G
W75-12202 5G
W75-12203 6G
W75-12204 6G
W75-12205 6E
W75-12206 6G
W75-12207 6G
W75-12208 2G
W75-12209 5G
W75-12210 5G
W75-12211 6G
W75-12212 5G
W75-12213 5G
W75-12214 6E
W75-12215 6E
W75-12216 5B
W75-12217 6E
W75-12218 5G
W75-12219 6E
W75-12220 6E
W75-12221 5G
W75-12222 5G
W75-12223 6E
W75-12224 6E
W75-12225 5G
W75-12226 5G
W75-12227 6F
W75-12228 5D
W75-12229 5G
W75-12230 5G
W75-12231 6G
W75-12232 6G
W75-12233 5G
W75-12234 5G
W75-12235 5G
W75-12236 5C
W75-12237 5G
W75-12238 5G
W75-12239 5G
W75-12240 2G
W75-12241 8A
W75-12242 5G
W75-12243 5G
W75-12244 6E
W75-12245 5G
W75-12246 5G
W75-12247 6E
W75-12248 5G
W75-12249 6E
W75-12250 6E
W75-12251 4B
W75-12252 6E
W75-12253 6E
W75-12254 5G
W75-12255 5E
W75-12256 5D
W75-12257 5D
W75-12258 8A
W75-12259 6E
W75-12260 5G
W75-12261 6E
W75-12262 6E
W75-12263 6E
W75-12264 5G
W75-12265 5G
W75-12266 5G
W75-12267 5G
W75-12268 5G
W75-12269 5G
W75-12270 5G
W75-12271 5G
W75-12272 5G
W75-12273 5G
W75-12274 5G
W75-12275 5G
W75-12276 5G
W75-12277 5D
W75-12278 6E
W75-12279 6E
W75-12280 6E
W75-12281 6E
W75-12282 6E
W75-12283 6E
W75-12284 6E
W75-12285 6E
W75-12286 6E
W75-12287 6E
W75-12288 6E
W75-12289 6E
W75-12290 6E
W75-12291 6E
W75-12292 6E
W75-12293 6E
W75-12294 6E
W75-12295 6E
W75-12296 6E
W75-12297 6E
W75-12298 6E
W75-12299 6E
W75-12300 5F
W75-12301 3B
W75-12302 3F
W75-12303 3F
W75-12304 5D
W75-12305 5F
W75-12306 5B
W75-12307 3D
W75-12308 5D
W75-12309 3F
W75-12310 3F
W75-12311 3A
W75-12312 5D
W75-12313 5D
W75-12314 5B
W75-12315 5F
W75-12316 5B
W75-12317 5G
W75-12318 5D
W75-12319 5D
W75-12320 5F
W75-12321 5D
W75-12322 5D
W75-12323 2I
W75-12324 5A
W75-12325 5C
W75-12326 5A
W75-12327 5C
W75-12328 4A
W75-12329 8B
W75-12330 5D
W75-12331 5G
W75-12332 8C
W75-12333 5D
W75-12334 5D
W75-12335 6E
W75-12336 5G
W75-12337 6G
W75-12338 8G
W75-12339 5E
W75-12340 5F
W75-12341 5D
W75-12342 5E
W75-12343 8C
W75-12344 2G
W75-12345 8C
W75-12346 5F
W75-12347 3A
W75-12348 5D
W75-12349 5D
W75-12350 5F
W75-12351 5D
W75-12352 5D
W75-12353 5D
W75-12354 5G
W75-12355 5G
W75-12356 5G
W75-12357 5G
W75-12358 5G
W75-12359 5G
W75-12360 5F
W75-12361 5D
W75-12362 3F
W75-12363 5A
W75-12364 5D
W75-12365 6F
W75-12366 4A
W75-12367 4A
W75-12368 4A
W75-12369 4A
W75-12370 4A
W75-12371 4
W75-12372 2E
W75-12373 2E
W75-12374 4A
W75-12375 4A
W75-12376 4A
W75-12377 4A
W75-12378 4A
W75-12379 4A
W75-12380 8B
W75-12381 2F
W75-12382 8E
W75-12383 8E
W75-12384 8E
W75-12385 8G
W75-12386 4B
W75-12387 8E
W75-12388 8B
W75-12389 8E
W75-12390 8B
W75-12391 2F
W75-12392 4B
W75-12393 5A
W75-12394 8F
W75-12395 4B
W75-12396 8B
W75-12397 8B
W75-12398 8G
W75-12399 4B
W75-12400 2F
W75-19954 7C
W75-19955 5A

# ABSTRACT SOURCES

| OURCE | ACCESSION NUMBER | TOTAL |
|---|---|---|
| . CENTERS OF COMPETENCE | | |
| Cornell University, Policy Models for Water Resources Systems | W75-12054 | 1 |
| Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology | W75-11856--11861<br>11906--11951<br>12065--12076<br>12126--12128<br>12130<br>12132--12150<br>12152--12156<br>12314--12322<br>12324--12343<br>12345--12359 | 136 |
| Illinois State Water Survey, Hydrology | W75-12014--12050<br>12052<br>12077--12110 | 72 |
| National Water Well Association, Water Well Construction Technology | W75-11865--11899<br>11952<br>12380--12392<br>12394--12400 | 56 |
| University of Florida, Eastern U. S. Water Law | W75-12194--12207<br>12209--12215<br>12217--12239<br>12241--12299 | 103 |
| University of North Carolina, Metropolitan Water Resources Planning and Management | W75-12360--12361<br>12364--12379 | 18 |
| University of Wisconsin, Eutrophication | W75-11970--11972<br>11974--11976<br>11978--11982<br>11985--11986<br>11988<br>11990--11994<br>11996--12002<br>12004--12013<br>12053<br>12157--12158 | 39 |
| Water Resources Economics | W75-12177--12182 | 6 |

| SOURCE | ACCESSION NUMBER | TOTAL |
|---|---|---|
| B. STATE WATER RESOURCES RESEARCH INSTITUTES | W75-11851--11855 | 5 |
| C. OTHER | | |
| BioSciences Information Service | W75-11900--11905<br>11973, 11977<br>11983--11984<br>11987, 11989<br>11995, 12003<br>12051, 12055<br>12064, 12129<br>12131, 12151<br>12176, 12208<br>12216, 12240<br>12323, 12344<br>12362--12363<br>12393 | 29 |
| Effects of Pollutants on Aquatic Life (Katz) | W75-11864<br>12187--12193 | 8 |
| National Oceanic and Atmospheric Administration | W75-12159--12175 | 17 |
| Ocean Engineering Information Service (Patents) | W75-12056--12063<br>12183--12186<br>12300--12313 | 26 |
| U. S. Geological Survey | W75-11954--11969 | 16 |
| Vanderbilt University, Metals Pollution | W75-11862--11863<br>11953 | 3 |

U S GOVERNMENT PRINTING OFFICE · 1976 O - 210-951 (10

# CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey and the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

## Subject Fields

- 1 NATURE OF WATER
- 2 WATER CYCLE
- 3 WATER SUPPLY AUGMENTATION AND CONSERVATION
- 4 WATER QUANTITY MANAGEMENT AND CONTROL
- 5 WATER QUALITY MANAGEMENT AND PROTECTION
- 6 WATER RESOURCES PLANNING
- 7 RESOURCES DATA
- 8 ENGINEERING WORKS
- 9 MANPOWER, GRANTS, AND FACILITIES
- 10 SCIENTIFIC AND TECHNICAL INFORMATION

## INDEXES

- SUBJECT INDEX
- AUTHOR INDEX
- ORGANIZATIONAL INDEX
- ACCESSION NUMBER INDEX
- ABSTRACT SOURCES

**U.S. DEPARTMENT OF COMMERCE**
**National Technical Information Service**
5285 Port Royal Road
Springfield, VA 22161

OFFICIAL BUSINESS
**PRINTED MATTER**

AN EQUAL OPPORTUNITY EMPLOYER

U.S. MAIL
POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE

John Littlewood
Documents Division
220 D Library
Champaign Ill. 61820

UNIVERSITY OF ILLINOIS-URBANA
3 0112 084232468